

### C. AES Licensing Considerations

47. In establishing a new regulatory framework for AMSS, we endeavor to craft rules that will minimize licensees' regulatory burden. Therefore, we invite commenters to identify, either generally or in connection with specific proposals, any licensing methods that may simplify and speed the licensing process, while still addressing our core regulatory concern with avoiding harmful interference.

48. *Blanket licensing.* We are proposing that AMSS networks operate under the direct control of a Network Control and Monitoring Center (NCMC) located within the United States.<sup>126</sup> The individual AES stations can operate anywhere in the satellite footprint. We seek comment on whether AES terminals should be permitted to operate under blanket licensing rules<sup>127</sup> that are similar to those under which VSATs and ESVs operate.<sup>128</sup> Boeing advocates the blanket licensing approach in its Petition.<sup>129</sup> Generally, blanket licensing for VSATs requires applicants to request a single license for the overall earth station network including the hub earth station and remote earth stations without site-specific information on each remote earth station.<sup>130</sup> As with ESVs, AMSS networks may or may not require the licensing of a hub earth station, however.<sup>131</sup> We propose that we will issue an AMSS system license (consisting of a hub, located in the U.S., and/or blanket earth station license) to applicants who demonstrate that they are capable of controlling all aspects of the AMSS network. Whether or not an applicant requests hub authority, we propose that the system license will also require that the licensee maintain in the United States both a NCMC and a 24 hours a day, seven days a week point of contact. We believe that, by making the AMSS system licensee responsible for meeting the operational considerations we propose, we ensure the protection of other in-band and out-of-band licensees.

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<sup>126</sup> See *supra* para. 42.

<sup>127</sup> Routine Licensing of Large Networks of Small Antenna Earth Stations Operating in the 12/14 GHz Frequency Bands, *Declaratory Order*, 1986 WL291567 at paras. 4-6 ("*VSAT Order*"). A Form 312 is required for each large (*i.e.*, diameter of 5 meters or more) hub station in addition to one Form 312 for each representative type of small (*i.e.*, diameter of less than 5 meters) earth terminal to be employed in the network. *Id.*

<sup>128</sup> See 47 C.F.R. § 25.134 and *ESV Report and Order* at paras. 114-17.

<sup>129</sup> Boeing Petition at 21.

<sup>130</sup> The satellites used in an AMSS network must be authorized to serve the United States. If an AMSS network operator proposes to communicate with a non-U.S.-licensed satellite the AMSS operator would be required to receive a case-by-case authorization to access the non-U.S. satellite. Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Satellites Providing Domestic and International Service in the United States, *Report and Order*, 12 FCC Rcd 24094 (1997) ("*DISCO II*"). AMSS providers operating a network out of the United States would have to get Commission authorization for four situations: access to U.S. satellites; access to non-U.S. satellites; service to U.S. aircraft; and service to non-U.S. aircraft.

<sup>131</sup> For example, Boeing's current non-conforming use AMSS authorization is only for the remote terminals. Boeing did not seek authority to operate a fixed hub. The Bureau required that Boeing's AES terminals be monitored and controlled by the NCMC. In such an AMSS system, transmissions between the satellite and the ground are carried out using one or more fixed Earth station hubs that are separately licensed by the Commission. See *Boeing Transmit-Receive Order*, 16 FCC Rcd at 22654, paras. 3, 19. See also *ESV Report and Order* at paras. 114-17 (noting that an ESV system license consists of "a hub and/or blanket earth station license").

49. We consider blanket licensing for AES terminals because the number and mobility of AES locations would make it impractical to license AES terminals on a site-by-site basis. Under a blanket licensing approach, applicants would be required to file a narrative describing the overall system operation as well as specific information on the antennas, power density, and emission characteristics for each class of earth station comprising the network. We propose requiring a point of contact to maintain information about the location of aircraft and the frequencies that they use. After the applicant submits point of contact and other relevant information, the Commission can then issue a blanket authorization for the system, which would encompass each hub station in the United States and/or each class of the AES terminals.<sup>132</sup>

50. We also seek comment on whether we should provide for the licensing of individual earth stations, using the same technical criteria that are applied to the antennas in a blanket-licensed AMSS network.<sup>133</sup> Although we believe that demand for such uses will be limited, we seek comment on whether there are any specific rule provisions that might be required to address such cases. In addition, we invite comment regarding any modifications to FCC Form 312 that might be necessary to accommodate applications for AMSS systems.<sup>134</sup>

51. *ALSAT authority.* We also seek comment on whether we should authorize Ku-band AMSS operators to operate with any U.S.-licensed satellite (*i.e.* ALSAT authority<sup>135</sup>) and non-U.S. satellites on the Permitted List using the parameters consistent with earth stations, specifically that the AES terminals comply with the proposed off-axis EIRP density requirements proposed herein. Or, for reasons relating to potential interference to two-degree spaced satellites, should AMSS operators be granted authority to access individual satellites only? Boeing argues that no technical reason exists to prohibit Ku-band AMSS from operating pursuant to ALSAT authority because these systems must be compliant with the Commission's 2-degree spacing rules, and cannot interfere with adjacent satellite operators.<sup>136</sup> In the *Part 25 Earth Station* proceeding, the Commission proposed a procedure under which ALSAT authority is not available to FSS earth station applicants whose operations must be coordinated with adjacent

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<sup>132</sup> See *VSAT Order*, 1986 WL291567 at para. 20.

<sup>133</sup> Specifically, we seek comment on whether to license AES terminals on an individual basis pursuant to the proposed off-axis EIRP requirements discussed in Section III.B.1.a. of this NPRM.

<sup>134</sup> Applications for new or modified transmitting and/or receiving earth stations must be filed on FCC Form 312. See 47 C.F.R. §§ 25.130, 25.131.

<sup>135</sup> "ALSAT" means "all U.S.-licensed space stations." Originally, under an ALSAT earth station license, an earth station operator providing fixed-satellite service in the conventional C- and Ku-bands could access any U.S. satellite without additional Commission action, provided that those communications are in accordance with the same technical parameters and conditions established in the earth stations' licenses. See 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, *Report and Order*, IB Docket No. 96-111, 15 FCC Rcd 7207, 7210-11, at para. 6 (1999) (*DISCO II First Reconsideration Order*). The *DISCO II First Reconsideration Order* expanded ALSAT earth station licenses to allow access to any satellite on the Permitted List. *DISCO II First Reconsideration Order*, 15 FCC Rcd at 7215-16 (para. 19).

<sup>136</sup> Boeing Petition at 23-24. Boeing adds that AMSS's secondary status reinforces that no interference risk exists for adjacent satellites. *Id.* at 24.

satellite operators.<sup>137</sup> Similarly, in the event that we decide to apply that procedure to AMSS applicants, ALSAT authority would not be available to those AMSS applicants whose operations must be coordinated with adjacent satellite operators, especially if the AES terminals exceed the proposed off-axis EIRP density requirements.<sup>138</sup> We seek comment on this tentative conclusion.

