

Nos. 21-1123, -1125, -1128

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IN THE UNITED STATES COURT OF APPEALS  
FOR THE DISTRICT OF COLUMBIA CIRCUIT

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VIASAT, INC.,

*Appellant,*

v.

FEDERAL COMMUNICATIONS COMMISSION,

*Appellee,*

SPACE EXPLORATION HOLDINGS, LLC,

*Intervenor for Respondent.*

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THE BALANCE GROUP,

*Appellant,*

v.

FEDERAL COMMUNICATIONS COMMISSION,

*Appellee,*

SPACE EXPLORATION HOLDINGS, LLC,

*Intervenor for Respondent.*

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On Appeal from the Federal Communications Commission  
IBFS File No. SAT-MOD-20200417-00037

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**REPLY BRIEF OF APPELLANTS VIASAT, INC. AND  
THE BALANCE GROUP**

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**GLOSSARY OF TERMS\***

Add	Addendum to Opening Brief
EA	Environmental Assessment
EIS	Environmental Impact Statement
Environmental Appellants	Viasat, Inc. and The Balance Group
FAA or Administration	Federal Aviation Administration
FCC or Commission	Federal Communications Commission
LEO	Low-Earth Orbit
NEPA	National Environmental Policy Act
SpaceX	Space Exploration Holdings, LLC
SuppAdd	Supplemental Addendum to Reply Brief
Application	Third Modification Application

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\* Several of these abbreviations appear only in quotations or citations, not in text written by Environmental Appellants. They are included here for clarity.



## INTRODUCTION AND SUMMARY OF ARGUMENT

The Commission's Order authorizes SpaceX to deploy approximately ten thousand satellites over the course of its license term—around the same number that have been deployed in all of human history. If that unprecedented deployment “*may* have a significant environmental impact,” then the Commission should have required an environmental assessment under NEPA. 47 C.F.R. § 1.1307(c) (emphasis added).

The record is more than sufficient to meet the “‘may’ standard.” *American Bird Conservancy v. FCC*, 516 F.3d 1027, 1033 (D.C. Cir. 2008). The purposeful disposal of SpaceX's satellites in the atmosphere will all-but-concededly disperse millions of pounds of alumina. Despite the Commission's and SpaceX's quibbles, that is the same pollutant that scientific studies describe as a potentially “unique” source of atmospheric warming, such that even “small changes” in alumina could “lead to large effects,” and even “trace amounts” can substantially affect stratospheric ozone. [Viasat.Petition.Ex.14.at.187]; [Viasat.Petition.Ex.12.at.54].

The record also shows that SpaceX's deployment will brighten and alter the night sky, with significant impacts on human health, animal behavior, and astronomical observations. As one study put it, “[e]ven if all mitigations [being discussed] were implemented, astronomy will pay dearly,” especially given that “none of [SpaceX's mitigation] strategies so far are yet achieving” recommended

brightness levels. [Viasat.Reply.Ex.13.at150, 247]. The Commission and SpaceX simply ignore the studies that contradict their claim of mitigation. SpaceX may be *trying* to mitigate, but simply promising to reduce pollution by some indeterminate amount is insufficient to avoid NEPA review. The record also shows the potential for a significant environmental impact from un-disintegrated satellite parts returning to Earth; atmospheric pollution from rocket launches; and the dramatic increase in orbital debris.

The Commission seeks to avoid review of its flawed decision by arguing that neither Environmental Appellant can challenge the Order. The Balance Group has standing in its own right and representing its member astronomers, who so clearly have injury-in-fact individually that the Commission does not dispute it. Rather, the Commission contends that the astronomers are not *real* members because The Balance Group's membership requirements are inadequate. But federal courts consistently decline to second-guess a voluntary membership organization on what it takes to join. Viasat, too, is a proper appellant. The Order substantially increases the risk of catastrophic collisions involving crucial Viasat infrastructure—harm the Commission concedes is within NEPA's zone of interests. Viasat's economic harm also falls within NEPA's zone of interests because it is directly caused by SpaceX's irresponsible use of a shared environmental resource.

## ARGUMENT

**I. The Commission was required to conduct an environmental assessment before approving the unprecedented deployment of thousands of satellites.**

**A. An environmental assessment is required whenever a significant environmental impact *may* result.**

The Commission's NEPA regulations could not be clearer: If SpaceX's deployment "may have a significant environmental impact," then the Commission must "require [SpaceX] to prepare an [environmental assessment]." 47 C.F.R. § 1.1307(c). While the threatened environmental harm must be "significant," it need not be certain. Instead, if significant harm *may* occur, the agency must require an environmental assessment and "consider environmental impacts before [it] act[s] rather than wait until it is too late." *American Bird*, 516 F.3d at 1033.

SpaceX emphasizes (at 29-33) the categorical exclusion, but if the Commission's action "may have a significant environmental impact," then that exclusion is irrelevant. The categorical exclusion applies only "[e]xcept as provided in § 1.1307(c) and (d)." 47 C.F.R. § 1.1306(a). So if Environmental Appellants demonstrated that the Commission's action "may have a significant environmental impact" under section 1.1307(c), then that action is not categorically excluded under section 1.1306(a) at all, and SpaceX "shall prepare" an environmental assessment, *id.* § 1.1308(a). *See American Bird*, 516 F.3d at 1032. SpaceX insists (at 32-33) that some separate "extraordinary circumstances"

inquiry is needed, but it cites *nothing* in the Commission’s regulations that supports such a requirement. Instead, SpaceX cites (at 32) a case involving differently worded NEPA regulations promulgated by a different agency. *See City of New York v. ICC*, 4 F.3d 181, 185 (2d Cir. 1993). And while the separate NEPA regulations promulgated by the Council on Environmental Quality set a floor for circumstances when an agency cannot rely on categorical exclusions, they do *not* require agencies to mandate a separate “extraordinary circumstances” criterion in their own regulations. *See* 40 C.F.R. § 1501.4(b). The Commission regards circumstances that meet the “may” standard as sufficiently extraordinary to warrant further environmental assessment—even if they would otherwise be categorically excluded.

