

IAC-18-D6-1-6

## **The Relevancy of Corporate Social Responsibility (CSR) as an Implementation Context for Industry-Consensus Principles for Responsible Space Operations**

**Mr. Ian Christensen<sup>a\*</sup>**

<sup>a</sup> *Director of Private Sector Programs, Secure World Foundation, 525 Zang Street, Suite D, Broomfield, CO, USA 80021, [ichristensen@swfound.org](mailto:ichristensen@swfound.org)*

\* Corresponding Author

### **Abstract**

As the private sector becomes an increasingly significant share of the actors operating in the space domain, a number of efforts are underway to develop industry consensus statements or publications of voluntary principles for responsible space operations. Principles (or related concepts) of this type are under consideration or development in a diverse range of space industry sub-segments such as: space mining, on-orbit servicing, and constellation operations. Successful development and implementation of these principles will contribute to the safety of operations in the orbital domain, through non-regulatory means.

Such voluntary principles – albeit often with an ecological sustainability focus - have been successfully developed in other industries (including the mining, forestry, and information technology sectors). Implementation of those principles at the firm level has often been undertaken in the context of Corporate Social Responsibility (CSR) initiatives. CSR has been defined by the World Business Council for Sustainable Development as “the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large” (Asongu, 2007).

As the space industry develops and commits to voluntary responsible operations principles; it must consider how those principles will be reflected in actual operations. It must understand the corporate strategy context, at the firm level, in which responsibility is integrated with business. This paper will, assess the relevancy of CSR as a method for providing that implementation context – by comparing element of the emergent discussion on responsible operations principles to the experience of CSR implementation in other industries. In doing so the paper builds upon work originally published by the author in 2016 (“Applying Corporate Social Responsibility Principles in the Space Sector,” Reinventing Space Conference, BIS-RS-2016-45, Oct 27, 2016. With Ryan Wells). Since the publication of this 2016 paper –industry efforts to develop voluntary principles have advanced from conceptual discussion to development.

**Keywords:** norms of behavior, best practices, corporate social responsibility

### **Acronyms/Abbreviations**

CONFERS – Consortium For Execution of Rendezvous and Servicing Operations

COPUOS – United Nations Committee on the Peaceful Uses of Outer Space

CSR – Corporate Social Responsibility

DARPA – Defense Advanced Research Projects Agency

GVF – Global VSAT Foundation

OOS – On-Orbit Servicing

PMD – Post Mission Disposal

RPO – Rendezvous and Proximity Operations

SIA – Satellite Industry Association

SSA – Space Situational Awareness

SWF – Secure World Foundation

SWOT – Strengths, Weakness, Opportunities and Threats

WBCSB – World Business Council for Sustainable Development

## 1. Introduction

The commercial space sector is currently undergoing rapid expansion. New and innovative business approaches are bringing new services and applications to market, and disrupting traditional industry approaches. This is leading to increased complexity in the operating environment, and in how operators interact with each other and with the regulatory system. Maintaining a space environment that is accessible to all actors, and supports continued economic development of, and return from, space activities, requires collaborative action from all of those involved in the space industry, including companies, regulators, and investors [1].

Recognizing this, government and industry leadership have called for the space industry to take the lead in self-identification of norms for safe and responsible space operations. In order to be successful, efforts to develop industry best practice must be appropriately linked to an effective corporate strategy context. In 2016 the author published an evaluation of Corporate Social Responsibility (CSR) principles, and related concepts, as a potential thematic underpinning for space industry-led development of principles [2]. This paper reviews that analysis in light of current industry efforts to develop voluntary principles for responsible space operations which have advanced from conceptual discussion to active development.

## 2. A More Complex Operating Environment

### 2.1 The Changing Context of Space Activities

Change is the operative word in the space sector today, as uses and users of space diversify. New actors, technologies, and applications are changing the way in which society interacts with, operates in, and benefits from the space environment. As the former U.S. Deputy Assistant Secretary of Defense for Space Policy, Douglas Loverro, writes in *The Space Review*:

*...[S]pace has moved from being solely the means by which two superpowers warned of, guarded against, and executed nuclear war, to an internationally vibrant and expanding economic nexus, a means for conducting routine national security and military missions, and an interconnected infrastructure that literally empowers the way of life of the earthbound citizenry who depend upon it. [3]*

This change has accelerated in recent years and will continue to do so. Based on currently announced plans, more than 18,000 private-sector satellites [4] are planned for launch in the next decade – dwarfing the approximately 1,900 satellites that are currently operating [5]. As shown in Figure 1, below, the number of satellites in operation has been dramatically increasing in number in recent years, in a trend that is not likely to slow down in the near future. Over the next decade the commercial sector will become the dominant player in the space environment.

