Enough Space to be accessible?

Disability and Human Rights in Outer Space

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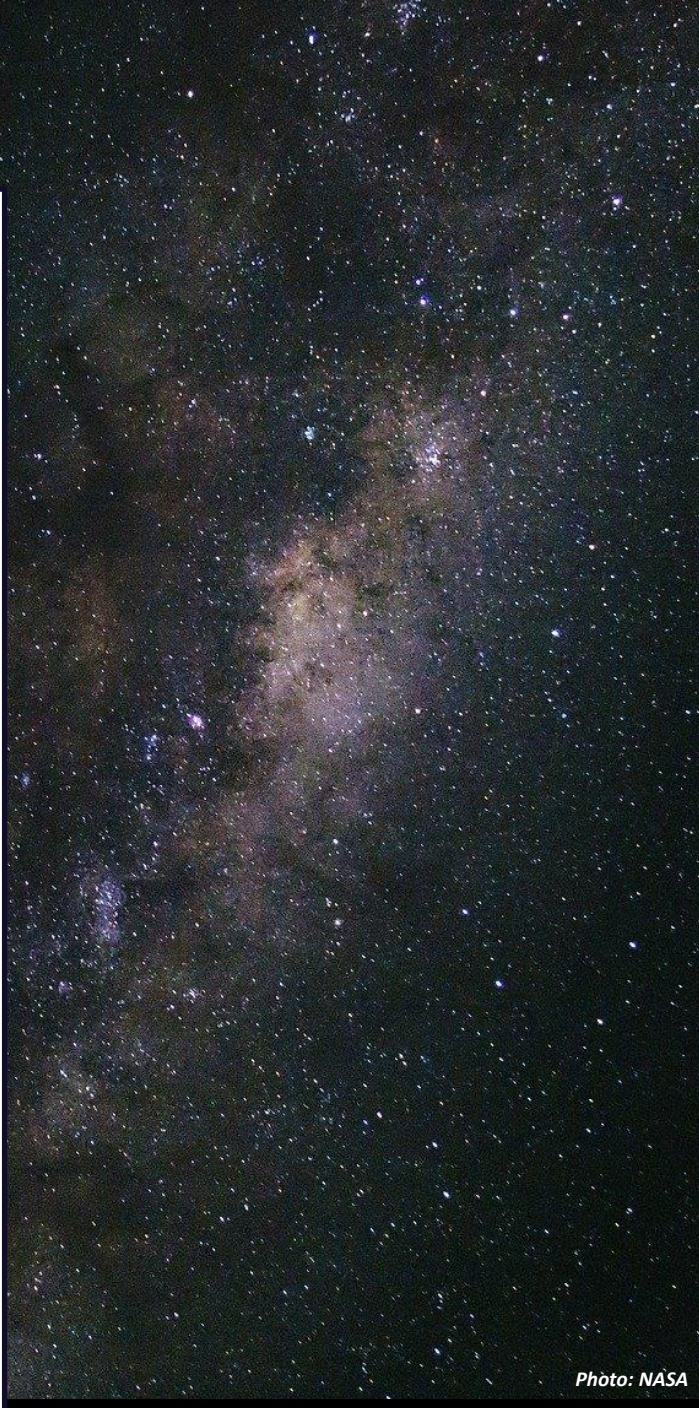

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Introduction

Amid the developing democratization and intensification of human activities across outer space, the advancement of human rights principles for the protection of vulnerable groups within society is necessary to upholding individual equality and inclusivity, and in defining humanity's growing ambitions among the stars. Herein, it is contended that the development of legal principles surrounding the rights of persons with disabilities, by both the United States and the international community, will support and advance the evolution of human activities in outer space.

The internationally accepted definition of what qualifies as a disability is outlined under Article 1 of the United Nations Convention on the Rights of Persons with Disabilities (CRPD), being: [1]

> *"Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others."*

Where disability has often been perceived as an issue of medicine, charity or dependency, the international community has since come to understand disability as a fundamental human rights issue. Where those with disabilities are often faced with discrimination and barriers restricting them from participating in society on an equal basis, over the past several decades there have been increased efforts to close the protection gap and ensure that persons with disabilities enjoy the same standards of equality, rights and dignity as everyone else.

Where the domain of space has been interpreted in international discourse as the province of all mankind, social advocates have increasingly campaigned for greater equality and access to space – a notion advanced by the

[1] *See* G.A. Res. 61/106 (May 3, 2008).

possibility of having people with disabilities as astronauts.[2] This is premised on the perspective that persons with disabilities may be better-suited to living and working in the unique environment of outer space - including instances where a person required to use an ostomy bag eases waste management procedures, or where an amputee may be better suited to working within more confined areas in a micro gravity environment.[3] Additionally, it is proposed that accessible instrumentation adapted for the use of persons with disabilities may also provide an additional layer of protection against mission failure.

Acknowledging the extensive physiological, policy, and legal challenges associated with human spaceflight, advocating for the recognition of human rights of persons with disabilities within the context of outer space and international space law benefits the future of human activities across the final frontier – including the development of universal safety standards, improvements to existing equipment and technologies used by astronauts, increasing accessibility to space, and in upholding equality and human dignity across the final frontier.

[2] Rose Eveleth, *It's Time to Rethink Who's Best Suited for Space Travel*, WIRED (Jan. 27, 2019), https://www.wired.com/story/its-time-to-rethink-whos-best-suited-for-space-travel/.

[3] *Disability Can Be a Superpower in Space*, NAT'L SPACE SOCIETY (May 16, 2018), https://space.nss.org/disability-can-be-a-superpower-in-space/.

Context

Background

In the US, the Disability Rights movement has been pushing for accessibility and inclusion of the underrepresented minority over the past half-century. Recent pop-culture media has reignited public conversation over identity and rights of persons with disabilities – seeking to advance disability as an aspect of identity that influences the experiences of an individual, and not as the sole-defining feature of a person.[4]

Among this is Netflix's Crip Camp, a 2020 documentary focusing on a group of teens with disabilities seeking to build a social movement and forge a new path toward greater equality. The documentary focuses on Camp Jened, a summer camp for disabled kids and teens located in the Catskills region of New York state that closed in 1977. The context of the film highlights several major events in the history of disability advocacy which unfolded as a direct result of the camp's activities, emphasizes the capacity for peoples with disabilities to rise above their problems to drive political change, and alludes to the future of the disability movement under the next generation of young leaders.

Underlined in the documentary were two of the most monumental events in disability advocacy that occurred last century - the 504 Sit-in and the Capitol Crawl. The 504 Sit-in took place in 1977 San Francisco, in response to the federal government's reluctance to enforce Section 504 of the Rehabilitation Act of 1973.[5] The Act represented one of the first pieces of federal legislation that offered specific protections to those with disabilities in the US. The language in Section 504 states in part that: [6]

> *"No otherwise qualified individual with a disability in the United States…shall, solely by reason of her or his disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity."*

[4] *A Brief History of the Disability Rights Movement*, ANTI-DEFAMATION LEAGUE, https://www.adl.org/education/resources/backgrounders/disability-rights-movement
[5] Kitty Cone, *A Short History of the Disability Rights Movement*, DISABILITY RIGHTS EDUC. & DEF. FUND, https://dredf.org/504-sit-in-20th-anniversary/short-history-of-the-504-sit-in/
[6] 29 U.S.C. § 701 et seq (2012).

In response to the movement, the Secretary for Health signed regulations implementing the scope of Section 504 in establishing a three-pronged legal definition of disability as opposed to a medical one – enabling its enforcement by the judiciary.[7] Accordingly, the outcome stood as a defining and unifying event for the disability movement, one which brought together peoples of different disabilities in support of legislation that affected the collective disability population.

Consequently, the Capitol Crawl represents another foundational moment in the US disability rights movement. During the lead up to the signing of the Americans with Disabilities Act of 1990 (ADA), disability rights advocates seeking to sway the opinions of lawmakers to support the law assembled in front of the US Capitol Building and proceeded to crawl up all 100 steps of the building's front steps.

The event demonstrated the daily struggles faced by peoples living with disabilities, highlighted the need for accessibility, and drew public attention to legislative delays surrounding the ADA. The ADA represents one of the movement's greatest legal achievements – being a major civil rights law which introduced immediate legislative demands to ensure equal access and equal treatment, and placing prohibitions on discrimination targeting people with disabilities in many aspects of public life.[8][9]

Models of Disability

Where there are several definitions for the terms "disabled" and "disability," there are several constructions or "models" of disability, demonstrating the evolution of how society has come to interact with persons with disabilities. Accessibility specialist Mary Ann Jackson identified six key models of disability,[10] including: the Charity Model, the Medical Model, the Social Model, the Relational Model, the Diversity Model, and the Human Rights Model.

