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A BUILDING BLOCK APPROACH TO SATELLITES AND ITS IMPACT ON NEW
CONFIGURATIONS AND CHANGES IN LATE AI&T

Abstract

The Space Force, NASA, and NOAA partnered to fly the Athena climate-change mission using NovaWurks' building block approach to demonstrate a new way to build and fly sensorcraft. This mission to measure Earth Radiation Budget was originally planned for launch in 2023 on a LauncherOne rideshare. Due to cessation of launch operations, Athena was shifted to a Falcon9 with a different LTAN. The change from 1300 to 1800 in a sun-synchronous LEO orbit would severely impact CONOPS. NASA asked NovaWurks whether the vehicle could be reconfigured to accommodate the new LTAN in just a few months. The eight identical blocks were re-arranged to allow the sensor to operate effectively in the new orbit. Launch is now planned for later this year. The paper will show how the physical arrangement changed dramatically after it had already been delivered for integration, along with the minimal steps required to make a major change in a short time. From the outset, the building block approach allowed the NASA sensor to be significantly simplified, which was a major consideration for NASA. In addition, the building block approach simplified the payload by using capabilities integral to the blocks. The NASA sensor is taking advantage of the building blocks' ability to gimbal the payload to scan the earth. The blocks also process and store data before transmission to the ground. While redesigning an already-built satellite would be costly and time consuming, the building block approach allows resolution of unexpected changes which may occur late in IT. In a Sun Synchronous Orbit (SSO), Athena's original configuration enabled the sensor to point NADIR 100°. The entirety of the reconfiguration consists of updating drawings and fabrication of a few mechanical items. With Athena, the original environmental test series was repeated. This whole process can happen in a matter of weeks and at any point in the IT timeline. This paper will describe the reconfiguration of NovaWurks' spacecraft on the ground, which successfully resolved external impacts on eXCITE and Athena. It will also describe In Space Assembly and Manufacturing (ISAM), allowing vehicles to be reconfigured, or built, in space.