

SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems Concepts (1)

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PROMISING TECHNOLOGIES AND ASSOCIATED CONCEPTS FOR FUTURE MISSIONS

Abstract

Thanks to ESA study "Concepts, technologies and development approaches for future SC", Thales Alenia Space has investigated technical solutions to reduce cost (and schedule) of future space missions without impacting resulting quality and associated risks.

TAS large past experiences (PROTEUS, Meteosat Second Generation, Herschel & Plank, SpaceBus 4000) were used to identify improvement areas with major system benefits.

Delays and costs of new platform developments are mainly driven by delivery times of new equipment and the functional validation of the platform. Recurrent programs allow large savings on cost (more than 60% saved) and on schedule (reduction over 40%). Thus future satellite architecture shall minimize non recurrent effort even for new missions. Modularity, scalability and flexibility are promising design trends already applied successfully on TAS product lines like PROTEUS or SpaceBus.

In addition, new technologies allow platform mass reduction of heavier subsystems (power and structure) and cost reduction of subsystems with large electronics use (power supply, guidance and navigation, and data handling). TAS experts have analysed numerous new technologies (350 including spin-in) to select most promising one's in term of significant benefits at SC level. Following technologies have been introduced in TAS roadmaps to be deeply evaluated:

- Power Line Communication
- New Solar Array concepts, involving thin film cells
- Li-Ion battery using nano-tubes electrodes
- ElectroChromic Device with active variable emissive coating (from 0.18 up to 0.88)
- Ammonium Di-Nitramide propellant. Roadmaps provided for these promising technologies are in line with a TRL 5-6 in 2015.

Concepts, re-usable and scalable with limited customization have been defined to cover a wide range of mission domain (Earth observation, Science, exploration, etc). The promising solution consists to have an architecture using common elements (electronics parts or equipments) or building blocks (Functional Channels and/or Sub-Systems), which present a certain performance scalability and interface flexibility. New technologies are involved to enable innovative concepts or to enhance their performances, that shall comply with large range of missions' requirements.

TAS has performed preliminary design of reusable Avionics, mechanical structure, thermal control, power supply, involving new technologies. This future building blocks concept was applied to three ESA missions (two Post EPS spacecraft involving different payloads and one Herschel like spacecraft), demonstrating quick return on investment even if the recurrence level is low.

The combination of technology evolution and "Design to re-use" architecture will favour the reduction of cost of high performances missions, while ensuring timely deliveries.