

DYNAMICS STUDIES OF NOSE PANEL OPENING USING CFD

VERTICAL:
AEROSPACE & DEFENCE

SERVICE:
ENGINEERING SERVICES

TECHNOLOGY:
CFD

Our customer belongs to defense research lab spearheading the feasibility demonstration of hypersonic technology. The demonstration of hypersonic vehicle is to be done at speed of 6.5 Mach at an altitude of more than 30 km. The vehicle will be carried to this altitude by a rocket booster with vehicle positioned inside its nose. The front panels of booster will open and separate to allow hypersonic vehicle to initiate its independent flight. This is the most critical event of the mission. The customer wants this event be simulated to be assured of safe separation dynamics.

Zeus Numerix undertook coupled analysis of CFD & 6-DOF and thus generated separation trajectories of panels. The analysis was done on proprietary NumerixExpert™ which handles multiple bodies with relative motion. The event is simulated in four stages: achieving level steady flight, opening by pyro force, opening from aerodynamic loads until release and finally 6-DOF motion of panels. NumerixExpert™ uses Adaptive Mesh Refinement technique and solves all four stages as series of steps without requiring any user intervention after initial set up.

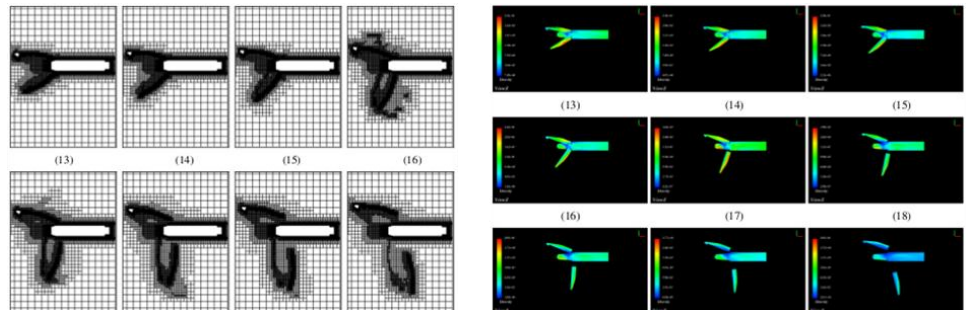
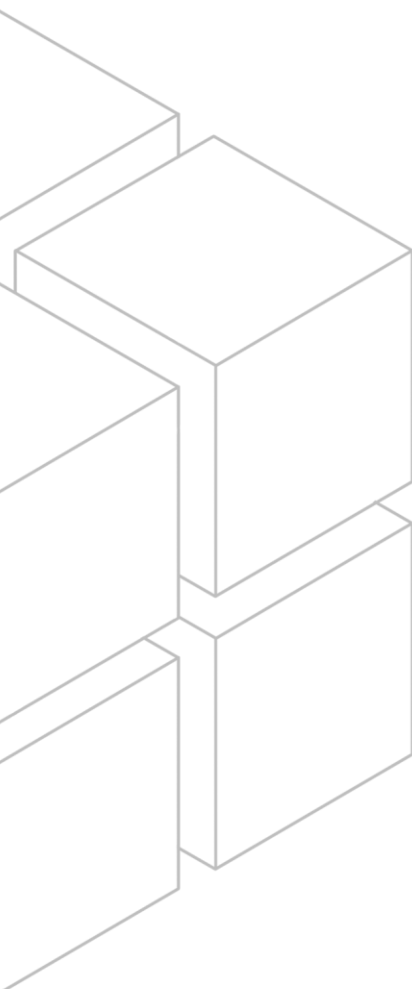


Figure 12: (a) Adaptive mesh refinement while separation (b) Predicted panel trajectories

Customer was supplied with simulation data that demonstrated safe opening and separation of front panels. The data will be used for getting clearance before demonstration trial. Simulation of such critical event would not have been possible with conventional CFD simulation approach.