

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)
)
Streamlining License Procedures for) **IB Docket No. 18-86**
Small Satellites)

To: The Commission
Via: ECFS

**COMMENTS OF ARRL, THE NATIONAL ASSOCIATION
FOR AMATEUR RADIO**

ARRL, the national association for Amateur Radio, formally known as The American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.415 of the Commission’s Rules (47 C.F.R. §1.415), hereby respectfully submits its comments in response to the *Notice of Proposed Rule Making*, FCC 18-44, released April 17, 2018 in the captioned proceeding (the Notice).¹ The Notice seeks comment on a proposed streamlined mechanism for authorizing and licensing small satellites. The Amateur Radio service has for decades provided a fertile environment for small satellite experimentation, research and development, and as such has a vested and unique interest in this proceeding. It is timely to revisit the Commission’s policies with respect to regulatory treatment of experimentation with small satellites and to draw some bright lines in the regulatory treatment of (1) commercial small satellite operation; (2) experimental small satellite research and development which is unrelated to Amateur Radio; and (3) *bona fide* Amateur Radio satellite operation and experimentation. It is ARRL’s concern that the Commission has not accurately defined the types of satellite operation in categories (2) and

¹ The Notice was published in the Federal Register May 24, 2018 (83 Fed. Reg 24064). That publication specified a comment date of July 9, 2018. Therefore these comments are timely filed.

(3) above. For its comments on behalf of and in the interest of the Amateur and Amateur-Satellite Services, ARRL states as follows:

I. Introduction and Background.

1. The Commission correctly notes in this proceeding that there are three regulatory paradigms that have been and are utilized now for authorizing small satellites. The first is pursuant to the Part 25 licensing process applicable to commercial satellites.² The second is as experimental, Part 5 authorizations, which are appropriate for relatively short term operations. The third is Amateur Radio space station operation pursuant to the Commission's Part 97 regulations.³ ARRL's view is that the Commission has, somewhat anomalously, used an overly restrictive interpretation of what constitutes a *bona fide* Amateur Radio satellite experiment subject to Part 97 rules, and erroneously requiring colleges, universities and secondary schools which wish to conduct Amateur Radio experiments using small satellites to obtain Part 5 experimental authorizations. At the same time, the Commission has used an overly lax regulatory scheme for certain types of small satellite operations using Amateur Radio spectrum – facilities that should be classified as commercial satellite deployments pursuant to Part 5 Experimental authorizations or Part 25 licenses. This proceeding offers a good opportunity to set things right, by (1) establishing a revised policy facilitating Amateur Radio satellite experimentation by educational institutions which utilize Amateur Radio in their curricula; but precluding exploitation of Amateur-Satellite Service and Amateur Service spectrum by commercial small satellite users pursuant to Part 5 experimental authorizations.

² ARRL makes no comment herein with respect to the appropriateness of the current Part 25 rules with respect to authorization for small satellites, other than to note that it is inappropriate to license those stations in spectrum utilized for Amateur Radio facilities. ARRL does agree with the Commission's statement at Paragraph 3 of the Notice that, because of the "increasingly commercial nature of small satellite missions, many satellites are not suitable for licensing under the Commission's Part 5 experimental licensing process..."