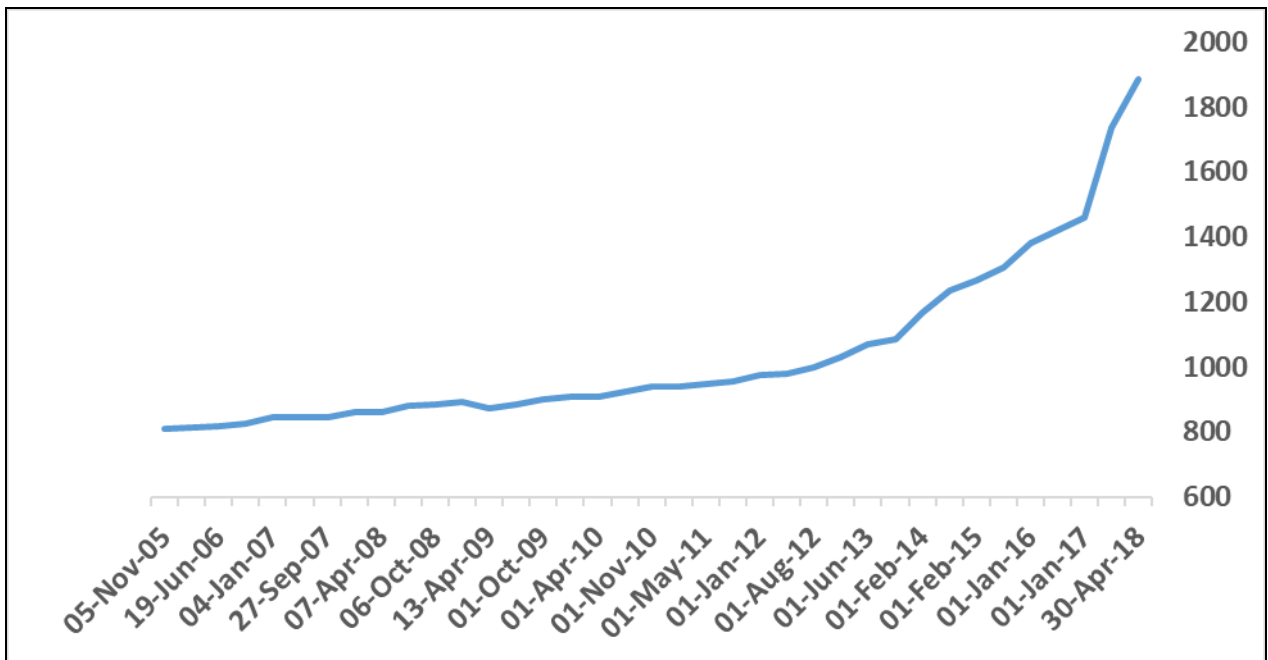


Fig. 1. Estimated Number of Active Satellites Over Time (Source: UCS Satellite Database)

## 2.2 A Private-Sector Driven Domain

This wave of commercial development has been supported – indeed enabled – by a mostly stable operating environment in space. Yet, that very expansion brings with it a number of potential threats to the space environment and challenges in maintaining the safety of space operations [6, 7]. These include:

- The introduction of large constellations of satellites (numbering in the 100s or greater), operating in a coordinated network, and possibly operating in similar orbital configurations as competitor constellations.
- Increased numbers of smallsat and cubesats in operation, including often launching via multi-manifest launches, many without propulsion or active tracking capabilities.
- An influx of investment and human capital from outside the space sector, which might not be as familiar with the traditional operational practices in the field.
- Increasing pressure on maintaining environmental factors such as space debris remediation and electromagnetic spectrum coordination.

Traditional regulatory and policy means of addressing operational context are challenged to keep pace with the speed of industry development. Development of industry-led norms of behavior, operational best practices, and/or shared responsible operations principles is a way to shape the development of a system that protects multiple interests and provides safety and stability to most actors [8]. Norms may be established “because formal regulatory instruments many not be timely enough for rapidly-developing activities. Instead, norms can emerge from all actors in a bottom-up fashion, subject to iterations and corrections, as a way in which to create some sort of stability for the new situation that has gotten ahead of formal laws on the matter [9].”

