

# **ON ORBIT MANUFACTURING AND ASSEMBLY: NEW MIND-SET FOR NEW CHALLENGES**

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Actual spacecraft structures are limited by the capability of the launcher. The possibilities to manufacture on orbit allows to overcome the launch and launcher constraints and it increases the spacecraft performance / cost ratio and to disruptively rephrase the paradigms of the spacecraft structure as it has been conceived so far.

The limitation can be defined on the size, volume and therefore design of what can be accommodated within the fairing of a single launch vehicle. Other than the physical limitation due to the fairing dimensions, the particular launch environment requires structures ruggedized and thus capable to withstand the launch loads and solicitations occurring during the first minutes just after the lift off.

To conceive and design structures capable to be manufactured and/or assembled on orbit is the new approach to be adopted for overcoming these limitations. Furthermore, the ability to on orbit assemble gives the possibility to create more performing satellite architecture that cannot be sent folded without really complex mechanism. Taking out those complex mechanisms could be the right way to avoid some possible defects that can ruin the entire mission.

On orbit assembly is a proven technology well documented. It has been validated along the years on the ISS on which Thales Alenia Space was fully engaged. There is now a large interest of the space community to use this technology to optimize the satellite industry. On orbit manufacturing is also rapidly becoming a mature technology to get more capacity in orbit while overcoming the mechanical constrains of the launch.

The on orbit manufacturing, substantially referred as additive manufacturing, is the solution for having very large structures directly manufactured in space (e.g. ultra-thin mirrors and light structures that can be bent or otherwise adversely affected by gravity forces), for space, and therefore optimized for the space environment rather than for the launch, bringing more capacity in orbit with less material.

From the ISS to the telecom satellite, TAS believes that On orbit assembly and manufacturing represent an opportunity to optimize the satellite design, to offer new services directly in orbit and to create a more sustainable space logistics. As we closely follow in the literature, there is a lot of initiative in this way. Having a look to the near future all these concepts could also turn into cost and time saving making a big step forward in the space market.