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Space Technology and System Management Practices and Tools (3)

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AN ALTERNATIVE PERSPECTIVE IN ASSESSING THE SUITABILITY OF SUSTAINABLE SPACE  
TECHNOLOGY

**Abstract**

The aim of ESA in space exploration is to support the European industry in its provision of competitive and cutting-edge technologies as well as to establish its presence within the international space industry. With the rise and development of novel technology, engineering and robotics often go hand-in-hand, which holds especially true for space applications.

One important perspective to consider is space sustainability, especially for space technology in space exploration missions. Certain technology demonstrations such as the Virgin Orbit LauncherOne is a technology, which promotes the use of reusable space technology. In order to gauge the feasibility of such future technologies, a Technological Sustainability Matrix (TS Matrix) was conceived. It consists of four main areas – Operational Feasibility (Research and development; Manufacturing and production; Space operational management), Technological Feasibility (Proof of concept; Heritage of existing technology demonstrated on Earth; Heritage of technology in space), Schedule Feasibility (Technological research; Manufacturing and production; Launch and operations) and Economic Feasibility (Marketability; ROI; long-term vs short term). The sub-components will be ranked and summed up in a matrix, whereby existing and emerging technologies will be assessed. This is in contrast to the Space Sustainability Rating conceived to mitigate debris, whereas this paper aims to gauge a demonstrated technology to evaluate its long-term sustainability impact on our environment.

Support from relevant agencies and organizations are vital to support the sustainability cause. One such way is that ESA can aim to be more ambitious by becoming autonomous over their missions and launchers, instead of collaborations with other national space agencies. This paper explores the various possibilities and options for independent launch and potential programs that would provide ESA with

mission autonomy. This includes shifting the focus in commercial growth areas and investigating the possibility of implementing possible space policy with an autonomous launcher capability. The EU Secure Connectivity Program is also a program that was investigated within this paper. This not only allows the maximum technological developments from various stakeholders, but also makes ESA a central and reliable player for the Global Exploration Roadmap (GER).

With relevant support and improvement in organisation autonomy and flexibility, the TS Matrix allows for the understanding if emerging sustainable space technologies are feasible. This not only helps to promote space exploration missions but also ensures that sustainability stays a key focus of our future. This project is part of the Space Generation Advisory Council (SGAC) space exploration project group ROADMAP.