

SPACE OPERATIONS SYMPOSIUM (B6)  
Human Spaceflight Operations (1)

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FROM INSTITUTIONAL LOGISTICS CARRIER TO COMMERCIAL LOGISTICS TO THE ISS: A  
CHALLENGE AND AN OPPORTUNITY.**Abstract**

Thales Alenia Space-Italy (TAS-I) played and still plays a key role in the design and development of the overall International Space Station pressurized element with a specific effort in the logistics resupply of the ISS. The involvement has been focused on various typologies of elements: logistics elements for NASA, the three MPLM, for ESA, to the 5 ATV and now to commercial logistics like Cygnus PCM for Orbital. The experience achieved via these elements is addressed in this paper, giving specific attention to the various requirements associated to maximization of the on board cargo and the associated improvement in reducing the mass for the cargo containment/stowage, the simplicity of the operations of cargo loading, unloading and of the minimum system functions, the capability to load on ground the cargo as late as possible and as much as possible, the capability to properly maintain the cargo within the needed environment from launch till its transfer on the ISS. The peculiarity of the needs with respect to permanent element is highlighted. The objective of this paper is to provide an overview of the evolution and different approaches in different contractual environment. Furthermore, the paper will address the challenges for the different missions and the flexibility of the design solution to accommodate changes in the mission. MPLM has been recently “converted” in an on orbit permanent module; Cygnus PCM is a candidate to become an element capable to accomplish a resupply mission, but also an experimental mission at “low impact”, that implies low cost. TAS-I involvement in the sustaining engineering of these element allowed also to derive lessons learned, and to improve the design and the operational concept for the new elements. The current experience on Cygnus PCM allowed to generate new lessons learned on design choices for the pressurized element and to identify new needs/processes for a commercial environment. All these experiences are also focused on the future missions as logistics resupply for exploration missions, first to moon and then to mars. Some considerations on the requirements changes and needs, but also on what can be common are shared.