

EFFECT OF SENSOR INSTALLATION ON AIRCRAFT PERFORMANCE

VERTICAL:
AEROSPACE & DEFENCE

SERVICE:
CERTIFICATION SERVICES

TECHNOLOGY:
CFD

Our customer is a defense establishment that spearheads research & development in the field of airborne electronic warfare and mission avionics. They are engaged with development of sensors and their installation on India's frontline fighter aircraft. Though small in size, but since externally installed and facing free-stream flow, these sensors are expected to affect the aerodynamics of aircraft and it needs to be analyzed with respect to clean aircraft configuration. The % increase in drag due to sensors is required to be estimated from low subsonic maneuvering to supersonic cruise flight conditions i.e. full flight envelope.

Since, accurate estimation of drag was important for study, Zeus Numerix decided to utilize turbulent flow simulations for correct prediction of skin friction drag. Proprietary hybrid mesh based implicit compressible flow CFD package was chosen, wherein a 25 million mesh (with $y^+ < 1$) was solved on 32 CPUs within 20 hours. In addition of aerodynamic coefficients, simulations also generated the effect of sensors on canard aerodynamics and engine mass flow rate. Force on sensors & fairings as well as aerodynamic heating on sensor surfaces was computed.

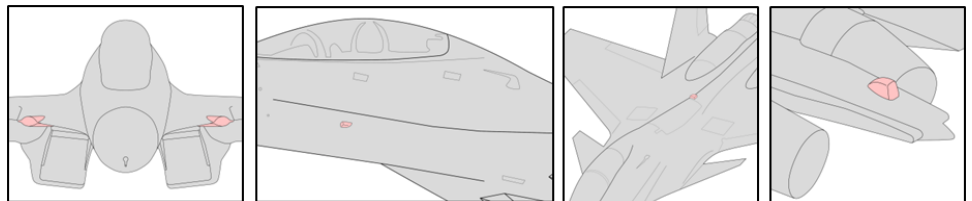


Figure 3: Certification of sensor locations on aircraft

Customer was delivered with aero-dynamics coefficients showing less than 3% increase in drag & negligible effect on canard & engine performance. The study obtained approval for the installation of sensors, from experts & certification agency.