



4. The Cal Poly comment observes that data for predicting orbital behavior for satellites of dimensions as small as Cubesats – typically, a 10 cm cube with a mass of approximately 1 kg – is severely limited because there is little or no pertinent published data. The Cal Poly faculty members note that even the best reference available<sup>1</sup> is not intended for predicting the orbital lifetime of picosats, and the extrapolations necessary for doing so result in estimated lifetimes of questionable validity. As they observe, "the science needs to do better!"

5. AMSAT agrees. We respectfully remind the Commission that many, indeed most, of the satellites currently under construction or awaiting launch that will carry amateur space stations into orbit are Cubesats or spacecraft of comparable dimensions. Even slightly larger spacecraft such as the Microsat-sized AMSAT-OSCAR 51, described in our Petition, are subject to comparable uncertainty in predicting their orbital lives.

6. The International Amateur Radio Union's satellite frequency coordination Web page, [www.iaru.org/satellite](http://www.iaru.org/satellite), currently lists 19 satellites presently in design, construction or awaiting launch that are expected to carry U.S. amateur space stations into LEO orbit. Of those, 14 are Cubesats and 5 are Microsat-sized spacecraft of comparable dimensions to AMSAT-OSCAR 51. Interestingly, all are sponsored by universities. In addition, AMSAT presently has in the preliminary design stage a HEO spacecraft, known as Eagle, whose dimensions are not yet finalized but whose mass in orbit is likely to be on the order of 50 kg.

7. It is for this reason that AMSAT was unable to file the Paperwork Reduction Act comments promised in our Petition. There is simply so much uncertainty, and so little useful data, that estimates of the time and expense required to comply with the Commission's proposed requirement would not be meaningful.

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<sup>1</sup> James R. Wertz and Wiley J. Larsen, eds., *Space Mission Analysis and Design*, 3<sup>rd</sup> Edition.

8. In view of the lack of applicable data and resulting uncertainty cited by the Cal Poly faculty members, to require the submission of orbital debris mitigation plans based on such estimates, and to contemplate taking administrative action on them, would be premature at best. As the Cal Poly faculty members note, the science to support such measures is simply not presently available.

9. Clarke writes as a vice president and board member of Project OSCAR (Orbiting Satellite Carrying Amateur Radio). She points out that there is relatively small risk posed by the existing and proposed "fleet" of U.S.-built OSCARs. She calculates that the 16 OSCARs presently in orbit have an aggregate surface area of approximately 5 cubic meters and an aggregate mass of 210 kg, and compares those figures with estimates for the 71 satellites in the Iridium constellation – approximately 1,704 cubic meters and 34,325 kg.

10. Clarke goes on to note that NASA guidelines (NSS 1740.14 § 1.3) indicate that the evaluation of orbital debris mitigation plans must be balanced against mission requirements and the need to control costs. She calculates that the strike probability posed by a typical OSCAR microsatellite is 10 to 100 times smaller than that of a "small commercial satellite" similar to Iridium. "Therefore," Clarke writes, "it appears both unfair and unbalanced to hold OSCAR satellites to the same rules as larger commercial satellites in the context of NSS 1740.14 § 1.3." AMSAT agrees.

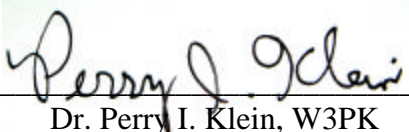
11. Clarke proposes an alternative to the Commission's proposed rule under which "AMSAT and its U.S. affiliates" would receive an exemption to the requirement to file orbital debris mitigation plans for a period of not less than 15 years. After that period expires, Clarke recommends that the matter be reconsidered based on criteria that might be pertinent at that time.

12. The substance of Clarke's proposal is certainly worthy of consideration, although we would have preferred that it be broadened to include *all* spacecraft carrying amateur space stations, not just those with which AMSAT might be involved. However, as discussed in our Petition, it is AMSAT's position that the Commission lacks the statutory and regulatory authority to impose such a requirement in the amateur-satellite service regardless of the time frame involved. Moreover, AMSAT contends that to do so through the ITU notification process as proposed by the Commission would be inconsistent with the intent of the international Radio Regulations and could be construed as being in derogation of them as well.

RESPECTFULLY SUBMITTED,

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