52. *License term.* Other licensed networks of earth stations have fifteen-year license terms.<sup>139</sup> In the context of Ku-band AMSS operations, we seek comment on whether there is any reason to diverge from the fifteen-year license terms. Nevertheless, we tentatively conclude that fifteen-year license terms for Ku-band AMSS networks are reasonable. We seek comment on this tentative conclusion.

53. We believe that these proposals for licensing Ku-band AMSS operations are consistent with the decisions of WRC-03. Additionally, our proposals would alleviate concerns that the current system of authorizing AMSS operations through case-by-case licensing procedures results in longer overall processing times, additional administrative burdens, and increased uncertainty in the marketplace. Furthermore, licensing Ku-band AMSS operations would promote more intensive and efficient use of this band by encouraging development of new services for aircraft without restricting current usage and the expansion of current services. We seek comment on the above proposals and any other proposals or comments that may be raised in the record.

#### **D. Tracking AES Terminals**

54. We seek comment on the need to track AES operations because opening the Ku-band to swiftly mobile AES terminals requires additional steps to allow proper enforcement. A necessary part to identifying sources of interference has always been the knowledge of exactly where the transmitting and receiving stations are, the frequency channels used and, the exact pointing angles of the antennas. We seek comment whether AMSS operators should maintain aircraft tracking data for a one-year period of time and provide the Commission, NTIA, or other interested parties (*e.g.*, a frequency coordinator or fixed-satellite system operator) with detailed information on the operating channels of its AES terminals on a particular air route within 24 hours upon request. Recognizing that "real time" public access to exact aircraft location information may present a security risk for the aircraft, the Commission would not make it public, but would use the operating frequency information provided by the AMSS operator for harmful interference resolution and enforcement purposes. The Commission would have a record of where AES terminals have operated and, if it receives a complaint of harmful interference, the interference could be eliminated or the AMSS operator could be ruled out as having caused the harmful interference. We seek comment on the anticipated effectiveness and utility of this process and whether a trial period could be implemented to gain experience with the process. We seek comment on whether this process would be adequate to protect SRS users of Ku-band spectrum from harmful interference. The ability to track AES terminals in real time would present FSS, FS,<sup>140</sup> space research and radio astronomy operators with an opportunity to identify a potentially interfering AES and take immediate

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<sup>137</sup> *Part 25 Earth Station NPRM*, 15 FCC Rcd at 25137 (para. 23); 25140 (para. 32).

<sup>138</sup> See also discussion in para. 39, *supra*, regarding our proposals for authorizing non-routine operations.

<sup>139</sup> See 47 C.F.R. § 25.121.

<sup>140</sup> We are referring to foreign FS operators, since there is no U.S. allocation for FS in the 14.0-14.5 GHz band.

steps to have the harmful interference resolved, including through termination of the AES operations, if necessary.

55. We seek comment whether AMSS operators should be required to make exact aircraft location information accessible, in a secure fashion, to individual operators in the Ku-band so that they can identify a potentially interfering AES, or should AMSS operators be required to make this information accessible to a third-party, single point of contact representing commercial or government agencies? We will consider all alternative methods for identifying harmful interference sources in a secure and controlled environment.

#### **E. Regulation of AMSS Operations Based on Aircraft Country of Registry**

56. As set forth in detail above, AES terminals are a mobile application of FSS technology and, therefore, have a higher potential for creating interference to terrestrial and space systems than other FSS applications operating in the same frequencies. We have proposed rules in this *Notice* with the goal of controlling this potential interference to other co-frequency applications. There are three very important regulatory factors related to the technical rules under which AES terminals must operate: the aircraft's country of registry; the country in which the AMSS operator and its control systems are located; and the physical location of the aircraft if a claim of interference occurs.<sup>141</sup> This section proposes the U.S. requirements that would apply to AMSS operations under the possible combinations of these factors.

##### **1. U.S.-Registered Aircraft**

57. Aircraft routes are not confined within the borders of the United States. U.S.-registered aircraft travel international routes both to and from the United States. At the outset, we observe that the Commission has the responsibility under the ITU Radio Regulations<sup>142</sup> and the Communications Act<sup>143</sup> for licensing AES operations of U.S.-registered aircraft, other than stations owned and operated by the federal government. Section 301(e) of the Act provides that no person shall engage in radio communication "upon any vessel or aircraft of the United States" without a Commission license.<sup>144</sup> The Act does not indicate, nor do we believe, that such jurisdiction is restricted to the location of vessels or aircraft. Therefore, the Commission's licensing obligation would apply regardless of whether the AES operates with a U.S. or foreign hub or is traveling though U.S. or international airspace.<sup>145</sup> Consequently, we are concerned with the potential for interference that may be caused by AES terminals operating on U.S.-registered aircraft. For this reason, to comply with our proposal that all AMSS systems maintain an NCMC in the United States, we propose that operators of any AES terminals on U.S.-registered aircraft must have a 24 hour point of contact within the United States that will have the capability and authority

<sup>141</sup> In the *ESV Report and Order*, we identified similar regulatory factors that affect ESV operations. See *ESV Report and Order* at para. 119. Accordingly, the proposals and analysis in this section are modeled after our decision in the *ESV* proceeding.

<sup>142</sup> See, e.g., ITU Radio Regulation 18.8.

<sup>143</sup> See 47 U.S.C. § 301(e).

<sup>144</sup> See 47 U.S.C. § 301(e).

<sup>145</sup> We reached a similar conclusion regarding our obligations to license ESVs on U.S.-registered vessels. See *ESV Report and Order* at para. 120.

to cause such AES terminals to cease transmitting.<sup>146</sup> We propose that this obligation would apply regardless of whether or not the hub through which the AES communicates is in the United States, and without concern for the location of the aircraft (*i.e.*, in U.S. airspace, over international waters, or in a foreign administration's airspace). Specifically, the point of contact would need to have a direct connection to the hub's or NCMC's network functions controlling AES terminals on U.S. aircraft. We do not wish to have U.S. sovereignty and regulatory control of U.S.-licensed AES terminals to be subject to the sovereignty and regulatory control of a foreign administration.

58. Next, we seek comment on rules to prevent interference that AMSS operations on U.S.-registered aircraft might cause to other services (i) in or near foreign airspace and (ii) over international waters (*i.e.*, "high seas," or regions beyond the territorial limits of any country). With regard to AES operations in or near the airspace of foreign nations, we propose that the AMSS operator follow a procedure similar to the one we adopted regarding ESV operations on U.S.-registered vessels near foreign coasts.<sup>147</sup> Under this proposal, we would require that prior to operations within the foreign nation's airspace, the AMSS operator would have to ascertain whether the relevant administration has operations that could be affected by AES terminals, and determine whether that administration has adopted specific requirements concerning AES operations. Once the aircraft enters foreign airspace, the AES would have to operate under our technical rules, or those of the foreign administration, whichever is more constraining.<sup>148</sup> To the extent that all relevant administrations have identified geographic areas from which AMSS operations would not affect their radio operations, AMSS operators would be free to operate within those identified areas without further action. To the extent that the foreign administration has not adopted requirements regarding AES operations, we propose that AMSS operators would be required to coordinate their operations with any potentially affected operations. We seek comment on this proposal.

