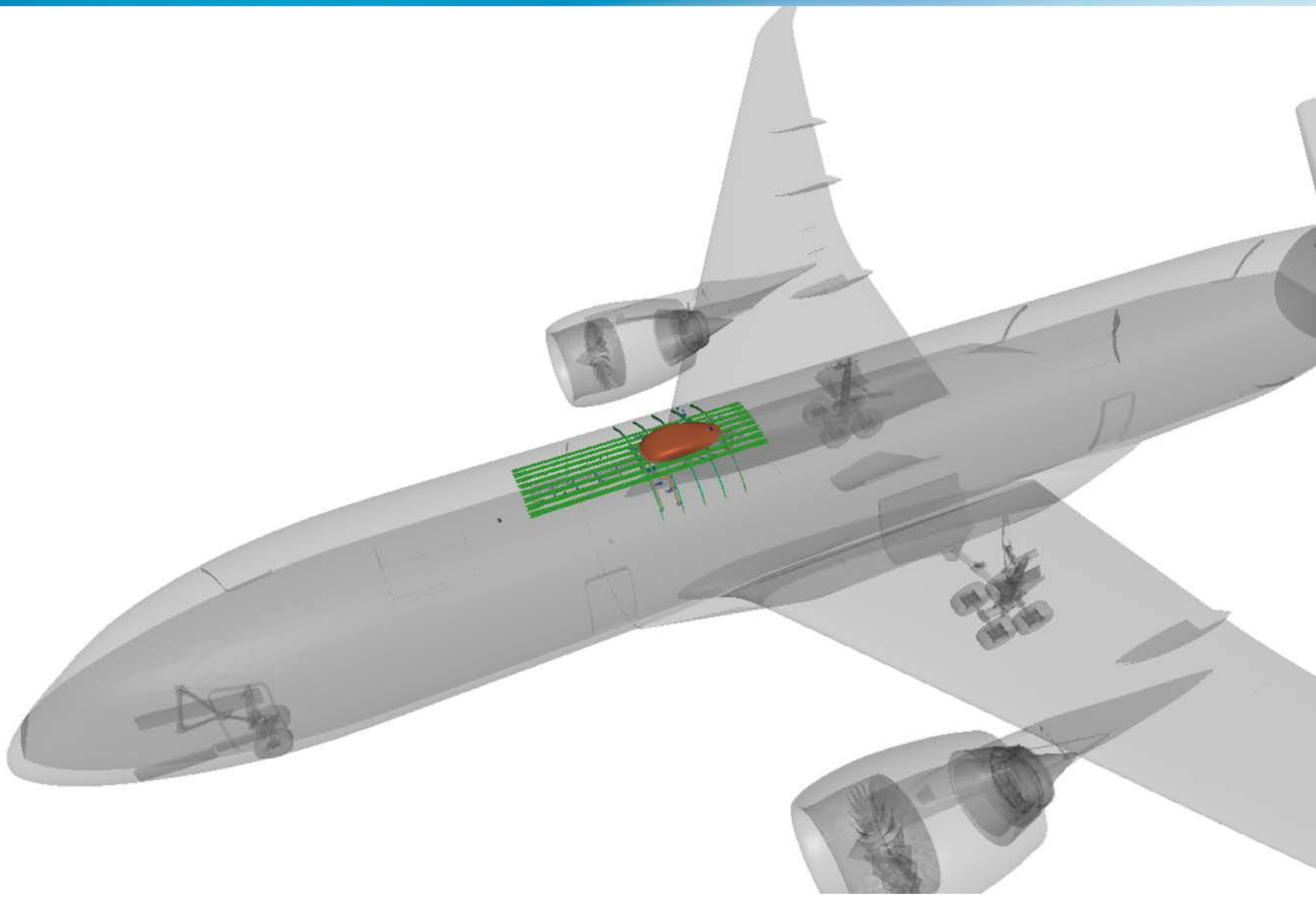
Antennae Installation on 787 airplanes

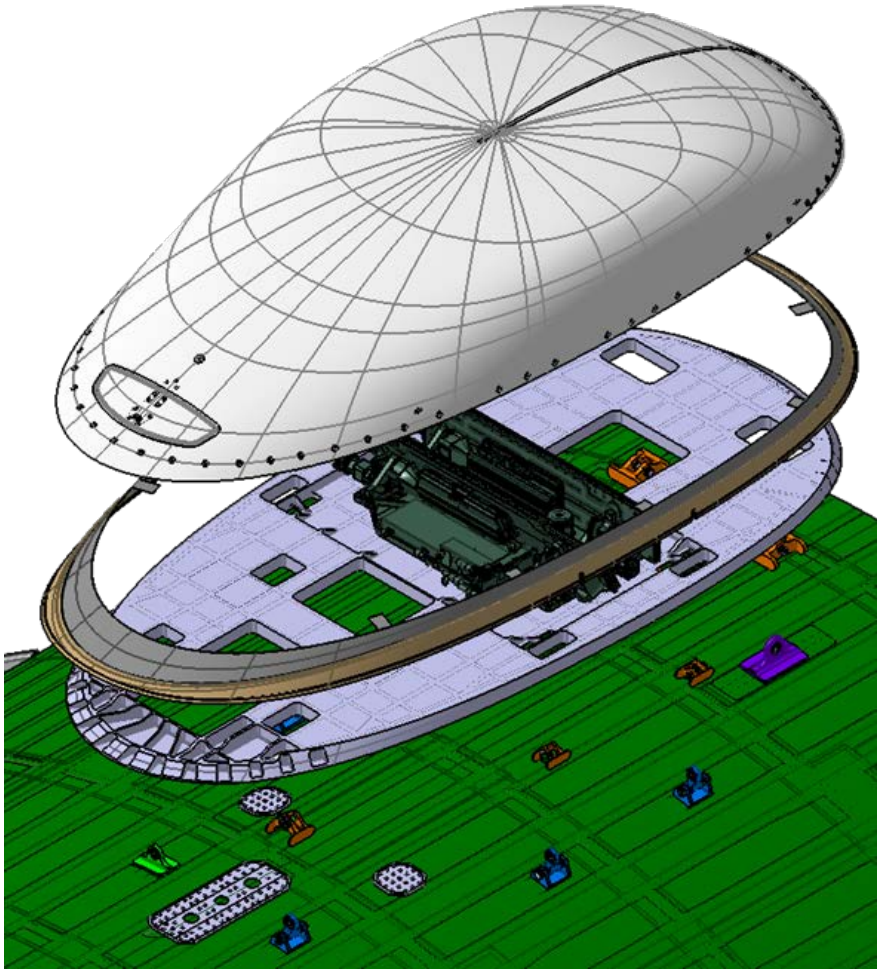
Composites Modifications Workshop
National Center for Aviation Training
Wichita, Kansas