Reading section 1.1307(c) to mean what it says is particularly important given how unusually broad the Commission’s categorical exclusion is. As Environmental Appellants explained (at 6), most agencies identify discrete categories of excluded actions. *E.g.*, 49 C.F.R. § 1105.6(c). The Commission, by contrast, excludes *everything* it does, 47 C.F.R. § 1.1306(a)-(b), outside a few specified categories—but, as a safety valve, provides for environmental review when an interested party shows that an otherwise exempted action “may have a significant environmental impact.” The Commission itself described section 1.1307(c) as a “safeguard” that is necessary “to assure performance of our

responsibilities under NEPA.” 60 Rad. Reg. 2d (P&F) 13, ¶ 6 (1986). Thus, contrary to SpaceX (at 42-43), Environmental Appellants are not attacking the Commission’s regulations, but asking that they be applied faithfully, as written.

With no response to the regulations’ actual text, SpaceX resorts (at 40-42) to histrionics, claiming that Environmental Appellants’ position would mean that “unsubstantiated allegations of any speculative chance of environmental impact are enough.” That, of course, elides the requirement that the environmental impact be “significant.” And more importantly, it ignores that the risks here *are* substantiated.

**B. The correct standard required an environmental assessment.**

The Order authorizes SpaceX to operate 2,824 satellites at any given time, which means it will launch and deorbit approximately *ten thousand* satellites over the license term.<sup>1</sup> The Commission’s conclusion that there is not even the possibility of a significant environmental impact from this unprecedented deployment cannot withstand scrutiny.

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<sup>1</sup> SpaceX notes (at 37-39) that the Commission concluded that its NEPA analysis need not account for SpaceX’s entire proposed constellation—100,000 satellites in total. That is irrelevant: SpaceX does not dispute that it will launch and deorbit approximately 10,000 satellites under the specific Order at issue, [Order.¶79]. Environmental Appellants focus on those satellites.

1. Satellite launch and reentry “may” have multiple significant environmental impacts.

***Ozone depletion and global warming from alumina.*** Alumina depletes the ozone layer and leads to global warming, and SpaceX’s satellites produce significant quantities of alumina when they burn up in the atmosphere by design. That pollution alone is sufficient to trigger environmental review.

First, Environmental Appellants introduced uncontroverted scientific studies showing that alumina harms the atmosphere: It damages the ozone layer and contributes to climate change by warming the stratosphere and upper troposphere. [Viasat.Pet.Ex.12.at54, 60]; [Viasat.Pet.Ex.14.at.193]. Indeed, one study described alumina as a potentially “unique source of lower stratospheric heating”; “even small changes ... might lead to large effects.” [Viasat.Pet.Ex.14.at.187]. Another study described how even “trace amounts” of radicals released by alumina can affect “much greater amounts of stratospheric ozone.” [Viasat.Pet.Ex.12.at54]. Once dispersed, alumina can remain in the atmosphere for three to five years—possibly longer. [Viasat.Ex.12.at54, 81]. The *only* response from the Commission (at 80) and SpaceX (at 46) is that these studies addressed alumina from rocket emissions. But alumina is alumina: its environmental impact is no less significant when dispersed through disintegrating satellites rather than rocket launches.

Second, the record makes clear that disintegrating ten thousand Starlink satellites into the atmosphere will disperse substantial quantities of alumina.

Though the precise amount may be disputed, the undisputed record shows that each Starlink satellite weighs approximately 260 kilograms, much of which is aluminum that will convert to alumina on reentry. [Viasat.Pet.Ex.15].<sup>2</sup> Satellite reentry from low-Earth-orbit constellations will disperse an estimated 22 million pounds of alumina. Starlink would be the single largest contributor of atmospheric alumina. *Id.*; Viasat Br. 30. It is therefore not necessary to ascertain *exactly* how many of those 22 million pounds Starlink will contribute to know that the quantity—and the effect on warming and ozone depletion—“may” be significant

This case is on all fours with *American Bird*, where this Court vacated the Commission’s decision for failing to conduct an environmental assessment based on uncertainty concerning environmental impact. 516 F.3d at 1030-1034. The Commission and SpaceX claim that, unlike here, *American Bird* presented “no real dispute” over significant environmental effects. FCC Br. 81-82; SpaceX Br. 34-35. Not true. In fact, the basis for environmental assessment is *stronger* here: the Commission and SpaceX dispute neither that alumina is environmentally harmful nor that SpaceX’s satellites will produce *millions* of pounds of alumina, whereas in *American Bird* there was a heated debate over whether the relevant

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<sup>2</sup> Unable to engage on the merits, the Commission and SpaceX attempt to brush off one piece of evidence as a “poster.” But that document reports the results of a scientific study completed by leading scientists in this field through a nonprofit dedicated to advising the government on space enterprise. Whatever its format, its conclusions are unrebutted.

communications towers killed birds at all. (The environmental groups submitted evidence of between 4 and 50 million bird deaths; industry argued no study demonstrated *any* population decline. 516 F.3d at 1030; 21 FCC Rcd. 4462, 4466 ¶ 10 (2006).) If the Commission is uncertain just how many million pounds of ozone-depleting and atmosphere-warming alumina Starlink satellites will disperse, that is a reason *for* environmental assessment. *See American Bird*, 516 F.3d at 1033 (“[U]nder NEPA,” the agency “is to predict the environmental effects of a proposed action before the action is taken and those effects fully known”).