Firstly, the Charity Model of Disability has also been described as the moral model and the religious model, being features most associated with the natural law paradigm. This approach to disability is based on a paternalistic view of the disabled; a view in which disabled people require caretaking and protection, which had traditionally

[7] Cone, supra note 5.
[8] Perri Meldon, *Disability History: The Disability Rights Movement*, NAT'L PARK SERVICE, https://www.nps.gov/articles/disabilityhistoryrightsmovement.htm
[9] A Brief History, *supra* note 4.
[10] Mary Ann Jackson, *Models of Disability and Human Rights: Informing the Improvement of Built Environment Accessibility for People with Disability at Neighborhood Scale?* Laws (2018).

been in the form of forced segregation into asylums and other institutions. Society has since mostly transitioned away from the Charity Model, but the centering of abled-bodied individuals is a lasting consequence of this model that still has lingering effects to this day.

Secondly, the Medical Model of Disability is a biomedical perception of disability.[11] This model of disability is normative and impartial in its classification of disability in "levels of deviance or deficiency."[12] This model of disability is most closely associated with the positivist paradigm explored in wider academia, viewing disability as inherently decreasing a person's quality of life, and looking to medical intervention as a way to diagnose, cure, and/or rehabilitate people with disabilities. This model shares similarities with the Charity model in terms of paternalism, and the resulting institutionalism of disabled persons – centering society around able-bodied individuals.

Third, the Social Model of Disability emerged out disability rights movements. This model view disability as a construct that "arises from barriers within an oppressive and discriminating society rather than impairment."[13] In the context of this definition, disability is "the disadvantage or restriction of activity caused by a society which takes little or no account of people who have impairments and thus excludes them from mainstream activity"[14] and that impairment is: [15]

> *"a characteristic, feature or attribute within an individual which is long term and may, or may not, be the result of disease, genetics or injury and may: 1) Affect that individual's appearance in a way which is not acceptable to society, And/or 2) Affect the function of that individual's mind or body, either because of or regardless of society, And/or 3) Cause pain, fatigue, affect communication, and reduce consciousness.* "

11 Pamela Fisher & Dan Goodley, *The Linear Medical Model of Disability: Mothers of disabled babies resist with counter-narratives*. 29 SOC. OF HEALTH & ILLNESS 66–81. (Jan. 2007).
12 Jackson, *supra* note 8.
13 Id.
14 Pam Thomas, Lorraine Gradwell & Natalie Markham, *Defining Impairment within the Social Model of Disability*, GMCDP COALITION MAGAZINE (Jul. 1997) ("Therefore disability, like racism or sexism, is discrimination and social oppression.").
15 Id. ("This covers people with learning difficulties, physical impairments, sensory impairments, facial disfigurement, speech impairment, mental illness, mental distress. Impairment neither causes, nor justifies disability; however only people with impairments are subject disability; they may also experience other forms of oppression simultaneously. Disabled people are those people with impairments who are disabled by society.")

Third, the Social Model is a direct response to the Medical Model; focusing on limitations to access created by society, rather than looking to cure or rehabilitate the individual as in the Medical Model. The relationship between the Social Model and its predecessor Models mirror the relationship between realism, natural law and legal positivism. While the Social Model represents an improvement on the Charity and Medical Models, it is not without flaws. While the Social Model has helped to reshape the conversation surrounding disability, it has not yet brought tangible changes in the lived reality of many people with disabilities.

Fourth, the Relational Model of Disability grew out of 1960s Nordic social theory. It is conceptualized as having several main tenets: A) Disability is a person-environment mismatch; B) Disability is a situational and contextual; and C) Disability is relative. The Relation Model creates space for a more nuanced dialog about accessibility. In the Nordic countries where the Relational Model is the default view of disability, universal design has become firmly entrenched in general policy. This Model can thus be interpreted as a version of the "post-social" interpretation of disability.

Fifth, the Diversity Model of Disability - often referred to as a "Universalist" approach - views disability as a variation that societal systems respond to when confronted. The "Universalist" moniker denotes the idea that disability is not a minority condition, but rather "a universal human phenomenon," making sure to explicitly recognize the high degree of diversity within the disability community instead of treating disability as a monolith identity. The Diversity Model uses an ability-disability continuum and rejects the false dichotomy of abled/disabled. Similar to the Social and Relational Models, the Diversity Model can also be viewed as part of the post-social paradigm.

Finally, the Human Rights Model represents the current iteration of social perceptions surrounding disability, having developed from the various international human rights agreements in the aftermath of the Second World War. This model, premised upon the adoption of the Universal Declaration of Human Rights in 1948, recognizes how disability is a natural part of human diversity that must be respected, that persons with disability have the same rights as everyone else, and that impairment must not be used as an excuse to deny or restrict people's rights. [16]

[16] See, G.A. Res. 217 (III) (Dec. 10, 1948).

Disability in Space

Noting past developments within the context of human spaceflight, individuals with disabilities have much to contribute towards the ideal of space as the province of all mankind. In focus is the specific contributions of the Gallaudet Eleven - 11 men from Gallaudet College whom had become deaf due to spinal meningitis - advanced the course of scientific knowledge concerning the human body in outer space and highlights the contributions made to human spaceflight by persons with disabilities.[17]

These individuals were selectively selected by NASA and the US Naval School of Aviation as part of a joint research program to understand the effects of prolonged weightlessness, motion sickness, and the human body's adaptation to spaceflight. The group underwent a battery of scientific tests including a ride aboard the "Vomit Comet" aircraft, and spending 12 days inside a 20-foot slow rotation room which remained in a constant motion of ten revolutions per minute.[18] The contributions of the Gallaudet Eleven highlights how peoples living with disabilities can rise above their limitations and contribute to human endeavors in space when they are given the opportunity.

Acknowledging this legacy of achievements, it is incumbent upon the US to maintain its role as one of the leading advocates for disability rights within the international community, and as the leading power in space - to advance the cause and future of human rights by pressing for greater dignity, equality and inclusion in the domain of outer space in the twenty-first century and beyond.

[17] Hannah Hotovy, *How 11 Deaf Men Helped Shape NASA's Human Spaceflight Program*, NASA (May 4, 2017) https://www.nasa.gov/feature/how-11-deaf-men-helped-shape-nasas-human-spaceflight-program.
[18] Samantha Mathewson, *Museum Honors 11 Deaf Men Who Helped NASA Send Humans to Space*, SPACE.COM (May 11, 2017), https://www.space.com/36789-deaf-men-nasa-spaceflight-museum-exhibit.html.

International Human Rights Framework

The basis of the contemporary international human rights law framework can be traced to the 1948 Universal Declaration of Human Rights (UDHR)[19], a historic document which sought to build upon the growing recognition of our common humanity following the horrors of the Second World War - articulating the fundamental, universal and inalienable rights and freedoms to which everyone is entitled.

The intentions behind those whom drafted the UDHR exhibited a heightened understanding of the importance of dignity, liberty, equality, and brotherhood as the document's foundational principles - from which the universal and inherent basis of human rights is founded.[20] The Declaration was, and continues to uphold, the basic notion of dignity which gives rise to equality and respect in the advancement of human rights values and principles. Where people are afflicted with mental health and psychosocial disabilities, they deserve to live with the dignity that is integral to the full realization of a healthy and fulfilling life.[21]

Indeed, the intended universal application of the UDHR and Article 25 therein emphasizes how everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, and a right to socioeconomic security in the event od sickness or disability.[22] The article represents the sole instance within which the word "disability" is mentioned in the UDHR and extols the document's intended vision; that everyone is entitled to the rights and freedoms set forth therein, without distinction of any kind.

Furthermore, the rights of individuals with disabilities have been grounded within the international human rights framework under the articles of the United Nation's Charter (UNC).[23] Article 55 of the UNC alludes to the equal treatment of persons with disabilities in its declaration, that it is the objective of the United Nations (UN) and its members to promote universal respect for human rights and fundamental freedoms for all without distinction, irrespective of race, sex, language or religion.

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19 G.A. Res. 217 (III) (Dec. 10, 1948).
20 O.P. DHIMAN, UNDERSTANDING HUMAN RIGHTS (2011).
21 *Everyone is entitled to a life of dignity, Ban says on World Mental Health Day*, U. N. (Oct. 12, 2015), https://www.un.org/sustainabledevelopment/blog/2015/10/everyone-is-entitled-to-a-life-of-dignity-ban-says-on-world-mental-health-day/.
22 G.A. Res. 217 (III) (Dec. 10, 1948).
23 *See* U.N. Charter.

These two foundational documents highlight how the full participation of persons with disabilities serves to benefit society, where their individual contribution enriches all spheres of life, and where such full participation is an integral part of individual and societal well-being and progress.[24]

Acknowledging the period between the UDHR in 1948 and the formation of the CRPD in 2006, the question arises as to why there has been such a prolonged period for disabled people to be acknowledged and protected within society, when compared to parallel social movements for racial and gender equality. Within the context of the broader global movement for disability rights and human rights, the international community has been slow in its adoption of dedicated human rights convention for those living with disabilities in the years following the founding of the UN.

