



What is in a name? Perceived identity, classification, philosophy, and implied duty of the ‘astronaut’[☆]



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ABSTRACT

Various cultural-specific names and labels are assigned to someone who travels to space. Some familiar names include: astronaut, cosmonaut, taikonaut, yu hang yuan (“space navigating personnel”), vyomanaut, as well as citizen astronaut, civilian astronaut, space tourist and spaceflight participant. This paper addresses what is in a name? We ask, what are the philosophical and cultural values that are applied in identifying ‘astronaut’? More importantly, why are we identifying them accordingly by these monikers? What are the implications of these labels, on a social, moral and legal level? Moreover, how do spacefaring individuals identify themselves in comparison with popular perceptions? By identifying selected poetic, cultural and legal definitions and terminologies we seek to answer these questions and highlight relevant distinctions and connections between the contextual spheres and definitions. ‘Intersubjectivity’ is also reviewed as an approach for formulating future categories and definitions of ‘astronauts’. Cumulatively, these terms and definitions serve to address pertinent legal, ethical and social implications and consequences for space-faring individuals at the advent of the Commercial Space Age.

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1. Introduction

Space is inherently an interdisciplinary and evolving field of technological activity and scientific discovery, and therefore requires new and updated labels and definitions on a periodic basis. For instance, Pluto was recently demoted in status due to the reclassification of the term ‘planet’ [1]. Similarly, new commercial actors and activities are challenging earlier space transportation concepts and definitions leading to the need for technologically accurate and legally precise definitions. For example, the questions of what constitutes ‘space tourism’ and whether a ‘space tourist’ is equivalent to an ‘astronaut’, present new challenges in space law and commercial activities. Various

cultural-specific names and labels have been assigned to a person who travels to, and in, space. Some familiar names include: astronaut, cosmonaut, taikonaut, yu hang yuan (“space navigating personnel”), afonaut, as well as Citizen Astronaut, civilian astronaut, space explorer, space tourist and spaceflight participant. But what is in a name? What are the philosophical and cultural values that are applied in the label ‘astronaut’? More importantly, why are we identifying them accordingly? What are the implications of these labels, on a social, moral and legal level? Moreover, how do spacefaring individuals identify themselves in comparison with popular perceptions? These are some of the underlying questions triggered in the adoption and utilisation of nametags and labels.

Currently, there are no clear answers to these questions as the interpretation of each actor and activity have yet to be uniformly adopted by the space industry, media, and governments. While poetic and cultural terms of art may provide evidence of conceptual interpretation, which may be useful

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Table 1

Astronaut Moniker: summary comparison of spheres of interpretation and definition examples.

| Contextual sphere | Interpretation | Definition E.g. |
|-------------------|----------------|--------------------------------|
| Poetic | Objective | <i>Space traveller</i> |
| Cultural | Subjective | <i>Afronaut</i> |
| Political | Subjective | <i>Cosmonaut</i> |
| Legal | Subjective | <i>Spaceflight participant</i> |

for targeted policy development for instance, independently they are inadequate for practical legal and regulatory purposes moving forward.

1.1. Research aims

This paper provides a preliminary survey of names and conceptual terms for ‘astronaut’. The aim is threefold: first, to conduct a global survey to aid in understanding the cultural landscape and social psychology for defining space-faring people across disciplines. The second aim is to identify and distinguish problematic and outdated labels that may require reclassification or clarification to meet new commercial space activities and regulation. Lastly, our contribution highlights the practical implications for these labels, to include potential and actual ethical and legal consequences specific to the role of the nametag identified. For instance, suborbital pilots, crew and passengers may all qualify as ‘astronauts’ under cultural terms—they may even receive astronaut wings—however, they cannot all be defined identically for legal and practical regulatory purposes.

1.2. Background

In 1610, Johannes Kepler called a planetary moon a *satellus*, adopted from an earlier Latin term, meaning a follower or attendant of a superior, because moons (satellites) were observed to orbit around a greater celestial body [2]. Since then the word ‘satellite’ has become applicable to a wide range of subsidiary bodies in space and on Earth. While humans may also orbit in space or alight on other orbiting bodies, the development of terminology referring to human travellers to and in space has diverged from the inanimate ‘servant follower’ to more individual, ideological, political, and cultural identities. Modern legal classifications today, moreover, serve to delineate the roles, rights and duties of space-faring individuals and entities. Nevertheless, ambiguity remains in the legal and cultural lexicons relating to ‘astronauts’.

1.3. Scope and significance

A cursory preview of literature on space terminology appear to take the term ‘astronaut’ for granted, either failing to define it at all, or merely providing a one-line definition. The etymological context is lacking. As a result, the scope of our research necessitated a broad literature review from dictionaries and media sources to treaty and legislative analysis to cumulatively illustrate the complexity of ideas and interrelationships pertaining to the label ‘astronaut’. This

research contributes to the field by filling the dearth of scholarly material available on this topic.