Moreover, while *American Bird* involved “conflicting studies,” *id.* at 1034, this case pits independent evidence—from scientists and an independent nonprofit studying exactly this question (the “Environmental Impacts of Satellites”)—against a party’s self-serving assertions. [Viasat.Pet.Ex.15]; *see also* [Viasat.Pet.Ex.12]; [Viasat.Pet.Ex.14]. The Commission (but, notably, not SpaceX) relies on SpaceX’s claim that reentering satellites will “create about 0.5% the amount of alumina as the metals generated by meteorites entering the Earth’s atmosphere in a given year.” FCC Br. 28, 80-81 (citing [SpaceX.2021.04.02.Letter.at.5]). The opening brief debunked that apples-to-oranges comparison (at 33), which is not drawn from scientific evidence, but from a back-of-the-envelope calculation based off a forty-year-old textbook’s estimate of *all metals* produced by meteorites. [SpaceX.2021.04.02.Letter.at.5]. In fact, a scientific paper published after the



Order found that satellite re-entries from Starlink “alone could deposit more aluminum into Earth’s upper atmosphere than what is done through meteoroids”—making those re-entries “the dominant source of high-altitude alumina.”<sup>3</sup>

***Risk from debris.*** The Commission did not analyze whether the SpaceX satellites being launched pursuant to the Order risk human casualty or injury (or other environmental damage). Instead, despite recognizing that satellite debris poses such a risk, it concluded that this was “not accurate for SpaceX’s satellites.” [Order.¶84]. *But see* [Viasat.Pet.Ex.17.at.7-9] (documenting potential casualty risk from SpaceX satellites). Moreover, the Commission claimed that “SpaceX has validated its conclusion with a Commission-mandated analysis using software purpose-built by NASA.” [Order.¶84].

That is all wrong: SpaceX’s analysis examined a *prior* satellite design, and showed that the prior design was *not* fully demisable. The Commission therefore asked SpaceX for *additional* analysis using NASA software, which SpaceX refused to provide. Instead, SpaceX announced that it planned to roll out a new design that it baldly claimed would be fully demisable. [Pet.Ex.11.at.5]; *see also* Application for Space and Earth Station Modification, Attachment A: Technical Information to Supplement Schedule S at 46, IBFS File No. SAT-MOD-20181108-

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<sup>3</sup> A. Boley & M. Byers, *Satellite Mega-Constellations Create Risks in Low Earth Orbit, the Atmosphere and on Earth*, at 1, Scientific Reports (May 20, 2021), <https://www.nature.com/articles/s41598-021-89909-7>.

00083 (Nov. 8, 2018). But SpaceX provided no information to evaluate the demisability of this new design, and no analysis of the sort that the Commission previously requested. Letter from FCC to SpaceX, IBFS File No. SAT-MOD-20181108-00083 (Feb. 26, 2019)<sup>4</sup>; [Pet.Ex.11.at.5].

The Commission now says (at 84-85) that it was reasonable to rely on SpaceX's mere assertion because licensees have a "duty of truthfulness." But that was not the basis for the Order. Rather, the Commission found that validation *was* necessary but concluded (incorrectly) that demisability had been validated. [Order.¶84]. Counsel cannot now defend the Order on the ground that validation was unnecessary after all. *See Grace v. Barr*, 965 F.3d 883, 903 (D.C. Cir. 2020) (reasonableness of agency action is based "only" on "what the agency said at the time of the [action]—not ... its lawyers' post-hoc rationalizations") (citation omitted).

The Commission's new argument is wrong in any event. A legal obligation to provide truthful information does not entitle a party to win an evidentiary battle, any more than an expert witness's oath requires a factfinder to credit her testimony. Because the parties can be wrong without lying, it is the agency's obligation to evaluate their evidence, *see* 47 U.S.C. § 309(e) (obligating the

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<sup>4</sup> [http://licensing.fcc.gov/cgi-bin/ws.exe/prod/ib/forms/reports/related\\_filing.hts?f\\_key=425955&f\\_number=SATMOD2018110800083](http://licensing.fcc.gov/cgi-bin/ws.exe/prod/ib/forms/reports/related_filing.hts?f_key=425955&f_number=SATMOD2018110800083).

Commission to resolve any “substantial and material question of fact”); [Viasat.Pet.Ex.17.at.7-9], which is why the Commission does not just rubber-stamp all applicants’ factual assertions. Here the Commission provides no reason for failing to require the “Commission-mandated” analysis for SpaceX’s new satellite design. [Order.¶84].

*Atmospheric damage from satellite launches.* The Commission failed to address the environmental effects of launching ten thousand satellites. Viasat presented evidence identifying rocket launches as having “a significant potential to become a significant contributor to the problem of stratospheric ozone depletion.” [Viasat.Pet.Ex.12.at.52]. The Commission punted to the Federal Aviation Administration, relying entirely on the Administration’s prior evaluation of SpaceX launches. [Order.¶82.]. But, as all parties apparently agree, that argument works only if the Administration adequately considered the relevant question. *See Env’t Health Trust v. FCC*, 9 F.4th 893, 904 (D.C. Cir. 2021) (rejecting the Commission’s reliance on another agency’s conclusory analysis). It did not.

The Administration recognized that SpaceX’s launches would emit ozone-depleting substances “directly into the stratosphere,” but declined to analyze their impact because “[t]hese emissions are a small fraction of the total emissions.” Federal Aviation Administration, *Final Environmental Assessment and Finding of No Significant Impact for SpaceX Falcon Launches* 71 (July 2020). This is the

type of “conclusory” aside “that [this Court] ha[s] previously rejected as insufficient to sustain” a Commission decision. *Env’t Health Trust*, 9 F.4th at 904-905. Among other things, the Administration addressed neither the dangers of injecting ozone-depleting substances directly into the stratosphere nor the “significant[]” ozone-depletion caused by even “relatively small absolute amounts” of these emissions. [Viasat.Pet.Ex.12.at.52-54].