³ See, 47 C.F.R. §97.207

2. The Amateur Radio Service, though principally known for its public service, emergency and disaster relief communications, is in its essence an experimental radio service.⁴ One area of telecommunications in which Amateur Radio experimenters have excelled during the last 58 years is the pioneering and refinement of small satellite communications technology. Amateur Radio satellites were launched as early as 1961: OSCAR I, (Orbiting Satellite Carrying Amateur Radio) was the first small satellite, weighing only 10 pounds. It carried a beacon transmitter that allowed terrestrial Amateur Radio stations to measure ionospheric radio propagation. The Radio Amateur-Satellite Corporation (AMSAT)⁵ was formed in Washington, D.C. in 1969 after almost a decade of Amateur satellite operation was conducted, including four OSCAR satellite launches during the period. AMSAT's goal was then and remains today the promotion and furtherance of Amateur satellite experimentation. By any measure, it has been quite successful in its mission. ARRL and AMSAT have collaborated on issues of common concern since AMSAT's formation. Amateur Radio operators in many countries have since established their own AMSAT organizations, and those international organizations work cooperatively with AMSAT-NA in North America on major Amateur satellite projects and other items of common interest to the worldwide Amateur satellite community. Amateur satellite experimentation is an excellent example of international scientific cooperation and of the social benefits of a robust Amateur Radio Service in the United States with minimal regulatory encumbrances or intervention, at no expense to taxpayers.

⁴ See, 47 C.F.R. §97.1(b), (c) and (d)

⁵ For more information about AMSAT, see: <http://www.amsat.org>. Often, the original AMSAT organization is known as AMSAT-NA, with NA standing for "North America."

3. Among the numerous successes in Amateur Radio satellite technology was the initiation and development of “microsats.”⁶ Beginning in January of 1990 with the launch of a series of small satellites, international Amateur Radio satellite experimenters utilized a radical design approach, taking advantage of rapid advances in solar cell technology. Shedding bulky spaceframes, these microsats measured less than 23 cm on each side and weighed only 13 kg. These were packet radio store-and-forward systems for international Amateur Radio communications, as well as for voice repeater operation. AMSAT-OSCAR 14 was ultimately dedicated for use by VITA (Volunteers In Technical Assistance) which used it for sending and receiving e-mail messages in Africa. Other microsats launched in the early 1990s by Amateurs were intended to and did provide non-Amateur, store-and-forward digital communications for non-profit, humanitarian organizations. By 2002, there had been at least 50 OSCAR satellites launched, some of which are still in operation today. 2003, however, marked the debut of Amateur CubeSats, based on designs at California Polytechnic State University which started in 1999. The first Amateur CubeSats were CubeSat-OSCAR 55 and CubeSat OSCAR 57, both of which were launched in June of 2003 by radio Amateurs at the University of Tokyo. These CubeSats transmitted telemetry in Amateur allocations. Since then, there have been numerous CubeSats launched by radio Amateurs individually, and by colleges, universities and secondary schools as part of STEM and engineering curricula incorporating Amateur Radio. Amateur Radio experimentation with CubeSats is currently robust. In all senses of the term, the Amateur Radio Service and the Amateur-Satellite Service have pioneered CubeSat technology and refined it over time, to the point that now, both commercial entities and government entities have found numerous applications for the technology, including Earth exploration. Colleges, universities and

⁶ A good and complete discussion of the extensive history of small satellite research and development by Radio Amateurs appears in the ARRL Satellite Handbook, 2008 edition at pages 1-1 to 1-23.

secondary schools have partnered effectively with Amateur Radio operators (often college and university professors and science teachers in secondary schools who are sponsors) in conducting CubeSat research projects. Such partnerships are to the benefit of the students in experiential learning; to the benefit of the Amateur Radio Service in the exposure to the Service and the interest that these projects engender in technically inclined younger students; and consistent with the goals of the Commission for the Amateur Service.⁷ The partnering between the Amateur Service and the academic community with respect to small satellite experimentation and deployment is completely compatible and symbiotic and should be encouraged from a regulatory perspective.

4. In this proceeding, the Commission has proposed revisions to its rules to facilitate deployment of a class of satellites referred to collectively as “small satellites,” which clearly would include Amateur microsat and CubeSat technologies. These types of satellites, which have relatively short duration missions, the Commission appropriately credits with advancing scientific research. The Notice states that which is quite apparent in recent years: that small satellites are also increasingly being used for commercial endeavors, such as gathering Earth observation data. The Notice states that the proposed rules are designed to lower the regulatory burden involved in licensing small satellites and reducing application processing times, while offering protection for critical communication links and enabling efficient use of spectrum for this dynamic sector. The Commission’s interest in this proceeding appears principally to be in encouraging and facilitating the authorization of *commercial* small satellites. However, the ongoing research, development and experimentation in this area involving academia and

⁷ 47 C.F.R. §97.1(c) and (d) of the Commission’s rules include as goals for the Amateur Radio Service the “encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art;” and “expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.”