Development of Human Rights for Persons with Disabilities

In 1971, the UN General Assembly adopted a Declaration on the Right of Mentally Retarded Persons (DRMRP) - providing an initial framework for protecting of rights of persons with disabilities through collective international action.[25] The declaration affirmed that persons living with intellectual disabilities had, to the degree feasible, the same rights as others; including a right to proper medical care and education, economic security, to a qualified guardian, to protection from exploitation, and to access to legal procedures. Accordingly, the declaration paved the way for a future set of comprehensive principles which would consider the wider needs and rights of those living with disabilities, and continues to provide qualified support for institutional accommodation for persons with disability under Article 4.

This was followed in 1975 by the UN General Assembly's adoption of a Declaration on the Rights of Persons with Disabilities (DRPD), encouraging the international protection of the rights of persons with disabilities.[26] Broader than the 1971 declaration, the DRPD established the broader recognition that those with disabilities of any nature were entitled to the just and acceptable political and civil rights as others, in accounting for the conditions and limitations imposed by their disabilities, including measures necessary to support self-sufficiency. Additionally, the declaration reiterated the rights of persons with disabilities to education, medical services, and placement service – incorporating a personal deficiency-based conceptualization of disability under Article 1.

[24] Human Rights and Persons with Disabilities, U.N. ENABLE (2007), https://www.un.org/esa/socdev/enable/rights/humanrights.htm#_ftnref5
[25] *See* G.A. Res. 2856 (XXVI) (Dec. 20, 1971).
[26] *See* G.A. Res. 3447 (XXX) (Dec. 9, 1975).

While not considered as hard international law, the effect of these two declarations stand as extensions of soft international law in expressing the will, intention, and opinion of the international community; that further attention and collective action would be required in upholding the specific human rights of those living with disabilities.[27] These declarations resulted in the UN General Assembly's subsequent decision to declare 1981 as the International Year of Disabled Persons, drawing international attention upon the contributions and rights of persons with disabilities.[28]

Between the years 1983 to 1992, the UN General Assembly proclaimed this period as the United Nations Decade of Disabled Persons.[29] The act was made to provide a time frame during which governments and organizations could implement activities and measures recommended under the World Program of Action. This period gave rise to a further two advancements in the international disability movement. Firstly, in 1989 the UN General Assembly adopted the Tallinn Guidelines for Action on Human Resources Development in the Field of Disability – providing a framework to promote the participation, training and employment of persons with disabilities within all government ministries, in order to equalize opportunities for persons with disabilities.[30]

Secondly in 1991 the UN General Assembly adopted the Principles for the Protection of Persons with Mental Illness and for the Improvement of Mental Health Care.[31] The 25 principles outlined herein sought to support of the rights of mentally disabled persons in healthcare, and built upon the achievements of the 1971 DRMRP in its definition of the fundamental freedoms and basic rights of concerning persons with mental illness.

Existing Framework

Consequently, the UN Convention on the Rights of Persons with Disabilities (CRPD) was adopted in 2006 and entered into force in 2008.[32] The document stands as a paradigm shift from the traditional charity and medical

[27] Oliver Dörr, *Declaration*, MAX PLANCK ENCYCL. PUB. INT'L. L. (2006), https://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e1397.

[28] *History of United Nations and Persons With Disabilities - A Human Rights Approach: The 1970s*, U.N., https://www.un.org/development/desa/disabilities/history-of-united-nations-and-persons-with-disabilities-a-human-rights-approach-the-1970s.html.

[29] *United Nations Decade of Disabled Persons 1983-1992*, U.N., https://www.un.org/development/desa/disabilities/united-nations-decade-of-disabled-persons-1983-1992.html.

[30] G.A. Res. 44/70 (Dec. 8, 1989).

[31] UN Principles for the Protection of Persons with Mental Illness and the Improvement of Mental Health Care, EQUAL RIGHTS TRUST (Dec. 17, 1991), https://www.equalrightstrust.org/content/un-principles-protection-persons-mental-illness-and-improvement-mental-health-care.

[32] *See* G.A. Res. 61/106 (May 3, 2008).

oriented approaches to disability to one focused on human rights. Its articles offer detailed and comprehensive standards of protection in relation to the civil, cultural, political, and socio-economic rights of persons with disabilities based on inclusion, equality and non-discrimination.

The Convention clarifies how all categories of rights established under the international human rights framework apply equally to persons with disabilities, and identifies areas where obstacles may arise to those with disabilities – including physical access to buildings, roads and transportation, and access to information through written and electronic communications.[33] The Convention also calls for its members to facilitate the appropriate instituting of adaptations for persons with disabilities, to effectively exercise their rights.

Additional to the CRPD has been the inclusion of several additional measures, which collectively contribute to the human rights framework on persons with disabilities:

A) First is the Committee on the Rights of Persons with Disabilities, a group of 18 independent experts whom oversee the promotion and implementation of the CRPD.[34]

B) Second, the Optional Protocol to the CRPD represents a more limited document that sets up an individual complaints procedure.[35] [36] The document commits parties to recognize the authority of the Committee on the Rights of Persons with Disabilities to consider complaints from individuals or groups whom allege an infringement of their rights covered under the CRPD.

C) Third, the Special Rapporteur on the Rights of Persons with Disabilities, whom possesses the mandate to research on violations of the rights of persons with disabilities, recommend on how to better promote and protect their rights, and to provide technical assistance to that purpose.[37]

[33] *Why is the Convention on the Rights of Persons with Disabilities Important?*, WORLD HEALTH ORG. (Sept. 10, 2013) https://www.who.int/features/qa/67/en/.
[34] Committee on the Rights of Persons with Disabilities, United Nations Human Rights Office of the High Commissioner, U.N. (2020), https://www.ohchr.org/EN/HRBodies/CRPD/Pages/CRPDIndex.aspx
[35] *See* G.A. Res. 61/106 (May 3, 2008).
[36] Michael Small, Senior Policy Officer, Austl. Hum. Rts. Comm'n, Physical Disability Council of Australia Forum (Oct. 24, 2007).
[37] Human rights of persons with disabilities, United Nations Human Rights Office of the High Commissioner, U.N. (2020), https://www.ohchr.org/EN/Issues/Disability/Pages/DisabilityIndex.aspx

In relation to the enforcement of human rights principles and values within the international community, its legal basis under international customary law has been settled. This is established by the 1971 Namibia Advisory Opinion, a watershed decision issued by the International Court of Justice (ICJ) which established precedent for the extraterritorial application of human rights.[38]

In addressing the question of state responsibility, the ICJ decision held that member states are endowed with the obligation to keep intact and preserve the rights of other states and the people in them. Consequently, the title of a state over a particular territory is not a prerequisite for the extraterritorial application of human rights law, but the state's physical control over said territory is alone sufficient. The cross-domain application of international human rights values and principles into the domain of outer space and space law jurisprudence is thus supported by prevailing international customary law.

[38] *See generally* Legal Consequences for States of the Continued Presence of South Africa in Namibia (South West Africa), Advisory Opinion, 1971 I.C.J. 53 (June 21, 1971).

Analysis of Spaceflight Hazards

In the context of space, pre-existing disabilities and health conditions among astronaut candidates have often given cause to their premature disqualification from human spaceflight missions.[39][40] The reasoning behind these heightened requirements for candidates is given the intensified nature of technical and physical challenges faced by astronauts in the full and proper performance of their duties in space – with NASA only accepting between 0.4 to 0.8% of applicants under their astronaut program.[41]

It is anticipated that such heightened requirements for astronauts and human spaceflight participants will continue into the future, and may over time give rise to socioeconomic discrimination - acknowledging the increasing China of outer space. This is concluded where a renewed emphasis on the bottom line, and pursuit of greater returns on investments, incentivizes the need to maximize the chance of mission success through the exclusion of individuals deemed incapable of meeting certain physical and mental requirements.

The importance of disability rights in space is thus central, not only in supporting the participation of those with disabilities, but also in discouraging the possible development of social Darwinism or eugenics in shaping humanity's presence among the stars.

An analysis of human rights, in relation to persons with disabilities, bears relevance in addressing the myriad of adverse health conditions which may result from human spaceflight activities, and which can in-turn give rise to injuries or diseases resulting in disability.

The hazards of spaceflight upon the human body have been well documented, with prolonged human activities in space giving rise to several health concerns amongst returning astronauts – including blood clots, and changes in vision arising from swollen optic nerves and flattened eyeballs.[42] Consequently, owing to such health concerns, returning US astronaut Scott Kelly has encountered persisting difficulties in the performance of once mundane

[39] FAQs: Health and Physical Conditions, EURO. SPACE AGENCY (Mar. 27, 2008), https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/European_Astronaut_Selection/FAQs_Health_and_physical_condition .