2. Light pollution from Starlink satellites has significant and well-documented negative effects.

Starlink creates two distinct adverse effects on the night sky: it increases background skyglow, and it dots the sky with thousands of sunlight-reflecting objects that “are brighter than 99 percent of ... objects visible” from Earth. [Viasat.Pet.Ex.24.at.6]. *Both* effects threaten “severe[] harm” to scientists’ ability to observe and document astronomical phenomena and record time-sensitive data. [Viasat.Pet.Ex.24.at. 1, 5]; *see also* [Viasat.Pet.Ex.19.at.3]; [Viasat.ReplyEx.13.at. 28-31, 137-145]; Lawrence Amicus Br. 25-28. Notably, neither the Commission nor SpaceX addresses skyglow *at all*.

This “troubling development” is particularly problematic for certain astronomical-research techniques, including “wide-field imaging on large optical telescopes” that require “uniform quality over the field of view.” [Viasat.Pet.Ex.19.at.3]. Beyond astronomy, light pollution interferes with stargazing, negatively affects human health, and impacts migration and other

activity necessary for animal and plant species survival. Opening Br. 11, 40-41; *see, e.g.*, [Viasat.Pet.Exs.21-24]; [Viasat.Reply.Ex.13.at.14-16, 92-108]. Recent studies have shown, for example, that increasing nighttime light “at levels far less intense than previously assumed” disrupts circadian rhythms and animal immune response. [Viasat.Reply.Ex.13.at.107].

There is ample evidence of the damaging effects of Starlink specifically. *See* [Viasat.Petition.Ex.19.at.3] (“Initial visibility simulations have shown the significant negative impacts expected from” Starlink); [Viasat.Petition.Ex.24.at.4-5] (specifically documenting the effects from Starlink). While the quantum of harm increases with the size and number of satellites, the Starlink satellites at issue surpass any sort of *de minimis* threshold. Indeed, even though not all the satellites have been launched, the harm “is already happening.” [Viasat.Petition.Ex.24.at.5]; *see also* [Viasat.Petition.Ex.19.at.3] (“In the last year, the sky has changed.”). “This is not some distant threat,” *id.*; it is visible today.<sup>5</sup>

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<sup>5</sup> *E.g.*, M. Kocifaj et al., *The Proliferation of Space Objects Is a Rapidly Increasing Source of Artificial Night Sky Brightness*, at L41, Monthly Notices of the Royal Astronomical Society (Mar. 29, 2021) (discussed at [Viasat.2021.04.16.Letter.at.5]), *available at* <https://academic.oup.com/mnrasl/article/054/1/L40/6188393>.



[Viasat.Petition.Ex.19.at.4].

The Commission “recognized that SpaceX’s satellites may affect astronomy and the night sky,” but refused to assess that impact because SpaceX had undertaken some mitigation. FCC Br. 88. But mitigation matters only if the result is “to avoid significant effects.” 40 C.F.R. § 1501.4(b)(1). In other words, mitigation must “render the net effect of the modified project on the quality of the environment less than ‘significant.’” *Audubon Soc’y of Cent. Ark. v. Dailey*, 977 F.2d 428, 436 (8th Cir. 1992) (citing *Cabinet Mountains Wilderness v. Peterson*,

685 F.2d 678, 682 (D.C. Cir. 1982)). If the net effect may be significant despite mitigation, environmental review is required.<sup>6</sup>

The Commission focused on SpaceX's efforts to dim its satellites, *e.g.*, FCC Br. 90, but never addressed the actual question: whether, even as mitigated, SpaceX's satellites still significantly increase light pollution compared to the pre-Order baseline. As the opening brief explained (at 42-43), they do. *E.g.*, [Viasat.Reply.Ex.13.at.150, 247] ("Even if all mitigations [being discussed] were implemented, astronomy will pay dearly," in part because "none of [SpaceX's] strategies so far are yet achieving" recommended brightness levels). In response, the Commission and SpaceX rely on the American Astronomical Society's remark that SpaceX has made modifications "that have lowered the apparent brightness of their satellites"—though they omit the Society's recognition that there remain "problems posed to the astronomical sciences by satellite constellations." [Viasat.Reply.Ex.4]. Even accepting at face value SpaceX's assertions about the effect of its modifications, SpaceX cannot skirt environmental review by slightly reducing a high level of pollution, particularly when SpaceX acknowledges that, post-mitigation, its satellites are *still* visible to the naked eye. [Order.¶86.n.351];

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<sup>6</sup> Contrary to SpaceX (at 50-51), Environmental Appellants never suggested that the agency could not account for mitigation, but explained that mitigation "obviates the 'need for additional review' only if the post-mitigation impact 'is not significant.'" Opening Br. 42 (quoting *Cabinet Mountain*, 685 F.2d at 682).

*see* [SpaceX.2021.04.02.Letter.at.13] (acknowledging that it has not yet achieved its target magnitude and has “[m]ore to do”); [Viasat.2021.04.16.Letter.at.3-4]. Moreover, that purported change does not address the extensive harms to astronomical research, *see* pp. 12-13, *supra*, or the effects of *cumulative* background skyglow. Indeed, in stark contrast to its approach with radiofrequency sources, 40 C.F.R. § 1.1307(b)(4), the Commission never considered what level of mitigation would avoid these effects.