59. With regard to the authorization of AES operations of U.S.-registered aircraft flying over international waters, we seek comment whether the only concern should be the protection of adjacent satellite operators. If this is the only concern, we seek comment on whether to require any AMSS operator seeking to operate over international waters to certify that the operator(s) of all satellites to be accessed over international waters have confirmed that the proposed AMSS operations would be within the coordinated parameters of the satellite. Alternatively, we request comment on whether such confirmation is necessary for AMSS operators that comply with off-axis envelope proposed above, in the event that the Commission adopts that proposal.

## **2. Non-U.S.-Registered Aircraft Using U.S.-Operated AMSS Systems in U.S. Airspace**

60. Foreign aircraft equipped with AES terminals are just as likely to travel through U.S. airspace<sup>149</sup> as United States-registered aircraft. Presently, Boeing's Connexion service is not available on

<sup>146</sup> See NCMC discussion in para. 42, *supra*.

<sup>147</sup> See *ESV Report and Order* at para. 121.

<sup>148</sup> We also would encourage bilateral arrangements between the United States and the foreign administration that would spell out the specific technical rules that an AES must meet in foreign airspace.

<sup>149</sup> U.S. airspace includes the airspace over territorial waters. Consistent with Presidential proclamation and the United Nations Convention on the Law of the Sea, the territorial waters would extend 12 nautical miles from the baselines of the geographic areas described in 47 U.S.C. § 153(51). See, *e.g.*, Presidential Proclamation No. 5928, 54 Fed. Reg. 777 (1988).

any U.S.-registered aircraft, although it is available on Lufthansa flights that travel through United States airspace.<sup>150</sup> We seek comment on whether we should develop rules to authorize AES communications of foreign-registered aircraft that are traveling through U.S. airspace and communicating with U.S.-located hub stations and/or are controlled by a U.S.-located AMSS operator.<sup>151</sup> In the ESV proceeding, we addressed a similar issue, given that foreign-registered vessels would be likely to use ESVs while approaching or in U.S. territorial waters. We concluded that, because both Section 301 and 306 of the Communications Act give the Commission the authority and responsibility to adopt regulations to protect U.S. licensed radio communications systems from receiving harmful interference from foreign vessels,<sup>152</sup> and given the likelihood of U.S. ESV hub operators communicating with ESVs on foreign-registered ships, we believed that adoption of some measure to protect both U.S. satellite and terrestrial licensees from ESV operations was warranted.<sup>153</sup> We believe measures are warranted for regulation of AES terminals on foreign-registered aircraft when these AES terminals are traveling through U.S. airspace and are part of a U.S. AMSS operator's network (as is the case with Boeing's Connexion service, which is installed on foreign-registered aircraft).<sup>154</sup>

61. Although Section 306 of the Act prohibits the Commission from licensing earth stations on foreign-registered ships, this section does not apply to aircraft.<sup>155</sup> The United States is a signatory to the Convention on International Civil Aviation ("Chicago Convention"), which states that aircraft registered to a member country may use radio transmitter equipment over another country's territory provided that the transmitter is licensed by the country that registered the aircraft and that said use is in compliance with the regulations of the country over which the aircraft is flying.<sup>156</sup> The Commission could require the operator of the AES on the foreign-registered aircraft to apply for a license authorizing transmissions while traveling through U.S. airspace. The licensee would then be subject to any and all rules we may adopt concerning AMSS operations. We invite comment on this approach. We also seek comment whether a U.S. licensee's blanket AES license could permit the licensee to install terminals on any aircraft, regardless of the country of registration. As long as the aircraft is within U.S. airspace, the AES would operate pursuant to the U.S. operator's blanket license. We seek comment on these proposals.

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<sup>150</sup> See "The New Era of Inflight Connectivity Is Here: Connexion by Boeing and Lufthansa Announce the World Premiere of Airborne Internet," Boeing Press Release, [http://www.boeing.com/news/releases/2004/q2/nr\\_040511j.html](http://www.boeing.com/news/releases/2004/q2/nr_040511j.html) (May 11, 2004); Boeing Petition at 2.

<sup>151</sup> Boeing identifies such AMSS systems as "associated with a U.S. AMSS licensee." Boeing Petition at 22.

<sup>152</sup> 47 U.S.C. §§ 301, 306. We noted in the ESV proceeding that Section 306 of the Act prohibits the Commission from licensing earth stations on foreign-flagged ships. *ESV Report and Order* at para. 122. However, this section does not apply to aircraft. See 47 U.S.C. §§ 306, 3(39)(A) (definition of "ship" excludes aircraft).

<sup>153</sup> *ESV R&O*, para. 122.

<sup>154</sup> In the next section, we propose a regulatory framework for foreign-based (*i.e.*, the hub and or network control systems are located outside the United States) and foreign-licensed AMSS operators operating on foreign-registered aircraft that fly through U.S. airspace.

<sup>155</sup> See 47 U.S.C. §§ 306, 3(39)(A) (definition of "ship" excludes aircraft).

<sup>156</sup> Convention on International Civil Aviation, signed Dec. 7, 1944, Article 30. By its terms, the Chicago Convention does not prohibit the nation over which the foreign registered aircraft is flying from also issuing a license for the transmitter. Therefore, a single AES onboard a single aircraft could have a separate license for each nation through which it passes.

62. In its petition, Boeing proposes that foreign-licensed AES terminals onboard foreign-registered aircraft and associated with a U.S. operator “be temporarily associated with and licensed to the U.S. AMSS licensee (or service vendor authorized by the operator) when the AES is operating within U.S. airspace.”<sup>157</sup> During this temporary period, Boeing suggests that the U.S.-licensed AMSS operator assume responsibility for the foreign AES “as if the AES were regularly licensed to it.”<sup>158</sup> Boeing notes that such an approach is similar to the Commission’s treatment of MSS transceivers designed to operate with U.S.-licensed systems.<sup>159</sup> We seek comment on whether this approach to authorizing foreign-registered aircraft AES terminals would be preferable to the approaches described above.

63. A different approach would be to prohibit operations by non-U.S. licensed AES terminals on aircraft of foreign registry in U.S. airspace, and to prohibit U.S. hub stations from serving and or U.S. AMSS operators from operating such AES terminals. We tentatively conclude that this approach would be overly restrictive and preclude a number of AMSS operations, including those already provided by Boeing on foreign carriers. Bilateral agreements between the United States and the relevant administrations of foreign registered aircraft may help provide U.S. licensees with adequate protection from AES terminals on foreign-registered aircraft. However, the extent of protection will depend on the specific language in these bilateral agreements, which may not be adequate to fully protect U.S. licensed services if the AES terminals have not been licensed by the Commission. In such cases, we tentatively conclude that we need to require operators of non-U.S. licensed AES terminals onboard foreign-registered aircraft communicating with U.S. hubs to be responsible for complying with all FCC rules in order to provide the necessary safeguards for protecting U.S. licensed services. We seek comment on this tentative conclusion.

