I. Introduction

Cyberspace, the electronic environment that consists of myriad connections between people and information, is also the transition space to outer space, the place where we may learn to productively to live, to work, and to
cooperate in preparation for our actual journeys off the Earth. While future space flight missions that go beyond today’s International Space Station promise to take us to new frontiers made possible by impressive, new levels of human cooperation, these missions also demand that we consider a new spectrum of preparations for those who will undertake them. These preparations range from mission and operations training to psychological concerns that engage the forward edge of continued evolution of humanity, its cultures, and its societies.

Cyberspace is our contemporary training ground for the cooperative purpose of space development. We train in cyberspace as a transition from our Earth habitat to off-planet habitats in space. Cyberspace can be and should be seen as a training, adaptive space.

We adapt in cyberspace to constructed, alien environments, different from the natural environment of Earth in which we evolved. We learn in cyberspace how to project beyond time and space the embodiment of our personhood, even to the point of teleporting the essence of our humanity, what for aeons has been called our “soul.” While this chapter does not address the evolution of humanity per se or the need to open the Earth habitat system to support the evolution of our species, it does suggest that leveraging cyberspace to support more effective communication can play an important role in the advancement of human knowledge.

Collaborative international teams can leverage cyberspace for global cooperation in the development of space by working together to build

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1 The author extends her recognition and sincere appreciation for the collaboration engaged in over a year with Dr. Jacquelyn Ford Morie, Dr. Gustav Verhulsdonck, and Dr. Kathryn E. Keeton on the benefits of virtual worlds (VWs) for astronaut and ground crew training for long-duration space flight. This work is based on this year-long research effort to investigate the potential of using advanced communication media in training for conflict management, communication, collaboration, team building, and skills proficiencies. See Morie, J.F., Verhulsdonck, G., Lauria, R., & Keeton, K. (August 2010) Operational assessment recommendations: Current potential and advanced research directions for virtual worlds as long duration space flight countermeasures. [Final Report] NASA Technical Manuscript NASA/TP-2011-216164, Houston, TX: BHP/Wyle Laboratories.


virtual worlds (VWs) in which to train our envoy astronauts who travel, work, and live in space. Jessy Cowan-Sharp, a collaborative web technology developer at the NASA Ames Research Center in Mountain View, California notes virtual worlds are “the seed of something that’s going to be one of the major transformational technologies of our species.”

II. International Collaboration

In the past, the US and the USSR competed to become the major power in space. But where these nations once engaged in a Cold War space race, the US and Russia now cooperate in the development of space, with Russia acting as the transporter of US astronauts to the ISS. Other nations, notably China, pursue their own national space programs with significant ambitions. While Chinese leaders insist that China’s purposes are peaceful as the nation looks for ways to exert its growing economic strength and to demonstrate its global might, others remain concerned.

International collaboration in the building of virtual worlds for envoy astronaut training suggests a strategy that can help generate cooperative objectives towards becoming global partners in the development of space. An international collaborative model to accelerate the development of space is not a novel idea. Indeed, the purpose of this chapter is to examine how such collaboration can be extended.

Just as NASA uses Space Act Agreements to support commercial space endeavors such as the recent 2012 SpaceX mission to the ISS, a similar initiative could be established to support using virtual worlds to train our envoy astronauts towards enabling them to develop specific competencies necessary for expert teamwork, communication, leadership, interpersonal skills, and other competencies. Such collaboration should engage the international community.

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5 The United Nations’ space treaties use the phrase “Envoys” to characterize astronauts. See also supra, notes 3.
8 See infra, Section IV. See also NASA. International Space Station Human Behavior & Performance Competency Model -Volume I & Volume II, Mission
III. Defining Cyberspace

Cyberspace is a constructed virtual reality that provides alternate environments for humans to use and to inhabit. Although creating virtual realities requires a cluster of interactive technologies and techniques to create an alternative reality through the engagement of one or more sensory channels, virtual reality is defined more by user experience and interactions among participants than by a particular technology. This experience is often characterized by a compelling sense of presence, of being inside an environment created by computer-mediated systems.