## 2.3 Best Practice Interests & Initiatives

A number of organizations and actors in the commercial space sector have publicly recognized the need for responsible operations principles to address these challenges. For example:

- The U.S.-based Satellite Industry Association (SIA) has issued a white paper covering “Responsible Space Operations” which focuses primarily on space situational awareness [10].

- In June 2015, the French space agency, CNES, launched the Collective for Space Care, a non-profit whose members commit to upholding values including: “assuring greater safety of people and property, and preserving the health of populations; mobilizing their efforts to protect the Earth and space environment; and helping to sustain the activities of the space community through sharing of experience and skills, and by setting the standard for others.” Industry actors such as Airbus, Arianespace, and Eutelsat have participated in this Collective [11].
- In a statement at UNCOPUOS Scientific and Technical Subcommittee: “OneWeb understands space is a shared, natural resource that must be protected like any other. We are passionate about preventing debris creation, respecting existing space assets, and ensuring a safe and sustainable space (and Earth!) environment for the future [12].”
- Since September 2017 the Global VSAT Forum (GVF), an international trade association of satellite operators and ground segment providers, has been facilitating a process to develop a satellite industry ‘Memorandum of Understanding’ which would provide “a consensus-based best practice guideline focused on preserving sustainability for the various commercial, and other peaceful, uses of space [13].”
- An international consortium of companies, with initial support provided by the Defense Advanced Research Projects Agency (DARPA), has in 2018 begun work to develop voluntary consensus principles, best practice, and standards for rendezvous and proximity operations (RPO) and on-orbit servicing (OOS). This activity – The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) – is driven in part by a belief that “the lack of clear, widely accepted technical and safety standards for responsible performance of OOS and RPO involving commercial satellites remains a major obstacle to satellite servicing becoming a major industry, and could lead to mishaps that would put long-term sustainability of space itself at risk [14].”

Collectively these initiatives and statements (and others like them) represent an industry recognition of challenges to the sustainability of the space domain, and the need to take collective action to maintain the stability of that domain. They provide an indication of some of the emerging incentives for satellite operators

to establish responsible operation principles without waiting for governments to act. These interests include: increasing the sustainability of their own business models; allaying concerns that “darkening the skies” will create havoc for existing users; and pre-empting (or at least informing) the need for government regulation. Yet, for this recognition to translate into meaningful implementation it must be related to a business context or strategy that has relevance at both the individual firm level and at the industry level. Industry actors’ interest in developing responsible operations principles may tie into the broader Corporate Social Responsibility movement: the related concepts that businesses both find value in social good beyond just the profit bottom line and that socially responsible practices can reinforce business models.

### 3. Corporate Social Responsibility as a Formal Strategy.

The World Business Council for Sustainable Development (WBCSD) has defined CSR as “the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large” [15]. CSR is a business strategy involving initiatives to benefit society, and can involve a range of activities including environmental impact reduction, supply chain management actions, philanthropy and community service; and employee engagement efforts. Sometimes referred to as “corporate citizenship,” the goal of CSR is to assess and take responsibility for a company’s impacts on the environmental and social context in which the business operates. A key component of CSR is sustainable development that extends the responsibilities of businesses past profit maximization to considering long-term social and environmental consequences of business activities. Table 1, at right, identifies some of business, social and environmental benefits that might arise from adoption of CSR-driven practices [16].

#### 3.1 CSR Applied to the Space Sector

Previous analyses [17, 18] have found that, in general, the space industry has been slow to adopt CSR. The SIA suggests that the community should “proceed cautiously when seeking to encourage space operators to conduct their activities responsibly,” [19] recognizing the need for any such initiatives to be properly cognizant of business and technical realities. History has

shown that industry sectors which are driven by business to consumer sales are more likely to adopt CSR related principles as core to the business model; than are industries in which sales are driven by business to enterprise or business to government, as has been characteristic in the space sector. The environmental impact motivations, with the associated supply chain actions in response, have not been a key concern for many space-sector companies, for whom the operating environment has not been related to Earth-based environmental impact considerations [20].