[40] Leland Melvin, *How I Overcame Disability to Become a NASA Astronaut*, BIGTHINK (Nov. 25, 2018), https://bigthink.com/videos/how-i-overcame-disability-to-become-a-nasa-astronaut.

[41] Ari Shisler, *Astronauts with disabilities?*, TIMES OF ISRAEL (Feb. 1, 2019), https://blogs.timesofisrael.com/astronauts-with-disabilities/.

[42] Marina Koren, *An Alarming Discovery in an Astronaut's Bloodstream*, THE ATLANTIC (Nov. 21, 2019), https://www.theatlantic.com/science/archive/2019/11/astronaut-blood-clot/602380/.

daily tasks.[43] The range of hazards associated with the unique environmental conditions of outer space, which result in the development of varying disability types for astronauts, includes[44]:

1. Radiation
2. Isolation and Confinement
3. Distance from Earth
4. Gravity
5. Hostile/Closed Environments

Recognition surrounding the development of adverse health conditions in space has been highlighted by a number of governments and international organizations – evident through the ongoing development of international ISO standards concerning the need for in-flight health assessments, the Europeantion for Space Standardization Coopera (ECSS) initiative, and the cooperative development of harmonized safety guidelines between NASA and Roscosmos.[45] [46] [47]

Radiation [48]

Space radiation arise from several key sources - including particles trapped in the earth's magnetic field, particles shot into space during solar flares, from the power source or propulsion method of space vehicles, or from galactic cosmic rays. Accordingly, exposure to space radiation places astronauts at a significant risk of radiation sickness, and an increased lifetime risk for cancer, central nervous system effects, and degenerative diseases.

The debilitating effects of space radiation can result in the following disability types – including non-malignant thyroid nodular disease, parathyroid adenoma, posterior subcapsular cataracts, and tumors of the brain and central nervous system.[49]

[43] Scott Kelly, *Astronaut Scott Kelly on the devastating effects of a year in space*, SYDNEY MORNING HERALD (Oct. 6, 2017), https://www.smh.com.au/lifestyle/astronaut-scott-kelly-on-the-devastating-effects-of-a-year-in-space-20170922-gyn9iw.html.
[44] Melanie Whiting & Laurie Adabie, *5 Hazards of Human Spaceflight*, NASA (May 8, 2019), https://www.nasa.gov/hrp/5-hazards-of-human-spaceflight.
[45] https://www.iso.org/standard/69375.html?browse=tc.
[46] European Cooperation for Space Standardization, https://ecss.nl/.
[47] https://sma.nasa.gov/SignificantIncidents/assets/nasa-astronauts-on-soyuz.pdf.
[48] Jason Perez & Brian Dunbar, *Why Space Radiation Matters*, NASA (Oct. 8, 2019), https://www.nasa.gov/analogs/nsrl/why-space-radiation-matters.
[49] *Diseases Associated with Ionizing Radiation Exposure*, U.S. DEPT. VET. AFF., https://www.publichealth.va.gov/exposures/radiation/diseases.asp.

To mitigate this hazard and advance the rights of persons with disabilities, a dedicated right to protection from radiation in outer space must be advanced as an essential human right. This may in turn given rise to mitigation efforts such as requirements for significant protective shielding, dosimetry, and alerts. This may also give rise to specific attached medical and healthcare obligations regarding persons whom develop a disability as a direct result of radiation in human spaceflight activities – which may include the affordability and availability of health services and goods, and access to basic shelter which provides protection from the elements,.

Isolation and Confinement [50]

It is acknowledged that the confined conditions of space vehicles and habitats, and the extreme isolation of communities operating in outer space, will give rise to the inevitable development of behavioral issues. This is given the prolonged period of time during which missions are conducted, whereupon space-related stressors may diminish the adaptability and resiliency of those living in such close quarters.[51]

The debilitating effects of extreme isolation and confinement can both give rise to or aggravate the following types of mental disabilities – including memory problems, psychomotor problems, mood disorders, anxiety disorders, and personality disorders.[52] [53]

To mitigate this concern and advance the rights of persons with disabilities, the development of a targeted right to health in the context of outer space must be explored as an essential human right. This may encompass requirements to provide for the monitoring of behavioral health, the provision of mental health resources, and adapting various tools for use in the spaceflight environment to detect and treat early risk factors relating to persons with disabilities.

Distance from Earth

The extreme distances from earth by which astronauts and human colonists will be separated strains the capacity of supply chains to address the needs of persons with disabilities, or those who develop disabilities. The

[50] Amanda vonDeak & Laurie Abadie, *Conquering the Challenge of Isolation in Space: NASA's Human Research Program Director Receives National Recognition*, NASA (Aug. 14, 2018), https://www.nasa.gov/feature/conquering-the-challenge-of-isolation-in-space-nasa-s-human-research-program-director.

[51] NICK KANAS, HUMANS IN SPACE: THE PSYCHOLOGICAL HURDLES (2015).

[52] Douglas Vakoch, *Astronauts Open Up About Depression and Isolation in Space*, PSYCHOL. TODAY (Feb. 10, 2019), https://www.psychologytoday.com/au/blog/home-in-the-cosmos/201902/astronauts-open-about-depression-and-isolation-in-space.

[53] *Types of mental illness*, HEALTHDIRECT (Nov. 2018), https://www.healthdirect.gov.au/types-of-mental-illness.

consequence of sparse supply chains also limits the rapid development and deployment of human resources, including medical practitioners and healthcare professionals, to meet the needs of persons with disabilities.

The prevalence of persons with disabilities within any general population is something which should be accepted as an inevitable development.[54] This may result from the natural development of disabling conditions unassociated with the conditions of human spaceflight – including allergies, asthma, diabetes, or genetic abnormalities. Some health conditions associated with disability result in poor health and extensive health care needs.

To mitigate this issue, and advance the rights of persons with disabilities, the development of an amended right to health within the context of outer space must be explored as an essential human right. As acknowledged under the existing right to health, all persons with disability have the same general health care needs as everyone else, and thus require equal access to mainstream health care services.[55] Addressing this issue may necessitate the need for advance supply chain planning, self-sufficiency, and institution of incident response plans to provide for the needs of persons with disabilities in outer space.

Gravity [56]

The variance of gravity within which astronauts will operate in space and across varying celestial bodies, represents a notable hazard to the health and wellbeing of the average person, and persons with disabilities. Consequently, the varying effects of gravity may encompass microgravity environments when traversing the expanse of space, periods of intensified gravity experienced during spaceflight or upon certain celestial bodies, and low gravity environments upon varying celestial bodies. Prolonged periods within such gravity-varied environments can give rise to health issues which can impact upon the human nervous system, musculoskeletal system, and cardiovascular system.[57]

[54] *Disability and health*, WORLD HEALTH ORG. (Jan. 16, 2018), https://www.who.int/news-room/fact-sheets/detail/disability-and-health.
[55] Human rights and health, WORLD HEALTH ORG. (Dec. 29, 2017), https://www.who.int/news-room/fact-sheets/detail/human-rights-and-health.
[56] G.I.MELESHKO, Y.Y.SHEPELEV, M.M.AVERNER, AND T.VOLK, *RISK TO ASTRONAUT HEALTH DURING SPACE TRAVEL* IN SAFE PASSAGE: ASTRONAUT CARE FOR EXPLORATION MISSIONS (1994).
[57] Sandra May, *What is Microgravity?,* NASA (Feb. 15, 2012), https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-microgravity-58.html.

The varying effects of gravity upon the human body can result in the following disability-related conditions – including disuse osteoporosis, muscular atrophy, dysregulated immune system, deep vein thrombosis, and mitral valve regurgitation.[58] [59]

In mitigating this issue and advancing the rights of persons with disabilities, the development of a right to a reasonable standard of gravity, encapsulated under a either the developing right to a healthy environment or existing right to health, must be explored. This may give rise to requirements which ensure the fulfillment of basic needs for those with disabilities, and which enable them to enjoy the highest attainable standard of health in outer space - including access to health services and goods, and eligibility for health insurance.

Hostile/closed environments [60]

Prolonged periods spent in the hostile and enclosed environments of human habitats in outer space may give rise to several unforeseen events which give rise to human harm, resulting in the development of chronic health conditions and disabilities. Astronauts will be subjected to confinement in close, relatively austere quarters along with fellow crew members with whom they will need to live and work effectively for months/years on end, with limited contact with family and friends and no possibility of direct outside human intervention.