64. We propose that the AMSS operator using a U.S. hub to communicate with non-U.S. licensed AES terminals (or using a U.S.-located NCMC to control the AMSS network) on foreign-registered aircraft be responsible for ensuring that the operations of the AES terminals comply with all of our rules, and that failure to do so could result in sanctions, including possible license forfeiture. Accordingly, the AMSS operator communicating with foreign-registered aircraft through a U.S. hub would need to have a 24 hour point of contact in the U.S. with the capability and authority to terminate transmissions of AES terminals that cause interference or otherwise fail to comply with any rules that we may eventually adopt. Authorizing AMSS operators in a manner that requires such control over all AES terminals with which the hub communicates ensures an environment where potential interference can be properly managed. We invite comment on this proposal.

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<sup>157</sup> Boeing Petition at 22.

<sup>158</sup> Boeing Petition at 22.

<sup>159</sup> Boeing Petition at 22 *citing* 47 C.F.R. §§ 25.136(c), 25.135(d), and Amendment of the Commission’s Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, CC Docket No. 92-166, *Report and Order*, 9 FCC Rcd 5936, at 6016, para. 208 (1995) (“*Big LEO Order*”).

### 3. Non-U.S.-Registered Aircraft Using Foreign-Based and Foreign-Licensed AMSS Systems

65. We next seek comment whether we should develop policies or rules to prevent any harmful interference that could result when foreign-licensed AES terminals traveling through U.S. airspace are communicating with foreign-licensed, rather than U.S.-licensed, hubs and/or are controlled by foreign-located NCMCs (in other words, a situation in which a foreign-registered aircraft has onboard a foreign-licensed AMSS system that does not communicate with and is not controlled by any U.S. network components). Although the Act specifically states that the Commission may not license radio communications on foreign ships while they are within United States jurisdiction, no such provision exists regarding foreign aircraft.<sup>160</sup> Therefore, similar to the proposal above regarding U.S. AMSS operators operating on foreign-registered aircraft, we propose that a foreign-licensed AMSS operator obtain U.S. approval prior to operating its system in U.S. airspace. As noted above, the United States is a signatory to the Chicago Convention.<sup>161</sup> By its terms, the Chicago Convention does not prohibit the nation over which the foreign registered aircraft is flying from also issuing a license for the transmitter.

66. We also seek comment on an alternative framework that we recently adopted for foreign-licensed ESVs operating on foreign-registered vessels within U.S. territorial waters.<sup>162</sup> Article 4 of the ITU Radio Regulations sets forth the general international principles and rules regarding the assignment and use of frequencies. ITU Radio Regulation 4.4 (ITU RR 4.4) permits licensing of services that do not otherwise conform to the Radio Regulations so long as those services do not cause interference to, or claim protection from interference by, other services licensed in compliance with the Radio Regulations.<sup>163</sup> Some administrations may authorize AMSS operations for their registered aircraft based on ITU RR 4.4. However, we believe that operations of such systems in U.S. airspace may not provide adequate protection to U.S. services because of the typically high speeds involved in aircraft operations which, unlike those involved in maritime operations, may cause transient interference where identification of the source is extremely difficult.

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<sup>160</sup> See 47 U.S.C. § 306. This section also provides that communications from a foreign vessel located in U.S. jurisdiction still must be in accordance with any relevant rules designed to prevent interference. *Id.*

<sup>161</sup> Convention on International Civil Aviation, signed Dec. 7, 1944, Article 30. The Commission implemented this Article in the Part 87, the regulations concerning aviation services. Section 87.191(a) provides:

Aircraft of member States of the International Civil Aviation Organization may carry and operate radio transmitters in the United States airspace only if a license has been issued by the State in which the aircraft is registered and the flight crew is provided with a radio operator license of the proper class, issued or recognized by the State in which the aircraft is registered. The use of radio transmitters in the United States airspace must comply with these rules and regulations. 47 C.F.R. § 87.191(a).

<sup>162</sup> *ESV Report and Order* at paras. 127-28.

<sup>163</sup> The full text of ITU RR 4.4 reads as follows: "Administrations of the Member States shall not assign a station to any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to , and shall not claim protection from harmful interference caused by, as station operating in accordance with the provisions of the Constitution, the Convention and these Regulations."

67. We propose to permit foreign AES terminals to operate on aircraft registered with foreign administrations through hubs located outside of the United States while flying through U.S. airspace by requiring the AMSS operator to apply for and obtain U.S. authorization, as proposed above in paragraph 66. We also seek comment whether, as an alternative to licensing, such foreign AES terminal operations should be permitted in the vicinity of radio astronomy and TDRSS sites<sup>164</sup> only after the technical parameters and operational procedures of these terminals and their associated hubs have been coordinated with the FCC/NTIA and been determined to satisfy Commission rules established for this service. We seek comment whether foreign AMSS systems should be subject to any or all of the operational requirements that we have proposed for U.S. systems, including, for example, the U.S.-located 24 hour point of contact that would be capable of terminating AES transmissions.<sup>165</sup> We are concerned that foreign AES terminal/hub operations over international waters and in the vicinity of U.S. TDRSS stations, such as the Guam station, may cause interference to those TDRSS stations. We invite comment on methods for preventing such interference, including whether we should adopt a regulation implementing Part D of ITU-R M.1643, which recommends a procedure for protection of space research systems.<sup>166</sup> Additionally, should we find evidence that AES terminals on aircraft of foreign registry communicating with non-U.S. hubs cause harmful interference to any U.S.-licensed satellite or terrestrial systems, we expect the Commission to take all appropriate actions, including requesting that the Department of State request that the appropriate foreign administration require the foreign-registered aircraft to cease further AES operations in the vicinity of TDRSS and radio astronomy sites. We invite comment on these proposals.

#### IV. CONCLUSION

68. The proposed licensing procedures described above for Ku-band AMSS reflect our interest in providing regulatory certainty to both new and incumbent operators in the Ku frequency band. The proposals set forth in this *Notice* are designed to: 1) address existing government, space research, RAS, and FSS operations that may be affected by AES terminals; 2) allow for future growth of FSS networks; 3) establish rules and a regulatory framework that minimize the regulatory burden on AMSS licensees to the extent possible; 4) promote more efficient use of the spectrum by permitting new uses of the band by AES terminals, thereby enabling important new communications services to be provided to consumers on board aircraft. We seek comment on each of the matters set forth above.

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<sup>164</sup> See *supra* fn. 72.

<sup>165</sup> See *supra* paras. 47-48, 56.

<sup>166</sup> Part D provides, in part:

Coordination agreements should be developed between AMSS and space research systems based on controlling the emissions levels of the AES in the frequency band used by the SRS systems, and, in severe cases, may require cessation of AES emissions on frequencies used by the SRS system when operating in the vicinity of the space research earth station. ITU Recommendation ITU-R M.1643, Part D.

