Paper ID: 98340
oral

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
In Orbit: Postgraduate Space Education (4)

Author: Dr. Jerry Sellers
Teaching Science and Technology, Inc., United States

Dr. John Paffett
KISPE Space Systems Limited, United Kingdom
Ms. Amanda Winters
Infinite Outcomes Inc., United States
Ms. Shannon Kimball
Infinite Outcomes Inc., United States

ESSENTIALSAT: LESSONS LEARNED FROM A SPACE SYSTEMS ENGINEERING LEARNING LABORATORY

Abstract

As the space industry expands, there is a pressing need for an experienced technical workforce. Paper-based "book learning" only takes us so far. Real hardware and software behave differently than theory or models sometimes predict. Experiential learning is far more impactful than lectures and homework. The EssentialSAT space system was developed to provide just such an immersive space systems engineering learning experience. This low-cost, desktop satellite simulator system provides a unique, proven, hands-on learning laboratory supported by an integrated space systems engineering curriculum.

EssentialSAT is an educational kit of representative spacecraft subsystems that can be assembled, integrated, and tested in the classroom with simple ground support equipment. This paper summarizes more than three years of experience using EssentialSAT in different professional training courses for hundreds of engineers from Virginia to Tokyo, from Noordwijk to Abu Dhabi.

The paper begins by describing the EssentialSAT classroom laboratory activities and support curricula in detail. This discussion will focus on the integrated digital ecosystem built around the hardware and software that includes CAD, eCAD, addictive manufacturing and other models that were all orchestrated using model-based systems engineering (MBSE) tools. From this background, specific lessons learned from using EssentialSAT, including feedback from industry professionals, is discussed. We will describe the impact EssentialSAT has had on helping engineers understand both the big-picture of space systems, while also being able to connect the detailed dots of their underlying complexity. Working in teams to test, integrate and operate a simulated space system highlights the importance of understanding and working with multiple technical disciplines. The paper concludes with future plans to evolve the system to provide even greater opportunities for hands-on learning to help build the space workforce of tomorrow.