The accumulated and prolonged impact of important habitability factors such as temperature, pressure, lighting, noise and quantity of space may differ from person to person. Similarly, the apparent dangers caused by space debris and other hazardous environmental conditions in outer space, combined with the psychological toll of outer space, will result in the increased incidence of mistakes and safety incidents.[61]

The development of disability conditions arising from these factors can thus be divided into two areas; disability conditions arising from behavioral and psychological issues, and those arising from unanticipated safety incidents.[62]

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58 Brian E. Crucian et al., *Immune System Dysregulation During Spaceflight: Potential Countermeasures for Deep Space Exploration Missions*, 9 FRONT. IMMUNOLOGY 1437 (2018).
59 *Ultimate Telemedicine: Experts help treat astronaut's blood clot during NASA mission*, SCIENCEDAILY (Jan. 2, 2020), https://www.sciencedaily.com/releases/2020/01/200102143439.htm.
60 COMMITTEE FOR THE DECADAL SURVEY ON BIOLOGICAL AND PHYSICAL SCIENCES IN SPACE AND NATIONAL RESEARCH COUNCIL, RECAPTURING A FUTURE FOR SPACE EXPLORATION (2013).
61 Vaughan Bell, *Isolation and hallucinations: the mental health challenges faced by astronauts*, THE GUARDIAN (Oct. 5, 2014), https://www.theguardian.com/science/2014/oct/05/hallucinations-isolation-astronauts-mental-health-space-missions.
62 Chelsea Gohd, *In 'Ad Astra,' Brad Pitt Portrays the Psychological Stress of Astronauts in Space*, SPACE.COM (Sept. 24, 2019), https://www.space.com/ad-astra-brad-pitt-portrays-psychological-stress-space.html.

Firstly, concerning disabilities which may directly arise from the development of behavioral and psychological issues, it is acknowledged that the hostile and closed environments experienced by astronauts will have an acute mental toll on many astronauts, giving rise to persistent mental health issues. Thereafter, mental issues may predicate an increased incidence of criminal acts which result in damage to property and harm to the individual or others. The varying effects of these conditions can result in the following disability-related conditions – depression, anxiety disorders, post-traumatic stress disorders, and psychosis.

Secondly, in relation to disabilities which may arise from safety incidents, it is foreseeable that the deterioration of the psychological and physiological well-being of astronauts over time will impact a mission's effectiveness, accomplishment of mission goals, and collective team cohesiveness. The direct impact of this may result in increased lapses in safety procedures throughout missions - giving rise to prolonged exposure to high-luminosity conditions or dangerous chemical, radiological, or biological elements. Similarly, increased exposure to hazardous environments as a result of judgement errors resulting from psychological issues, may result in an elevated chance of incidents arising from an "Act of God." The varying effects of these circumstances can result in the following disability-related conditions – impaired vision, impaired hearing, paraplegia, or quadriplegia.

In mitigating this issue and advancing the rights of persons with disabilities, the development of a right to a habitable environment in outer space must be explored. This may give rise to specific requirements which address mental health and safety-related risks – including the need for continuous cognitive tests of astronauts, that such tests be validated against actual mission performance, the inclusion of behavioral scientists in the initial phases of mission planning, and the provision of mental health resources.

Reviewing the CRPD

The need to recognize the development of human rights for those with disabilities in outer space under the CRPD ensures the continuing fulfillment of its core objectives – that persons with disabilities enjoy the same standards of equality, rights and dignity as everyone else. Where the CRPD is intended as a human rights instrument with an explicit social development dimension, this elicits the question as to the role which persons with disabilities will have to play in both ongoing and anticipated socioeconomic developments in outer space.[63]

In bolstering the anticipated contributions and roles of persons with disabilities across the final frontier, it is advanced the following CRPD articles may be considered relevant in promoting the wider participation of, ensuring equality of opportunity for, and furthering the accessibility of outer space for those with disabilities[64]:

- Article 1 promotes the right for those with disabilities to "full and effective participation and inclusion in society on an equal basis with others."

  The article seeks to emphasize the social dimension of disabilities - whereby persons with disabilities have been prevented from exercising their economic, social, or cultural rights on an equal basis owing to neglect, ignorance, prejudice, exclusion, distinction, or separation.

- Article 5 advances that all persons are recognized as "equal before and under the law," and that the elimination of discrimination must be pursued through the positive adoption of "appropriate steps to ensure that reasonable accommodation is provided."

  The origins of this article lie in the desire to establish a distinction between equality under the law, achieved through strict respect for non-discrimination, as opposed to equality as a social goal referring to equal opportunities. Further, the requirement to take appropriate steps sought to compel parties to adopt positive discrimination measures, to include persons who were previously excluded.

[63] *See* G.A. Res. 61/106 (May 3, 2008).
[64] Marianne Schulze, *Understanding The UN Convention On The Rights Of Persons With Disabilities* (July 2010), https://accessible-techcomm.org/wp-content/uploads/Understanding_The_UN.pdf.

- Article 9 enshrines the right to access, where appropriate measures must be taken to ensure persons with disabilities can access the physical environment and public facilities, with the goal of enabling them "to live independently and participate fully in all aspects of life."

  The rationale behind this article is given the contention that limitations in accessibility amount to unequal treatment. Its requirement that relevant services and goods be provided at a 'minimum cost' rather than an 'affordable cost' to persons with disabilities is given the acknowledgement that the demands of the free market and financial capabilities of governments may vary in accordance with their level of socioeconomic development.

From a broad perspective, these articles of the CRPD does not limit the consideration of associated rights and guidelines, concerning persons with disabilities, across the five foundational international space law agreements. This is supported by the state opinion of the UN Office for Outer Space Affairs in Office (UNOOSA) of the need to remain "mindful of the need to promote access to the scientific, technological, social, environmental and cultural benefits of space activities." This was outlined to the international community during the 2018 UN General Assembly Resolution in celebration of UNISPACE+50 - the 50th anniversary of the first UN conference on the exploration and peaceful uses of outer space.[65] [66]

Furthermore, the objectives of the UNOOSA remains fixed upon the promotion of international cooperation in the exploration and peaceful uses of outer space for economic, social and scientific development. This was detailed within the text of the 2019 UN General Assembly Resolution for *International cooperation in the peaceful uses of outer space*.[67]

In summary, the consideration of specialized safety requirements as general comments under the CRPD for the benefit of those with disabilities, will benefit both able bodied and persons with disabilities alike.[68] The transition from being an active, confident, able-bodied person to an active and confident person with a disability exists as a cognitively and emotionally complex task – one further complicated by the unique environmental hazards and

[65] *See* G.A. Res. 73/6 (Oct. 26, 2018).
[66] https://www.unoosa.org/oosa/en/ourwork/unispaceplus50/index.html
[67] *See* G.A. Res. 74/82 (Dec. 13, 2019).
[68] General Comments, Committee on the Rights of Persons with Disabilities, United Nations Human Rights Office of the High Commissioner, U.N. (2020), https://www.ohchr.org/en/hrbodies/crpd/pages/gc.aspx

technical challenges of space.[69] Accordingly, the promotion of specified human rights, and introduction of tailored guidelines, addressing the needs of those with disabilities will enable the provision of adaptive equipment and dedicated specialists, and help ease this necessary transition for affected astronauts.

[69] Sheri Wells-Jensen, *The Case for Disabled Astronauts*, SCI. AM. (May 30, 2018), https://blogs.scientificamerican.com/observations/the-case-for-disabled-astronauts/

Reconciling Human Rights and Space

For peoples with disabilities to reside in outer space and actively participate in the social, economic and cultural activities necessary for the full realization of their potential as human beings, human rights law must develop to recognize that people with disabilities have the basic rights required in leading a dignified life. Bridging and developing upon this intersection between human rights law and space law, for the advancement of the human rights of people with disabilities, may be pursued through several means.

Right to Health

The advancement of disability rights in the context of outer space requires a consideration of the universal and inherent human rights values and principles contained under the established right to health, and subsequent efforts made in the intersection between health and outer space. It is through this acknowledgement of the foundational elements offered by the contemporary right to health that precedent may be founded between international human rights law and space law, and from which new jurisprudence may be advanced in the intersection between the human rights of those with disabilities and the domain of outer space.

The right to health encompasses the right to enjoyment of the highest attainable standard of physical and mental health, seen as an indispensable human right for the exercise of other human rights.[70] Its foundations are set within Article 25 of the UDHR, and its scope is detailed under Article 12(1) of the International Covenant on Economic Social and Cultural Rights (ICESCR).[71] The rationale of the right to health is based on the belief that every human being is entitled to enjoyment of the highest attainable standard of health conducive to living a life in dignity.