In the late 1980s a group of researchers and entrepreneurs popularized the term “virtual reality.” Often terms from science fiction literature merge with the idea of VR. For instance, William Gibson coined the term “cyberspace” in his 1982 short story Burning Chrome, and continued to use the term in his 1984 novel Neuromancer. In Neuromancer, cyberspace is described as a connected “consensual hallucination” shared by real people inhabiting the virtual space inside the computer. Science fiction writer Neal Stephenson coined the term Metaverse in his 1992 book Snow Crash to describe a similar concept of shared, computer-generated spaces. Stephenson’s term suggests such spaces represent a metaphorical universe with spatial dimensions.

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9 This section is largely extracted from the final report to NASA by the author and her colleagues who engaged in a year-long research effort to explore the possibility and implications of using virtual worlds as countermeasures for long-duration space exploration and habitation. See supra, note 1, Morie, J.F., Verhulsdonck, G. Lauria, R., & Keeton, K. (August 2010) Operational assessment recommendations: Current potential and advanced research directions for virtual worlds as long duration space flight countermeasures. [Final Report] NASA Technical Manuscript NASA/TP-2011-216164, Houston, TX: BHP/Wyle Laboratories.


Most early virtual reality applications were single-purpose environments in which only a few people shared the computer-generated virtual space. These VR applications were often created for virtual travel to famous monuments, or promoted as new game spaces, or perhaps as artistic experiences. These were also referred to as Virtual Environments (VEs) and were explored for their serious potential as venues for therapy to mitigate phobias such as fear of spiders, flying, heights, public speaking, as well as for training purposes. NASA Ames Research Laboratories worked to use VE tools to engage in telepresence to effect results at a distant place. Telepresence refers to the ability to use actions in a virtual environment to manipulate objects in a non-virtual environment, often in remote locations.

Virtual reality and virtual environments afford a sense of immersion and presence in a synthetically generated, computer-mediated space. The objective of VR is to provide an authentic experience of presence in a virtual reality. Early systems featured head-mounted displays that insulated and physically isolated users within a digital space. Various

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interface tools, such as gloves and tracking devices, enabled users to experience the simulated world as though they were traversing the virtual space, or manipulating virtual objects, and provided a distinct spatial experience. For this reason, virtual environments are often understood as “spatial virtual reality.”

A spatial VR typically has limited or no connectivity to other VRs, is created for a single purpose, has a repeatable set of starting parameters (no persistence across usage) and minimal, or no self-representation. If there is self-representation, the representation is usually defined by the program’s authors and not by the individual user.

Virtual worlds, by contrast, are highly social virtual realities built to be inhabited, traversed, and manipulated by many concurrent users who interact and communicate with each other through their virtual representations, their avatars.\(^{14}\)

In virtual worlds, participants model, explore, and interact within an environment that can be similar to our physical surroundings. On the other hand, virtual worlds may present novel, imaginary, or fantastic environments that are not bound by the constraints of common reality. Therefore, virtual worlds allow for a greater range of opportunities and experiences that may help prepare an individual to inhabit even further dimensions than the Earth and cyberspace.

Video games share much with virtual reality and with virtual worlds as they provide common spaces for players to interact with each other in a virtual space. Video games and virtual worlds are popular pastimes whose use is growing steadily. According to GigOm Research, one in eight people in the United States report having used a virtual world.\(^{15}\) The use of VWs, especially by children from age 5 to 15, seems to be increasing exponentially.\(^{16}\) Indeed, combining its use of games, virtual worlds, digital communications, and tools like Google, Facebook, and YouTube, the current generation can rightly be called a “digital generation.”

\(^{14}\) An avatar representation is literally the “embodiment” of someone in a virtual space. According to Webster’s Ninth New College Dictionary (1986), to embody is to give a body to (a spirit), to incarnate or to make concrete and perceptible.


