

SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)

Space Technology and System Management Practices and Tools (4)

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International Space University (ISU), United StatesSELECTION AND EXPLOITATION OF 3D PRINTING TECHNOLOGY TO ENABLE ON-BOARD
MANUFACTURING CAPABILITY ON THE ISS: USING SCENARIO PLANNING FOR
DEVELOPING REQUIREMENTS**Abstract**

Although space technology is often thought of as ‘cutting edge’, the harshness of the space environment and the very limited capacity to respond to technological failure often dictates a quite conservative approach to technology adoption. Moreover, while a system/technology assessment may determine the current maturity of a system it does nothing to inform of what it required to successfully complete the technology development process.

In this paper we investigate the processes involved in exploiting 3D printing technology (and rapid prototyping in general) to enable on-board manufacturing capability on the ISS. More specifically, to better understand how decisions regarding space technology are made; it is necessary to briefly evaluate which steps are common and which are unique in the different methodologies used for space-based and earth-based technologies, as well as understanding the reason behind these differences.

Additionally the usefulness of scenario planning as an input to system design process and requirements management will be explored. Despite having its roots in strategic decision making, scenario-based planning can also be used to aid and add value to Systems Engineering processes. Changes in requirements are commonplace during systems development due to the progressive maturity of the system’s technology and design. The main strength of scenario planning is in describing functional behaviour and is a powerful antidote to the complexity and uncertainty of new system developments as it can help systems engineers define a robust set of system requirements.

The research described in this paper embraces these challenges, while also playing an important role in the scope of the technology planning activities, hopefully contributing positively to the issue of lack of innovative technologies in space systems developments.