General Comment No.14 to the ICESCR further defines the obligations that States parties have to fulfill in order to implement the right to health at the national level. This includes the immediate realization of minimum core obligations such as the guarantee of non-discrimination and equal treatment, in addition to progressive

[70] Right to health, Attorney-General's Department, AUSTRALIAN GOVERNMENT (2020), https://www.ag.gov.au/RightsAndProtections/HumanRights/Human-rights-scrutiny/PublicSectorGuidanceSheets/Pages/Righttohealth.aspx

[71] *See* G.A. Res. 217 (III), at 25 (Dec. 10, 1948) *and* G.A. Res. 200A (XXI), at 12 (Dec. 16, 1966).

realization in possessing a specific and continuing obligation to move expeditiously toward the full realization of the right to health. [72]

Cementing the right to health within the context of international space law jurisprudence will contribute to expanding the role and relevance of human rights and disability rights in outer space activities. Accordingly, the right to health has been highlighted under the 1999 UNISPACE III Resolution, which expressed the need to use space applications in the context of "human security, development and welfare" to improve "public health service" by expanding and coordinating space-based services for telemedicine and for controlling infectious diseases.[73]

Further continuing efforts under UNOOSAs "Space for Global Health" initiative has resulted in the creation of the STSC Working Group on Space and Global Health and numerous transparency and confidence building activities between UN member states, specialized agencies, and intergovernmental organizations in the area of application of space technologies to global health.[74] [75] The advancement of human rights for persons with disability in outer space may benefit from its consideration under ongoing discussions concerning space-based solutions for global health.

[72] Special Rapporteur on the right of everyone to the enjoyment of the highest attainable standard of physical and mental health, United Nations Office of the High Commissioner for Human Rights, U.N. (2020), https://www.ohchr.org/en/issues/health/pages/srrighthealthindex.aspx.
[73] *See* G.A. Conf. 184/6 (July 30, 1990).
[74] Space for Global Health, United Nations Office for Outer Space, U.N. (2020), https://www.unoosa.org/oosa/en/ourwork/psa/globalhealth/index.html.
[75] Working Group on Space and Global Health, United Nations Office for Outer Space, U.N. (2020), https://www.unoosa.org/oosa/en/ourwork/copuos/stsc/gh/index.html

Space Law Agreements

The importance of disability rights in the context of outer space may be advanced by shaping state practice and interpretation surrounding the notion of "safety" under the five foundational space law agreements.[76] From a theoretical perspective, a consideration of dedicated human rights for persons with disabilities under international space law jurisprudence may be drawn from the 1967 Outer Space Treaty (OST), the 1968 Rescue Agreement, and the 1979 Moon Treaty.[77]

1967 OUTER SPACE TREATY

Firstly, concerning the OST, Article V outlies the duty of state parties to the treaty to immediately inform other states and the UN of any phenomena discovered in outer space which "could constitute a danger to the life or health of astronauts." The article carries a humanitarian element, in placing a positive obligation upon states to share information and protect people involved in the exploration of outer space on behalf of all mankind.[78]

Article XII of the OST references the concept of safety in outlining that all "stations, installations, equipment and space vehicles on the moon and other celestial bodies" shall be open to "representatives" of other state parties – whereupon advanced and reasonable notice must be provided by the lessee state to the lessor, to allow that "maximum precautions may be taken to assure safety" and avoid interference with normal operations.

The measure of free access detailed herein relates to the question of visits, by state representatives of contracting parties, to space objects located on celestial bodies – established by a *lex specialis* where there is no general international law rule giving the right of free access to areas under the quasi-territorial jurisdiction of states in outer space.[79] The wording and intent of the article advances its interpretation as being that there shall be free access at all times to all areas of outer space and celestial bodies, except as provided by Article XII.[80]

[76] International Space Law: United Nations Instruments, UNITED NATIONS (May 2017), https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.
[77] *See* G.A. Res. 2222 (XXI) (Jan. 27, 1967) and G.A. Res. 2345 (XXII) (Dec. 16, 1967) and G.A. Res. 34/68 (Dec. 5, 1979).
[78] Stephan Hobe, Bernhard Schmidt-Tedd &, Kai-Uwe Schrogl, *Outer Space Treaty*, 1 COLOGNE COMMENTARY ON SPACE LAW (2017).
[79] Cestmir Cepelka et al., *The Application of General International Law in Outer Space*, 36 J. AIR L. & COM.30 (1970).
[80] Paul G. Dembling and Daniel M. Arons, *The Evolution of the Outer Space Treaty* 33 J. L. & COM. 419-456 (1967).

The requirement of advance notice and consultations, and absence of procedural details as to the conduct of consultations and detailed methods of performance of Article XII, implies the importance of inter-state dialogue and diplomacy in its enforcement. Acknowledging the underlying basis of reciprocity within this article, and the intent of the article to prevent harm, leads to the conclusion that the requirement to take maximum precautions flows both ways – requiring such precautions as to safeguard the health and wellbeing of the concerned state representatives.[81]

Accordingly, where it is foreseen that some state representatives may encounter difficulties in accessing such resources of a lessor state as a direct result of their individual disability conditions, it falls upon both the lessor and lessee state to take all reasonable measures to satisfy the need for "maximum precautions" – to enable the concerned representative with disabilities the safe access and use of such resources.

However, this contained duty to undertake maximum precautions in meeting the needs of persons with disabilities has not ascended to international customary law – where such requires State practice and *opinio juris*. There has never been a practice of accommodating the disability requirements of astronauts in space, and the OST does not create a clear duty to meet such requirements.[82]

THE RESCUE AGREEMENT

Secondly, concerning the Rescue Agreement, Article 4 outlines that in the event of an accident or emergency concerning a spacecraft, whereby its personnel are compelled to abandon their vehicle in space or land in another jurisdiction, concerned state parties shall return these personnel "safely and promptly" to the representatives of the launching authority.

The Rescue Agreement represents a document primarily defined by the period within which it was written, that being the prevailing geopolitical circumstances of Cold War competition between the United States and the Soviet Union. The exchange of letters between these two superpower states which

81 Hobe, Schmidt-Tedd, & Schrogl, *supra* note 76.

82 Memorial of Lydios, The Case Concerning the Operation of a Lunar Station (Lyd. v. End.), 2013 Manfred Lachs Space Law Moot Court Competition, INT'L. INST. SPACE L. (2013), https://www.iislweb.org/lachsmoot/memorials/2013_Applicant.pdf.

predicated the creation of the Agreement sought to emphasize that the following points be considered in the agreement[83]:

1) That astronauts in distress on earth should be assisted as much as possible;
2) That astronauts in outer space should be equally assisted as much as possible; and
3) That states are generally obligated to provide information that will aid in such assistance.

When considered in parallel with the final wording of the Agreement, it is observed that the return of astronauts to their launching state places a legal duty on the responsible state party to provide basic medical services and accommodation - ensuring that the health of astronauts is maintained and does not deteriorate under their supervision. This has been observed as a common element of state practice and international space cooperation across a number of missions, whereby post-mission medical checks are performed by healthcare professionals of the responsible state prior to their return to the launching state.[84] [85]

Where the scope of the Rescue Agreement appears primarily concerned with the safety and well-being of "astronauts," the question then arises as to what types of persons should be considered astronauts. A common interpretation of astronaut is that of "a person who travels beyond earth's atmosphere, or a trainee for spaceflight."[86]

While the term astronaut appears both in the title and preamble of the Rescue Agreement, the document's substantive provisions emphasize the responsibility of state parties to rescue and return 'personnel of a spacecraft.' Where the language and contents of the Rescue Agreement declines to make a clear distinction in its use of the term astronaut, determining what class of persons fall under the term requires a reference to international space law agreements and state practice.[87]

[83] Frans G. von derDunk *A Sleeping Beauty Awakens: The 1968 Rescue Agreement after Forty Years,* 34 J. SPACE L. 411 (2008).
[84] *Daria Litvinova & Vladimir Isachenkov, ISS crew lands in Kazakhstan after more than 200 days*, PHYS.ORG (Apr. 17, 2020), https://phys.org/news/2020-04-iss-crew-kazakhstan-days.html.
[85] Mark Garcia, *Touchdown! Expedition 62 Returns to Earth, Completes Station Mission*, NASA (Apr. 17, 2020) ,https://blogs.nasa.gov/spacestation/2020/04/17/touchdown-expedition-62-returns-to-earth-completes-station-mission/.
[86] Louis de Gouyon Matignon, *The Rescue Agreement of 1968*, SPACE LEGAL ISSUES (Apr. 6, 2019), https://www.spacelegalissues.com/space-law-the-rescue-agreement-of-1968/.

[87] Steven Freeland, *Fly Me to the Moon: How Will International Law Cope with Commercial Space Tourism*? MELB. J. INT L. 4 (2010).