Amateur Radio is at a high level at the present time and will be for the foreseeable future. It is clearly in the best interest of commercial entities which make use of small satellites to encourage this ongoing Amateur Radio research and development. It is also clearly in the public interest to allow and encourage the continuation of both Part 5 experimental small satellite operation (where appropriate), and to encourage and facilitate Amateur Part 97 small satellite experimentation. To do that, the Commission should now, in this proceeding, examine the proper classification of Amateur Part 97 satellite experimentation and that of Part 5 experimental operation. In ARRL's view, there exists, and there should be used, a bright line test for making proper distinctions between these two regulatory paradigms. Specifically, it is possible to clarify, going forward, which types of satellite operations are properly considered Amateur experiments conducted pursuant to a Part 97 Amateur Radio license [coordinated by and through the International Amateur Radio Union (IARU)] and which should be considered experimental, non-Amateur facilities properly authorized by a Part 5 authorization. There is a justification for *expanding* the category of satellite experiments that can be conducted pursuant to an issued and outstanding Amateur license, especially those in which a college, university or secondary school teacher is a sponsor. However, there is also a compelling need to discourage Part 5 experimental authorizations for satellites intended to operate in Amateur allocations by non-Amateur sponsors absent compelling showings of need. There is no doubt but that Amateur Radio should be protected against exploitation by commercial entities, and there should be a compelling justification for a Part 5 Experimental license issued for a satellite experiment to be conducted in Amateur spectrum. A defining criterion for this latter category should be that there is no other spectrum practically available in lieu of Amateur Radio allocations. This is ARRL's position and, we understand, the position of AMSAT-NA and IARU as well. At the same time, however,

the Commission should more flexibly permit and encourage college, university and secondary school Amateur Radio research and academic experiments pursuant to Part 97 rules where such experiments are conducted entirely within Amateur and Amateur-Satellite Service spectrum allocations, and which are in compliance with all applicable Part 97 rules.

II. IARU Coordination and Resolution 659.

5. The Notice, at paragraph 18, notes that a variety of frequency bands have been used for, or requested for use by small satellite operations, “both on a conforming and nonconforming basis with respect to the allocations in the United States Table of Frequency Allocations (U.S. Table).” Frequency bands sought for use by small satellite operators for downlinks or uplinks have included (among other bands) the Amateur allocations at or within 144-146 MHz, 435-438 MHz, 449.75-450.25 MHz, 902-928 MHz, 2390-2400 MHz, 2400-2450 MHz, and 5830-5850 MHz. The majority of these bands have been authorized by the Commission for one or more small satellite(s) or systems on an experimental basis under Part 5 of the Commission’s Rules. Amateur-Satellite Service and Amateur Service spectrum allocations which are not also allocated for commercial space operation are inappropriate for use by commercial or non-Amateur small satellites. Authorizing such pursuant to Experimental authorizations creates difficulties for Amateur Radio operators, inasmuch as commercial or experimental, non-Amateur small satellite operations have a substantial potential to cause interference to ongoing terrestrial or satellite Amateur Radio operation, over exceptionally wide areas. For this reason, as discussed below, ITU Radio Regulations do not include the concept of experimental satellites.

