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Viewpoint

An international symbol for the sustained exploration of space

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A B S T R A C T

As humanity prepares to extend its reach beyond low-Earth-orbit for the first time since the 1970s, a new symbol of international cooperation is needed to further promote the message of peace and collaboration such exploration entails. The space race that occurred between the USSR and the USA is an ill-suited model for long-term sustained space exploration because it is too costly and too resource-intensive for a single nation to bear. While competition is healthy for technology development, the success of a sustained space exploration strategy lies beyond technological capabilities. It lies in international cooperation, space policy, and public support. Without these, no program can realistically achieve a sustained presence in space beyond low-Earth orbit. To this effect, this paper proposes a cost-effective first step in the form of a universal symbol which, when placed alongside national flags displayed on hardware and astronaut/cosmonaut/taikonaut flight-suits, would send a strong message to the world that space exploration is done for the benefit of humanity as a whole, not just for spacefaring nations. The "Blue Marble", the first complete picture of Earth taken from space by humans in 1972, fits this universally appealing symbol. This symbol requires no political collaboration between countries, yet is an image that anyone, anywhere in the world, can relate to regardless of nationality, ethnic origin or religious beliefs. Placed on the shoulder pads of human 'nauts – ambassadors of planet Earth – or prominently displayed on spacebound hardware, this symbol would send a universal message to present and future generations that, in space, our planet is working together for the benefit of everyone.

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1. Introduction

Space exploration strategies have evolved substantially since their beginnings in the late 1950s, when they were closely associated with military technological prowess. Yet today, some 20 years after the end of the Cold War, space development is still considered a strategic asset. Technological achievements by one nation are often viewed as threats by others, as expressed by satellite-destroying missile demonstrations [1,2]. If history is a witness, then a space race between nations will not benefit humanity in the long run. The most ambitious space program of all time, to place a man on the Moon in a decade, illustrates the amount of resources necessary for such a bold endeavor to succeed. In 1966, during the height of expenditures of the Apollo program, NASA's budget peaked at 5.5% of the US federal budget, compared with 0.5% today. In 2004, despite a substantial reduction of budget over the years, the US president presented a vision for a human return to the moon and Mars, in addition to a shift in NASA funding for the development of human-rated spacecraft dedicated to exploring those worlds as precursors to human settlements. In 2009, the Augustine report commissioned by the following US administration indicated that this vision was unsustainable with the current budget of the agency. Likewise, the bold vision of the European Space Agency (ESA) for Mars exploration, ExoMars, has been a victim of budget cuts, and will be a scaled-down mission done in collaboration with NASA. Space exploration spending at cold-war levels is not sustainable in the present economic realities of our society. Particularly after the worldwide economic downturn of 2008–2009, mass spending is viewed with a more cautious eye. This underlines the fact that space exploration is a particularly vulnerable field, because the associated benefits are typically poorly understood by the general public, and it is an inherently expensive discipline with non-immediate returns on investment. This provides a challenging environment for business ventures because bold explorations such as human lunar landings will, for the foreseeable future, require substantial costs beyond those that a private company can provide, particularly because of international technology transfer restrictions. Consequently, such bold exploration-enabling spending will only be achievable through cooperation between spacefaring nations, as is increasingly occurring [3,4].

The International Space Station (ISS) is a great example of what can be accomplished through sustained international collaboration, and as a result, one can reasonably claim that the relationship between NASA and Roscosmos (its Russian counterpart) has been stronger and more stable than that between the White House and the Kremlin.

2. Private enterprise as a link to the general public and a driver for bolder exploration

The success of a long-term space program is linked, directly and indirectly, to the excitement, enthusiasm and awareness of the

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supporting general public. While space services can and will be provided by the private sector, such as payload launch and tourism, private Moon-bound missions are still being heralded as the culmination of private enterprise for this generation of space travel. This idea is spearheaded by the partnership between software giant Google and the X-Prize Foundation. The Google Lunar X-Prize is a $30 million prize for the first private company from anywhere in the world to land smoothly on the Moon and return high-definition images [5]. These efforts aim to reawaken public interest in space exploration and wedge open new commercial niches. *Keeping the public excited, stimulated and engaged is a key ingredient to sustained success*, and private space enterprise will certainly contribute to this effort because attracting investors requires substantial communication with the general public. However, because space is still considered primarily a military asset, transfer of space-based technologies between international commercial companies remains a challenge thanks, *inter alia*, to the International Traffic Arms Regulations (ITAR) statutes [6]. These restrictions do not apply to collaboration between governments. As such, and while admittedly speculative, increased and sustained collaboration in space between nations may provide the opportunity to create and achieve new forms of international corporate regulations and stimulate competition, giving access to new frontiers for private companies and allowing yet bolder exploration by governmental coalitions. This has precedence in the largely symbolic Apollo–Soyuz mission of 1975, which paved the way for commercial international partnerships leading to, for example, Sea Launch (a commercial partnership between the USA, Russia, Ukraine and Norway) in 1995. Compelling and inclusive symbols or symbolic acts, in conjunction with effective leadership, can lead to mutually beneficial relationships even between estranged groups.