## V. PROCEDURAL MATTERS

### A. Ex Parte Presentations

69. This proceeding shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's ex parte rules.<sup>167</sup> Persons making oral ex parte presentations are reminded that memoranda summarizing the presentations must contain summaries of the substance of the presentations and not merely a listing of the subjects discussed. More than a one or two sentence description of the views and arguments presented is generally required.<sup>168</sup> Other rules pertaining to oral and written presentations are set forth in Section 1.1206(b) of the Commission's rules as well.

### B. Initial Regulatory Flexibility Analysis

70. Pursuant to the Regulatory Flexibility Act (RFA),<sup>169</sup> the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and actions considered in this Notice. The text of the IRFA is set forth in Appendix B. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the Notice as provided in paragraph 56 below. The Commission will send a copy of the Notice, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.<sup>170</sup>

### C. Initial Paperwork Reduction Act of 1995 Analysis

71. *Paperwork Reduction Act.* This NPRM contains proposed new and modified information collection(s). The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection(s) contained in this NPRM, as required by the Paperwork Reduction Act of 1995, Public Law No. 104-13. Public and agency comments are due 60 days from date of publication of the NPRM in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law No. 107-198, *see* 44 U.S.C. § 3506(c)(4), we seek specific comment on how we might "further reduce the information collection burden for small business concerns with fewer than 25 employees."

<sup>167</sup> 47 C.F.R. §§ 1.1200, 1.1206; Amendment of 47 C.F.R. § 1.1200 et seq. Concerning Ex Parte Presentations in Commission Proceedings, GC Docket No. 95-21, *Report and Order*, 12 FCC Rcd 7348 (1997).

<sup>168</sup> 47 C.F.R. § 1.1206(b)(2).

<sup>169</sup> *See* 5 U.S.C. § 603. The RFA, *see* U.S.C. § 601 et seq., has been amended by the Contract with America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

<sup>170</sup> 5 U.S.C. § 603(a).

72. A copy of any comments on the information collections contained herein should be submitted to Judy Boley Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to [jbHerman@fcc.gov](mailto:jbHerman@fcc.gov) and to Kristy L. LaLonde, OMB Desk Officer, Room 10234 NEOB, 725 17th Street, N.W., Washington, DC 20503, via the Internet to [Kristy.L.LaLonde@omb.eop.gov](mailto:Kristy.L.LaLonde@omb.eop.gov), or via fax at 202-395-5167.

#### **D. Comment Filing Procedures**

73. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments in response to this Notice no later than on or before 75 days after Federal Register publication. Reply comments to these comments may be filed no later than on or before 105 days after Federal Register publication. All pleadings are to reference IB Docket No. 05-20. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. Parties are strongly encouraged to file electronically. See Electronic Filing of Documents in Rulemaking Proceedings, 63 Fed. Reg. 24,121 (1998).

74. Comments filed through the ECFS can be sent as an electronic file via the Internet to <http://www.fcc.gov/e-file/ecfs.html>. Parties should transmit one copy of their comments to the docket in the caption of this rulemaking. In completing the transmittal screen, commenters should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to [ecfs@fcc.gov](mailto:ecfs@fcc.gov) and should include the following words in the body of the message, "get form <your e-mail address>." A sample form and directions will be sent in reply.

75. Parties choosing to file by paper must file an original and four copies of each filing in IB Docket No. 05-20. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). If more than one docket or rulemaking number appears in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number. The Commission's mail contractor, Vistronix, Inc. will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12<sup>th</sup> Street, S.W., Washington, D.C. 20554. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

76. Comments submitted on diskette should be on a 3.5 inch diskette formatted in an IBM-compatible format using Word for Windows or compatible software. The diskette should be clearly labeled with the commenter's name, proceeding (including the docket number, in this case, IB Docket No. 05-20), type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy - Not an Original." Each diskette should contain only one party's pleadings, preferably in a single electronic file.

77. All parties must file one copy of each pleading electronically or by paper to each of the following: (1) The Commission's duplicating contractor, Best Copy and Printing, Inc., 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, telephone (202) 488-5300, facsimile (202) 488-5563, or

via e-mail at [FCC@BCPIWEB.COM](mailto:FCC@BCPIWEB.COM). (2) Arthur Lechtman, Attorney, Satellite Division, International Bureau, 445 12<sup>th</sup> Street, S.W., Washington, D.C. 20554; e-mail [Arthur.Lechtman@fcc.gov](mailto:Arthur.Lechtman@fcc.gov).

78. Comments and reply comments and any other filed documents in this matter may be obtained from Best Copy and Printing, Inc., in person at 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, via telephone at (202) 488-5300, via facsimile (202) 488-5563, or via e-mail at [FCC@BCPIWEB.COM](mailto:FCC@BCPIWEB.COM). The pleadings will be also available for public inspection and copying during regular business hours in the FCC Reference Information Center, Room CY-A257, 445 Twelfth Street, S.W., Washington, D.C. 20554 and through the Commission's Electronic Filing System (ECFS) accessible on the Commission's World Wide Website, [www.fcc.gov](http://www.fcc.gov).

79. Comments and reply comments must include a short and concise summary of the substantive arguments raised in the pleading. Comments and reply comments must also comply with Section 1.49 and all other applicable sections of the Commission's rules.<sup>171</sup> All parties are encouraged to utilize a table of contents, and to include the name of the filing party and the date of the filing on each page of their submission. We also strongly encourage that parties track the organization set forth in this Notice in order to facilitate our internal review process.

80. Commenters who file information that they believe is proprietary may request confidential treatment pursuant to Section 0.459 of the Commission's rules. Commenters should file both their original comments for which they request confidentiality and redacted comments, along with their request for confidential treatment. Commenters should not file proprietary information electronically. See Examination of Current Policy Concerning the Treatment of Confidential Information Submitted to the Commission, Report and Order, 13 FCC Rcd 24816 (1998), Order on Reconsideration, 14 FCC Rcd 20128 (1999). Even if the Commission grants confidential treatment, information that does not fall within a specific exemption pursuant to the Freedom of Information Act (FOIA) must be publicly disclosed pursuant to an appropriate request. See 47 C.F.R. § 0.461; 5 U.S.C. § 552. We note that the Commission may grant requests for confidential treatment either conditionally or unconditionally. As such, we note that the Commission has the discretion to release information on public interest grounds that does fall within the scope of a FOIA exemption.

#### **E. Further Information**

81. For further information regarding this proceeding, contact Arthur Lechtman, Attorney, Satellite Division, International Bureau at (202) 418-0719. Information regarding this proceeding and others may also be found on the Commission's website at [www.fcc.gov](http://www.fcc.gov).

