

Comment on LEO (Low Earth Orbit) Satellites for Internet Access

by Pedro Ferraz de Abreu

pfa@mit.edu

2022/07/03

Summary

Internet Society (ISOC) prepared a draft for a policy position concerning the use of LEO (Low Earth Orbit) Satellites for Broadband Internet Access. It asked for feedback, with the central question "*Could LEOs Help Close the Digital Divide?*", with sub-question "*Are you a LEO enthusiast?*" (Steve Olshansky, ISOC, 2022/07/01). In this brief comment, I praise the ISOC draft but raise several limitations it has, with a few suggestions for clarification.

My view can be summarized answering directly the question: yes, of course LEO could help "close the digital divide", but at a tremendous cost, that is not worthy to risk, given the way it is being done and my conviction that current political and economic power structure will not allow major change in the near future - unfortunately - despite all good efforts by good people and good proposals, like the ones in ISOC draft.

It is not just the problem of Elon Musk's XSpace private company (1900 low-orbit satellites on 2021 and counting) and Cia (and it is a huge problem, the logic of private for-profit action in space, in this context). It is also the government-led geopolitical hostile confrontation, which clearly is prevailing more and more over international cooperation, and not likely to be reverted any time soon.

So no, I am not a "LEO Enthusiast", because of these concerns.

In short, unless we develop a way of removing any low-orbit object (be it debris or active) at any time in a cost effective way, and, most importantly, secure the power of the community to enforce that removal at will, LEO, as is, can simply **block Humankind future freedom of access to space**, at least for too many years; and have tremendous cost for all citizens of the world - opportunity costs (of negated uses, by preemptive occupation or debris), clean up space debris costs, multiplied rocket launch environmental costs, and the social cost of private interest's control over public interests.

Consequently, I believe we need to limit the damages of LEO savage deployment, as much as we can (not condoning it, much less encouraging it), while procuring other alternatives to address the digital divide. I suggest one in my comment, but there are others. For that, an ISOC policy document and Internet Society action may be very important.

Brief Comment on LEO, sent on 2022/07/03 to ISOC (leo-comments@isoc.org)

Dear colleagues at Internet Society,

Thank you for your work on LEO, for your excellent policy draft, and for your effort to engage discussion on such critical issue.

This is just a brief comment, given that I am unsure if I will be able to send, within your deadline, a substantive contribution to the LEO issue.

This is my first suggestion: due to the strategic relevance of LEO issue, and of this document in particular, it is important that ISOC allow further opportunities to send input [note: message was sent 2022/07/01, with deadline 2022/07/04]. Unless someone had already access to your draft, it is very unlikely that one can provide meaningful contribution in such short time. Even if, as in my case, the potential contributors did have previous concerns and researched the LEO issue - and therefore could bring relevant feedback.

I have been concerned with LEO, not directly in relation with internet, but because of the seriousness of "far west" savage appropriation of space above Earth by private interests, with tremendous potential cost for humankind.

I was happy to find in ISOC draft a thorough list of these issues, as part of ISOC analysis. I congratulate ISOC for that, and for a clear effort to provide a balanced view on its implications. However, imho, ISOC draft risks to convey an equivalent relevance to the several points presented; when some of them have much higher impact, and risk potential, than others.

So my second suggestion, is that ISOC take in consideration the need to discuss the relative levels of impact and risk, either on each item, or dedicate a new section for that reflection / discussion.

I present here, briefly, a few examples.

We have to deal with the "fait accompli" of some LEO deployment, and the way it has been done. You correctly acknowledge this, even if not in an extensive way. But this raises the issue of how to revert current practices, if at least some of your policy (and regulatory) proposals are found to be correct and urgent by those in public office.

Experience has shown that trying to regulate after the fact, specially without expropriating private rights of "ownership" (which are protected in market economies), either fails or has very limited success; we often see a race between private interest's deflection actions (besides powerful lobbying) and regulatory initiative - and public interest frequently loses these races.

So, from this issue, comes a first important distinction between the several aspects you present: which ones represent options or situations that are easy to revert, and which ones are difficult, and / or at great cost? Because we know who ultimately pay the cost: citizens and Humankind.

In my view, which is shared by others that write about LEO, issues like space debris, and non-legitimate appropriation of space above Earth (in this case, low-orbit range), are more urgent than, for instance, the issue of market impact, or spectrum management, etc.