The digital generation is comfortable learning, living, and communicating through computer games and computer-based environments. The growth and prospects of the digital generation for NASA means that learning and communicating with computers are familiar and expected ways of being in the world, thus reinforcing the tremendous opportunity that exists to use VWs as digital, learning environments in many contexts.

Figure 2: The Digital Generation’s Participation in Virtual Worlds Organized by year from the origin, and by age (5, 8, and 10 years old.) Reprinted by permission.

IV. Virtual Worlds for Space Development

Conceiving, planning, building, operating, and using the ISS research platform is a remarkable achievement in international cooperation and collaboration and the latest step in humanity’s quest to explore and to live in space. Completion of the space station has already strengthened international cooperation towards the development of space as a scientific
collaboration among five space agencies representing fifteen countries.\textsuperscript{18} These accomplishments illustrate the potential for international cooperation and collaboration to lead to unprecedented technological, political, and human achievement. Indeed, NASA considers the ISS program’s greatest accomplishment to be as much a human achievement as it is a technological achievement.\textsuperscript{19}

Through 2020 and beyond, the ISS will serve as a test-bed for permanent human presence in space, and as a foothold for long-term exploration. The tools and technologies envisioned and developed today will not only support the ISS through 2020, but also will support programs to the moon, to Mars, and to asteroids.

Training in virtual worlds can augment current mission training for these ventures. As we model the final frontier, engaging in long-duration space flights and space habitation towards developing space, all the participating space agencies engaged in the ISS program agree that specific human behavior and performance competencies encompass the knowledge, skills, and attributes required for successful performance on long-duration missions.\textsuperscript{20} Using virtual worlds to train our envoys in these competencies offers great potential.

NASA’s Human Research Roadmap indicates that the agency works to identify how virtual reality and virtual world technologies can be used to train crews and controllers to mitigate behavioral health and performance risks.\textsuperscript{21} NASA seeks tools, strategies, and technologies to extend our human presence beyond low Earth orbit. To support humanity’s journeys into space, new tools and technologies must be identified and developed that can help prevent performance degradation, human errors, and failures resulting from interpersonal conflicts or lack of team cohesion, coordination, and communication, and a host of other factors that can lead


\textsuperscript{20} L. L. Schmidt (2008), Competency modeling for the final frontier: Supporting psychosocial health and performance in low earth orbit. Performance Improvement, 47: 52–58, p. 54.

to performance degradation and human errors. Hence, NASA seeks to develop virtual reality environments as a countermeasure approach to support and/or to enhance team functioning.22

One tool NASA has developed and uses is the Human Behavior and Performance (HBP)23 model, which defines eight psychosocial competencies and associated behavioral markers.24

The HBP competences include:

1) Self-care/self management;
2) Communication;
3) Cross-cultural understanding;
4) Teamwork and group living;
5) Leadership;
6) Conflict management;
7) Situation awareness; and
8) Problem solving and decision-making.

NASA identified the Human Behavior and Performance competencies as requirements for those participating in international long duration missions.25 Virtual worlds, social versions of virtual reality, provide an ideal environment in which to conduct HBP training. Indeed, collaboration in virtual worlds training may not only be practically necessary, it could also support continued cooperation to build a powerful global partnership such as that which constructed the International Space Station.26

Future tasks will focus on virtual reality development to utilize efficient and cost-effective approaches to providing support for crewmembers engaged on long duration missions related to in-flight interventions and countermeasures for supporting task performance,

23 Ibid.
24 For a discussion of each ISS partner’s training locations and contributions see e.g., NASA. Behind the scenes: Training locations. [Online] Available: http://spaceflight.nasa.gov/shuttle/support/training/isstraining/locations.html [1 June 2012]. See also infra notes 29 and 30.
teamwork, and psycho-social performance.

