

SECTOR:
AEROSPACE SYSTEMS

OFFERINGS:
DESIGN APPROVAL STUDIES

TECHNOLOGY:
CFD+FEM+DYNAMICS

ADAPTER STRUCTURAL DESIGN AND SAFE SEPARATION

Missile launcher integrated to a platform requires adapter to connect it to pylon. The missile is mounted on the rails of the launcher. Due to presence of control surfaces, it is seen in literature that the separation may be non-monotonic. Hence, the forces require a thorough study of the adapter to confirm its structural integrity during flight and CFD studies to estimate safe separation. Initial studies are done for benign flight conditions to be followed by aggressive maneuvers during release.

Critical load cases for the adapter were taken from MIL-STD8591 and the platform flight envelope. Wherever there was deviation in the loading conditions, higher value was taken for simulation. Loading conditions consisted of pullout, pushover, bank-to-bank roll, and aerodynamic loads etc. FEM analysis of adapter for loading conditions for obtaining the mode shapes, random vibration analysis and fatigue was completed. Areas of high stress concentration were specifically marked. After adapter structural certification, safe rail launched separation analysis for missile was done for cruise conditions. The simulation considered the tip-off of the missile due to gap between rail and missile shoes. After the constrained motion in the rails, full 6DOF simulation was done for safe separation. Simulation was stopped after the missile successfully cleared the aircraft.



Figure 1: Generic image of aircraft firing missile

The project involved review by multiple agencies and coordination with partners doing experiments. In the reports submitted, adapter was found to be safe. Separation was found safe for the benign flight conditions given in the study.