While Article V of the OST classifies an astronaut as "envoys of mankind in outer space," the interpretation attached to this term did not consider the possibility of alternative classes of persons travelling into outer space.[88] The broad use of the term in the treaty is premised upon the prevailing Cold War geopolitical circumstances during the treaty's drafting – whereby the US and Soviet Union were the two primary space powers. The treaty does not make any further distinctions on what classes of person qualifies as an astronaut. Similar to the Rescue Agreement, the OST Article draws a similar distinction as to the differing circumstances within which state responsibility should be concerned[89]:

A) Situations where astronauts are in distress somewhere on earth;
B) Situations where astronauts are in distress somewhere in outer space; and
C) Situations where astronauts are in distress, thus obligating states to provide information.

By incorporating the handling of space objects upon their return to earth, it assumed the interests of a handful of other states that had already developed their own launch capabilities.[90] The drafters sought to integrate both the standard English terminology of astronaut with that of the term "cosmonaut," where both terms are used to describe those whom "venture extra terrestrially to outer space."[91] However, noting the classification of astronauts as "envoys", the formulation found in Article V can thus be compared with the prevailing usage of the term astronaut across various member states.

One alternate conception of what constitutes an astronaut has been presented through the routine use of the term "spaceflight participant" by the International Space Station (ISS) partners – including Canada, Japan, Russia, US, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, and the UK.[92] [93] This distinguishes the more classical astronaut, being individuals trained for years to operate manned space craft, and scientists as representatives of a state, from those of tourists who visit the station for the purpose of leisure. The use of the term spaceflight participant thus refers to people who have travelled aboard space missions, but whom are not a part of the crew.

[88] von derDunk, *supra* note 81.
[89] Hobe, Schmidt-Tedd, & Schrogl, *supra* note 76.
[90] de Gouyon Matignon, *supra* note 84.
[91] von derDunk, *supra* note 81.
[92] Valery V. Bogomolov et al., *International Space Station medical standards and certification for space flight participants*, 78 AVIATION, SPACE, & ENVIRONMENTAL MED. 1162-9 (2007).
[93] United Nations Committee on the Peaceful Uses of Outer Space Legal Subcommittee "The Legal Framework for the International Space Station", U.N. COPUOS (Apr. 17, 2013).

Similarly, the distinction is recognized under US law, where the 2004 US Commercial Space Launch Amendment Act (CSLAA) refers explicitly to "spaceflight participants" – in providing for license requirements concerning launch vehicles carrying a human being for compensation.[94] This view continues to be applied to present day, following the promulgation of Title 51 of the United States Code (51 U.S.C.), known as the National and Commercial Space Programs, in December 2010 by President Barack Obama.[95] Herein, section 50902 of title 51, United States Code defines a government astronaut as an individual who is designated as such by NASA, is carried aboard a space vehicle in the course of employment, and who is an employee of the US government or an international partner astronaut.[96]

While there is no established definition of the term "astronaut" under international space law jurisprudence, there exists a clear inclination toward distinguishing between professional and private participants to spaceflight.[97] Absent of any authoritative definition, and noting state practice, the term astronaut should thus be defined as "human beings travelling into outer space for professional reasons of a non-commercial, non-private nature."[98]

The consequences which flow from this definition of astronaut upon the rights of persons with disabilities in outer space reveals that current international safety guidelines under the core international space law agreements, concerned with the health and wellbeing of astronauts, will apply only to persons travelling into space for non-commercial reasons as designated representatives of a state. Accordingly, this deficiency underscores the urgent need for the development of a human rights interpretation of the Rescue Agreement and the OST - one which highlights the universal, inalienable, and inherent nature of human rights principles concerning the safety and security of the person across the domain of outer space.

Advocating for the universal application of fundamental human rights in outer space, pertinent to the safety and well-being of all persons, is central to advancing the rights of persons with disabilities; by

94 H.R.3752 (2004) ("Commercial Space Launch Amendments Act of 2004.")
95 51 U.S.C. § 10101 et seq. (2012).
96 51 U.S.C § 50902 (2012).
97 Alex Li, *Are Space Tourists Astronauts?*, #THESPACEBAR (Nov. 12, 2017), https://alexsli.com/thespacebar/2017/11/12/are-space-tourists-astronauts.
98 Hobe, Schmidt-Tedd, & Schrogl, *supra* note 7**6**.

improving overall safety, promoting economic stability, and protecting the dignity of the most vulnerable people in society.

THE MOON TREATY

Third, the Moon Treaty exists as the only core outer space agreement which speaks directly to the definition of astronaut. The Treaty contains substantive terms of significant importance to the well-being of humanity, requiring that the moon be used for peaceful purposes, that the exploration and exploitation of the moon be the province of all mankind, and astronauts and other persons present on the moon be afforded all safeguards respecting their lives and health.[99] In focus is Article 10 of the Treaty, outlining that "state parties shall adopt all practicable measures to safeguard the life and health of persons on the moon" and that states "shall regard any person on the moon as an astronaut" across the five core international space law agreements.[100]

Among the several core considerations which guided the drafting of the agreement was that the Treaty should protect the right of all people to a share of the resources of outer space, and to secure for all countries the opportunity to benefit from space activities.[101] This was reinforced by the notion that such resources should be regarded as the "common heritage of mankind," implying the element of a "beneficial domain" which includes the enjoyment, profit, and partaking in space benefits which had been excluded by the articles of the OST. Where the Treaty imparts a degree of shared responsibility between state parties over the moon as a *terra communis humanitatis*, it gives rise to a collective responsibility to manage this area as representatives of all mankind.[102]

Further, where the Treaty is concerned with the need to ensure the safety and welfare of astronauts, its concerns may provide a suited opportunity to expand upon what elements and processes contribute to the notion of safety in the context of persons with disabilities. Indeed, the Treaty requires its signatories to consider the possible repercussions of their actions in space upon the quality of life of both present

99 Carl Q. Christol, *The Common Heritage of Mankind Provision in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,* 14 THE INTERNATIONAL LAWYER 429-483 (Summer 1980).
100 G.A. Res. 34/68, at 5 (Dec. 5, 1979).
101 Antonella Bini, *The Moon Agreement: Its effectiveness in the 21st century*, United Nations Office for Outer Space Affairs (UNOOSA) EUROPEAN SPACE POLICY INSTITUTE (2008).
102 Michael E. Davis & Ricky J. Lee, Twenty Years After the Moon Agreement and its Legal Controversies, 1999 AUSTRALIAN INT'L. L. J. (1999).

and future generations.[103] It is thus posited that the requirement to "safeguard the life and health" of persons on the moon represents an objective standard, one which should be applied with equal vigor by all state parties, and which naturally draws allusion to human rights law and principles as an existing and shared universal standard concerning human health and well-being. Considering the eventuality that persons with disabilities will one day reside on the moon, this elicits the need for the application of human rights principles to ensure that these individuals are provided with the opportunity to achieve the highest attainable standard of health in outer space, conducive to their full and effective participation and inclusion in society on an equal basis with others.

While the impact of the treaty across the international community has been limited by the fact that it possesses only 18 parties and 11 signatories, the 21 principles of the Treaty represents the collective effort of 152 nations to establish a basic legal framework for the exploration and exploitation of the moon and other celestial bodies, and reflects the UN's commitment to the ideals of peace and development through international cooperation.[104]

[103] James R. Wilson, Regulation of the Outer Space Environment Through International Accord: The 1979 Moon Treaty 2 FORDHAM ENVIRONMENTAL L. REPORT 173-193 (Summer 1991).
[104] **T** Bini, *supra*, note 99.

Approach in the United States

The extensive technical and policy experience accrued by NASA and the US government across the area of human spaceflight - especially astronaut health and wellbeing – highlights the developing realization of the varied health and environmental hazards present in outer space. Acknowledging the reputation of the US as a global leader in human rights advocacy, Washington's status as a leading global space power provides it with a unique opportunity to spearhead the promotion of human rights principles for persons with disabilities in outer space.

Firstly, NASAs prolonged history of human spaceflight activities has provided it with extensive experience concerning the required best practice guidelines for astronaut health and safely. NASAs Office of Safety and Mission Assurance is responsible for the creation and enforcement of top-level policy and safety requirements for all Agency activities. NASAs Procedural Requirements provides the basis for the NASA safety program, and serves as a framework for more detailed requirements to subsidiary departments.[105] This has resulted in the creation of several noted documents in respect of astronaut health.

The NASA Space Flight Human System Standards - NASA Standard 3001 (NASA-STD-3001) is a two-volume collection of documents which address human needs in spaceflight.[106] Volume 1 addresses "Crew Health" and outlines the requirements needed to support the health and wellbeing of astronauts throughout the pre-flight, in-flight, and post-flight phases of human spaceflight.[107] This encompasses a collection of policy requirements which authorize the provision of health and medical programs for crewmembers, with the intent of optimizing crew health and performance and contributing to overall mission success. [108] This governs such areas as medical care, nutrition, sleep, and exercise – elements considered integral to realizing and supporting health and human dignity, and in advancing the individual right to health in outer space.