Significantly, we acknowledge that a myriad of terms exist across languages extending and varying the concept and definition of ‘astronaut’. At the same time, additional terms and concepts are emerging with the new Commercial Space Age to address a wider interested public and increased access to space. The convolution of legal definitions with popular culture and artistic interpretations of would-be space farers consequently calls for thoughtful analysis and clarification. We do not purport to provide an exhaustive list, instead select known terms and concepts are analysed with relevant contextual background to provide insight into the associated cultural, ethical and legal implications for each term or name.

2. Theoretical review

The focus of our review expands upon four contextual spheres for identifying and developing definitions: poetic, political, cultural and legal (Table 1).

2.1. Poetic concepts

Poetic interpretations offer the earliest uses and interpretations of humans in space, and remain objective in definition. Sometimes, these contexts have cross-over providing for a measure of cohesive subjective interpretation. At other times, the interests and requirements differ, creating a lack of continuity across spheres. For this reason, acknowledging both concept (idea or notion) and perception (way of understanding something) is a necessary step for understanding existing interpretations and defining relevant (new) terms and labels.

Original terms of art and concepts for space-faring individuals derive from art and literature. The physical universe, flight and travel to other stars and planets have served as inspirational material for poetry, art, architecture and fiction for centuries, even where the actual concepts vary in interpretation. Western concepts are exhibited, for instance, in Daedalus’ winged creations in Ovid’s *Metamorphosis* (c. 8 C.E.), Leonardo de Vinci’s flying machines (1480s), Johannes Kepler’s fictional work, *Somnium* (1634), and Bernard le Bovier de Fontenelle’s philosophical piece, *A Conversation on Plurality of Worlds* (1686), among other works.

The Oxford English Dictionary lists the first use of ‘astronaut’ in 1880, after Percy Grey penned the term as the fictional spacecraft name in *Across the Zodiac* [3]. It was not until the late 1920s with the establishment of astronautics as a field that the word is applied to “a person who travels in space” or “[is] part of a space mission” [4]. Thus, the early concept of an abstract *hu/man* in space transcended to a modern concept and identity of the individual, that of an *astronaut*.

Modern and contemporary genres of popular science and science fiction have further proliferated the means, modes, purposes and destinations of extra-terrestrial travel in the human imagination. For instance, in 1968, Arthur C. Clarke coined the term ‘Citizen Astronaut’ [5]. Since then, the term has been adopted by some in the commercial human space transportation industry [6]. Additional monikers continue to arise in scholarly and popular literature. French ethicist and

advisor to the French space agency (CNES), Jacques Arnould refers to astronauts as ‘cloud riders’ [7]. Other culturally descriptive labels seek to identify a subjective versus an objective identity: what an astronaut is [8]. Moreover, we note poetic descriptions evolve along with scientific accuracy, culminating in more exacting contemporary art and public intelligence. As a result the functions, identities and perceptions held about astronauts, and by astronauts, are inevitably changing in tandem with the culture, science and times.

2.2. Cultural-political distinctions

Historical monographs and analytical articles detail the rationales and policies of early space programs showing, that while cultural-political positions influence the terminologies adopted by governments and the media, the terms ‘astronaut’ (from Greek meaning ‘star sailor’) and ‘cosmonaut’ (used since 1959) appear by definition to be essentially interchangeable labels with mere citizenship as the distinguishing element. This indicates a close conceptual connection of the original terms despite geopolitical distinctions. Culturally, both ‘astronauts’/‘cosmonauts’ were deemed heroes by virtue of their courage in pioneering space. So too, media and government campaigns on both sides of the Atlantic successfully rendered the ‘astronaut’/‘cosmonaut’ a global celebrity.

Nevertheless, early ‘astronauts’ were fashioned into social and cultural icons to fit political agendas [9] leading to a political polarisation of terms. This rendered an intriguing juxtaposition between a Soviet cosmonaut being perceived both as a unique and ideal individual—a hero—who is inherently distinguishable from the ordinary folk, as well as a symbol of the common man, a hardworking man of the people [10]. Conversely, the well-educated and highly trained American astronaut advanced a new socio-political perspective of ‘organisation men’, the professional skilled labourer [11].

Internally, however, the role of astronaut on board a spacecraft was diversely perceived. In the US, *Apollo* crew asserted their engineering expertise in spacecraft construction and development, and as pilots they sought to exert a measure of human control over their craft [12]. By contrast, cosmonauts were intentionally “designed” to be an intrinsic part of the spacecraft system, not independent elements [13]. So too, “aviation designers, rocket engineers, human engineering specialists, and cosmonauts had very different assumptions about the role of the human on board a spacecraft” [14]. Most significantly, this impacted “the definition of the astronaut profession... [highlighting] the connections between technological choices, professional identity, and the social status of cosmonauts” [15]. Contextually, the defining role of what an astronaut is and does conflicted between the political agenda, engineering design, and pilot ‘astronauts’/‘cosmonauts’ who were dissatisfied with the relegated role of ‘passenger’.