6. IARU, the international organization of Amateur Radio national societies, has for many years offered a frequency coordination service for Amateur satellite operation due to the

need for international coordination of such operations to prevent interference. The program is described in an information paper⁸ for developers of satellites planning to use frequency bands allocated to the Amateur-Satellite Service. IARU provides frequency coordination in bands allocated by the International Telecommunications Union (ITU) to the Amateur-Satellite Service. Its recommendations are non-binding. IARU is not a regulator and has no enforcement authority. Some administrations, including the United States, have chosen to require IARU coordination for Amateur-Satellite operations conducted pursuant to Part 97 rules. IARU's policy with respect to satellites operated in Amateur Radio spectrum is to coordinate only satellites whose station licensees and control operators are licensed radio Amateurs, and whose mission and operation are consistent with the Radio Regulations' definitions of the Amateur Radio Service and the Amateur-Satellite Service. Crowding of certain Amateur Radio allocations and the significant potential for interference caused IARU to cease all international satellite coordination in the Amateur-Satellite Service band 144-146 MHz as of July 1, 2014.⁹ Similar crowding in other Amateur-Satellite Service bands has increased since that time. However, for several years, IARU has been obligated to coordinate frequencies in the amateur-satellite bands for satellites that are *not* licensed as Amateur-Satellites. The situation developed gradually over time but became acute when interest in small satellites, CubeSats in particular, boomed. Academic institutions, particularly colleges and universities have long recognized that the construction and deployment of small satellites offer an excellent opportunity for student learning. As long as there were just a few such projects underway, they could be readily accommodated within the Amateur-Satellite Service and were generally regarded as being of substantial benefit to both the Amateur Service and to the academic institutions sponsoring them.

⁸ http://www.iaru.org/uploads/1/3/0/7/13073366/iarusatspec_rev15.7.pdf

⁹ See, http://www.iaru.org/uploads/1/3/0/7/13073366/satellite_frequency_coordination_in_the_two.pdf

Most recently, however, because of (1) the dramatic increase in interest in small satellites for academic, commercial and government purposes; (2) the standardization of CubeSat architecture, simplified design and the development of a cottage industry providing satellite modules to constructors; and (3) the vast improvement in launch opportunities offered by a NASA program (Educational Launch of Nanosatellites, or ELaNa) among others, it became a burden on IARU to conduct frequency coordination of small satellites using Amateur or Amateur-Satellite Service spectrum. So it decided as both a policy matter and as a practical matter to cease coordination of non-Amateur experimental operations.

7. In announcing the termination of IARU coordination of Satellite operation in the 144-146 MHz band in 2014, IARU stated in part as follows:

Accommodating a temporary special need, IARU has extended [its] frequency coordination service to experimental stations sharing amateur-satellite service frequencies. IARU most strongly recommends that satellite builders asking for coordination make sure that their mission fits the definitions of the amateur services.

RR 1.56 amateur service: A radiocommunication service for the purpose of self training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

RR 1.57 amateur-satellite service: A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service.

Satellite projects not conforming to these definitions may be returned for reconsideration with a recommendation to look for frequencies allocated to radiocommunication services fitting their mission requirements. Builders are also urged to support work on ITU Resolution 757 in ITU-R Working Party 7B. Beginning 1 July 2014, IARU will no longer be able to accept frequency coordination requests for experimental stations in the two-metre band.

8. IARU in 2017 again re-examined its small satellite coordination policies in view of the adoption by the ITU at the 2015 World Radiocommunication Conference (WRC-15) of a

provision in Resolution 659¹⁰ containing (1) protective language against non-Amateur satellites operating in Amateur-Satellite Service spectrum, and (2) the exclusion of any Amateur bands from spectrum under consideration for allocation to the Space Operation Service at a future WRC. In adopting Resolution 659 at WRC-15, the ITU clarified that what are now called “short duration mission,” *non-Amateur satellites* do not belong in amateur-satellite (or amateur) allocations, either now or in the future. Consistent with this unequivocal international resolution, IARU decided in 2017 to stop coordinating non-Amateur satellite operations, effective in July of 2017. Accordingly, IARU adopted new guidelines for satellite frequency coordination. After July 1, 2017, IARU would conduct international coordination for the following three types of facilities only:

- a) Space stations operating under an amateur license authorization, with a clear amateur mission. This includes combined missions.
- b) Satellite stations where the use of an amateur frequency band is directed in writing by the licensing administration.
- c) Educational and university satellite projects may be coordinated only when there is an identified amateur component and the mission is to teach and train students in satellite communication and building and launching satellites. The person responsible for the satellite communications must be a licensed radio amateur.