3. A vision of unity is needed

It is clear that the way our society returns to the Moon and beyond will be of crucial importance. We cannot afford, in our global economy, to return beyond low-Earth orbit in a competition between superpowers. It may spur development and bolster economic return in the short run, but it is financially unsustainable in the long run. While competition is healthy in the private enterprises, and capitalistic endeavors are valuable for spurring competition and driving down cost, the need for a united humanity in space goes beyond investment returns, and thus beyond a capitalist framework. It must be thought of on a different level, a level where the sustainability of our species beyond Earth is at stake [7]. A greater vision for human peace, international awareness, and sustainability could help steer our world toward a more hopeful future. Space appears to be a great medium by which to do this, because of its lack of international boundaries. Future space explorers will have an opportunity to send a clear message that they are, above all else, ambassadors of planet Earth. This will by no means lessen the triumph of the nations or companies involved in successful exploration, for everyone will know who they are, where they come from, and how they got there. But exploration under a symbol of international unity in space will make the whole world, not just the country's citizens, feel pride over the accomplishments of humanity. This is what we need in our 21st century. Media coverage of a moon landing, particularly with today's web 2.0 technologies, will be followed by an order of magnitude more people than those who followed the Apollo successes; the international broadcast of a symbol of peace and world unity emanating from world superpowers would be completely new, striking and inspiring, particularly for the up and coming generation who will lead our world in the future.

As an example, consider the following scenario. Nation X has acquired the technological know-how and funding to pursue lunar exploration. It will doubtless place its flag, the symbol of its nation, on the Moon, as it should because a Moon landing is a great accomplishment. However, if at the same time it prominently places a flag with a symbol representing the success of the human species, not just of X's nationality, then the whole world will probably pay a great deal more attention, and the support and celebration of nation X's accomplishment will be magnified. It will be an amazing day to be human anywhere on our planet.

Fig. 1. The "Blue Marble" as a symbol of international unity in space exploration.

Space exploration provides a responsibility and opportunity to send a strong message of unity to the world community. It is the moral duty of spacefaring nations to unite in their endeavors because the benefit of humanity's sustained presence in space is at stake. Indeed, world powers have a responsibility to steer humanity toward a better future and avoid careless abuses of our societal tools and mechanisms that cause dramatic and international consequences, as witnessed in the catastrophic failure of the world financial market that began in 2008. This steering is known to be enabled when there is recognition of the urgency of a particular topic, such as climate change. A united symbol would only enhance the view of spacefaring nations toward international economic and humanitarian leadership.

Here, we propose that the symbol representing humanity in space be the Blue Marble, the first picture taken by a human being of the entire planet (Fig. 1). It was taken on 7 December 1972 by the crew of Apollo 17, and may be among the most distributed images worldwide. The image is internationally neutral. It is a symbol that requires no political collaboration between countries, yet is one that anyone, anywhere in the world can relate to, regardless of nationality, ethnic origin or religious beliefs.[1]

4. Conclusions

As humanity prepares to return to the Moon and beyond, a new philosophy in space exploration is needed to ensure our sustained presence in space because bold space exploration cannot be financially sustained by a single nation. We propose a first step in the adoption and display by spacefaring nations of a politically neutral unifying symbol that anyone in the world, regardless of nationality, ethnic origin or religious beliefs, can relate to: the Blue

[1] Some people may state that the image shows Africa and the Middle East, and so spacefaring nations should not use it as a symbol. However, one should simply view this image as planet Earth. The political delineation of Africa is artificial and is not visible in the image. It is a terrestrial landmass like any other, though, significantly, it was also the birthplace of humanity.

Marble. When referring to a similar image of Earth returned from space in 1968, Ernst Stuhlinger, the father of astronautics, declared:

> Of all the many wonderful results of the space program so far, this picture may be the most important one.

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