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Author: Mr. Rémi Lapeyre
CNES, France

ATV-5 DEORBITATION OPERATIONS USING A SHALLOW TRAJECTORY : AN EXAMPLE OF ADAPTIVE OPERATIONS

Abstract

ESA mandated CNES at the end of the 1990's to drive ATV (Automated Transfer Vehicle) operations, from launcher separation to deorbitation, for each of the five spacecraft to be built. First ATV model, Jules Verne, was launched and docked to the station in early 2008. This proto-flight model carried out for the first time a cargo delivery to the station by European means.

After this tremendous success, 4 ATVs were set to be launch in the following years. Toulouse Mission Control (ATV-CC) had to define an operational baseline to make the following flights as recurrent as possible. Now the fifth mission ended, it's time to look back on the Vehicle Engineering Team operational products and see how much this baseline has been kept, corrected or changed from flight to flight. It turns out that every on-board possible technical issue was covered, but that does not means nothing changed. Our experience of joint operations on ISS led us to curve our operational baseline in order to cope with the reality of the operations we were asked to support. And this reality was that ISS operations were very versatile and that it was hard to define rules to prepare each type of operation we were involved in, without making any deviation to our operational baseline.

Recently, one of the most ambitious project was to change the deorbitation operational baseline for ATV5 Georges Lemaitre in order to set a demonstration of a shallow atmospheric reentry. In the standard profile, two retrograde burns were performed. First burn was to lower the perigee from about the ISS cruise altitude to the limit of ATV qualified domain altitude. The second burn targeted a perigee with an altitude of 0 km or -70 km depending of the propellant level remaining on-board.

For the very last ATV mission, it has been decided between CNES, ESA and ISS partners to use a new reentry profile, targeting a +70km perigee in altitude, with a time and place compliant with observation of the reentry from ISS, along with other constraints. As all operational material was designed to cope only with the standard reentry profiles, we had to update our procedures and design new tools. This paper describes what has been prepared to carry out such unusual operations, the challenges we had to face and the final strategy we came up with.