Updated concepts and roles of government-sponsored astronauts in space and in the public have since expanded. This is evident in more recent policies, missions and technological capabilities. Consequently, NASA provides a functional definition of ‘astronaut’ as “a person trained to travel and work in space” [16]. In addition, the Astronaut Corps routinely

serve as medical test subjects in space [17], aquanauts in training [18], industry leaders, space advocates [19], business people, entertainers, educators, authors etc. The life of a government-sponsored astronaut remains a public one but the conceptual understanding of what one is and does is evolving.

2.3. Cultural naming trends

Other space-faring nations are formulating linguistic labels for their astronauts too. The most recent popular culture addition is the term ‘afonaut’. In 2014, a South African candidate won a global competition to ride aboard a Lynx suborbital flight in 2015. He will be the first black African ‘astronaut’ [20]. Thus, the term ‘afonaut’ is intentionally used to reflect a new African cultural presence in space as well as distinguish the moniker from reflecting merely an identity based on citizenship (the first African to fly in space was a caucasian South African, in 2002).

In 2010, India also settled on ‘vyomanaut’ merging the classical Greek word ‘naut’ with the Sanskrit term ‘vyo-mana’ for sky and space [21]. Another choice term considered was ‘gaganaut’ which also indicates “something that passes in the sky” in Sanskrit [22]. The former name was selected as a more appropriate term. Perhaps, at the heart of these decisions was the desire for political uniformity of a term with the suffix ‘naut’, while also popularizing a national identity, on a global scale.

In China the term ‘taikonaut’ sprung from the grassroots level and was later (reluctantly) adopted by the government. Reportedly, the term was coined in May 1998 by a Malaysian news blogger who merged the Mandarin word for outer space or cosmos ‘tai kong’ with the traditional ‘naut’ creating the moniker ‘taikonaut’ [23]. At the same time, another journalist applied the term in Western media. By 1999, the term ‘taikonaut’ had gone viral and emerged as the predominant public preference. Other related terms that have been used in the Chinese media are: ‘yu hang yuan’ an older translation meaning ‘universe navigating personnel’ or ‘travellers of the universe’; ‘hang tian yuan’, a more technical translation used in the media, meaning ‘space navigator’ or ‘space navigating personnel’; and ‘taikongren’ meaning ‘spaceman’ [24].

Another label rarely seen is the gender-specific term ‘astronette’, referring to a “woman engaged in space-flight exploration” [25]. This gender identity appears in a 1963 *Space Age Dictionary*. Two other obsolete female monikers suggested at the dawn of the space age are ‘astronautess’ and ‘cosmonette’ although these terms were readily rejected in favour of the neutral term ‘astronaut’ [26]. Consequently, gender label distinctions have not manifested in other cultural translations and are not found in colloquial or formal use today.

2.4. Legal terminology

To date, no internationally recognized definition of ‘astronaut’ exists. Yet, the term has been broadly utilised in international legal discussions and instruments since the 1950s. The United Nations’ 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (Outer Space Principles) [27]

established nine philosophical, ethical and legal principles pertaining to outer space and space actors. These guiding Principles formed the basis for the legally binding 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) [28]. Notably, both instruments primarily refer to human space actors as ‘astronauts’.

3. Analysing results

The Outer Space Treaty is the foundational instrument in international space law, followed by four other treaties, which together with five sets of U.N. Principles comprise the space legal framework or *corpus iuris spatialis*. Four of these five treaties invoke reference to individuals as space actors, yet they apply different terms in light of the treaty theme. Some of these definitional issues have already been raised in international legal circles [29]. Here we synthesise the pertinent aspects with cohesive insight and an overarching perspective of the treaty terms, contexts and legal implications, followed by commercial space law distinctions on evolving terms: ‘commercial astronaut’, ‘persons on the ISS’, ‘space tourist’, and ‘outer space’.

3.1. The outer space treaty

Article V of the Outer Space Treaty is the first to identify ‘astronauts’ “as envoys of mankind in outer space.” This article section iterates Principle 9 of the Outer Space Principles. The rationale here was to distinguish State sponsored astronauts in space. The traditional ambassadorial title ‘envoys’ reflects this official capacity granted to early astronauts in the event that they would be the first to represent humanity in outer space. This officiate does not extend the status to Astronaut Corps on Earth, however. Therefore, the international legal position of ‘astronauts’ as ‘envoys’ is context specific, whereas ‘astronauts’ retain their legal identity and label regardless of their physical location (e.g. on Earth, in flight and in space).