According to NASA’s human research roadmap, “The desired state of knowledge includes a suite of tools that span the mission phases (pre, during, and post) that crews can use to support their team functioning for a long duration mission and furthermore, enhance both their performance and well-being. Thus … it is very important that the tools that are developed are tested in both ground and spaceflight studies for validation purposes.”\(^{27}\)

NASA seeks to use virtual reality tools and techniques to train crews and controllers in areas such as cross-cultural interactions, interpersonal conflicts, team cohesion and coordination, communication, leadership, and other HBP competencies. The agency intends to develop virtual worlds to train individuals for complicated, multi-agent tasks, such as human and robotic collaboration, and wants to identify how virtual reality and world technologies can be used to train for performance readiness, cross-cultural interaction, psychological support, and effective collaboration with other team members or artificial intelligent agents.\(^{28}\)

V. Human Behavior and Performance Competencies

Virtual worlds can be used for training astronaut envoys in various contexts, including mission preparation, mission support, and space flight. The basic training flow consists of instructional units, or blocks, comprised of several subjects that are further broken into individual lessons. Training for ISS missions consists of classroom sessions that bring each astronaut candidate to the required levels of background knowledge in mission critical areas, which includes introducing the astronaut candidate to the training process, fundamentals, ISS Systems, robotics, Extravehicular Activity (EVA), and other matters.\(^{29}\)

Each global partner who participates in the ISS program also provides advanced training courses in their specialties. The Columbus multifunctional pressurized laboratory is Europe’s largest contribution to

\(^{27}\) Ibid.

\(^{28}\) Intelligent agents act autonomously to respond to a person using Natural Language Processing and thus appear as artificially intelligent. Intelligent Tutoring Systems (ITS) use the input of a person’s responses to a task, then gauge their performance on the task and ask follow-up questions that provide the person with post-task reflection. An ITS can provide important mentoring opportunities for students. See generally, Morie et al, Operational Assessment Recommendations, supra note 1.

\(^{29}\) International Space Station Astronaut Candidate Training Catalog (Baseline, August 2009), Mission Operations Directorate Spaceflight Training Management Office. Johnson Space Center Manuscript JSC-36543 Baseline, Houston, TX.
the International Space Station, where astronauts carry out experiments in materials science, fluid physics, life science, and technology. The European Astronaut Centre near Cologne, Germany is the training center for all European built ISS hardware, including Columbus laboratory systems, subsystems and payloads, as well as for astronaut operations for the Automated Transfer Vehicle (ATV).^30^ Each global partner holds great pride in its contribution to the ISS, including pride in the training courses the partner develops to train the international astronauts to competency in the system or subsystems associated with the partner’s contribution to the space station. An opportunity exists to further advance these accomplishments in international cooperation towards the development of space by collaboratively building virtual worlds for mission training in the HBP competencies. Virtual worlds can be built as a collaborative effort to provide virtual environments that can augment traditional training and exposure to learning materials.

Virtual worlds training platforms are especially promising for preparing for and solidifying learning of cognitive skills that have traditionally been difficult to instruct, are often tacit in nature, and require extended exposure to, and experience with learning situations. While these cognitive skills may be difficult to master, they must be acquired to meet the difficult demands of living, working, and traveling in space where “failure is not an option.”^32^ These cognitive skills are the HBP “soft skills.”^33^ Developing these skills can readily lend towards accelerating

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30 The European Astronaut Centre. See: http://www.esa.int/esaHS/ESA1IE0VMOC_astronauts_0.html
See also supra, note 9.

31 Interviews by the author were conducted with a range of individuals within the NASA organization on a range of topics, including building training within a virtual world context. For a selected sample of the content of the interviews with astronauts working in human space flight programs, with group leadership working inside Mission Operations Directorate, with psychologists working in training and management, with senior scientists working in Space Life Sciences, and with personnel working on the operational side of Human Performance and Behavior see Lauria, R., Morie, J.F., Verhulsdonck, G. (June 2010) Applying countermeasure technologies to augment current training protocols for long duration space flight: Using virtual worlds to enhance team performance, resiliency, and proficiency skills. [Operational Assessment and Data Analyses] Johnson Space Center Manuscript JSC 66218, Houston, TX: BHP/Wyle Laboratories.