Table 1. Typical expected benefits that might arise from adoption of CSR-driven practices

Business
<ul style="list-style-type: none"> <li>▪ Lower operating costs</li> <li>▪ Enhanced brand reputation</li> <li>▪ Increased customer loyalty</li> <li>▪ Reduced regulatory oversight</li> <li>▪ Enhanced employee satisfaction</li> <li>▪ Increased product and supplier quality</li> <li>▪ Enhanced risk management culture</li> </ul>
Environmental
<ul style="list-style-type: none"> <li>▪ Greater material reuse and recycling</li> <li>▪ Improved durability and reliability of products</li> <li>▪ Reduced consumption</li> <li>▪ Greater use of renewables</li> </ul>
Social
<ul style="list-style-type: none"> <li>▪ Corporate charitable and philanthropic efforts</li> <li>▪ Employee community volunteering</li> <li>▪ Business involvement in community affairs</li> </ul>

Christensen and Wells [21] used a Strengths, Weakness, Opportunities and Threats (SWOT) analysis framework, shown in Figure 2, to describe the potential relevancy of CSR principles in the space sector. In general, the link between CSR policies and efforts to address operational challenges, rather than reputational and corporate well-being challenges, is indirect. CSR policies can contribute to overall risk management postures within corporations. For example, efforts to mitigate orbital risks to satellites can be considered within a CSR policy [22]. The CSR policy of satellite operator Inmarsat references both the mitigation of orbital debris and industry action to coordination activity through the Space Data Association. However, the majority of the policy focuses on environmental impact, supply chain, employee ethics, and corporate philanthropy activities, rather than operating challenges faced by the satellite industry [23,24].

<p style="text-align: center;"><b><u>Strengths</u></b></p> <ul style="list-style-type: none"> <li>• Long term planning perspective that complements space industry timelines</li> <li>• In a traditionally risk adverse industry, CSR may enhance a risk mitigation approach</li> <li>• Increased public facing transparency</li> </ul>	<p style="text-align: center;"><b><u>Weaknesses</u></b></p> <ul style="list-style-type: none"> <li>• Relationship to supply chain is clear but links to operations challenges is not</li> <li>• Short-term resource drain/diversion with potentially unclear operational impacts</li> <li>• Disconnect between large corporate CSR policies and space unit practices/issues</li> </ul>
<p style="text-align: center;"><b><u>Opportunities</u></b></p> <ul style="list-style-type: none"> <li>• In some geographic regions, CSR can be a vehicle for attracting and sustaining talent</li> <li>• Sets the stage for dialogue on new regulatory issues</li> <li>• Links between CSR, Sustainable Development Goals and societal benefits of space development</li> <li>• Relatively small size of space industry may ease widespread adoption of CSR</li> </ul>	<p style="text-align: center;"><b><u>Threats</u></b></p> <ul style="list-style-type: none"> <li>• Culturally, structural and maturity differences in space companies complicate industry wide adaptation of CSR principles</li> <li>• Limited competition means brand differentiation is not as impactful</li> <li>• The space environment is not [yet] linked to environmental sustainability, challenging the connection to CSR</li> </ul>

Figure 2: SWOT Analysis of Applying CSR to Space Industry Challenges

### 3.2 CSR Policies of Existing Satellite Operators

The Inmarsat example suggests one possible way in which challenges to the stability of the operating domain might be linked to CSR policies. In order to further explore this potential link for this paper, the author conducted a qualitative literature survey to determine the extent of CSR policies – and the degree to which they mention or address operational challenges – of a number of leading satellite operators (i.e. existing companies currently flying multiple satellites). This literature survey focused on reviewing both annual management/investor reports and CSR policies or statements posted to public-facing company websites (which included corporate citizenship and sustainability policies.” Operators included in this review included: Asiasat, DigitalGlobe, Eutelsat, Globalstar, Inmarsat, Intelsat, Iridium, ORBCOMM, SES, Sky Perfect JSAT, Telesat, Thuraya, and Viasat. The survey focused only on satellite operators, and did not at this time include other segments of the space industry, such as space launch or satellite manufacturing.

This is best considered a preliminary review & sample – and was not exhaustive. It is worth specifically mentioning that many of the emerging start-up companies do not have the reporting requirements that publicly traded companies do, and thus may have policies that are not publicly reported. Within the reviewed group of companies:

- No public mention of CSR policies or strategies was found for four companies: Globalstar, Iridium, ORBCOMM, and Telesat
- The CSR policies of an additional five companies (Asiasat, DigitalGlobe, Intelsat, Sky

Perfect JSAT, Thuraya, Viasat) referred only to philanthropic, social impact, human resources, and/or on-Earth environmental functions, without making specific link to the space environment.