This IARU policy and ITU Resolution 659 provide, in ARRL’s view, a reasonably good means of protecting the Amateur Service and the Amateur-Satellite Service against exploitation; of preventing Amateur allocations from being misused for commercial purposes; and for encouraging the continuation of educational satellite research projects which incorporate Amateur Radio in academic curricula.

¹⁰ See, https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000C0007PDFE.pdf

III. Incorporation of Amateur Radio Operation In Experiential Learning Using Small Satellites is Good for Amateur Radio; Good for Students; and Good for the Advancement of Technology, and the Commission’s Regulatory Paradigm Should Encourage Such.

9. The Commission has since 2013 applied what ARRL views as an incorrect and overly strict standard for what constitutes an Amateur satellite, forcing academic projects that previously would have and should have been operated in the Amateur-Satellite Service, pursuant to and in compliance with Part 97 regulations, to apply for Part 5 experimental licenses instead.¹¹ The existing, flawed standard is premised on the false rationale that a satellite launched by an educational institution must be “non-Amateur” because the instructors are being paid for their academic work by a learning institution, and they therefore have a “pecuniary interest” in the small satellite project, ostensibly in violation of § 97.113(a)(3) of the Commission’s Rules.¹² This premise, however, fails to apply well-established Commission jurisprudence which contradicts it. Section 97.113(a)(3) contains an exception to the general prohibition on communications in which the station licensee or control operator has a pecuniary interest (including communications on behalf of an employer) whereby the “control operator may accept

¹¹ See the *Public Notice*, DA 13-445, released March 15, 2013 “*Guidance on Obtaining Licenses for Small Satellites.*”

¹² Section 97.113 of the rules provides, in relevant part, as follows:

§ [97.113](#) Prohibited transmissions.

(a) No amateur station shall transmit:

(1) Communications specifically prohibited elsewhere in this part;

(2) Communications for hire or for material compensation, direct or indirect, paid or promised, except as otherwise provided in these rules;

(3) Communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer, with the following exceptions:

(iii) A control operator may accept compensation as an incident of a teaching position during periods of time when an amateur station is used by that teacher as a part of classroom instruction at an educational institution.

compensation as an incident of a teaching position during periods of time when an amateur station is used by that teacher as a part of classroom instruction at an educational institution.” See, § 97.113(a)(3)(iii). The Commission has made clear that this exception is not limited to classroom instruction and that the instruction is as the educator defines it. See, *Amendment of Part 97 of the Commission’s Rules to Relax Restrictions on the Scope of Permissible Communications in the Amateur Service*, Memorandum Opinion and Order, 9 FCC Rcd. 2602 (1994).

10. Paragraph 16 of the Notice in this proceeding states, in part:

16. Amateur-Satellites. The amateur-satellite service, as a subset of the amateur service, is reserved for communications made for the purpose of self-training, intercommunication between amateur stations, or technical investigations carried out by amateurs. Rules regulating the operations of the amateur radio service are contained within Part 97 of the Commission’s rules. Section 97.113(a)(3) of the Commission’s rules, 47 CFR § 97.113(a)(3), prohibits “communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer.” Such restrictions on operations in the amateur service are generally consistent with the ITU Radio Regulations and the domestic and international understanding of the purpose of the amateur service. (footnotes omitted)

