Activity Title:	***Direct Manufacturing of Structure Elements for the Next Generation Platform***		
Contract type	**Artes 5.1**	**Budget** *(k€)*	**297 k€**
Company (-ies) *(including country)*	University of Paderborn (GER) INVENT GmbH (GER) citim GmbH (GER) OHB System AG (GER) SLM Solutions GmbH (GER)		
Team *(name of the participants in the project)*	Benoit Bonvoisin (ESA ESTEC) Eric Klemp (University of Paderborn) Thomas Reiher (University of Paderborn) Ulrich Jahnke (University of Paderborn) Christian Lindemann (University of Paderborn) Christoph Tschepe (INVENT GmbH) Martin Sauerbrey (INVENT GmbH) Andreas Berkau (citim GmbH) Peter Böttner (citim GmbH) Reinhard Schlitt (OHB System AG) Dieter Schwarze (SLM Solutions AG)		
(*) **Speaker (s)**	Thomas Reiher	**Email**	reiher@mail.uni-paderborn.de
Short Speaker Information *(experience and involvement in this project – maximum 60 words)*	Thomas Reiher has been involved in the development of a trade-off methodology for the selection of feasible parts for additive manufacturing. As well he was in charge of the FE-based optimization of the selected structure elements.		
Summary of the activity *(maximum 400 words and 2 pictures)*	The aim of the project “Direct Manufacturing of structure elements for the next generation platform” is to examine the ability of using Additive Manufacturing for producing structural metallic parts used in actual telecommunication satellites. Therefore trade-off methodologies to select feasible parts, test and verification plans as well as manufacturing strategies for space parts are to be developed. In a first step a trade-off methodology was developed and used for selecting sample parts of already developed satellites. Based on this procedure actual structure elements were identified and ranked according to two types: - Case A parts: identical elements applicable to each platform - Case B parts: more complex parts featuring a high buy-to-fly ratio Typical relevant parts are those with a high buy-to-fly ratio and time-consuming or complex fabrication steps. For each case one part was examined in detail. These parts were built in the Selective Laser Melting (SLM) process. The resulting improvements gained by changing the manufacturing process regarding costs, weight, waste and time reduction were figured out. For manufacturing of space parts there are special requirements like an extremely high reliability and lightweight design demanded. Additive manufacturing enables these lightweight designs but also requires a special quality assurance. Therefore a space dedicated test and verification plan as well as a special manufacturing strategy for both parts were developed. This will help to develop standardized test, verification and quality assurance processes in the future. For the examination of cost reduction for near series production of identical parts applicable to each platform (case A) the “edge inserts” were selected. They are glued into CFRP-panels and are used to provide screw holes for mounting of further parts. Due to an elaborating conventional machining and the ability to fit many items in one build job, a reduction of manufacturing time is expected. For the evaluation of weight, waste, time and cost reduction for complex parts with a high buy-to-fly ratio by use of an AM-specific redesign of parts, the “Reaction Wheel Bracket” is used. Four of these brackets are used per satellite to mount a reaction wheel for adjusting the orientation of the satellite without using propellant. The part was redesigned with a topology optimization to gain a huge weight reduction.  		

(*) The speaker needs to do the registration through this website