

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Technologies to Enable Space Systems (3)

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INDUSTRIALIZING DESIGN & PRODUCTION OF SATELLITES AND LAUNCHERS: HOW
SUPPLIERS CAN MAKE A DIFFERENCE

Abstract

The demand for ubiquitous and uninterrupted service from space has generated a flurry of new satellite constellation programs – both for commercial and governmental use. This development has become the pivoting point for the industrialization in the design and manufacturing of spacecrafts and launchers, with the outlook of radically improved cost, modularity, repeatability, and delivery speed. However, industrialization is not limited to system level architectures. Including suppliers early in such iterative design-to-manufacturing processes, covering both subsystem and equipment level, is key for success.

The main drivers to take advantage from economies of scale are: Modular and scalable designs, reusability standardization; automated and digitalized processes; qualify non-space components as well as manufacturing technologies for use in space.

This paper demonstrates how these principles have been applied by Beyond Gravity to different subsystems and equipment. Examples presented in this paper cover a wide variety of products, ranging from composite and metallic structures, mechanisms, to avionics products. Depending on the value drivers in each case, different solutions were found. Automated and digitalized processes were developed that would eliminate a large part of the touch labor (eg. Automated Potting Machine and Automated Fiber Placement for spacecraft composite structures) and manual data entry (eg. IoT connectivity and Augmented Reality for high accuracy mechanisms); scalable and universal production lines that would provide repeatability for the baseline product yet allow late changes for customization (eg. universal composite panel production line); modular designs that would create a whole product family from same or similar components using the same manufacturing technologies (eg. Solar Array Drive Mechanisms, launcher's dispensers); a standardized computing platform that serves several functions and is configurable through software (eg. constellation Onboard Computers). The advanced industrialization process used to develop such solutions follows the industrial level principles, tailored to the Space industry, using the main lean methodologies, like Process Flow Diagram, Value Stream Mapping, Takt Time calculation, Balance Charts and many others, to reach the optimal manufacturing layout and technologies to fulfill customers' demand.

In each of the presented cases, step-function improvements in efficiency and affordability are achieved while guaranteeing best-in-class performance and quality.