The statement above is not entirely accurate. The United States is the only country which, relative to the non-commercial character of the Amateur Service, defines "pecuniary interest" as the United States does in this context. ARRL is not aware of any country that has a rule defining an Amateur or Amateur-Satellite Service experiment in such a way as to preclude its incorporation in an educational curriculum, regardless of the fact that a teacher, professor or teaching assistant who is acting as a control operator of the Amateur Station may be compensated by the educational institution for teaching services generally. Furthermore, it is impossible to construe existing Commission precedent to preclude the conduct of Amateur Radio

Part 97 experiments sponsored by educational institutions with compensated instructors or participants who are licensed Radio Amateurs.

11. ARRL is appreciative and supportive of the Commission's consistent sensitivity to the potential for exploitation of the allocations to the Amateur and Amateur-Satellite services by commercial and governmental entities. The Section 97.113 rule generally protects the Amateur Service and the Amateur-Satellite Service against commercial exploitation and it is worth retaining. In the context of small satellite experimentation, there is a need for a distinction between what can and should be authorized as an Amateur-Satellite facility and what should be authorized pursuant to Part 5 Experimental operations. Nevertheless, ARRL's discussions with both AMSAT and IARU representatives have led to the conclusion that all three entities endorse the use of the Amateur-Satellite Service and Amateur Service spectrum by non-commercial colleges and universities and by *bona fide* educational institutions *under certain conditions*. There is an identity of interest between universities conducting small satellite experiments in Amateur bands as Amateur-Satellites, and the Amateur-Satellite Service generally because (1) it encourages the launch of more satellites that radio Amateurs can use; (2) it enables universities to engage the international Amateur Radio community in gathering telemetry information from their satellites; (3) it promotes awareness of Amateur Radio to university students and encourages growth in Amateur Radio and technical self-training in Amateur-Satellite operation; (4) it promotes interaction and cooperation between Amateur Radio volunteers and universities in the provision of technical expertise; and (5) it promotes STEM learning and a competent future workforce.

12. With those benefits in mind, IARU has continued to conduct frequency coordination for these college, university and secondary school satellite operations, provided that "there is an

identified amateur component” and the mission is to teach and train students in satellite communication and building and launching satellites; and that the person(s) responsible for the satellite communications is (or are) licensed radio amateur(s). The alternative that was faced by IARU in 2017 was for such small satellites to be authorized by an administration to operate in amateur spectrum *without* coordination, which is unacceptable. Now, however, ARRL urges strongly that the Commission henceforth apply a new definition of an Amateur-Satellite experiment, with the goal that future educational satellites with objectives that are consistent with those of the Amateur and Amateur-Satellite services should be allowed to operate pursuant to an Amateur license and to be considered Amateur Radio experiments, governed by Part 97 regulations. The bright-line, practical definition would be as follows: An Amateur Radio satellite experiment would be one which is: (1) being conducted in Amateur-Satellite Service spectrum; (2) having a licensed radio Amateur as a control operator at all times; (3) being operated in compliance with all applicable portions of the Commission’s Part 97 rules governing Amateur Radio operation; and (4) which is coordinated by IARU in advance of launch. All other small satellite operations should be subject to either Part 25 licensing or Part 5 Experimental authorization grants in accordance with whatever expedited procedures that the Commission establishes. Neither of those two regulatory alternatives, however, should permit operation in Amateur-Satellite Service or Amateur Service allocations, consistent with ITU Resolution 659.

IV. Non-Amateur, Experimental Part 5 Operation Should Not Be Permitted in Amateur or Amateur-Satellite Allocations Absent a Compelling Showing That There Are No Alternatives.

