Bringing space tech to earth

INTRODUCTION

Space programs create countless spinoffs that benefit society. To speculate on future spinoffs, it is useful to explore the domains in which they occur: structure design, sustainability, human resilience, communication and research. As the global space race accelerates, commercial applications in these domains are likely to increase.

OBSERVATIONS

- NASA has identified nearly 2,000 spinoff technologies since 1976. Fast rising space power India has also identified a range of spinoffs.
- We can categorize five domains of space programs that lead to spinoffs: spacecraft design and maintenance; preparing an efficient and sustainable space trip; creating a resilient astronaut; communication with earth; creating the ability to conduct research in space.
- ‘Structure design spinoffs’ include 3D laser scanners, battery monitoring systems, structural analysis software and sensors and vehicle aerodynamics.
- ‘Sustainability spinoffs’ include solar cells, water and air purification systems and pollution remediation.
- ‘Human resilience spinoffs’ include cardiac pumps, artificial limbs, exoskeletons, scratch-resistant lenses, space blankets and enriched baby formula.
- ‘Communication spinoffs’ include satellite television and wireless and emergency communications.
- ‘Research spinoffs’ include digital imaging, environmental mapping, precision GPS, CAT scanners and breakthroughs in cloud computing.

ANALYSIS

The essence of space exploration reveals why so many spinoffs originate in space programs. After all, space exploration requires structures that can withstand anything, an efficient and sustainable trip, extraordinarily resilient people, far-reaching communication systems and the ability to conduct high quality research. With the help of space programs, we will continue to create better materials and structures, shape a sustainable revolution, turn ourselves into powerful cyborgs, lay out improved global communication networks, and scan, image and map ever larger data flows. These technological spinoffs also create economic spinoffs across society. For example, improved weather forecasts and advances in navigation and communication (due to GPS and satellites) have made sea-shipping much more productive. Such economic spinoffs point to sectors that will benefit from future spinoffs. For instance, the energy sector also becomes more productive due to better forecasting: forecasting the weather predicts future demand for energy. Healthcare is another longstanding beneficiary. New ways to image and map the human body will continue to improve healthcare. In addition, there are relatively new sectors that will be impacted. Digital media stands to benefit from improved satellite networks. Even video gaming has been impacted. Biofeedback technology intended for pilots has created prototypes to make video gamers more immersed, as their physiological state (such as heart rate and breathing) becomes input for a video game. These developments show that spinoffs from space programs are penetrating deeper into society. As the global space race accelerates, we can expect more robust materials, improved sustainable technology, more extensive human augmentation, improved global communication networks and larger data flows. However, distinctions between national space programs mean that innovations will not be evenly spread across countries. NASA delivers so many innovations because it cooperates with space agencies from other countries and with emerging companies, such as SpaceX, and offers licenses of patented technologies. The same cannot be said of China, whose space program remains inextricably linked with the military. Moreover, if the global space race becomes a race for prestige or security, like it did in the previous century, it will be less likely that commercial applications increase significantly.

POTENTIAL BENEFICIARIES

- Human augmentation will increase (augmented reality and brain-enabled technologies – and its applications such as in gaming) as space programs aim to make astronauts more resilient.
- Digital media, communication networks and cloud computing will benefit from improved coverage and data infrastructure.
- Healthcare stands to benefit even more from improved digital scanning and imaging.