Volume 2 addresses "Human Factors, Habitability and Environmental Health" and addresses the requirements for system design and environmental control and live support systems that will maintain astronaut safety and promote performance.[109] The scope is restricted to human spaceflight missions and includes activities which

[105] NASA Procedural Requirements, NASA (2014), https://www.nasa.gov/sites/default/files/atoms/files/npr_8820.002g.pdf.
[106] Robert Lewis, *NASA Standard 3001*, NASA (Mar. 4, 2015), https://www.nasa.gov/hhp/standards.
[107] NASA SPACE FLIGHT HUMAN-SYSTEM STANDARD VOLUME 1, REVISION A: CREW HEALTH. National Aeronautics and Space Administration 2015
[108] NPD 1000.3 – The NASA Organisation, NPD 8900.5 – NASA Health and Medical Policy for Human Space Exploration, NPD 8900.1 – Medical Operations Responsibilities in Support of Human Space Flight Programs, NPD 8900.3 – Astronaut Medical and Dental Observation Study and Care Program.
[109] NASA SPACEFLIGHT HUMAN-SYSTEM STANDARD VOLUME 2: HUMAN FACTORS, HABITABILITY, AND ENVIRONMENTAL HEALTH. National Aeronautics and Space Administration 2019

affect the crew in all phases of the life cycle (design, development, test, operations, maintenance) insider and outside spacecraft in space and on celestial bodies. This encompasses a collection of standards established by the NASA Office of the Chief Health and Medical Officer, aimed at minimizing health and performance risks for flight crews in human spaceflight programs. This focuses on human physical and cognitive capabilities and limitations, defining standards for food facilities, bathrooms, workstation layout, seating and crew restraint, lighting, and environmental requirements. These elements allude to the requirements of CRPD Article 9 and the right to access, whereby appropriate measures are required to ensure persons with disabilities can access the physical environment and public facilities, enabling them to live independently and participate fully in all aspects of life.

Secondly, NASAs involvement as one of the fifteen International Partners to the International Space Station (ISS) has resulted in the creation of the SSP 50667 International Space Station Medical Operations Requirements Document. (ISS MORD), a multilateral document inviting the collective participation of ISS partners to ensure the overall health and safety of ISS crew members, with the aim of optimizing human performance and mission success.

The document was developed by the ISS Multilateral Medical Operations Panel (MMOP) in accordance with the NPDs - providing for the development of medical selection and certification standards; countermeasures definition and implementation; medical monitoring; response capability for in-flight medical events; support of individual and crew behavioral health and performance; environmental monitoring; Emergency Medical Services (EMS) support; establishment of a process for medical training and certification of ISS crewmembers, IP flight surgeons (IP FS), and other medical support personnel; and post-flight activities including rehabilitation.

Acknowledging the international character of the ISS MORD and the applicability of these standards to all ISS and ISS-related flight activities - including those involving Shuttle, Soyuz, and other vehicles that may conduct ISS flight operations - it is conceded that this document exists as one of the current key authoritative multilateral agreements surrounding the technical and physiological challenges of human spaceflight, and provides a stable foundation for the realization of human rights principles in outer space rooted in the protection of human health and dignity.

Thirdly, the NASA Transition Authorization Act of 2017 (the "TREAT Act") sought to expand on the medical monitoring services offered to US astronauts, and ensure that astronauts are provided with proper care for any medical issues which may arise as a direct result of their vocation.[110] [111] Signed into law on 21 March 2017, the Act provided for NASA to pay for the monitoring, diagnosis, and treatment of any health issues where such issues are determined "to be associated with space flight" – effectively providing lifetime health care for retired astronauts for all space flight related issues.[112]

Specifically, Section 2 of the Act recognizes the increased health risks associated with long-duration and exploration spaceflight missions - including vision impairment, bone demineralization, cardiovascular issues, behavioral health and performance risks which may arise from the environmental effects of microgravity and galactic cosmic radiation.

The Act reinforces the notion as to the appropriate standard of care which is to be provided to astronauts in addressing healthcare issues tied to human spaceflight.[113] This is premised upon the reasoning that such as standard should be defined by common law, to suit the specific hazards of each mission and the evolving nature of such a standard. Hence, the objectives of any space-related healthcare system should be to maximize the individual astronaut's ability to function as a productive member of the crew during the mission and to maintain or to restore normal function during and upon completion of the mission.

The significance of the TREAT act is observed through the legislative acknowledgement of the hazards of human spaceflight activities on the human body, the acceptance of the legal responsibility of the US government astronaut health and well-being under US law, and in the introduction of a standard of healthcare for astronauts. Consequently, this de facto realization of a right to health for astronauts serves as an impetus and blueprint for the advancement of human rights for persons with disabilities in outer space. When considered with requirements Article 5 of the CRPD, that all persons be recognized as "equal before and under the law," it is perceived that the provisions of the TREAT Act shall be applied equally to astronauts both with and without disabilities.

[110] H.R.6076 (2016) ("TREAT Astronauts Act.")
[111] *About TREAT Astronauts Act*, NASA (Nov. 2017), https://www.nasa.gov/hhp/about-treat-astronauts-act.
[112] Alex Stuckey, *Doctors urge NASA to follow astronauts until end of life to determine cancer rates*, HOUSTON CHRON. (Oct. 14, 2019), https://www.houstonchronicle.com/news/space/article/Doctor-urges-NASA-to-follow-astronauts-until-end-14521154.php
[113] DANIEL S. GOLDIN, PLANNING AN INFRASTRUCTURE FOR ASTRONAUT HEALTH CARE IN SAFE PASSAGE: ASTRONAUT CARE FOR EXPLORATION MISSIONS (1999).

The NASA-STD-3001, ISS MORD, and TREAT Act collectively implement a series of policy and technical requirements to human spaceflight activities both domestically and internationally. These documents stand as a testament to the diplomatic and technical competence of the US as a leading space power, and underscore the need for Washington to consider the application of human rights principles in outer space as a means of maintaining its influence and position as a leading space power and global leader.

Conclusion

The domain of outer space presents a unique challenge to the advancement of human rights in the 21st century, within which humanity must strive to ensure that peoples with disabilities have equal access to the same rights and opportunities afforded to everybody else. The continued ability of the US to maintain its status as the moral leader of the free world rests upon its ability to capitalize upon its leading position in outer space, and its legacy of disability rights, in the advancement of universal human rights.

As outlined, the opportunity exists for the development of legal jurisprudence concerning the intersection between human rights and international space law, for the advancement of human rights for persons with disabilities. Advocating for equality and inclusivity in relation to the most vulnerable group of people in society will ultimately benefit the democratization of access to outer space, exemplify our moral and ethical values as human beings, and define humanity's growing ambitions among the stars.

The realization of outer space as an increasingly inclusive and accessible environment for all will open the possibility for the increased involvement and representation of individuals with disabilities in space missions, recognize the past contributions of persons with disabilities to the advancement of human spaceflight, build upon the legacy of past disability advocates, and result in wide-reaching effects upon the course of humanity's socioeconomic activities in outer space – including space tourism, asteroid mining , and human exploration.

However, a reluctance by governments to recognize the growing significance of the relationship between human rights, disability rights, and outer space risk jeopardizing their capacity to create and foster a harmonious and inclusive society. Indeed, states which inhibit, restrict, or ignore the growing role of disability rights risk impeding social progress and economic opportunity, drawing criticism and condemnation from the international community, and stands in violation of their duties and obligations under the CRPD and associated international human rights law agreements.[114]

The relevance and importance of fundamental human rights and disability rights to humanity's exploration and exploitation of outer space is not a question of "if", but of "when." Over the following decade, as space tourism

[114] Robert Booth, *One in five Britons with disabilities have their rights violated, UN told*, THE GUARDIAN (Oct. 7, 2018), https://www.theguardian.com/society/2018/oct/07/one-in-five-britons-with-disabilities-have-their-rights-violated-un-told.

increasingly becomes a reality for the average person, it is envisioned that the emergence of public advocacy concerning disability rights will inevitably drive legal reform in this area.

Consequently, it is the focus of the Jus Ad Astra project lies to advocate for dialogue surrounding disability rights in the development of legal jurisprudence in this intersection between human rights and outer space. Through its, the project seeks the uniform observance, application, and enforcement of the several fundamental human rights necessary to the sustainability of human activities in outer space – the right to water, the right to a breathable atmosphere, and the right to a habitable environment.

It is the project's aspiration that the scientists, designers, and engineers leading humanity's expansion into outer space constantly question whether their motivations and actions are accessible and conducive to the inclusion of persons with disabilities. Where society is continuously moving towards greater disability inclusion and universal accessibility, this trend must continue as we begin to explore and inhabit the final frontier.