### 3. SpaceX’s satellites pose an undisputed collision risk.

The Commission and SpaceX dispute neither that SpaceX’s satellites pose a collision risk nor that a collision could cause significant harm. The only dispute is, again, over the magnitude of the risk, which the Commission suggests could be as high as one in 44.5. [Order.¶63]. The Commission never explained why that risk is tolerable, especially given the dramatic consequences of a collision. SpaceX points (at 53) to the Commission’s tepid observation that “the trend [in SpaceX’s satellite failure rate] is at this point promising,” but fails to mention that “the data covers only the early stages of constellation deployment” and does not account for the “high failure rates” that occur at the “latest stages of satellite observations.” [Order.¶64]. Given this uncertainty, the Commission required only “continue[d] monitoring.” *Id.*



Despite recognizing the need for additional data, which an environmental assessment would provide, the Commission did not require one. Both the Commission and SpaceX now point to the Commission's separate orbital-debris regime, but the Order's analysis was necessarily incomplete given that the Commission never determined what level of risk SpaceX's satellites pose. Instead, the Commission recognized that SpaceX's failure rate was "a matter of significant contention in the record"—a dispute the Commission did not resolve. [Order.¶61].

The Commission now suggests (at 93) that it did not need to resolve this issue because the data is "evolving." But the "evolution" of relevant data *supports* the need for further environmental review. Moreover, the "primary point of contention" was not "the underlying data," but "the interpretation of its significance"—a dispute the Commission could and should have resolved. [Order.¶61]; *see* 47 U.S.C. § 309(e). The Commission's orbital-debris regime is also in flux, as the Commission is extensively reexamining what level of risk is tolerable for constellations like Starlink. *See Mitigation of Orbital Debris in the New Space Age*, 35 FCC Rcd. 4156, ¶¶ 155-168 (2020). The Commission should have paused and properly evaluated this critical issue *before* damage occurs, at which point it will be too late to resolve. *See id.* at ¶4 & n.6 (orbital regions could become unusable due to "collision hazard").

## **II. The Balance Group and Viasat are proper appellants.**

The Balance Group is a membership organization that represents, *inter alia*, astronomers and other scientists concerned about light pollution and other environmental impacts of satellite constellations. Viasat is a provider of satellite internet services that depends on the sustainability of space. Environmental Appellants represent the individuals and entities most directly harmed by the Commission's refusal to conduct an environmental assessment. Both are proper parties to this appeal (though either would suffice, Opening Br. 15, 52 n.19).

### **A. The Balance Group.**

The astronomer declarants state that they are “member[s]” of The Balance Group and that light pollution from SpaceX's proposed deployments significantly impairs their astronomical research. The Balance Group confirms their membership and that their injury is germane to the Group's purpose. The Commission does not dispute that these individuals, or a relevant association to which they belong, would have standing. *See Hunt v. Wash. Apple Advert. Comm'n*, 432 U.S. 333, 343 (1977). Nor does it dispute that they fall within NEPA's zone of interests. That should be the end of the matter.

Instead, the Commission claims (at 73-74) that The Balance Group's members are not actually members. But courts have repeatedly refused to question whether an organization's members are “genuine,” describing such an inquiry as

“at odds with decades of decisions.” *E.g.*, *Students for Fair Admissions v. President & Fellows of Harvard Coll.*, 980 F.3d 157, 183 (1st Cir. 2020). The cases the Commission cites all concerned a different question: whether “an organization that *has no members*” can invoke associational standing to sue on behalf of *non-members*, through *Hunt*’s indicia-of-membership test. *Gettman v. DEA*, 290 F.3d 430, 435 (D.C. Cir. 2002) (emphasis added) (magazine “readers and subscribers”); *American Legal Found. v. FCC*, 808 F.2d 84, 89 (D.C. Cir. 1987) (“supporters” who are “not *members*”); *see also Sorenson Commc’ns, LLC v. FCC*, 897 F.3d 214, 225 (D.C. Cir. 2018) (“passive subscribers to its e-mail list and individuals who ‘follow’ the group’s Facebook page”). This Court has never applied its indicia-of-membership cases to organizations that, like The Balance Group, actually have members. And many courts—including district courts in this circuit—have explicitly refused to second-guess an organization’s membership-based structure, even where the members did not “pay dues” or “elect their governing body.” *Brady Campaign To Prevent Gun Violence v. Salazar*, 612 F. Supp. 2d 1, 29 (D.D.C. 2009); *see also Students for Fair Admissions*, 980 F.3d at 183; *Cal. Sportfishing Prot. All. v. Diablo Grande, Inc.*, 209 F. Supp. 2d 1059, 1066 (E.D. Cal. 2002).

Regardless, the Commission offers no basis on these facts to disregard the sworn testimony concerning The Balance Group’s members. In fact, The Balance

Group’s website, to which the Commission refers, shows that the Group’s members—astronomers, scientists, and others concerned about environmental and other harms from satellite constellations—affirmatively choose to join the Group and help carry out its mission. The Balance Group is “the medium through which [they] seek to make more effective the expression of their own views.” *NAACP v. Alabama*, 357 U.S. 449, 459 (1958). Unlike the newspaper readers or Facebook followers in the cases the Commission cites, the members with standing *are actual members*. To treat them otherwise just because The Balance Group does not have a burdensome membership process would conflict with the very purpose of associational standing.

The Commission also questions (at 74-75) the timing of the declarants’ membership. Dr. Baddiley became a member before the Order and has remained a member ever since. SuppAdd3. The same is true of Dr. Stefano Gallazzi, whose declaration incorporated into the agency record explains similar harm from SpaceX’s proposed deployment. SuppAdd2-8; [Balance.Group.Opposition.6-7 & n.12]; *see also Sorenson*, 897 F.3d at 224 (standing may be based on administrative record).