13. It has been beneficial in past years that the Commission has required applicants for experimental licenses specifying operation on Amateur or Amateur-Satellite frequencies, prior to

taking action on that application, to submit evidence of IARU coordination.¹³ This process cannot continue due to the 2017 change in IARU policy. However, the Commission should also clarify unequivocally that IARU coordination is not available for non-Amateur-Satellite experiments which specify the use of Amateur Radio Service or Amateur-Satellite Service spectrum, except where the use of Amateur or Amateur-Satellite spectrum is directed by the Commission (rather than by the applicant) and where the experiment is consistent with the purpose of the Amateur Service. In the past, before issuing an experimental authorization for a satellite operating in Amateur-Satellite Service Spectrum, the Commission has required that the applicant provide evidence of IARU coordination prior to grant. While this has been helpful in general terms, it put IARU in the position of coordinating a non-Amateur-Satellite in Amateur spectrum on the basis of a request from an applicant, not from an administration. This situation has led to a proliferation of experimental satellite operations specifying Amateur spectrum which is not in the best interests of the Amateur and Amateur-Satellite Services. IARU has made it clear that it will not coordinate non-Amateur experiments in Amateur-Satellite Service spectrum at all, unless the relevant administration directs such, *and* where the purpose of the experiment is consistent with the Amateur Service purposes as stated in the Radio Regulations. This policy dictates the procedure going forward to some extent. The Notice in this proceeding does not explain this accurately. Footnote 64 in the instant Notice reads as follows:

64. *Small Satellite Licensing Guidance*, 28 FCC Rcd at 2557. “The IARU will only coordinate a non-Amateur-Satellite if an administration directs in writing that it be operated in an amateur-satellite band under an experimental or other

¹³ In seeking Commission approval of amateur-satellite operations, the amateur-satellite control operator must submit a pre-launch notification to the Commission, specifically to the International Bureau, not later than 30 days after the date of launch vehicle determination, but no later than 90 days before integration of the satellite into the launch vehicle. Applicants must submit to the Commission a draft “Appendix 4” notification for submission to the ITU; early coordination with the International Amateur Radio Union (IARU) is also strongly encouraged, and must be completed and documented by submitting a letter from the IARU before materials will be submitted to the ITU. *Guidance on Obtaining Licenses for Small Satellites, Public Notice, DA 13-445, 28 FCC Rcd 2555, 2557 (March 15, 2013)*.

non-amateur license.” IARU, “IARU Aligns Satellite Coordination Guidelines with ITU WRC-15 Decisions,” June 30, 2017, <http://www.iau.org/news--events/iau-aligns-satellite-coordination-guidelines-with-itu-wrc-15-decisions>.

This is misleading relative to the current IARU policy, discussed hereinabove. The United States is the only country that issues "experimental" authorizations to non-commercial "experimental satellites." In fact, the Notice points out that "experimental satellites" licensed under Part 5 of the Commission's Rules are not the same as "experimental stations" as defined in ITU Radio Regulation 1.98.¹⁴ Current IARU practice is to coordinate non-commercial, educational satellites authorized by the Commission under Part 5 if they meet the same standards as Amateur-Satellites of other countries, including the person responsible for communications being a licensed radio amateur and the mission of the satellite project being consistent with RR 1.56, which defines the Amateur Service.

14. As the Notice states at Paragraph 17, “to date, the majority of non-governmental small satellite operations in the United States have been authorized through the experimental process under Part 5 of the Commission's rules on a non-interference, unprotected basis and with limited license terms.” Non-interference, unprotected operations may be acceptable for some satellite operations, but for other types of operations, and particularly for satellite mission critical functions such as telemetry, tracking, and command (TT&C), it can be important that satellite links have some level of interference protection. This is precisely the justification for ITU Resolution 659, and the best reason to segregate experimental and all other commercial satellite facilities from Amateur small satellite stations operating under 97 in terms of frequency bands. It is notable in this connection that ITU Radio Regulations contain no provision for experimental space stations. To ARRL's knowledge, upon diligent inquiry, the United States is the only

¹⁴ That ITU definition is as follows: “A station utilizing radio waves in experiments with a view to the development of science or technique. This definition does not include amateur stations.”

country that issues such licenses. In so doing, the Commission may be relying for its authority on RR 4.4.¹⁵ However, experimental stations are subject to the far more stringent international requirement of RR 27.7, which states at Section 5 thereof that: “Where there is no risk of an experimental station causing harmful interference to a service of another country, the administration concerned may, if considered desirable, adopt different provisions from those contained in this Article.” Because it is literally impossible to find that there is “no risk” of interference to allocated services from a space station, the requirement cannot be met.