Article VIII refers to ‘personnel’ of a space object in regard to juridical issues of jurisdiction, ownership and control. An interesting topical discussion raised here is whether a commercial astronaut constitutes a ‘space object’ while performing a spacewalk under the treaty and not an ‘astronaut’ per se [30]. The term ‘space object’ includes component parts of a space object as well as its launch vehicle and parts thereof [31]. Spacewalks are conducted utilising a spacesuit, called an extra-vehicular mobility unit (EMU), which can qualify as “component parts,” and therefore raise separate questions concerning the EMU’s legal identity versus the legal status of the individual inside.

While this presents an interesting academic question to be clarified, this concern does not significantly affect the legal definition or status of ‘astronauts’ at present, however. Nor does it impact potentially applicable legal principles to individual ‘astronauts’ such as the nationality principle and long-arm jurisdiction. The fundamental question here concerns the implications of defining spacewalking ‘astronauts’ as ‘space objects’. Definitional outcomes have direct bearing on liability and legal interpretations as how to identify the

spacewalker in the event that he/she causes damage or commits a crime to another state’s astronaut or space object in space.

3.2. The rescue & return agreement

The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Space Objects Launch into Outer Space (Rescue and Return Agreement) [32] utilises the term ‘astronaut’ in the treaty title. However, the legally binding text refers only to ‘personnel of a spacecraft’, [33] which is reiterated in the first four articles. The Rescue and Return Agreement constitutes the shortest treaty in the legal framework and was specifically “prompted by sentiments of humanity” as the Preamble states.

Consequently, the term ‘astronaut’ is eschewed in the text in favour of a broader term. There is still debate as to whether ‘personnel’ means ‘staff’ or ‘persons’ in general. Interpretations seem to vary based on linguistic and cultural contexts. For instance, European lawyers may interpret the term to incorporate crew and anyone else that may be on board (i.e. stowaways) [34] whereas US lawyers may apply a more stringent interpretation, to crew.

While these term interpretations and evaluations may appear academic, they are practically important. Indeed, they represent pertinent questions that have real life implications at the onset of commercial spaceflight.

3.3. Commercial space law

The United States is currently the only nation with existing commercial spaceflight legislation and regulation which incorporate humans in launch payloads. For purposes of regulating commercial human spaceflight activities, the U.S. Commercial Space Launch Act (CSLA) (as amended) distinguishes three classifications of civilian actors or parties engaged in commercial spaceflight activities: the spaceflight operator (corporate entity), crew (pilot and crewmembers) and spaceflight participant (private/commercial passenger). The label ‘astronaut’ is only retained for NASA and government-sponsored space-farers.

Specifically, the regulations provide the following definitions [35]:

- Crew means “any employee or a licensee or transferee, or of a contractor or subcontractor of a licensee or transferee, who performs activities in the course of that employment directly relating to the launch, re-entry, or other operation of or in a launch vehicle or re-entry vehicle that carries human beings.”
- Spaceflight participant means “an individual, who is not crew, carried within a launch vehicle or reentry vehicle.”

3.3.1. Distinguishing and defining ‘commercial astronauts’

The significant implications in distinguishing crew and spaceflight participants under the CSLA lies in the distinct contractual roles, informed consent procedures and requirements, liabilities, training and safety requirements, and

medical qualification requirements of each category, respectively. In sum, these legal labels separate the transportation service providers from the service receivers with all the accompanying legal rights (or non-rights due to personal liability waivers) and duties attached. Notably, while spaceflight/launch operators may perform like a ‘common carrier’ (e.g. airline) ferrying ‘passengers’ for hire, the U.S. Congress has excluded them from the legal scope of ‘common carriage’ [36]. Hence, a ‘spaceflight participant’ does not qualify as a typical ‘passenger’ nor do they incur the same rights, privileges and heightened duties of care relevant to other transportation ‘passengers’.

The U.S. broadly construes ‘spaceflight participant’ to cover all personnel aboard who do not qualify as ‘crew’. This includes any spaceflight participant flying in a sub-orbital or orbital trajectory, as a participating space tourist, scientist/researcher, businessperson, entrepreneur, educator, entertainer or other role. Sub-categorisation of types of spaceflight participants are not legally relevant at present and therefore do not exist. Nonetheless, legal and regulatory definitions remain inherently amendable as commercial actors and activities advance in space.

Furthermore, the FAA, as the delegated regulatory body for commercial human spaceflight, is only authorised to regulate space activities that involve actors and a launch and/or a re-entry. In-space activities fall outside the scope of FAA jurisdiction, although this does not preclude another relevant industry from establishing other appropriate rules and guidelines, or redefining identities and roles of in-space actors and activities. For instance, hospitality and tourism associations may foreseeably play a future role in self-regulation and operation of space hotels and commercial space stations in space.