Finally, The Balance Group established standing in its own right, because SpaceX’s deployment will impose direct costs on it. The Commission complains (at 75) that The Balance Group did not tie these costs to the “deficiencies in the

Commission’s environmental analysis.” But The Balance Group need only tie its costs to the “substantive government decision that may have been wrongly decided because of the lack of” adequate NEPA review—*i.e.*, to SpaceX’s satellite deployment. *WildEarth Guardians v. Jewell*, 738 F.3d 298, 306 (D.C. Cir. 2013); Opening Br. 16.<sup>7</sup>

### **B. Viasat.**

The Order injures Viasat in three ways, each of which falls within NEPA’s zone of interests.

*First*, SpaceX’s operation of many thousands of satellites will substantially increase the risk of a catastrophic orbital collision involving one or more Viasat satellites—including a direct collision with a SpaceX satellite or a collision with debris created by a SpaceX satellite. Add24-25. The Commission disputes neither that a “probabilistic injur[y]” can be sufficient for standing, nor that when the threatened injury is “severe,” even “relatively modest increments in risk should qualify.” *Mountain States Legal Found. v. Glickman*, 92 F.3d 1228, 1234-35 (D.C. Cir. 1996). Instead, the Commission seeks (at 71-72) to brush off the risk to Viasat’s satellites as not just probabilistic but “remote” and “speculative.” The record refutes that contention: Consistent with Viasat’s declaration, Add16-28,

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<sup>7</sup> Neither the Commission nor SpaceX disputes that The Balance Group’s injuries (associational and direct) fall within NEPA’s zone of interests. The zone-of-interests inquiry is not jurisdictional, so that issue is not before this Court.

independent studies describe the increased risk of collisions caused by satellite deployments like SpaceX's as the "most critical concern for every space ... entity" and "a growing and potentially catastrophic threat."<sup>8</sup> [Viasat.Pet.Ex.35.at.61008]; [Viasat.Pet.Ex.34.at.1].

The Commission notes (at 71) that Viasat currently operates only one satellite in low-Earth orbit. But Viasat's satellites are not expendable. That satellite provides critical services to the U.S. government, at a cost of tens of millions of dollars. Add9-10. Damage to, let alone destruction of, that satellite would jeopardize those services, such that even a "modest" increase in risk confers standing. *Mountain States*, 92 F.3d at 1235. Moreover, Viasat will deploy many more satellites into low-Earth orbit for the Department of Defense during the license term. Add10. A collision involving a SpaceX satellite would send debris into other orbits, putting other Viasat satellites at risk. Add21-24. And Viasat plans to launch many high-value satellites *through* low-Earth orbit in the near term. Add28.<sup>9</sup>

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<sup>8</sup> In fact, a recent article suggests that "Starlink satellites alone are involved in about 1,600 close encounters between two spacecraft every week"—about half "of all such incidents." T. Pultarova, *SpaceX Starlink Satellites Responsible for Over Half of Close Encounters in Orbit, Scientist Says*, Space.com (Aug. 18, 2021) (discussing findings of Hugh Lewis, "Europe's leading expert on space debris"), <https://www.space.com/spacex-starlink-satellite-collision-alerts-on-the-rise>.

<sup>9</sup> Neither the Commission nor SpaceX disputes that this particular injury falls within NEPA's zone of interests. *See* note 6, *supra*.

*Second*, orbital crowding from SpaceX's launches will increase the costs of Viasat's operations, especially the costs and complexity of its launches. Add29-30. The Commission (at 70-71) does not dispute that such harm is sufficient for standing and agrees that Viasat and other operators incur costs avoiding satellites and other objects in orbit. Contrary to the Commission, Viasat's statement that SpaceX's operation will *increase* those costs is not speculative and does not ask the Court to presume any missing facts. Viasat provided sworn testimony that *the thousands of SpaceX satellites at issue in this appeal* will increase Viasat's operational costs. Add29-30. SpaceX has provided nothing to rebut this evidence, meaning there is no basis for disregarding it. The Commission's unreasoned assertion (at 71) that this injury has *no* "environmental component," and hence falls outside NEPA's zone of interests, is wrong. These increased costs are directly tied to Viasat's interest in the efficient and sustainable use of the shared orbital commons—a classic environmental concern. *See also* pp. 24-25.

*Third*, Viasat is injured because the Order "lift[s] regulatory restrictions on [its] competitor[]," *Sherley v. Sebelius*, 610 F.3d 69, 72 (D.C. Cir. 2010) (citations omitted), authorizing SpaceX to use its environmentally irresponsible satellite constellation to compete with Viasat without a legally mandated review. The Commission complains (at 67) that this injury is insufficiently "concrete" for Article III, but this Court has held that government action that directly "aids the

plaintiff's competitors"—by, for example, allowing them to bypass regulatory requirements—leads to “actual injury” as a matter of “economic logic.” *E.g., id.* Even the case the Commission cites—which addresses *indirect* skewing of the playing field through incentives to a competitor—recognizes that an agency decision that *directly* “increase[s] competition” necessarily leads to Article III injury. *PSSI Glob. Servs., LLC v. FCC*, 983 F.3d 1,11-12 (D.C. Cir. 2020).