#### **VI. ORDERING CLAUSES**

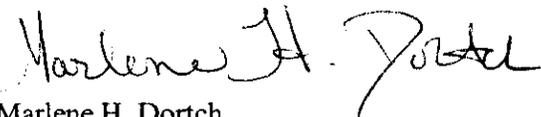
82. Accordingly, IT IS ORDERED that, pursuant to the authority contained in Sections 1, 4(i), 4(j), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), and 308 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 154(j), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), 308, this Notice of Proposed Rulemaking IS ADOPTED.

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<sup>171</sup> 47 C.F.R. § 1.49.

83. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center shall send a copy of this NOTICE OF PROPOSED RULEMAKING, including the initial regulatory flexibility analysis, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with Section 603(a) of the Regulatory Flexibility Act, 5 U.S.C. § 601, et seq. (1981).

FEDERAL COMMUNICATIONS COMMISSION



Marlene H. Dortch  
Secretary

**APPENDIX A**

**Parties Filing Comments**  
(3 Commenters)

Name of Party

Aeronautical Radio Inc.

The Boeing Company

PanAmSat Corporation

**Parties Filing Reply Comments**  
(5 Reply Commenters)

Name of Party

The Boeing Company

Intelsat LLC

Loral Space & Communications Ltd.

Rockwell Collins Inc.

SES Americom, Inc.

**Parties Filing *Ex Parte* Comments**  
(1 *ex parte*)

SES Americom, Inc.

## APPENDIX B

## INITIAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),<sup>172</sup> the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in the Frequency Bands Allocated to the Fixed Satellite Service, Notice of Proposed Rulemaking (Notice).<sup>173</sup> Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the Notice provided in paragraph 109 the Notice. The Commission will send a copy of the Notice, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).<sup>174</sup> In addition, the Notice and IRFA (or summaries thereof) will be published in the Federal Register.<sup>175</sup>

**A. Need for, and Objectives of, the Proposed Rules**

In this Notice the Commission makes proposals and seeks information on measures to provide a level of regulatory certainty to government, space research, radio astronomy, and fixed satellite service (FSS) operators regarding operations of the Aeronautical Mobile Satellite Service (AMSS). As discussed in greater detail below, the Commission proposes rules and procedures to license aeronautical earth stations (AES) for operation in the Ku-band similar to the Commission's current licensing rules for very small aperture terminals (VSATs) that operate in the Ku-band, with appropriate modifications. However, rather than propose rules requiring minimum earth station antenna sizes and power limits, the NPRM proposes an off-axis EIRP envelope that, if adopted, would give AES operators more flexibility over their operations. This off-axis EIRP envelope proposal would provide for a minimally intrusive licensing regime for AESs that would maximize the efficient use of the Ku-band spectrum, by allowing a new service to be provided in that band, while respecting the legitimate expectations of incumbent operators. Establishing a licensing regime for AMSS also facilitates provision of a new service in the Ku-band, which would also advance the Commission's continuing effort to provide licensees with greater authority to most efficiently use of the spectrum that they occupy.

It is the Commission's view that if adopted, the off-axis EIRP licensing methodology proposed in the Notice would benefit businesses both large and small by streamlining the process for obtaining authority from the Commission to provide AMSS service, which currently must be obtained on a case-by-case basis. The proposed procedures would provide license terms of fifteen years and would permit

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<sup>172</sup> See 5 U.S.C. § 603. 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>173</sup> See Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in the Frequency Bands Allocated to the Fixed Satellite Service, IB Docket No. 05-20, Notice of Proposed Rulemaking (Notice).

<sup>174</sup> See 5 U.S.C. § 603(a).

<sup>175</sup> See 5 U.S.C. § 603(a).

parties to seek authorization using simplified procedures. The proposed procedures would also require AMSS operators to provide aircraft tracking information to the Commission upon request. This would benefit businesses large and small by providing businesses that might be affected by AMSS operations with a simple, clear mechanism with minimal administrative burden to resolve any possible claims of harmful interference resulting from those operations.

#### B. Legal Basis

The Notice is adopted pursuant to Sections 1, 4(i), 4(j), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), and 308 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 154(i), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), 308.

#### C. Description and Estimate of the Number of Small entities to Which the Proposals will Apply

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.<sup>176</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>177</sup> In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.<sup>178</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 Small Business Administration (SBA).<sup>179</sup> Below, we further describe and estimate the number of small entity licensees that may be affected by the adopted rules.

**Satellite Telecommunications.** The SBA has developed a small business size standard for Satellite Telecommunications Carriers, which consists of all such companies having \$12.5 million or less in annual receipts.<sup>180</sup> According to Census Bureau data for 1997, there were 324 firms in the category Satellite Telecommunications, total that operated for the entire year.<sup>181</sup> Of this total, 273 firms had annual receipts of \$5 million to \$9,999,999 and an additional 24 firms had annual receipts of \$10 million

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<sup>176</sup> 5 U.S.C. § 603(b)(3).

<sup>177</sup> *Id.* § 601(6).

<sup>178</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, 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 the 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." 5 U.S.C. § 601(3).

<sup>179</sup> Small Business Act, 15 U.S.C. § 632 (1996).

<sup>180</sup> 13 C.F.R. § 121.201, NAICS code 517410.

<sup>181</sup> U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Receipt Size of Firms Subject to Federal Income Tax: 1997," Table 4, NAICS code 517410 (issued Oct. 2000).

to \$24,999,990.<sup>182</sup> Thus, under this size standard, the majority of firms can be considered small.

**Space Stations (Geostationary).** Commission records reveal that there are 15 space station licensees. We do not request nor collect annual revenue information, and thus are unable to estimate of the number of geostationary space stations that would constitute a small business under the SBA definition cited above, or apply any rules providing special consideration for Space Station (Geostationary) licensees that are small businesses.

**Fixed Satellite Transmit/Receive Earth Stations.** Currently there are approximately 3,390 operational fixed-satellite transmit/receive earth stations authorized for use in the C- and Ku-bands. 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.

**Cellular and Other Wireless Telecommunications.** The SBA has developed a small business size standard for Cellular and Other Wireless Telecommunication, which consists of all such firms having 1,500 or fewer employees.<sup>183</sup> According to Census Bureau data for 1997, in this category there was a total of 977 firms that operated for the entire year.<sup>184</sup> Of this total, 965 firms had employment of 999 or fewer employees, and an additional twelve firms had employment of 1,000 employees or more.<sup>185</sup> Thus, under this size standard, the majority of firms can be considered small.

**Paging.** The SBA has developed small business size standard for Paging, which consists of all such firms having 1,500 or fewer employees.<sup>186</sup> According to Census Bureau data for 1997, in this category there was a total of 1,320 firms that operated for the entire year.<sup>187</sup> Of this total, 1,303 firms had employment of 999 or fewer employees, and an additional seventeen firms had employment of 1,000 employees or more.<sup>188</sup> Thus, under this size standard, the majority of firms can be considered small.

#### **D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements**

The proposed rules would, if adopted, require satellite telecommunications operators to establish

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<sup>182</sup> U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 4, NAICS code 513340 (issued October 2000).

