

AMRD University Engineering Design Challenge 2017-2018

Challenge 2: Digital Twin Usage Monitoring

Background:

Idea/Concept: "An integrated multiphysics, multiscale, probabilistic simulation of an as-built system that uses the best available models, sensor information, and input data to mirror and predict activities/performance over the life of its corresponding physical twin."

Source: Definition provided by the Office of the Deputy Assistant Secretary of Defense (Systems Engineering [ODASD (SE)] – Digital Engineering Initiative

Digital Twin (DT) is a vehicle health management paradigm in which a computational model of an as-built aerospace vehicle is used to make continual predictions of the state of the vehicle throughout its service life. These predictions allow mission planners and operators to make decisions about each aircraft based on its predicted state (e.g. pull a vehicle offline for service or alter a mission profile to ensure safety of the vehicle) A critical input to each DT is the data describing how its physical twin is being used, i.e. environments, loads, etc.

Design Challenge:

In this challenge students are asked to choose a COTS or other available aircraft to provide detailed data about the state and usage of the vehicle while it is being flown including aerodynamic data (airspeed, angle of attack, etc.), battery condition (current, voltage, temperature), and structural loading on critical components. Students should construct a digital twin model of the same vehicle and mirror the real data in flight simulations.

Design Paper is described in the Submissions Requirements link on the website (aero.larc.nasa.gov/university-contest/ and should also include:

- A discussion of usage and state data being recorded (types of data, location of sensors, etc.)
- Results of digital twin model compared with the actual real vehicle usage and state monitoring data.