The Commission's zone-of-interests argument (at 67-69) fails because, unlike the petitioners in the cases the Commission cites, Viasat's economic harm is *not* entirely divorced from the environment. *See Gunpowder Riverkeeper v. FERC*, 807 F.3d 267, 274 (D.C. Cir. 2015) (petitioner sought to avoid eminent domain without asserting “any environmental harm”); *ANR Pipeline Co. v. FERC*, 205 F.3d 403, 408 (D.C. Cir. 2000) (petitioner sought to prevent construction of a competing gas pipeline without asserting “any interest in the environment at all”). Viasat's alleged harm comes not just from competition in the abstract, but from SpaceX's plan to compete through the reckless use of the shared orbital environment, externalizing environmental costs onto Viasat (and others who depend on use of space). Low-Earth orbit is a limited resource, and SpaceX's inefficient occupation and pollution of that resource in order to compete with Viasat imposes interrelated competitive and environmental harm through the unsustainable use of the commons.



Because Viasat's competitive harm has a clear environmental component, Viasat's interests "can be expected to police the interests that the statute protects." *Amgen, Inc. v. Smith*, 357 F.3d 103, 109 (D.C. Cir. 2004) (citation omitted). They are certainly not "so marginally related to or inconsistent with the purposes implicit in the statute that" Congress could not have meant to authorize the suit. *Match-E-Be-Nash-She-Wish Band of Pottawatomis Indians v. Patchak*, 567 U.S. 209, 225 (2012). Precluding a commercial party from challenging an agency's blessing of competition carried out through the irresponsible use of a shared environment would undermine, not promote, NEPA's goals.

### **III. Vacatur is necessary to avoid vitiating NEPA.**

This Court should vacate the Commission's decision. *See Standing Rock Sioux Tribe v. U.S. Corps of Eng'rs*, 985 F.3d 1032, 1050 (D.C. Cir. 2021) (vacatur is "routine[]" remedy for NEPA violation); *United Steel v. Mine Safety & Health Admin.*, 925 F.3d 1279, 1287 (D.C. Cir. 2019) ("The ordinary practice is to vacate unlawful agency action."). The Commission and SpaceX drop footnotes asking for remand without vacatur. But vacatur "depends on two factors: the likelihood that 'deficiencies' in an order can be redressed on remand, even if the agency reaches the same result, and the 'disruptive consequences' of vacatur." *Black Oak Energy, LLC v. FERC*, 725 F.3d 230, 244 (D.C. Cir. 2013) (quoting *Allied-Signal v.*

*Nuclear Regul. Comm'n*, 988 F.2d 146, 150-51 (D.C. Cir. 1993)). Here, both factors weigh in favor of vacatur.

Starting with the latter, vacatur would not be overly disruptive. Viasat is not suggesting that SpaceX deorbit satellites—only that it pause future deployments pending the necessary environmental review. Neither SpaceX nor the Commission identifies, much less substantiates, any true disruption from such a pause.

Moreover, the deficiencies in the Commission's decision extend far beyond failures of explanation. SpaceX's satellite deployment *will* deplete the ozone layer, warm the atmosphere, interfere with astronomical research, alter the night sky, and substantially increase the chance of orbital collisions. The mountain of confirmatory evidence is growing.<sup>10</sup> No further explanation could “justify [a] decision to skip [a major] procedural step” under NEPA. *Standing Rock*, 985 F.3d at 1052. Allowing SpaceX to plow ahead, deploying hundreds of satellites each month, despite the lack of a proper NEPA review would “‘vitate’ the statute.”<sup>11</sup> *Id.* (citation omitted) Remand without vacatur is inappropriate.

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<sup>10</sup> E.g., R. Skibba, *As SpaceX's Starlink Ramps Up, So Could Light Pollution*, Wired (Oct. 1, 2021), <https://www.wired.com/story/as-spacexs-starlink-ramps-up-so-could-light-pollution/>; Boley, *supra*.

<sup>11</sup> In the case the Commission and SpaceX cite, the agency *prepared* an environmental impact statement and the only challenge was to its failure to address two narrow issues. *Vecinos para el Bienestar de la Comunidad Costera v. FERC*, 6 F.4th 1321, 1332 (D.C. Cir. 2021).

## CONCLUSION

The Court should vacate the Order, hold that NEPA requires at least an environmental assessment, and remand.

Dated: October 12, 2021

Respectfully submitted,

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### CERTIFICATE OF COMPLIANCE

This brief complies with the type-volume limitation of Federal Rule of Appellate Procedure 32(a)(7) and this Court's July 20, 2021 order as it contains 5,493 words, excluding the parts of the brief exempted by Federal Rule of Appellate Procedure 32(f) and D.C. Circuit Rule 32(e)(1).

This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6), as it has been prepared in a proportionally spaced typeface, 14-point Times New Roman font, using Microsoft Word 2010.

Dated: October 12, 2021

/s/ William M. Jay  
William M. Jay

**CERTIFICATE OF SERVICE**

I hereby certify that on October 12, 2021 I electronically filed the foregoing document with the United States Court of Appeals for the D.C. Circuit by using the CM/ECF system. I certify that the counsel of record for Appellee and Movant-Intervenor are registered as ECF Filers and that they will be served by the CM/ECF system.

/s/ William M. Jay  
William M. Jay

# **SUPPLEMENTAL ADDENDUM**

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Nos. 21-1123, -1125, -1128

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IN THE UNITED STATES COURT OF APPEALS  
FOR THE DISTRICT OF COLUMBIA CIRCUIT

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THE BALANCE GROUP,

*Appellant,*

v.

FEDERAL COMMUNICATIONS COMMISSION,

*Appellee,*

SPACE EXPLORATION HOLDINGS, LLC,

*Intervenor for Respondent.*

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VIASAT, INC.,

*Appellant,*

v.

FEDERAL COMMUNICATIONS COMMISSION,

*Appellee,*

SPACE EXPLORATION HOLDINGS, LLC,

*Intervenor for Respondent.*

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On Appeal from the Federal Communications Commission  
IBFS File No. SAT-MOD-20200417-00037

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DECLARATION OF JAMES S. TURNER

1. My name is James S. Turner, and I make these statements pursuant to 28 U.S.C. § 1746 and based upon my own personal



knowledge. I am over 18 years of age, and if called to do so, am competent to testify that the contents of this Declaration are accurate and true.