32 See Schmidt, supra note 20, at 53.

international cooperation.

While training in virtual worlds can teach system proficiency, navigational skills, Extravehicular Activity (EVA), robotics and telepresence control, the soft skills can be taught in virtual worlds towards developing situational awareness, communication, leadership, conflict management, decision-making, and teamwork. Virtual worlds have inherent qualities that may facilitate learning the soft skills by using game or story-based mechanisms. Such game or story-based strategies allow participants a way to play out, for instance, various experiments in learning without the risk of exposure to others.

Intelligent agents embedded in virtual worlds can provide game-based virtual environments that use the pedagogy of guided discovery for cross cultural engagement and sensitivity training.\(^3^4\)

Such learning experiments can include leadership or team roles\(^3^5\) through which participants can actively experiment with various roles using embodied avatar representations to interface with intelligent agents rather than through the traditional interface of face-to-face role-playing with another human being. Such role-playing using avatars in virtual worlds allows cost effective, safe, continued rehearsal in crucial communication, intercultural, decision-making, and other tacit skills.

A virtual world not only provides a safe and varied environment to keep these skills up-to-date, it can be fully integrated with embedded testing and benchmarking. Reports can be generated to identify potential problem areas while allowing the participant the freedom to practice independently and in the safety of a personal, simulated environment.\(^3^6\)

Virtual worlds can be used for training both physical and psychophysical health, and for various therapies. Therapy training could

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include mindful stress reduction, addressing phobias,\textsuperscript{37} therapy for post-traumatic stress syndrome (see Figure 3),\textsuperscript{38} for physical therapy, and for other medical purposes such as immersive telemedicine for consultation between patients, physicians, and other clinicians.\textsuperscript{39}

Virtual worlds can also be used for recreation and re-creation, for gaming and exploration, for worship and reflection, for calming environments, and for re-generation of spiritual health. Finally, research has shown that virtual worlds can be used for resiliency training.\textsuperscript{40}

Virtual worlds in these applications and others can significantly advance international cooperation for the development of space by engaging global partners in training the “soft” human behavior and performance skills that our envoy astronauts and support crews will need to...


\textsuperscript{38} See Post-Traumatic Stress Disorder Assessment and Treatment (PTSD), [Online]. Available http://ict.usc.edu/projects/ptsd/. [2 April, 2012].


\textsuperscript{40} Interviews were conducted with six individuals who operate as contractors within NASA. The purpose of the interviews was to operationally assess the potential of using virtual worlds (VWs) to augment current NASA Training for astronaut candidates, astronauts, and flight controllers. The interviews related to using VWs as countermeasure technologies to augment current training protocols for long-duration space flight. All identifying information related to the sources was removed to protect privacy of the sources and to ensure anonymity and confidentiality. The interviewees were designated as Interviewee One through Interviewee Six (I-1–I-6). According to Interviewee One (I-1) People who work the Rover Mars mission work a Mars’ day. A Mars’ day is a 25-hour day. Working a Mars’ day changes these people dramatically. Imagine, said Interviewee One: “Fall back every day! … When you turn your clock back in the Fall you do that every day on Mars’ time. A lot of people say, ‘I just haven’t recovered yet.’ If you kept that up everyday … You evolved in a 24 hour day, in 9.8 meters/second\textsuperscript{2} - the acceleration for gravity. And virtually all life we know and understand on this planet evolved in that. So we, as best as we can understand, we have no pre-formed design to adapt to a lower gravity. We have some design for hyper G, but not for lower G.”

