

SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering - Methods, Processes and Tools (1) (3)

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INDUSTRY 4.0 APPROACHES FOR PRODUCTION OF LARGE QUANTITIES OF SATELLITES

Abstract

The planned mega-constellations in the communication (internet for everybody via satellite) and the Earth observation (high temporal resolution images by small satellites) sector will impact production methods significantly. The traditional way of satellite implementation is classical manufacturing based on significant manpower and not including significant automation nor robotic systems. For the currently envisaged mega-constellations hundreds of satellites are to be produced in a very limited timeframe, this will not be feasible by the traditional approach. Therefore this contribution analyses transfer of advanced networked automation approaches developed as “industry 4.0” for advanced production of consumer goods and for automotive industry. Specific joint requirements with satellite production include

- high flexibility to variations of standard product
- fast integration of modular components
- respecting high quality requirements

This contribution reports about the concept and first experiences with a technology demonstrator realized in Wuerzburg, addressing the following realized key design steps for efficient satellite realization:

- modular satellite bus architecture to support flexible integration in production. Here a standardized baseplate (similar like in computers) carries all power and data line; the different subsystems are plugged in, allowing high flexibility in replacement,
- satellite system integration is realized by close worker / robot cooperation, introducing a much higher automation level,
- to take account of extremely high quality assurance requirements, transport robots provide a flexible flow of materials between integration and testing areas,
- automated tests for functionality and performance of the satellite are established.

Thus the similarities to automotive and computer production will be exploited for potential future satellite mass production. In this contribution details of the industry 4.0 demonstrator in Wuerzburg will be presented, including networked robotic manipulators and mobile transport robots. Experiences from operations of this plant will be reported.