- The CSR policies or strategies of three of the reviewed companies made specific mention of the space environment: Eutelsat, SES, and Inmarsat.

Where reference was made to the space environment as part of CSR policies; that reference was consistently made in the context of extending principles of on-Earth environmental stewardship to the in-space domain:

- SES’s Corporate Social Responsibility brochure states that “Protecting the environment on Earth is important and, as a satellite operator, we understand that protecting the environment beyond our planet is equally important [25].”
- The *Corporate, Environmental, Social and Societal Responsibility* chapter of Eutelsat’s 2016-2017 Annual Management Report refers to a commitment to “Protecting the environment and maintaining the space around the earth uncongested and clean [26].”
- Inmarsat’s public Corporate Social Responsibility commitments include “a responsibility to minimize its environmental impact – on the ground and in space [27].”

Figure 3, below, summarizes the results of the review of CSR Policies of Existing Satellite Operators.

	Eutelsat	Inmarsat	SES	AsiaSat	DigitalGlobe	Intelsat	Sky Perfect JSAT	Thuraya	Visasat	Globalstar	Iridium	ORBCOMM	Telesat
<b>Publicly-visible CSR policy/strategy</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓				
<b>CSR policy mentions space env.</b>	✓	✓	✓										
<i>Space environment linked to on-Earth environmental stewardship</i>	✓	✓	✓										
<i>Space debris mentioned in context of CSR policy</i>	✓	✓	✓										
<i>Coordination with other space operators mentioned</i>	✓	✓	✓										
<i>Supply chain implications &amp; management mentioned relative to impact on space environment</i>	✓												

Figure 3: Results of Survey of Extant Satellite Operators CSR Policies

#### 4. Areas of Opportunity

Current commercial sector plans to field multiple large constellations – commonly based on smallsat or cubesat systems – to provide remote sensing and communications services offer the potential to greatly expand space-based applications and benefits to society. At the same time, these new constellations, and the possible interactions between them, have raised concerns in the community about their possible impacts on the long-term sustainability of the space environment.

As the deployment and operations phases for these large constellations approach, there is an opportunity to develop shared industry operations principles and best practices to mitigate these possible negative impacts. Speaking at a July 2017 panel session, OneWeb’s Director of Mission Systems Engineering stated: “We truly believe that new environmental safeguards and responsible norms of behavior need to be established now in order to ensure the sustainability of future space activities for everybody [32].” This opportunity is reflected in the industry initiatives that have been mentioned previously in this paper.

In recent years the Secure World Foundation (SWF) has held several workshops discussing best practices in several areas related to smallsat and cubesat operation. Topics addressed at these workshops have included: satellite operator best practices for minimizing collisions; space situational awareness (SSA) and smallsats; cubesat launch and deployment best practices; cubesat post-mission disposal best practices; and principles for safe and responsible active debris removal. Discussions at these workshops have identified or raised a number of topics that might be included in space industry efforts to develop consensus best practices [29]. These topics include:

- Satellite de-orbit & decommission commitments & practices
- Orbital plane and altitude separations
- Launch vehicle deployment & satellite check-out practices
- Inter-operator coordination practices and data-sharing
- Satellite tracking, orbital position sharing, and maneuver notification/coordination
- Satellite reliability commitments
- Best practices for satellite end of life operations, beyond the de-orbit guidelines.

This includes a need for the operator community to develop a better shared understanding over how “end of mission” or “end of spacecraft life” is defined. This might include developing best practices for end of life spacecraft passivation and configuration for end of mission, covering topics such as: battery discharge, shutting down transmit functions, and safing of other spacecraft systems [30, 31].

Efforts ongoing within industry (as well as within multilateral government forums) have also identified similar areas of need; and are developing consensus best practice principles in response [32].

## **5. Conclusion – Space as Extension of Environmental Aspects of Corporate CSR Policies**

Speaking in context of his company’s ongoing efforts to transition to its next generation constellation, while deorbiting the prior generation of satellites, Iridium CEO Matt Desch states, “Our space is a shared resource. This is not something that is [just] a business issue for that operator, it’s a business issue for the rest of this industry, as well as for manned spaceflight, as well as for space exploration [33].” Desch’s comment both reflects the links between treatment of the space environment as extension of on-Earth environmental stewardship that is seen in the public CSR policies of Eutelsat, Intelsat, and SES; and calls to mind the typical function of CSR to assess and take responsibility for a company’s impacts on the environmental and social context in which the business operates.