According to Interviewee One, conditions imposed on the body during space flight and working a Mars mission necessitate resiliency. Training for these stresses is important. VWs can facilitate training for resiliency during space flight and for working a Mars’ day. See Lauria, R., Moire, J.F., Verhulsdonck, G. (June 2010) Applying countermeasure technologies to augment current training protocols for long duration space flight: Using virtual worlds to enhance team performance, resiliency, and proficiency skills. [Operational Assessment and Data Analyses] Johnson Space Center Manuscript JSC 66218. Houston, TX: BHP/Wyle Laboratories.
survive in the alien environment of space.

Figure 3: Virtual Iraq/Afghanistan PTSD Exposure Therapy Scenarios (Courtesy of Skip Rizzo, USC Institute for Creative Technologies).

VI. Benefits and Opportunities of Using Collaborative Virtual Spaces

A. Convenience, Time, and Cost Efficiency

Space exploration is a relatively new endeavor in the time frame of human history, and although commercial space transportation and the privatization of space have begun to usher in a new era, very few have actually experienced space travel. However, all space agencies believe maximizing returns while reducing risks as much as possible in such an endeavor is the best option.41 Adding opportunities to practice or to perfect skills without increasing training time is a critical concern for all agencies.

Several advantages exist to using virtual worlds for human and behavior performance training, including simply reducing the constraints associated with the time and distance required to travel to various international training centers. Peggy Whitson, Chief of the NASA Astronaut Office, is responsible for the mission preparation and on-orbit support for all ISS crews and their support personnel, as well as for organizing the crew interface support for future heavy launch and commercially-provided transport vehicles.42 She noted that, “I don’t miss

41 Schmidt, supra note 20, at 53.
the training. For the International Space Station we trained in five different countries, and that was a challenge.\textsuperscript{43}

Using virtual worlds to augment current training protocols could alleviate much of this type of dissatisfaction by augmenting face-to-face training in virtual spaces. This offers not only time and cost savings, but allows important team bonding to occur by providing engaging ways of interactive and embodied learning that can both supplement and extend “real world” training.\textsuperscript{44}

Virtual worlds offer other advantages as well. Virtual world training can accommodate unexpected performance requirements and trainee timelines, rather than constraining training activity to a particular flow with a particular instructor on a particular time schedule. Resources can be shared to maximize cost efficiencies, and anytime, anyplace learning can be conducted without the rigid scheduling of location-based training lessons. And virtual world simulations are readily reconfigurable and can be adapted to changing design requirements.

\textbf{B. Promotion of Effective Cross-Cultural Understanding and Interactions}

The challenges of living and working in space require that all envoy astronauts consistently perform at a high level, which means maintaining a healthy psychological and social environment. The diverse cultures and backgrounds of those who are and will be living and working together in space suggests that effective cross-cultural understanding and interactions are an important concern of participating space agencies. Psychological training is important to promoting successful teamwork and group living. Virtual training worlds can help astronauts develop important interpersonal and teamwork skills.

People who have known each other for a long time generally communicate with greater understanding because of their shared history, potential affinity, and social bonding. Virtual worlds can facilitate such social interactions as increased group cohesion can be developed by applying the capacities of social networking of virtual worlds like avatar


\textsuperscript{44} Morie and Lauria, How virtual worlds can benefit future space travel.
co-presence, chat, and messaging to share learning experiences and to get to know other crew members prior to a mission.\textsuperscript{45}

As tight training schedules in multiple locations and the international diversity of crews increase, the ability of virtual worlds to effectively provide a high level of interactivity and inclusion in the virtual space allows for the creation of a much needed infrastructure and framework for social interaction and enhancement of group communication and understanding.

C. Resiliency Training

In studying the topic of virtual worlds training for space flight preparation, I had the opportunity to interview several NASA personnel, including a psychologist working in the training management group\textsuperscript{46} who trained flight controllers and others. He noted that while flight controllers work eight-hour shifts, the simulations they train on last for only about four hours. He suggested that an eight-hour training simulation would enhance resiliency preparation, which could aid against fatigue in the critical and demanding job the flight controller performs.