2. I am a co-founder of Appellant, The Balance Group.

3. The Balance Group exists to provide a balanced approach to solving large, systemic issues concerning existing and proposed man-made systems and their impact on the human condition and the environment at large. Its members include astronomers, physicists, scientists, environmentalists, technologists, telecommunications experts, medical professionals, and consumers, among others. The Balance Group's members choose to be a part of the Group as a way to join together to express their views and work together towards shared goals.

4. One of The Balance Group's primary concerns is the impact of large satellite constellations, including the light pollution those constellations cause. To that end, many of The Balance Group's members are astronomers whose work is impacted by this light pollution. Those astronomers include, among others, Dr. Christopher Baddiley and Dr. Roger Malina, who submitted declarations with the opening brief, as well as Dr. Stefano Gallozzi, who submitted a declaration before the Commission at an earlier stage of this proceeding.


That declaration was incorporated by reference into The Balance Group's opposition to the SpaceX Modification (The Balance Group Opposition to SpaceX Application for Major Modification, File No. SAT-MOD-20200417-00037, filed May 26, 2020, at pp. 6-7).

5. The Balance Group had astronomer members who were injured by the Order at the time the Notice of Appeal was filed. For instance, Dr. Christopher Baddiley was a member of The Balance Group at the time The Balance Group filed its notice of appeal, is still a member today, and at all relevant times has been a member of The Balance Group. Similarly, Dr. Stefano Gallozzi was a member of The Balance Group at the time The Balance Group filed its notice of appeal, is still a member today, and at all relevant times has been a member of The Balance Group.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 12, 2021 at 5614 Connecticut Avenue, NW, #339 Washington, DC 20015.

Signed,



---

James S. Turner

# ATTACHMENT

**Before the Federal Communications Commission, Washington, D.C. 20554**

**APPLICATION FOR REVIEW**

**File Number: SES-LIC-20190211-00151**

**Blanket License Granted to SpaceX Services Corporation on March 13, 2020  
by the International Bureau, Satellite Division**

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In the matter of SpaceX Services Corporation, )  
 )  
Organizational Applicants for Review )  
 Healthy Heavens Trust Initiative (HHTI) )  
 5G Free Santa Barbara )  
 5G Free California )  
 )  
Individual Applicants for Review )  
 Julie Levine, Lisa Aileen Cianci, Diane Craig, )  
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April 15, 2020

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**Exhibit 6****Declaration by Stefano Gallozzi**

My name is Stefano Gallozzi and I am a graduate in Physics specializing in Astrophysics and working as a Research Technologist for the Astronomical Observatory of Rome of the Italian National Institute for Astrophysics, INAF.

I have worked for more than ten years with the images of the great international telescopes, in particular the Large Binocular Telescope (LBT) located in Mount Graham in Arizona, and while working with the LBT images I found out how harmful the passages of the satellites were during scientific observations at the focus of biggest telescopes.

As soon as my colleagues and I learned of the intention to launch mega-constellations totalling more than 50,000 satellites into low earth orbit, we committed to try to move international scientific opinion that seemed to be ignoring the impacts.

In a personal capacity I created an [international appeal](#) for professional astronomers from all over the world and in a very short time I collected almost 2,000 signatures. In this appeal, I exposed many inherent problems that the mega-constellations of satellites will produce to astronomical observations and, within a short time, other expert colleagues working on data from other bands of the electromagnetic spectrum began to highlight additional problems with respect to the optical bands.

We have therefore published two papers highlighting all the damages we found that are produced by satellites' constellations that show up in astronomical observations from the ground:

[Gallozzi | Concerns about Groud-Based Astronomical Observations: Safeguarding the Astronomical Sky | 3Feb2020.pdf](#)

[Gallozzi | Concerns About Ground-Based Astronomical Observations - Quantifying Satellites' Constellations Damages | 2Apr20.pdf](#)

But this is not just some inconvenience; radio astronomy, for example, could be totally annihilated and unable to operate in few years, despite the billion dollar investments for the large facilities on the ground.

Even in optics, investments funded by public money for large telescopes could suffer a percentage decrease in value proportional to the loss of scientific content of the observations made: if for some telescopes with medium-large field of view, it is possible to lose 60-70% of the science data produced within an observing night, this would have the same effect on the loss of value for the public investment committed to that ground based facility.

Each institution has invested different amounts of public money in astronomical ground based projects. Over the past two years for example, my institute, INAF, has invested around 100

million euros for ground projects; so the loss of economic value would be significant. These projections are best explained in [this](#) article.

The more satellites in orbit there are, the more this percentage of damage to the observations will necessarily grow, so if satellites density reaches a critical value, observations from the ground will become totally impossible, and all the tens of billions of euros / dollars spent so far will be permanently lost.

Clearly the fear is not only that of safeguarding a profession or of avoiding damage to public finances, but that of losing an immeasurable good for all humanity for the sake of commercial profit, which is why the astronomers' petition asks agencies and governments to take action in order to block any further satellite launches, and simultaneously to deorbit all low-orbit satellites launched to date, and to put in place and immediately execute an international moratorium on all exploitation of the sky for commercial purposes. We are 2,000 scientists who are clamoring for it and as promoter I am the spokesman for this appeal.

Dott. Stefano Gallozzi

Osservatorio Astronomico di Roma - INAF

v. Frascati 33 – 00078 Monte Porzio Catone (RM)

I declare under penalty of perjury that the foregoing is true and correct.

/s/ Stefano Gallozzi

Stefano Gallozzi