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OHB INITIATIVES IN DEVELOPMENT OF ADDITIVE MANUFACTURING TECHNOLOGY FOR OPTO-MECHANICAL AND MECHATRONIC SPACE SYSTEMS

Abstract

Additive Manufacturing technology has shown impressive new opportunities and convincing results over the last years, mainly in terrestrial applications. Today, it has proven to represent a completely new approach to shape complex mechanical parts, with enormous potential for optimization of dedicated parameters. Numerous possibilities arise for the aerospace industry, among others, and let engineers dream of mechanical parts which only a few years ago rather seemed like science fiction.

OHB System has been involved in the development of Additive Manufacturing for more than five years via several ESA studies, DLR-funded projects and by significant internal RD activities. These projects and studies have convinced us of the potential of AM for future satellite platforms, instruments and payloads.

A new dimension of freedom in generating shapes and geometries is opened, offering more flexibility for optimizing the parts and components according to functional and performance requirements. On the other hand, the efforts of qualifying an AM part to flight worthiness are significantly higher than for conventional manufacturing technologies, taking into account all the required aspects of material and production process control, inspection and testing. A concise trade-off has to be performed for each potential use case to find out whether these high efforts and associated costs are justified by the benefits of the new technology such as e.g. light-weighting, ease of integration and performance improvement.

The paper introduces OHB's AM roadmap, which has been developed jointly by OHB experts from both sites in Bremen and Oberpfaffenhofen, following an in-depth analysis of the potential impact of the technology on space systems. Furthermore, it provides an overview of applications where AM is expected to offer extraordinary opportunities.

Among these 'high-potential' applications the two following topics are addressed in more detail:

- opto-mechanical assemblies (isostatic structures, optical mounts) and
- mechatronic systems (compliant mechanisms or integrated smart structures).

The paper reports on the objectives and work logic of ongoing studies in these specific topics and provides intermediate results.