

Engineering Sketch Pad (ESP) Training

Session 7: Putting it All Together

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Revised for v1.09



Overview

- Multi-fidelity models
- Using UDCs to build aircraft components
- Assembling an aircraft
- Hand-on exercises
 - myGlider
 - myAircraft
- Course summary



Multi-fidelity Models

- During the design of an aircraft, various coupled models are needed
 - different disciplines
 - structures
 - controls
 - aerodynamics
 - ...
 - different fidelities
 - conceptual design
 - preliminary design
 - detailed design
- There needs to be communication between these models

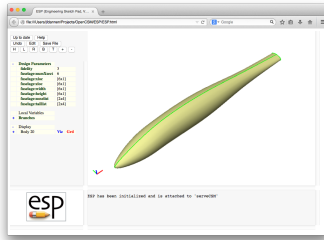


Using UDCs to Build Aircraft Components

- Build a UDC for each major component type
 - wing
 - also used for tail surfaces
 - fuselage
 - duct
 - might use 2 ducts for high-bypass engine
 - pylon
 - connects ducts and wing

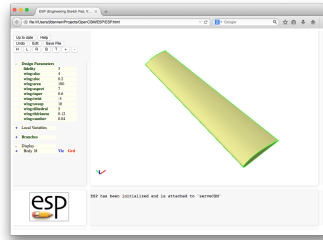
esp Aircraft UDCs

fidelity = 3



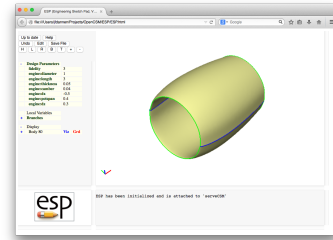
fuselage.udc

xloc (array)
zloc (array)
width (array)
height (array)
noselist (8×1)
taillist (8×1)



wing.udc

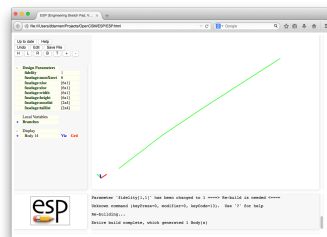
area
aspect
taper
twist
sweep
dihedral
thickness
camber



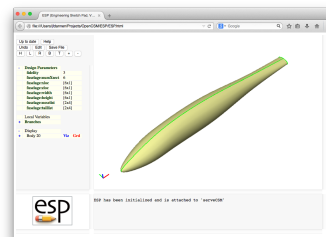
duct.udc

diameter
length
thickness
camber

esp Transport Fuselage at 2 Fidelities



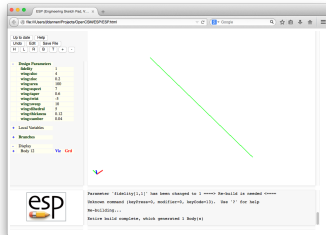
fidelity = 1



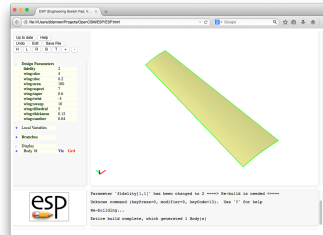
fidelity = 3



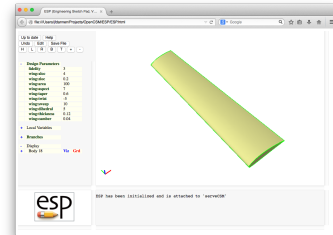
Wing at 3 Fidelities



fidelity = 1



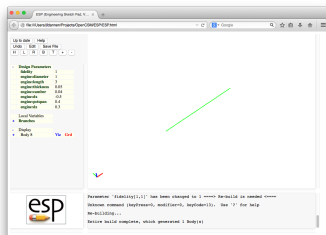
fidelity = 2



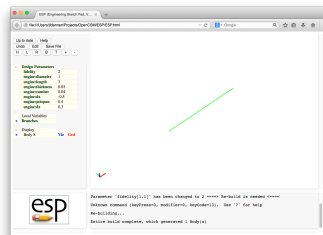
fidelity = 3



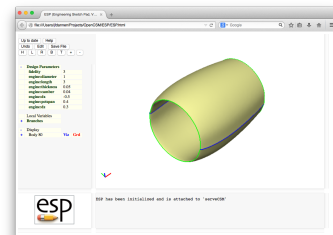
Duct at 3 Fidelities



fidelity = 1



fidelity = 2



fidelity = 3



Combine UDCs into Aircraft

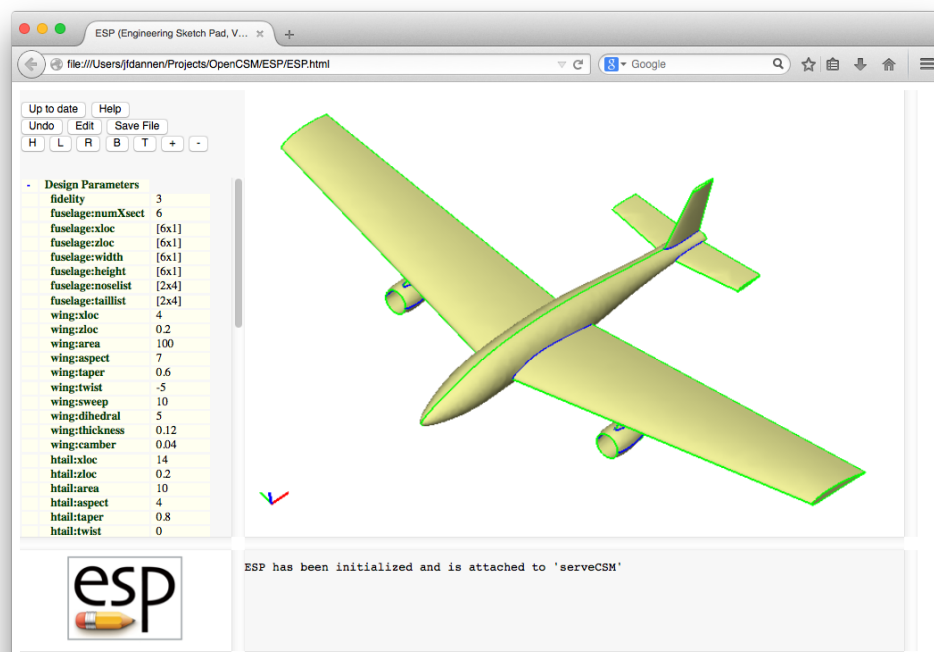
■ Majors steps:

- Set up global parameters
- Set up parameters for, and position of, each component
- Call each UDC (perhaps multiple times)
- If not first component
 - combine with previous components



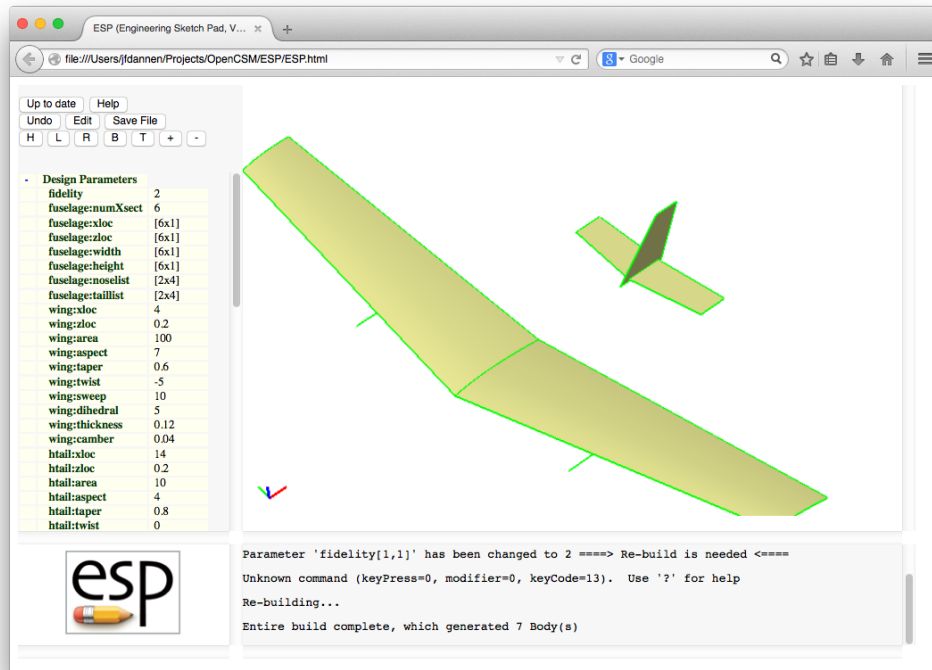
myPlane at fidelity=3

Outer-mold line for CFD

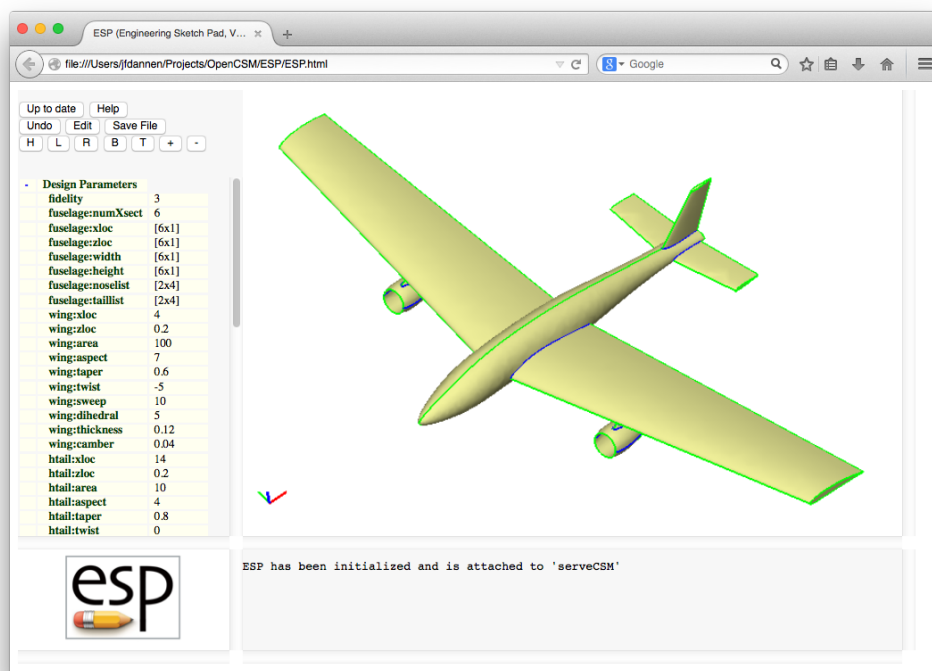




myPlane at fidelity=2



myPlane at fidelity=3





Hands-on Exercises

- Run data/CAPS/myPlane
 - vary Design Parameters
 - vary fidelity
- Add a tip-mounted pod
 - use fuselage.udc



Muddy Cards

- Questions / suggestions about multi-disciplinary models
- Questions / suggestions about multi-fidelity modes
- Overall effectiveness of course