July 19-20, 2016

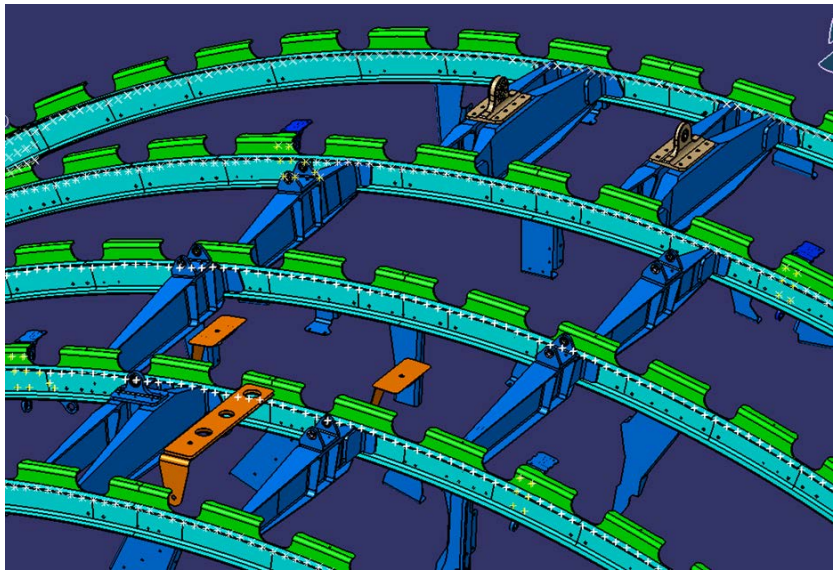
Fuselage Crown Installation

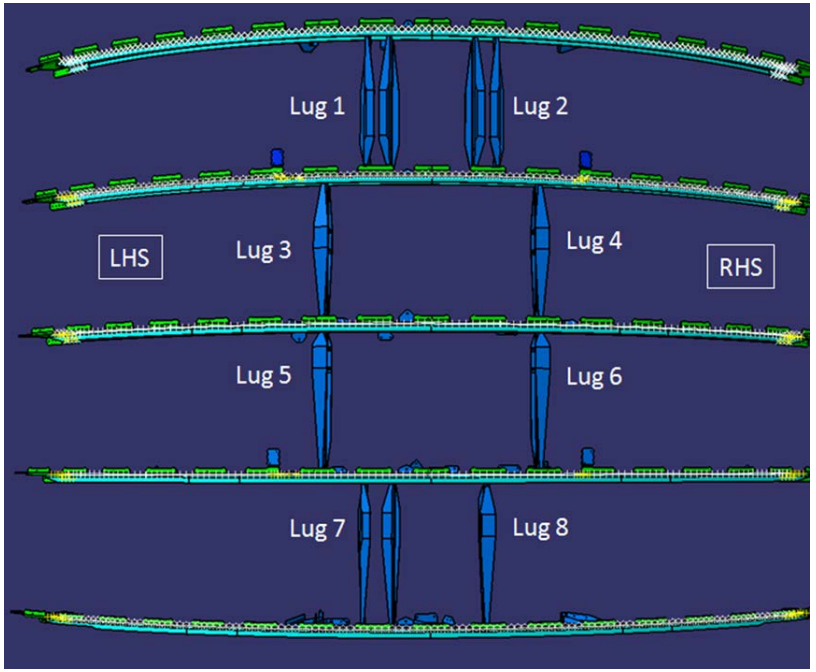


Fuselage Crown Installation



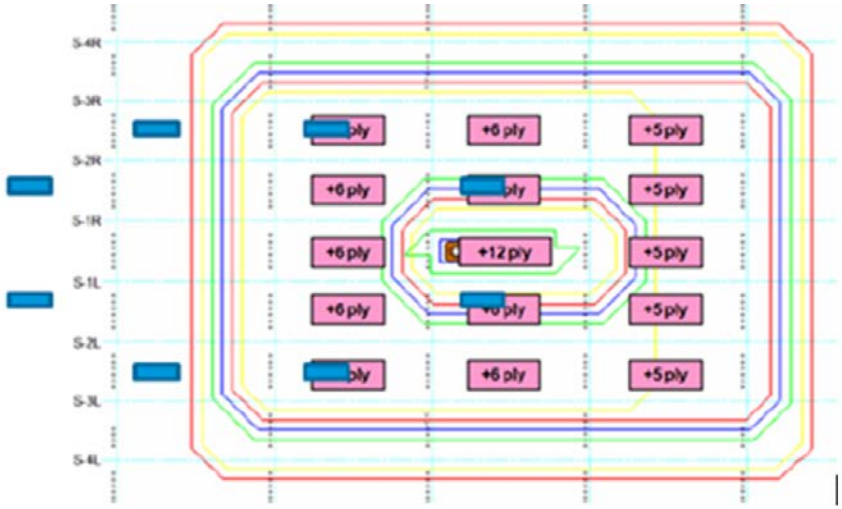
Fuselage Modifications



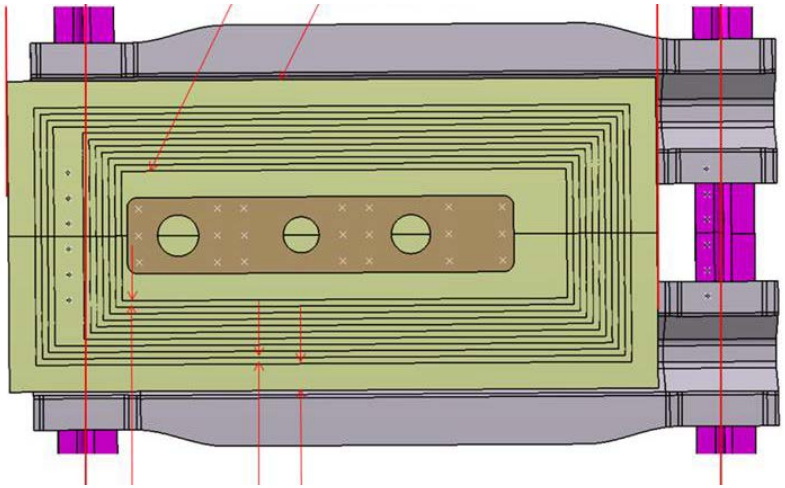


Fuselage Skin Reinforcement

787 production:
Skin reinforcement with 200:1 ramp ratio

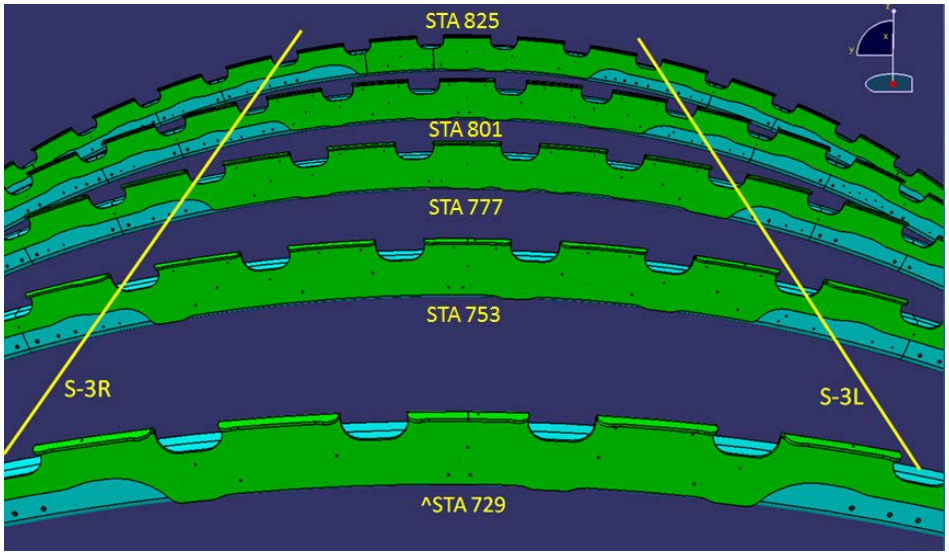


787 retrofit:
Skin reinforcement - 30:1 ramp ratio

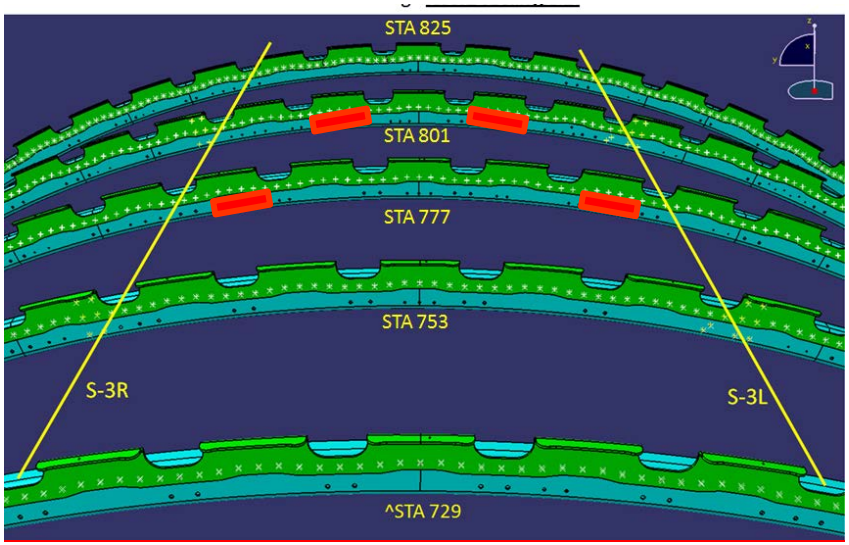


Fuselage Frame Reinforcement

787 production:
Full-depth frames

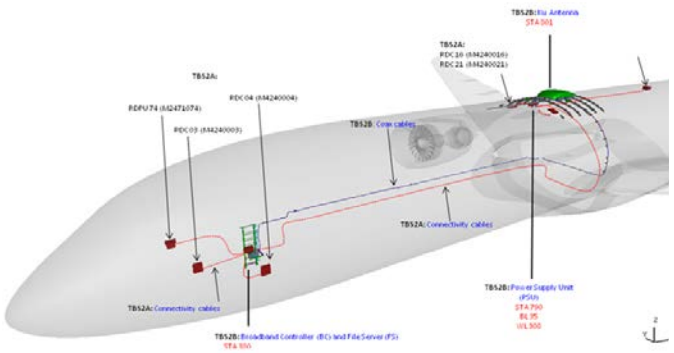


787 retrofit:
Local reinforcement at frame web

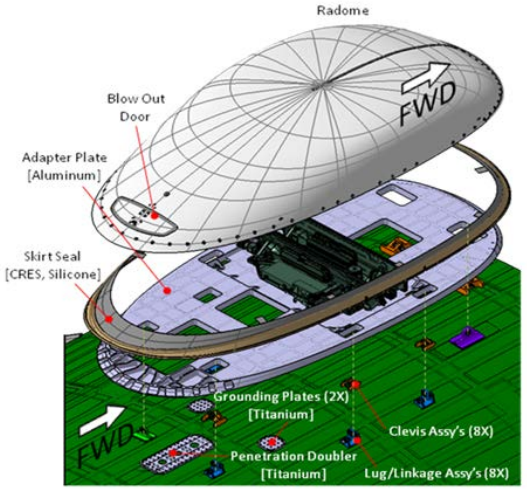


Design Aspects

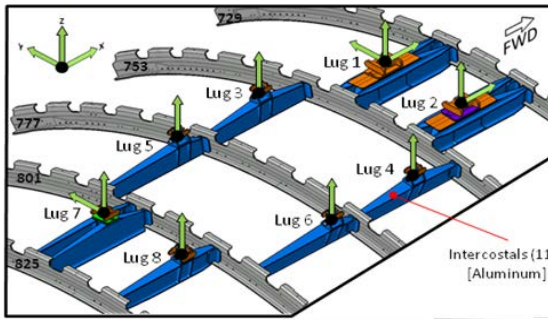
1. Radome and antenna is attached to and supported by an adaptor plate
2. The system is isolated from fuselage deflections by pivot links at discrete mounting points on airframe
3. The whole installation is supported by backup structures attached to reinforced airframe
4. Other electronic components are installed within fuselage



Broadband antenna



Structures above OML



Structures below IML

Bird Strike

To meet bird strike related requirements, radome has been certified by test; bird strike loads have been developed with transient finite element method, and this load has been used to substantiate other structures.

Normally, there are two options to develop bird strike load with analytical method

Classic method: Dayton or Metcalf:

Advantage: simple hand calculation

Disadvantage: predict conservative result and result in heavy structures

Transient finite element method, such as LS-DYNA:

Advantage: greatly reduce conservatism in load prediction

Disadvantage: need to build complicated finite element model and the model needs to be validated (by test data)

Bird Strike Load Development

Comparison between test and LS-DYNA model