This suggests the most likely link between CSR and the implementation of industry space practices or principles for responsible space operations. While most elements of CSR (and most actual current CSR policies in the satellite operator segment) focus on social impact of products, human resources, and corporate philanthropy; the aspects of CSR that deals with environmental stewardship provides a conceptual link to efforts to address the sustainability of the space environment. Satellite operators have already begun to treat space debris mitigation efforts as part of CSR strategy (in addition to consideration of space debris under corporate risk management – a subject for a different analysis.) Many of the topical issues areas (or ‘opportunity areas’) identified in the prior section could – at least theoretically – be similarly considered as an element of environmental stewardship. And thus be candidates for consideration as elements of CSR strategy.

In this regard the *Corporate, Environmental, Social and Societal Responsibility* chapter of Eutelsat’s 2016-2017 Annual Management Report offers a well-elucidated approach. Eutelsat’s Global Environmental Policy refers both to impacts on Earth’s environment from the firm’s activities and to mitigation of impacts on the space environment. The Environmental Policy includes a “responsible fleet management policy” that covers aspects like debris mitigation, end-of-life operations and satellite passivation. Separately the Policy addresses inter-operator coordination and the firm’s commitment to collaborate on and share best practices. Eutelsat also suggests some basic metrics for tracking environmental performance in space including: number of end-of-life passivations and success rate in orbital maneuvers [35].

This approach adopted by Eutelsat clearly indicates a strategy-level link between responsible space operations principles and corporate CSR philosophy. However, the actual impact of this link on operational practices is less easy to discern. Eutelsat’s policy includes some elements of CSR that are linked to operations, including inter-operator coordination (specifically, through the Space Data Association); and the role of the prime contractor in managing risk through the supply chain (specifically, increasing environmental performance and reliability of satellites through working with suppliers). Eutelsat also specifically articulates a link between the environmental aspects of its performance and French regulatory requirements [36].

Collectively, this analysis suggests that at the least a thematic link between challenges to the space environment and the environmental aspects of CRS exists. Yet, is that enough to provide a contextual basis for the implementation of industry consensus principles or best practice within corporate strategy? Corporate Social Responsibility itself – on its own – does not provide a complete business imperative for the implementation of best practice principles responsible operations. However, if those principles are developed in a way that is consistent with elements of CSR, integration into existing CSR policies (or expansion of CSR policies to include) can facilitate adoption and success.



