

Comments on Further Notice of Proposed Rulemaking

Mitigation of Orbital Debris in the New Space Age, IB Docket No. 18-313

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Open Research Institute is a 501(c)(3) non-profit research and development organization which provides all of its work to the general public under the principles of Open Source and Open Access to Research.

Open Research Institute strongly agrees with the motivational statements (FCC-20-54A2 through FCC-20-54A6) from the Commissioners concerning Mitigation of Orbital Debris in the New Space Age.

Reducing the risk of explosions, collisions, and injuries while maintaining US commercial viability, increasing access to critical communications services, and preserving the ability to innovate are critical items that we must accomplish as a nation. It is clear that a tremendous amount of excellent work is behind the ongoing development of the proposed rules, and some excellent progress has been made. As Brendan Carr wrote concerning this FNPRM,

“As a result of our edits, the Commission now adopts our sister agencies’ large object collision and casualty risk standards; we now seek further comment on spacecraft maneuverability and indemnification requirements; and we now take a more cautious and balanced approach to our bond proposal.”

And here is where the greatest potential risk to the survival of the Amateur Radio Satellite Service lies.

Amateur Radio Satellite Service payloads are almost exclusively put in orbit by the efforts and fundraising of volunteers.

Amateur Radio Satellite Service work is best and most safely done as open source work under the public domain carve-outs in ITAR and EAR.

Amateur Radio Satellite Service research and development is not limited to low earth orbit missions.

Current, funded, and staffed Amateur Radio Satellite Service work includes GEO, HEO, and interplanetary missions from multiple organizations. Open Research Institute has raised approximately \$600,000 for open source microwave-band digital transponder work. This project targets GEO and interplanetary missions. This project relies entirely on donated volunteer labor. Fundraising comes from the amateur radio and hobbyist community and amateur radio charitable foundations.

Assumptions that amateur payloads will remain in LEO and only ever target LEO are not accurate. Assumptions that amateur projects will never attempt small formations or constellations are not accurate. Assumptions that insurance or bond costs will be low or zero because amateurs will only ever use single-payload LEO missions are not accurate. We must not inadvertently stunt ambitious non-commercial work.

Open source payload projects dramatically lower the barrier to entry for critical hands-on learning and training opportunities for the next generation of scientists and engineers. Our current space industry technical leadership is built upon several generations of engineers being able to participate in amateur, experimental, and university payload projects. All five members of the board of directors of Open Research Institute are licensed amateur radio operators. Two of five have significant career experience in the space industry. This is not an isolated or unusual situation. Another example is Nobel Laureate Joe Taylor, K1JT. Some of his very influential work includes Earth-Moon-Earth communications and advanced digital signal processing modes WSJT, JT65, and FT8. Joe credits amateur radio for inspiring his interest in science.

For more, see

http://www.princeton.edu/~paw/archive_old/PAW95-96/02_9596/1011feat.html

As explained in the Comments of the Commercial Picosatellite and Nanosatellite Developers Group, propulsion options are not yet available to open source amateur payloads. A maneuverability exemption is needed and warranted. Development of open source propulsion will lead to improvements in commercial propulsion, just as development of open source server technology enabled massive technical giants like Amazon, Facebook, and Google to achieve high levels of commercial success. If there is a golden goose at work here, it's open source.

As explained by AMSAT and ARRL, modification of the indemnification regulations must specifically address the volunteer and non-profit nature of the Amateur Radio Satellite Service. Otherwise, there will be no one willing to operate a payload moving forward.

Without an exemption for the Amateur Radio Satellite Service with respect to maneuverability and indemnification, virtually all Amateur Radio Satellite Service activity will move outside the United States.

Putting space out of reach of the Amateur Radio Satellite Service would severely reduce the number of US persons choosing a career in space and space technology. The statutory justifications for the amateur radio and amateur radio satellite service are reason alone for strong, enduring regulatory protection. Good intentions with debris mitigation are clearly aimed at large commercial constellations. The unintended consequence of implementing many of these regulations, without exemptions for amateur and experimental work, could be a complete cessation of all US-based amateur and experimental launches. Crippling amateur and experimental satellites will devastate academic space programs at US universities.

Exemptions would provide immediate relief. The Commission has the opportunity to “do no harm” to the Amateur Radio Satellite Service by making exemptions in these rules.

However, specific regulatory protections, incentives to government and commercial launches to include amateur equipment, and innovation-supporting privileges would be a better way forward.

We can accomplish the requirement of maintaining US technical leadership while mitigating debris creation by actively supporting the educational mission of amateur radio. Trapping amateur satellite payloads at LEO through exemptions is not of long-term benefit to the service. Exemptions that inadvertently relegate amateur work to LEO take amateur volunteers out of higher orbit work. Amateurs should be active participants in the development of technologies vital to debris mitigation and remediation. Innovation is well worth the inclusion. The new space race needs everyone engaged, not just those organizations launching massive commercial constellations.

Grant the Amateur Radio Satellite Service more spectrum and more opportunities.

Grant space-to-space amateur allocations at 3 GHz, 5 GHz, and 10 GHz for amateur constellations and formations.

Grant microwave-band uplink and downlink allocations that require the amateur radio service to use dynamic spectrum sharing in order to access. This would galvanize educational attainment in cognitive radio, machine learning, and advanced digital communications techniques.

Create an incentive for including amateur radio communications equipment on commercial and government payloads, especially scientific missions. This could

be accomplished with a reduction in fees and/or preferential licensing status.

These rules would not increase the risk of explosions, collisions, or injuries. They would increase innovation and contribute to broad improvements in technical leadership.

Civic-mindedness is a hallmark of amateur radio. Not every amateur radio operator becomes an engineer in the space industry. But, almost all of them will have the opportunity to vote. It's important to not be too narrow-minded about the benefits of active and accessible amateur radio programs in the United States. Engineers and scientists do not act in isolation. We must have broad support across the population in order to achieve critical national goals. The non-commercial, volunteer-driven, and educational nature of the Amateur Radio Satellite Service provides enormous and enduring value to the economy and security of the United States.

Regulations can help, do no harm, or hinder those that are regulated. We ask that these rules at least do no harm, given the enormous benefit provided by Amateur Radio and the Amateur Radio Satellite Service.

Thank you,

Michelle Thompson
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