<sup>183</sup> 13 C.F.R. § 121.201, NAICS code 517212.

<sup>184</sup> U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 5, NAICS code 513322 (issued October 2000).

<sup>185</sup> *Id.* The census data do not provide a more precise estimate of the number of firms that have 1,500 or fewer employees; the largest category provided is "Firms with 1,000 employees or more."

<sup>186</sup> 13 C.F.R. § 121.201, NAICS code 517211.

<sup>187</sup> U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 5, NAICS code 513321 (issued October 2000).

<sup>188</sup> *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is "Firms with 1,000 employees or more."

a database for tracking the location of AES remote earth stations. This database would assist investigations of interference claims. The Notice seeks comment on this proposal, including the effectiveness and utility of the proposal, and seeks comment regarding possible alternatives. The proposed rules, if adopted, would also require AMSS operators to name a point of contact to maintain information about aircraft location and frequencies used by AESs. Such information would assist in investigating interference claims. The Commission does not expect significant costs associated with these proposals, if adopted. Therefore, we do not anticipate that the burden of compliance would be greater for smaller entities.

The Notice seeks comment on possible methods for coordinating AMSS operations with space research service and radio astronomy operations.

**E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered**

The RFA requires that, to the extent consistent with the objectives of applicable statutes, the analysis shall discuss significant alternatives such as: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage or the rule, or any part thereof, for small entities.<sup>189</sup>

This Notice solicits comment on alternatives for more efficient processing of aircraft earth station (AES) applications and simplifying AMSS procedures, for example, by migrating from non-conforming use licensing to a licensing method that would provide for licenses with terms of fifteen years. The Notice also seeks comment on streamlining the application process for AMSS operations by permitting blanket licensing of multiple AES terminals in a single application, as an alternative to requiring all AESs to be licensed individually. Adoption of some of these proposals would simplify the application process for AESs and establish license terms consistent with other satellite-based services (such as Earth Stations on Vessels). Accordingly, the Commission believes that adoption of these proposed rules would benefit all AMSS applicants, including small entities, by significantly reducing the cost associated with obtaining and maintaining authority to operate an AMSS network.

As described above, the Commission also seeks comment on a number of alternative compliance and coordination processes. For example, the Commission seeks on whether to base the off-axis EIRP requirement on an aggregate limit or on a per-earth station limit. The Commission has taken care to consider the costs on business both large and small and has solicited comment on alternatives to its proposals.

**F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rules**

None.

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<sup>189</sup> 5 U.S.C. § 603(c)(1)-(c)(4).

APPENDIX C

ITU Recommendation ITU-R M.1643

Rec. ITU-R M.1643

1

## RECOMMENDATION ITU-R M.1643\*

**Technical and operational requirements for aircraft earth stations  
of aeronautical mobile-satellite service including those  
using fixed-satellite service network transponders in  
the band 14-14.5 GHz (Earth-to-space)**

(2003)

**Summary**

This Recommendation provides the technical and operational requirements for aircraft earth stations (AES) of aeronautical mobile-satellite service (AMSS), including those using FSS network transponders operating in the band 14-14.5 GHz (Earth-to-space), that should be used by administrations as a technical guideline for establishing conformance requirements for AES and facilitating their licensing, for worldwide use.

The ITU Radiocommunication Assembly,

*considering*

- a) that various technically and operationally different aeronautical mobile-satellite service (AMSS) networks have been designed to commence operation in the near future,
- b) that these planned AMSS networks may provide access to a variety of broadband communication applications (Internet, email, internal corporate networks) to and from aircraft on a global basis,
- c) that the aircraft earth station (AES) will operate on national and international airlines around the world,
- d) that circulation of AES is usually a subject of a number of national and international rules and regulations including satisfactory conformance to a mutually agreed technical standard and operational requirements,
- e) that there is a need for identifying the technical and operational requirements for the conformance testing of AES.

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\* NOTE - The Arab Group represented at RA-03 reserves its position on this Recommendation and is not ready to accept any repercussions with respect to WRC-03 Agenda item 1.11

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## Rec. ITU-R M.1643

0) that the identification of technical and operational requirements for AES would provide a common technical basis for facilitating conformance testing of AES by various national and international authorities and the development of mutual recognition arrangements for conformance of AES.

g) that the technical and operational requirements need to achieve an acceptable balance between radio equipment complexity and the need for effective use of the radio-frequency spectrum.

*considering also*

a) that in the frequency band 14-14.5 GHz there are allocations to the FSS (Earth-to-space), radionavigation, fixed and mobile (except aeronautical mobile) services on a primary basis, that secondary services allocated in the band 14-14.5 GHz or in parts of the band include mobile-satellite (except aeronautical mobile-satellite) service (Earth-to-space), space research service (SRS), radio astronomy service (RAS), and radionavigation-satellite service.

b) that there is a requirement to fully protect all primary services and pre-existing systems of secondary services in the band 14-14.5 GHz.

c) that results of the studies conducted in accordance with Resolution 216 (Rev. WRC-2000) showed the feasibility of using the band 14-14.5 GHz by AMSS (Earth-to-space) on a secondary basis under certain conditions and arrangements<sup>1</sup>.

d) that the identification by ITU-R of technical and operational requirements for AES operating in the band 14-14.5 GHz could assist administrations to prevent harmful and/or unacceptable interference to other services.

e) that technical and operational characteristics should be continuously and accurately measurable and controllable.

*recommends*

1) that the technical and operational requirements<sup>2</sup> for aircraft earth stations of AMSS networks operating in the band 14-14.5 GHz given in Annexes 1 and 2 be used by administrations as a guideline for

establishing conformance requirements for AES,

facilitating AES operations

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<sup>1</sup> The characteristics of the typical aircraft earth stations need to fulfil the requirements described in this Recommendation and, further, need to be within the envelope of those initially published in the international Frequency Information Circular (BR 1FIC) relating to the corresponding FSS network. In the case that the characteristics are outside of the envelope of those in the initial publication, the required coordination of such an aircraft earth station needs to be effected in accordance with the current provisions of the Radio Regulations (RR) and a modified Rule of Procedure as contained in § 2 of the Rules of Procedure relating to RR No. 11.32, as appropriate.

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## Annex I

**Technical and operational requirements for AES of AMSS networks in the band 14-14.5 GHz (Earth-to-space)**

## Part A

**Essential requirements related to the protection of FSS networks**

**1** AMSS networks should be coordinated and operated in such a manner that the aggregate off-axis e.i.r.p. levels produced by all co-frequency AES within AMSS networks are no greater than the interference levels that have been published and coordinated for the specific and/or typical earth station(s) pertaining to FSS networks where FSS transponders are used.