## References

- [1] I. Christensen, "Future Issues for Commercial Space Sustainability Suggested by Space Industry Socio-Economic Trends." IAC-16-E3.3.5. Paper presented at the 67th International Astronautical Congress (IAC), Guadalajara, Mexico, 26-30 September 2016
- [2] I. Christensen and R. Wells, "Applying Corporate Social Responsibility Principles in the Space Sector," BIS-RS-2016-45. Paper presented at the Reinventing Space Conference, London, United Kingdom, Oct 27, 2016
- [3] D. Loverro, "Why the US must lead again." *The Space Review*, August 14, 2017, <http://www.thespacereview.com/article/3307/1> Accessed September 12, 2018
- [4] C. Henry, "Iridium to finish deorbiting legacy constellation early next year." *Space News*, September 12, 2018, <https://spacenews.com/iridium-to-finish-deorbiting-legacy-constellation-early-next-year/> Accessed September 12, 2018.
- [5] Union of Concerned Scientists, "UCS Satellite Database." August 10, 2018 [https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.W5k\\_rOhKiUk](https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.W5k_rOhKiUk) Accessed September 12, 2018.
- [6] Christensen, 2016.
- [7] Christensen and Wells, 2016.
- [8] B. Weeden and I. Christensen, "Norms of Behavior for Small Satellite Operators – Basic Principles." IAC-17-A6.10-B4.10.1. Paper presented at the 68th International Astronautical Congress (IAC), Adelaide, Australia, 25-29 September 2017.
- [9] I. Christensen, "Norms of Behavior In An Increasingly Commercialized Space Domain." September 5, 2017, <https://swfound.org/news/all-news/2017/09/insight-norms-of-behavior-in-an-increasingly-commercialized-space-domain> Accessed September 12, 2018.
- [10] Satellite Industry Association. 2015. "Responsible Space Operations." White Paper, Washington, D.C. [http://www.sia.org/wp-content/uploads/2015/08/SIA\\_Responsible\\_Space\\_Operations\\_White\\_Paper\\_2015\\_08\\_Final.pdf](http://www.sia.org/wp-content/uploads/2015/08/SIA_Responsible_Space_Operations_White_Paper_2015_08_Final.pdf). Accessed September 12, 2018.
- [11] CNES. "CNES launches Collective for Space Care to promote responsible space activities." June 17, 2015. [https://presse.cnes.fr/sites/default/files/drupal/201506/default/cp110-2015\\_-\\_collective\\_for\\_space\\_care\\_va.pdf](https://presse.cnes.fr/sites/default/files/drupal/201506/default/cp110-2015_-_collective_for_space_care_va.pdf) Accessed September 12, 2018.
- [12] OneWeb, 2016. "Overview." Presentation to UNCOPUOS STSC. February 15. <http://www.unoosa.org/documents/pdf/copuos/stsc/2016/tech-32E.pdf>. Accessed September 12, 2018.
- [13] Global VSAT Forum. "Sustainability of Space Operations: Emerging New Space & Orbital Debris," at p. 18 in *GVF Directory and Satellite Resource Guide 2018*, <http://www.satelliteevolutiongroup.com/magazines/GVF-20181/content/GVF-2018-Issue.pdf> Accessed September 12, 2018.
- [14] CONFERS, "CONFERS One Pager," <https://www.satelliteconfers.org/wp-content/uploads/2018/07/OnePager-062018.pdf> Accessed September 12, 2018.
- [15] Asongu, J.J. 2007. "Innovation as an Argument for Corporate Social Responsibility." *Journal of Business and Public Policy* 1 (3): 1-21.
- [16] Christensen and Wells, 2016.
- [17] Christensen and Wells, 2016.
- [18] Mendes, Michelle. 2010. Corporate Social Responsibility Optimization for Satellite Operators. Executive MBA Thesis, International Space University.
- [19] SIA, 2015.
- [20] Mendes, 2010.
- [21] Christensen and Wells, 2016.
- [22] Mendes, 2010.
- [23] Inmarsat. 2014. "Corporate Social Responsibility." [http://www.inmarsat.com/wp-content/uploads/2014/05/06\\_Corporate\\_Social\\_Responsibility.pdf](http://www.inmarsat.com/wp-content/uploads/2014/05/06_Corporate_Social_Responsibility.pdf). Accessed September 12, 2018.
- [24] Inmarsat. 2018. "Protecting the Planet." <https://www.inmarsat.com/about-us/csr/protecting-the-planet/> Accessed September 12, 2018.
- [25] SES "Engagement Beyond Frontiers and Corporate Social Responsibility," February 2018, [https://edit.ses.com/sites/default/files/2018-02/SES\\_CRS\\_BROCHURE\\_web\\_1.pdf/](https://edit.ses.com/sites/default/files/2018-02/SES_CRS_BROCHURE_web_1.pdf/) Accessed September 12, 2018.
- [26] Eutelsat, 2016-2017 *Annual Management Report*. <https://www.eutelsat.com/files/contributed/investors/pdf/AG2017/7%20Eutelsat%20Communication%20Mgmt%20Report%20EN.pdf> Accessed September 12, 2018.
- [27] Inmarsat, 2018
- [28] Weeden and Christensen, 2017.



- [28] T. Maclay, “Remarks at Trash in the Skies II: Industry Perspectives on Dealing with Space Debris.” July 10, 2017.  
[https://swfound.org/media/205928/trash\\_in\\_the\\_skies\\_ii\\_jul2017.pdf](https://swfound.org/media/205928/trash_in_the_skies_ii_jul2017.pdf) Accessed September 13, 2018
- [29] Weeden and Christensen, 2017
- [30] Secure World Foundation, “Dialogue on Practices for CubeSat Post Mission Disposal Summary of Key Themes.” August 10, 2017,  
[https://swfound.org/media/205955/2017\\_post\\_mission\\_disposal\\_dialogue\\_summary.pdf](https://swfound.org/media/205955/2017_post_mission_disposal_dialogue_summary.pdf) Accessed September 13, 2018.
- [31] Weeden and Christensen, 2017
- [32] Global VSAT Forum, 2018
- [33] Quoted by C. Henry, 2018.
- [34] Eutelsat, *2016-2017 Annual Management Report*
- [35] Eutelsat, *2016-2017 Annual Management Report*.