3.3.2. Distinguishing and defining ‘persons on the ISS’

It is important to note that the U.S. definition and scope of legislation for ‘spaceflight participants’ and ‘crew’ are not the same as that applied to the *International Space Station (ISS)*. The *ISS Agreement* (and associated documents) is a treaty and stipulates its own terms, definitions and scope of application. For purposes of comparative analysis, on the *ISS* “there are two types of crewmembers, professional astronauts/cosmonauts and spaceflight participants. These individuals can be designated as expedition or visiting crewmembers.”

The *ISS Agreement*’s human categories and definitions are as follows: [37]

- “A professional astronaut/cosmonaut is an individual who has completed the official selection and has been qualified as such at the space agency of one of the *ISS* partners and is employed on the staff of the crew office of that agency”.
- “Spaceflight participants are individuals (e.g. commercial, scientific and other programs; crewmembers of non-partner space agencies, engineers, scientists, teachers, journalists, filmmakers or tourists) sponsored by one or more partner(s)”.
- “Expedition (Increment) Crewmembers are the main crew of the *ISS* and are responsible for implementing

the planned activities for an increment [...]. As part of this allocation, it may be possible to have spaceflight participants as part of an expedition once the *ISS* has a crew complement of more than 3 persons.”

- “Visiting Crewmembers. Based on experience to date with visiting vehicles to the *ISS*, visiting crewmembers travel to and from the *ISS*, but are not expedition crewmembers... They may be either professional astronauts/cosmonauts or spaceflight participants”.

Astronauts sponsored by participating nations (but who are not States Parties to the intergovernmental *ISS Agreement*) have flown to the *ISS* under these crew selection criteria. Private individuals or space tourists, as they are colloquially called, fly under the definition and role of ‘spaceflight participants’. To date, eight ‘spaceflight participants’ have flown to space and spent time aboard the *ISS*, and a ninth is planned for 2015.

3.3.3. Distinguishing and defining ‘space tourist’

Today there is no generally accepted definition of what constitutes ‘space tourism’ or ‘space tourist.’ A private passenger on a suborbital or orbital flight may indeed be a traveller for leisure or business, or someone with a definitive purpose to serve as a scientist, inventor, researcher, educator, artist etc. in space.

In Fall 2004, European aerospace lawyers proffered a broad objective interpretation of space tourism: “any commercial activity offering customers direct or indirect experience with space travel” [38]. Around the same time the Ansari XPRIZE was awarded to Scaled Composites for repeatedly reaching suborbital space (an altitude of 112 km) with SpaceShipOne, launching the new Commercial Space Age [39]. Consequently, ‘space tourism’ was further identified as “activities [which] may thus include the use of an aircraft and/or spacecraft” [40]. However, these attempts at defining ‘space tourism’ and ‘space tourists’ failed to gain traction. They remain too broad in scope for application in law, and convolute the physical and juridical delineations of air and space. Nonetheless, these and other general ‘space tourism’ definitions may serve as cultural signifiers, identifying parameters of new perceptions on the participatory role of one subset of private and commercial ‘astronauts’.

3.3.4. Defining stratospheric balloon flight ‘Voyagers’

Several companies, like Bloon (Spain) and World View Enterprises Inc. (United States), have proposed (high altitude) stratospheric balloon flights to take space enthusiasts to the edge of space. In 2013, the FAA deemed World View a commercial spaceflight operator for regulatory purposes, as the company’s space capsule is recognized as space capable technology [41]. World View promises its passengers, dubbed ‘Voyagers’, a unique experience and panoramic views from near-space [42]. Target markets include space tourism, research and education.

Significantly, the flight profile is labelled a ‘suborbital spaceflight’ even though the helium-inflated balloon will reach an altitude of only 20 mile (32 km or 100,000 ft). The adventure is also heavily touted as a ‘space tourism’ activity in the media. Yet, this begs the question as to whether a

colloquial conception of ‘near-space’ will suffice to render ‘Voyagers’ as a new addition or subset category of commercial ‘astronaut’.

The issue herein is whether a stratospheric balloon flight that qualifies as ‘space tourism’ and governed by the FAA as commercial spaceflight is sufficient to create a new category of quasi-astronaut? The original 1965 definition from NASA’s Aerospace Dictionary would qualify stratospheric balloon passengers as astronauts: “a person who rides in a space vehicle” [43] as the high altitude capsule is space capable. However, many in the space industry today hold that these balloon flights do not constitute commercial spaceflight, suborbital or otherwise. If this is the case, how should these ‘space tourists’ be defined as they float in an ontological limbo between the delimitation of ‘aeronauts’ and ‘astronauts’? In essence, how does one define a ‘space tourist’ not intended to reach space?