15. Under the circumstances, there is no justification for the Commission to permit Part 5 experimental small satellite operations in Amateur or Amateur-Satellite Service allocations, unless the applicant can make a convincing showing that (1) there is no other spectrum available for the type of experiment that the applicant wishes to conduct; and (2) the particular experiment that must be conducted in Amateur or Amateur-Satellite Service spectrum is consistent with the purposes set forth for the Amateur Service.

V. Conclusions.

16. The Amateur Radio Service has since the beginning of satellite technology, contributed significantly, and stands to continue to contribute significantly to the development, refinement and innovation in CubeSat, nanosat and picosat technology. The Commission’s regulatory structure for Part 97 Amateur-Satellite Service operation is, generally speaking, reasonably accommodating. However, the regulatory paradigm applicable to Part 97 small satellite operation are too stringent; and that applicable to Part 5 experimental small satellite operation is too lax. With regard to the use by colleges, universities and secondary schools of

¹⁵ RR 4.4 reads as follows: “Administrations of the Member States shall not assign to a station 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, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations.”

small Amateur Radio satellites as part of STEM curriculum in experiential learning programs, the Commission is overregulating the bona fide educational institutions, forcing them to utilize a Part 5 Experimental license, out of a largely misplaced fear of commercial exploitation of the Amateur-Satellite Service and a significant misapplication of the Amateur business communications rule. While the risk of exploitation does exist, it can be prevented and managed, and the strong benefits of incorporation of Amateur Radio in educational curricula achieved by (a) applying clear Commission precedent cited herein which makes Section 97.113 concerns inapplicable to small satellite research experiments by colleges, universities and secondary schools; and (b) by applying a bright line test for what constitutes a bona fide educational Amateur Radio experiment. An Amateur Radio satellite experiment should be considered one which is: (1) being conducted in Amateur-Satellite Service spectrum; (2) having a licensed radio Amateur as a control operator at all times; and (3) being operated in compliance with all applicable portions of the Commission's Part 97 rules governing Amateur Radio operation; and (4) coordinated by IARU in advance of launch.

17. At the same time, the Commission should not permit non-Amateur, experimental satellite operation in Amateur Radio allocations, absent a convincing showing by the Part 5 applicant that there is no practical alternative to the use of Amateur spectrum, and that the purpose of the operation is consistent with those of the Amateur and Amateur-Satellite Services. Assuming that Part 25 and Part 5 applicants do not specify Amateur or Amateur-Satellite spectrum, ARRL has no concern with the regulatory paradigms associated with those two regulatory mechanisms for authorizing small satellites for whatever purpose. Typically ARRL does not object to non-Amateur, terrestrial experimental licenses or Special Temporary Authority in Amateur spectrum unless there is a fundamental incompatibility demonstrated in the

application. With respect to experimental, non-Amateur satellites in Amateur allocations, however, the situation is quite different. There is no workable means of accurately avoiding the risk of interference, internationally or domestically, to Amateur or Amateur-Satellite facilities; the “footprint” of such satellites is exceptionally large; and the ITU has determined that the best means of resolving that incompatibility is to create dedicated space service spectrum for non-Amateur small satellites and to avoid use of Amateur spectrum by such satellites. ITU has the correct policy.

Therefore, the foregoing considered, ARRL, the national association for Amateur Radio, respectfully requests that the Commission adopt the suggestions in these comments in a Report and Order in this proceeding.

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