EyasSAT: A Classroom Nanosatellite for Teaching Space Systems Engineering

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Space Systems Engineering is a complex discipline that spans the full life-cycle of all space programs, from Mega to Nanosats. Traditionally, space systems engineers first gained expertise in a specific domain, such as astronautical or electrical engineering, then learned how to apply that expertise to different phases of a projects through on-the-job training. Unfortunately, as the life-cycles for major programs stretch into decades, and as engineers move from project to project, there is less and less opportunity to gain hands-on system-level experience from design through operations. A further limitation on gaining hands-on experience is the cost, complexity and scarcity of flight hardware. Increasingly, space projects have adopted a proto-flight approach to flight hardware whereby only a single flight article is built, tested and launched. Thus, there is little opportunity for budding space systems engineers to get their hands on hardware and software. Recognizing these fundamental limitations, engineers at the USAF Academy, in cooperative effort with industry, design and built the EyasSAT™ Educational Satellite System. EyasSAT enables a revolutionary approach to teaching space systems engineering by giving students the opportunity to: 1) review and analyze the design from basic need through detailed drawings; 2) verify each subsystem against a set of design requirements; 3) integrate the entire system; 4) perform system-level verification and validation procedures; 5) “fly” the satellite through RF-based ground system. This presentation will review the background on EyasSAT, describe its system architecture and give examples of how EyasSAT is being used to teach space systems engineering at the USAF Academy, NASA and ESA over the last four years.