We can reach some incremental changes to better adjust policy and regulation to short-medium impacts in economy, but Humankind may see itself literally locked out of deep space access; and bare the tremendous cost (and huge technology challenge) of cleaning up space debris, rocket/launchers debris, and removal of some or all of these "constellations" of thousands of low orbit satellites. Because even those that remain active (non-debris) are bound to severely limit, or endanger, critical space use (observation, navigation for other purposes or other ranges of orbit). As it is, and as usual, private interests appropriate for themselves "the commons" on what may provide profit, and leave for Humankind the cost of losses.

Already there were episodes of LEO collision high risk / near-collision, both with other satellites (years ago) and space stations (more recent), including the International Space Station. There was at least one major geopolitical incident (2021), addressed in the United Nations, between China and a private company based in the US. So we do not only have to deal with environmental or

operational space costs, we risk to suffer major consequences in world conflict provoked by private interests, who respond to the votes of shareholders, not of citizens.

ISOC document draft correctly list some of these costs as "externalities", but imho it does not give enough priority and relevance on these concerns; and some of the proposals are too soft. For instance, it cannot be found in that text a clear-cut concept that whoever is responsible for debris, is responsible to clean up the mess and in real time. Or a clear-cut norm that any space deployment should incorporate a zero-space-debris deactivation process, for each and any device, as a mandatory obligation - so its design and development costs must internalize this; etc.

And there are other issues of public interests in question, correctly listed in ISOC draft, such as control of content, control of access, privacy protection, etc. that face the risk of being overtaken by profit-driven private interests and, even worse, private interests with growing monopolistic power.

One last example of different levels and different categories of issues, concerns those that deal with structural choices, with long term and deep and wide implications, like property/ownership control, vs. issues that are conjunctural, arising from current circumstances, therefore more relevant on the short term, like current costs, orbit coordination, spectrum management, etc.

Property / ownership does not refer only to devices, but obviously to space itself. Modern property theories (MIT' Omar Razzaz is a very good example) define ownership (property) of something, as implying the ability to restrain others, to benefit from that something – unless in the owner's terms ... and price. Private companies, by preemptively occupying orbit space, are in fact acting as "owners" of space. While you do correctly point to the need of regulating use, imho you do not address upfront the imperative of consolidating space as part of "the commons", therefore "owned" by Humankind; and whether any solution that takes away, for a fact, even partially, this "ownership", is simply non-acceptable.

So, my third suggestion is that ISOC make the most of the fact that the LEO issues go well beyond Internet implications, and address those issues by proposing a larger framework for LEO handling, that should concern, and have the support of, a larger coalition of all of LEO-related stakeholders. Ultimately,

all citizens and all countries of the planet. Many of your policy suggestions are indeed good proposals that go beyond the Internet agenda.

Finally, I suggest that ISOC include in its document a discussion, even if brief, of other alternatives to LEO, to bridge the digital divide. ISOC draft does discuss complementing systems (ground or GEO, for instance), but I think there are alternative airborne solutions, like the extensive use of airship (Zeppelin-like, not just blimps), that are worthy of further study. We know flight industry is relaunching these, even for cargo and passenger transport, besides current uses, given environmental and other costs. An increasing, large network of such airships circulating, adapted for multi-use (passenger / cargo / communication relay) may very well represent a better solution to complement current systems (ground and GEO satellites), when considering all factors and "internalizing" all externalities in the cost/benefit analysis.

I realize this is just a comment, and not a structured contribution to ISOC LEO document. But it is what I can send in such a short notice. I hope it will be useful, and help ISOC in its important work.

I would like to have the opportunity to provide a more comprehensive and structured contribute, and connecting it to my work and research in internet-related domains, since my MIT days. You may find some of that work on e-Planning sites (<http://www.e-planning.org>) and CITIDEP (Research Center on Information Technologies and Participatory Democracy) sites (<http://www.citidep.net>).

I am very grateful for ISOC work reflected in this LEO draft, and for the persistent role that Internet Society has played in trying to preserve our best human values in this major Human infrastructure: the Internet.

Pedro Ferraz de Abreu, PhD
CIAUD / FA-UL
Univ. de Lisboa

MIT-DUSP
Research Associate
<http://www.e-planning.org>

CITIDEP