He also noted that virtual world simulations for flight controllers’ training would increase the number of individuals who could be certified. This number is currently limited due to the limitations of simulator time.\textsuperscript{47}

As we move towards the private commercialization of space development, more people will need to be trained in all phases of mission preparedness and operations. Using virtual worlds for various training can help ensure adequate numbers of people are trained for the activities of space exploration and habitation.

VII. Conclusion

A comprehensive model of psychosocial competencies and associated behavioral markers was defined by subject matter experts to consist of necessary competencies for effective space mission performance. The model reflects eight competency categories that must be mastered by astronauts to adequately support psychosocial health and performance during space missions, including 1) self-care/self management; 2) communication; 3) cross-cultural understanding; 4) teamwork and group

\textsuperscript{45} Morie, Verhulsdonckh, & Lauria, supra note 12, at § 2.2.
\textsuperscript{46} See supra notes 31 and 40.
\textsuperscript{47} Ibid.
for the Development of Space

living; 5) leadership; 6) conflict management; 7) situation awareness; and 8) problem solving and decision-making. \(^{48}\)

Simulated, virtual worlds offer immersive, inclusive spaces in which to train our envoy astronauts who will work and live in outer space. We currently experiment using cyberspace to effectively project human personhood beyond the boundaries of ordinary reality, to the point even of teleporting the essence of humanity through time and space through the use of avatar representations. We adapt in cyberspace to constructed, alien environments that do not necessarily reflect the constraints of the natural environments in which we as a species evolved.

Leveraging cyberspace to help individuals adapt to these constructed, computer-generated virtual realities, humanity moves one step closer to fully transitioning to the alien environment of outer space. Cyberspace thus offers the possibility of enhancing our capacity to adapt to outer space.

One of the essential keys to higher states of cooperation and understanding is communication. Higher states of cooperation can be attained by cooperatively and collaboratively building virtual worlds for the training of our envoy astronauts. The next steps will require agencies, organizations, and entities interested in developing space to identify ways to increase training support.

Enhanced psychosocial training will become even more significant as ISS crews meet private crews who travel to space for tourism, work, and life in space. By innovating together to build virtual worlds for the training of our envoy astronauts, including technical and mission training as well as training in the soft skills like communication, cross-cultural understanding, leadership, conflict management, teamwork, situation awareness, problem solving and decision-making, international cooperation in the development of outer space will be facilitated. The time is ripe to build not only space stations as endeavors in international cooperation, but also to engage in the building of virtual worlds through and in which envoy astronauts can train to master the psychosocial health competencies necessary to effectively perform in the alien environment of space.

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\(^{48}\) See Schmidt, supra note 20.
Dr. Rita M. Lauria

Dr. Rita M. Lauria founded Metalaw®.US to develop a legal and consulting practice that would build upon her years of experience in media, communications, and the law. Dr. Lauria is licensed to practice law in California and North Carolina. Based in Los Angeles, she specializes in cyber communications and criminal law and serves as Adjunct Professor of Cyber and Media Law at the University of La Verne College of Law. She also teaches at the University of Southern California (USC).

Prior to founding Metalaw®.US, Rita Lauria served the Superior Court of California, County of Los Angeles as judicial clerk extern in Major Crimes. There she assisted the Honorable Kathleen Kennedy on death penalty and other complex capital cases. Dr. Lauria served as Special Advisor for Communications to the Secretary of the Department of Transportation, Communications, and Infrastructure of the Federated States of Micronesia, as Associate Professor of Media Law, Ethics, and Emerging Technologies in the University of North Carolina system and was Director of the Global Virtual University there.

Metalaw®.US continues Rita Lauria's work at the frontier of media and communications science where she investigates the impact of cyber and communications upon legal regimes and other societal systems.