3.3.5. Distinguishing and defining ‘outer space’

The definition of ‘astronaut’ as one who travels to/in space is inextricably linked with the definitional concepts of ‘space’, which is equally convoluted. In fact, philosophical and scientific debates defining outer space date back to the time of Aristotle and Ancient Greece. In addition, international legal debates spanning the gamut of actual, legal and practical definitions of the concept—distinguishing ‘outer space’ from ‘aerial space’ or ‘air space’—have continued over the last century. Like the plurality of conceptual terms for ‘astronaut’, interdisciplinary and popular distinctions for ‘outer space’ have evolved over time and multiplied from a singular physical notion to distinguish various concepts and regions, such as: sub-orbital space, near space, orbital space, outer space, interplanetary space, interstellar space, and galactic space.

The crux of the question, “Where does airspace end and space begin?” is fundamentally a practical one. Law governs actors and activities; therefore, the scope of activity and jurisdictional territory or *res communis* (area of non-jurisdiction) must be clearly stipulated. Likewise, the actor acting within the specified environment must also be identified under the law. The first law article raising the delimitation of space issue was written by a Belgian lawyer and published in France, in 1910 [44]. Subsequent jurists in Europe and the Soviet Union raised initial scientific and legal arguments for demarcation throughout the 1920–1930s. The debate recommenced after World War II in the 1950s with the progressive development of astronautics, the International Geophysical Year of 1958, and the onset of international negotiations for establishing unified principles for the use of outer space.

Notably, the Outer Space Treaties and Principles apply the term prolifically while failing to reach a definitive official consensus on the term’s meaning. Space law distinguishes merely between ‘outer space’, ‘the Moon and celestial bodies,’ ‘Earth’ and/or ‘ground’, and ‘in flight’ (air). Multiple definitional approaches have been advanced and debated by scientists and lawyers at the international level. They include: functional (relating to aero-craft capable flight), spatial (relating to the physical extension of atmospheric particles) and hybrid definitions. The most

popular position embraces the von Karman line at 62 mile (100 km) as adopted by the Fédération Aéronautique Internationale [45].

Officially, however, many states officially decline to adopt a fixed boundary point in the atmosphere due to the legal, military and political ramifications of a strict demarcation. Australia is the only state with national space legislation that refers to space at an altitude of 100 km in defining other key terms [46]. The adoption of this delimitation was practical, intended for executing the parameters of the national space legislation, not as a political statement. The European Union also indirectly qualifies space by defining ‘space qualified’ products for use at an altitude of 100 km for a similar reason [47]. The United States, on the other hand, circumvents the demarcation issue in its commercial space legislation by utilising technical and functional definitions. The underlying reason being that taking an official stance on delimitation would implicate national security and other concerns that run contrary to current national legal, military and political interests. As a result, the exact delimitation of ‘outer space’ remains legally ambiguous and conceptually fluid.

4. Discussion

As a result of an undetermined legal definition of ‘outer space’, associated terms like ‘astronaut’ or ‘space tourist’, whose definitions are dependent on reaching this physical demarcation, therefore also lack clarity. The results further show that the complexity of contemporary issues establishes a basis for pondering the significance of future spaceflight. As we prepare for potential new forms of legal entities and actors participating as envoys and in EVA activities: including but not limited to, robotic envoys, cyborgs, and artificial intelligence (AI), what may we imagine as “drones and clones” of to-be-determined beings and of their implied status, acting in space? This question triggers legal and ethical duties for all: what will this mean for the spectrum of private and commercial space actors engaged in orbital/suborbital flights or located on extra-terrestrial stations?

4.1. Ethical implications

While international law generally applies to States, the Outer Space Treaty is singular in that Article V stipulates one requirement for individual ‘astronauts’: the requirement to render assistance to other astronauts in distress in space. This is not a new concept, stemming from traditional maritime principles and the Law of the Sea on providing rescue and assistance on the high seas. Indeed, while the treaty creates a legal duty towards ‘astronauts’, the service of rendering rescue and assistance in emergency situations, where one is capable of doing so, may also be perceived as an ethical duty. Thus, while the legal duty may apply strictly to ‘astronauts’ (however that term is applied or restricted) an underlying ethical duty may be applicable to everyone in space—even to spaceflight participants deemed not to be ‘astronauts’.

Given that commercial space is opening access to space to less fit-to-fly individuals who may physically be

incapable or unwilling to render assistance, this raises practical, ethical and legal implications. For instance, on an aircraft an airline passenger can decline the heightened duties of an emergency row passenger and obtain a reassigned seat. Spaceflight does not provide for an identical possibility to avoid potential heightened risk and duty. Spaceflight participants may be analogous to exit row passengers. Meaning, that if voluntary spaceflight equates to acceptance of heightened risk does this therefore create an inalienable ethical duty for all space farers, regardless of labels or identities aboard a spacecraft, to render assistance to each other in space? If so, this may require a new instrument, such as a Code of Conduct, that outlines the ethical duties applicable to commercial spacefarers and passengers as well as professional ‘astronauts’. Enforcement and conformity with (voluntary) ethical duties remain a challenge, however, as with other internationally proposed codes of conduct.

