

Modeling Common Cause Failures of Thrusters on ISS Visiting Vehicles

This paper discusses the methodology used to model common cause failures of thrusters on the International Space Station (ISS) Visiting Vehicles. The ISS Visiting Vehicles each have as many as 32 thrusters, whose redundancy makes them susceptible to common cause failures. The Global Alpha Model (as described in NUREG/CR-5485) can be used to represent the system common cause contribution, but NUREG/CR-5496 supplies global alpha parameters for groups only up to size six. Because of the large number of redundant thrusters on each vehicle, regression is used to determine parameter values for groups of size larger than six. An additional challenge is that Visiting Vehicle thruster failures must occur in specific combinations in order to fail the propulsion system; not all failure groups of a certain size are critical.