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Author: Mr. Adriano V. Autino
Space Renaissance International, Italy

Prof. Bernard Foing
ILEWG "EuroMoonMars", The Netherlands
Mr. Devanshu Jha
Space Generation Advisory Council (SGAC), India
Ms. Susan Ip-Jewell
United States
Dr. Julio Rezende
Federal University of Rio Grande do Norte (UFRN), Brazil
Prof. Enrico Feoli
Università degli studi di Trieste, Italy

FROM SPACE EXPLORATION, TO SUBORBITAL SPACE TOURISM, TO LIVING AND WORKING
IN SPACE: EVOLUTION OF THE MISSION REQUIREMENTS

Abstract

Civilization expansion into space is 50 years late. The advent of reusable rockets, by Space X since 2015, gave us hope, after a long wait for space tourism to become a reality. This paper briefly summarizes the causes of the delay. However, for the real start of the geo-lunar space industrialization, reusable rockets and low cost launch vehicles are just the first essential step. A realistic business plan shall be drafted, addressing the most profitable industrial development strategies, such as, e.g., satellites assembly and maintenance in orbit, low gravity products, space debris and wreckages recovering and reusing in orbital workshops, by 3d printing and other technologies. Envisioning industries in space, it is clear that space travelers and workers will not be astronauts. In other terms, space settlement will begin when it will be possible to move civilian people to space and accommodate them for long periods, eventually as resident space citizens. Just as airline passengers don't need to be pilots, nor hostesses, nor stewards, space travelers shouldn't be astronauts. It is clear that civilian space travelers have mission requirements different from military astronauts. Civilian passengers and settlers need softer traveling conditions and protection against the austerities of living in space, such as low gravity and cosmic radiations, they need green environments in the habitats, not to mention legal warranties, as any airline company knows well. Astronaut Scott Kelly spent a year on the ISS, exposed to microgravity and radiation, which had detrimental effects on his health, as documented in his book, "Endurance". Microgravity can be solved by providing rotational gravity. Radiation can be solved by shielding. If we want the average person, without astronautic training, to travel in space, we also need vehicles as comfortable as normal airliners, with horizontal takeoff and landing, low acceleration, and safe reentry into the atmosphere. For the sake of our physical and mental health, we also need green environments in space habitats: vegetables and animals with us. Passenger Transportation Systems and Space Habitats requirements are briefly captured and assessed, considering few evolving levels, from classical astronautic space exploration to space settlement, as to duration, distance from Earth, different vulnerability to radiations, low gravity, hard psychological and logistic conditions: - Sub-orbital tourism - Sub-orbital transportation - Orbital tourism - Lunar tourism - Space exploration: short missions, lunar missions, Mars missions long distance missions - Working and living in space