In addition, ethics is gaining prevalence in recent studies and guidelines with regard to the role of astronauts and Agency, and organisational respect for autonomy and assumption of (personal) risk. In July 2014, the U.S. Institute of Medicine released an ethical decision framework for astronauts. Two of the six recommended ethical principles for NASAs decision-making framework for the Astronaut Corp include [48]:

- “Respect autonomy by allowing individual astronauts to make voluntary decisions regarding participation in proposed missions”.
- “Recognise fidelity and the individual sacrifices made for the benefit of society...”

This document provides an ethical approach to decision-making from a predominant humanistic perspective, reframing the roles, rights and duties of astronauts (as employee) and NASA (as employer). It also demonstrates an interesting shift in today’s perception of what ‘astronauts’ are. The focus now is on ‘astronauts’ as human beings and individuals, instead of government employees and “company men”.

4.2. Astronaut wings

As with aviation, one of the associative benefits of qualifying linguistic labels is eligibility to receive the exclusive astronaut wings. The winged pin, reminiscent of the story of *Icarus*, identifies a professional and cultural symbol as well as independent status of accomplishment. In the 1960s, the U.S. Air Force and NASA awarded X-15 pilots with astronaut wings for recorded flights exceeding 50 mile (80 km) [49]. In 2005, the FAA awarded the winning pilots of the XPRIZE competition with astronaut wings for exceeding an altitude of 62 mile (100 km) [50]. Commercial spaceflight companies, like Virgin Galactic and XCOR, likewise promise astronaut wings to successful spaceflight participants who fly on their spacecraft estimated to reach around 68 mile (110 km).

The FAA, on the other hand, has not indicated an intention to extend astronaut awards or certificates to

participants other than pilots [51]. It is unclear whether non-pilot commercial crewmembers going forward are eligible for the government-sponsored wings. As a result, the definition of ‘astronaut’ for purposes of cultural status and recognition remains widely flexible in definition, and therefore, open to commercial interpretation and business interests. Part of the issue lies in the convoluted concepts of ‘astronaut’—as a person who travels in space—with the official or legal definition of what constitutes ‘space.’ These definitional issues have yet to reach consensus and so we note the complexities involved with legally defining space terms.

From a cultural perspective, the practice and intent to award astronaut wings to commercial space tourists or suborbital spaceflight participants who engage in an activity that may be largely defined as ‘space tourism’ is telling. As this identifies a cultural conception and perception of what action, role or activity defines a private/commercial ‘astronaut.’ In this case, cultural perceptions and corporate commercial objectives may merge to forge a new perception of ‘astronaut.’

In current commercial terms however ‘space tourists’, in contrast to ‘astronauts’, are synonymously linked to a generic two-pronged identity of wealth and leisure [52]. While a space tourist does not equate to the definition of a fully trained professional astronaut, the label ‘space tourist’ belies the identity and contribution of the ‘space tourists’. In fact, Anousheh Ansari, the fourth private passenger to spend 10 days on the *ISS* has vocally dismissed the label. Given the pre-requisite training, fitness, skill, education and professional credentials of the ‘space tourists’ to the *ISS*, coupled with the fact that they have been sponsored by ESA and various entities to conduct scientific experiments while in space, the term seems a misnomer to more than just a few.

4.3. Recognising: ‘intersubjectivity’

Future development of cultural interpretations of ‘astronaut’ may also benefit from proposed approaches on ‘intersubjectivity’ and communication. David Dunér argues, in *Interstellar Subjectivity: The Significance of Shared Cognition for Communication, Empathy, and Altruism in Space* (2014), that “intersubjectivity is a basic requisite for the emergence of intelligence, sociability, communication, and technology”. He defines intersubjectivity as “the sharing of experiences about objects and events” [53]. In addressing successful communication issues for future interstellar spaceflight, Dunér presents a case outlining “three socio-cognitive capacities that characterise advanced complex technology: a sustainable, complex social system for collaboration, such as ethics; complex communication for collaboration and abstract conceptualisation; and a high degree of distributed cognition” [54]. Thus, he refers to Peter Gärdenfors’ five capacities for intersubjectivity, namely: “representing other beings’ emotions (empathy), attention, desires, intentions, and beliefs and knowledge” [55].

By incorporating these human aspects in the drafting of new definitions of ‘astronaut’ and associated identities, human communication in space can relate both personally

to individuals (as they live and work in space) and symbolically to public culture as a whole. The aim here would be to provide a humanistic approach to creating labels, subjective to the identities of individuals yet useful for communicating specific concepts and perceptions. These identities may change along with technological progress and activities.