**2** The design, coordination and operation of an AES should, at least, account for the following factors which could vary the aggregate off-axis e.i.r.p. levels generated by the AES:

**2.1** mispointing of AES antennas. Where applicable, this includes, at least, effects caused by bias and latency of their pointing systems, tracking error of closed loop tracking systems, misalignment between transmit and receive apertures for systems that use separate apertures, and misalignment between transmit and receive feeds for systems that use combined apertures;

**2.2** variations in the antenna pattern of AES. Where applicable, this includes, at least, effects caused by manufacturing tolerances, ageing of the antenna and environmental effects. AMSS networks using certain types of AES antennas, such as phased arrays, should account for variation in antenna pattern with scan angles (elevation and azimuth). Networks using phased arrays should also account for element phase error, amplitude error and failure rate.

**2.3** variations in the transmit e.i.r.p. from AES. Where applicable, this includes, at least, effects caused by measurement error, control error and latency for closed loop power control systems. Network control and monitoring centres (NMCs) that calculate the e.i.r.p. of AES based on the received signal need to take into account error sources and latency in this calculation. NMCs that calculate the e.i.r.p. of AES based on input power must account for measurement error and reporting latency.

**3** AES that use closed loop tracking of the satellite signal need to employ an algorithm that is resistant to capturing and tracking adjacent satellite signals. AES must immediately inhibit transmission when they detect that unintended satellite tracking has happened or is about to happen.

**4** AES should be subject to the monitoring and control by an NCMC or equivalent facility. AES must be able to receive at least "enable transmission" and "disable transmission" commands from the NCMC. AES must automatically cease transmissions immediately on receiving any

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"parameter change" command, which may cause harmful interference during the change, until it receives an "enable transmission" command from its NCMC. In addition, it should be possible for the NCMC to monitor the operation of an AES to determine if it is malfunctioning.

5. AES need also to be self-monitoring and, should a fault which can cause harmful interference to FSS networks be detected, the AES must automatically mute its transmissions.

### Part B

#### Essential requirements related to the protection of the fixed service

In the 14-14.5 GHz frequency band as used by fixed service networks, within line-of-sight of the territory of an administration where fixed service networks are operating in this band, the maximum field produced at the surface of the Earth by emissions from a single AES, of an AMSS network, should not exceed

$$\begin{array}{lll} 132 + 0.5 \cdot \theta & \text{dB(W/(m}^2 \cdot \text{MHz))} & \text{for } 0 \leq \theta \leq 40 \\ 112 & \text{dB(W/(m}^2 \cdot \text{MHz))} & \text{for } 40 < \theta \leq 90 \end{array}$$

where  $\theta$  is the angle of arrival of the radio-frequency wave (degrees above the horizontal)

NOTE 1 - The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

NOTE 2 - An e.i.r.p. mask can be derived from the aforementioned pfd mask by applying the method given in Annex 2 of this Recommendation. Simplification of the resulting e.i.r.p. mask could also be considered.

### Part C

#### Essential requirements related to sharing with the RAS

In order to protect the radio astronomy in the band 14.47-14.5 GHz, AMSS earth stations should comply with both following measures:

##### *AMSS channels in the 14.47-14.5 GHz band*

AMSS stations do not transmit in the 14.47-14.5 GHz band within line-of-sight of radio astronomy stations operating within this band,

or,

if an AMSS operator intends to operate co-frequency within the visibility of the radio astronomy station, a specific agreement with the radio astronomy station will be needed to ensure that AMSS AES will meet the requirements of Recommendations ITU-R RA 769 and ITU-R RA 1513 within the 14.47-14.5 GHz band during observations. Where practicable, this may include advance information to AMSS operators regarding observation schedules.

##### *AMSS channels in the 14-14.47 GHz band*

All AES transmitters on channels in the 14-14.47 GHz band within line-of-sight of radio astronomy stations during radio astronomy observations have emissions in the band 14.47-14.5 GHz such that they meet the levels and percentage of data loss given in

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Recommendations ITU-R RA 769 and ITU-R RA 1513. Results from studies show that the following AES pfd levels (dBW/m<sup>2</sup>/150 kHz) in the band 14.47-14.5 GHz are sufficient, with some margin, to meet the radio astronomy pfd levels in Recommendation ITU-R RA 769 and the percentage of data loss given in Recommendation ITU-R RA 1513, i.e.

190 + 0.5θ	dBW/m <sup>2</sup> /150 kHz)	for	0 ≤ θ
185	dBW/m <sup>2</sup> /150 kHz)	for	10 ≤ θ ≤ 90

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal)

Such AES pfd levels in the band 14.47-14.5 GHz may be achieved by the AMSS operators through a combination of reduced AES signal power, sharp filtering, maintaining adequate frequency separation, or better AES antenna performance.

#### Part D

##### Essential requirements related to sharing with the space research service

Coordination agreements should be developed between AMSS and space research systems based on controlling the emissions levels of the AES in the frequency band used by the SRS systems, and, in severe cases, may require cessation of AES emissions on frequencies used by the SRS system when operating in the vicinity of the space research earth station. Specifics of the agreements will vary based on the characteristics of the individual SRS sites and the AMSS networks.

#### Annex 2

##### Derivation of a lower hemisphere e.i.r.p. mask from a pfd mask

In testing AMSS equipment to determine if it meets a given pfd mask, such as the one in Annex 1, Part B, it may be useful to determine an equivalent e.i.r.p. mask that can be used for testing purposes.

The pfd mask, pfd(θ) where θ is the angle of arrival (elevation angle) at the Earth's surface, can be used to mathematically determine an e.i.r.p. mask, e.i.r.p.(γ, H) where γ is the angle below the local horizontal plane and H is the altitude of the aircraft. This conversion proceeds in two steps. First, γ is converted to an equivalent angle of arrival, θ. Then the length of the propagation path for angle of arrival θ is determined and used to calculate the spreading loss for the path and the resulting e.i.r.p.

*Step 1.* Calculation of an angle of arrival in degrees, θ, from γ and H

$$\theta = \arccos((R_e + H) \cos(\gamma) / R_e)$$

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where

- $\theta$  angle of arrival
- $R_e$  earth radius (6378 km)
- $H$  altitude of the aircraft (km)
- $\gamma$  angle below horizontal

NOTE 1 - If the argument of the arccos function is greater than 1, the propagation path in the direction of the angle  $\gamma$  does not intersect the Earth. In this case, which occurs for values of  $\gamma$  of about  $3.5^\circ$  or less, a value for  $\theta$  does not exist and so there is an undefined value for the pfd mask.

Step 2: Calculation of the e.i.p. value from the defined pfd( $\theta$ )

$$d = (R_e^2 + (R_e + H)^2 - 2R_e(R_e + H)\cos\gamma)^{1/2}$$

$$e.i.p.(r; H) = pfd(\theta) + 10 \log_{10}(\pi d^2) + 60$$

where

- $d$  distance between the AES and the considered point on the Earth's surface (km)
- $pfd(\theta)$  (dBW/(m<sup>2</sup> MHz))
- $e.i.p.$  (dBW/MHz)

The graph in Fig. 1 shows this function for various aircraft altitudes based on the pfd mask provided in Annex 1, Part B of this Recommendation.

FIGURE 1  
e.i.p. mask derived from pfd mask