For instance, what would the term ‘astronaut’ or ‘crewmember’ mean to a ‘professional astronaut’ (nongovernmental) who lives and works on a Mars installation versus the conception held of an ‘astronaut’ by people on Earth of those individuals? Other future identities and labels for contemplation may include: professional asteroid miner, crew of an interplanetary luxury space cruiser, extra-terrestrial settlers, private space explorers and even space athletes and sports-men/-women.

An analogy to new types of ‘astronauts’ may even be made to occupational divers, who are “not employed to dive, as such, but to carry out some specified work tasks whilst underwater” [56]. This means that some future ‘astronauts’ will inevitably traverse the medium of space to perform his/her function or profession; thereby, incorporating dual identities—a professional with a specific skill and that of one who travels through space. Understanding these future cultural distinctions, whether legally significant or not, and reconciling them requires acknowledgement of the human points of view.

5. Conclusion

Man must rise above the Earth – to the top of the atmosphere and beyond – for only thus will he fully understand the world in which he lives.~ Socrates

Numerous names, concepts and definitions are applied in the label ‘astronaut.’ The perceptions held by society, legislators, industry and governments diverge based on subjective interests and priorities. Transliterations and term interpretations also diverge from the objective to the subjective and descriptive. While an objective definition may label a person a ‘star traveller’, the subjective on the other hand indicates different levels of skill, training, intent and purpose in space. These additional nametags in turn present ethical and legal implications specific to the subjective role.

Specifically, some of the pertinent issues presented by current interpretations of ‘astronaut’ are:

- No unified consensus on the concept or perception of what constitutes ‘astronaut’.
- Definitions of ‘astronaut’ and related monikers differ with regard to allocated identities before/ after spaceflight. These distinctions refer subjectively to intent, purpose, skill and training, or presence aboard a space vehicle.
- Discrepancies exist across contextual spheres that can result in public, professional and disciplinary cross-communication issues.

Table A1

Naming an Astronaut: broad definitions, meanings and categories of space related to terminology.

| Selected terms and definitions | Meanings | Categories of space |
|--------------------------------|---------------------------------------|----------------------|
| Astronaut | Star sailor | Space |
| Astronette | Person who travels in space | Outer space |
| Citizen astronaut | Person who works in space | Near space |
| Civilian astronaut | Person who trains for space | Near earth orbit |
| Cloud riders | Person who is part of a space mission | Low earth orbit |
| Cosmonaut | | Medium earth orbit |
| Envoys of mankind in space | | Geospace |
| Gaganaut (Sanskrit) | | Cislunar space |
| Hang tian yuan (Chinese) | | Interplanetary space |
| Launch operators | | Interstellar space |
| Mission specialists | | Intergalactic space |
| Payload specialists | | |
| Personnel of a spacecraft | | |
| Space explorer | | |
| Space navigating personnel | | |
| Space tourist | | |
| Space traveller | | |
| Spacefarer | | |
| Spaceflight participant | | |
| (Space) Crew | | |
| (Spaceflight) Passengers | | |
| Spaceman | | |
| Spacewalker | | |
| Spacewoman | | |
| Spationaute (French) | | |
| Star traveller | | |
| Taikonaut | | |
| Taikongren (Chinese) | | |
| Traveller of the universe | | |
| Voyagers | | |
| Vyomanaut (Sanskrit) | | |
| Yu hang yuan (Chinese) | | |

- New space actors and spaceflight activities are challenging current legal definitions requiring the development of new technologically accurate and conceptual definitions.
- Even new legal definitions of terms (e.g. spaceflight participant) can differ between international and national law.
- Looking forward, routine spaceflight (e.g. suborbital flights) may eventually render the term ‘astronaut’ non-significant as more and more people fly to ‘space’ and become astronauts.

Consequently, the term ‘astronaut’ reflects an evolving concept, not a static one, requiring a comprehensive contextual understanding. For instance, future legal terms and definitions are linked to associated definitions and technologically relevant descriptions on environment (space), place (vehicle), intent (launch), and training (crew).

In sum, distinguishing and defining any ‘astronaut’ requires relating the philosophy and duty of the ‘astronaut’ to the contextual spheres: poetic, political, cultural and legal, in which they are identified and understood. Future terminology development may also benefit from a humanistic perspective, incorporating personal perceptions of the role of ‘astronaut’ based on subjective experience and understanding, psychological foresight and cross-cultural communication of experiences and perceptions. This may also lead to a human distinction in the definitional consensus of ‘astronauts’ as actors in space (in contrast to animals, robots and AIs in space), and embrace the multi-professional dimension of those who travel to, and live and work in space.

Appendix A

See [Table A1](#)

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