

Computational Aircraft Prototype Syntheses



Training Session 4 Geometry Analysis Views ESP v1.26

Marshall Galbraith

galbramc@mit.edu

Massachusetts Institute of Technology

Bob Haimes

haimes@mit.edu

John F. Dannenhoffer, III

jfdannen@syr.edu

Syracuse University

- Multi-analysis Models
 - transport.csm Example
 - Geometric Analysis Views
 - Coupled Analysis View
- Suggested Exercises

Single-analysis Models

- Only single analysis geometric models considered so far:
f118-C.csm → masstranAIM
naca.csm → xfoilAIM
avlPlaneVanilla.csm → avlAIM
- Different parameterizations for each model

Multi-analysis Models

- Single model parameterizations for multi-analysis
avlAIM
transport.csm → fun3dAIM
nastranAIM
- Each analysis requires different geometric representation

ESP/fusePmtrs.udc

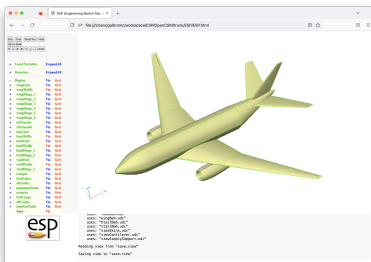
DESPMTR	fuse:fwdLength	28	# length of forward fuselage
DESPMTR	fuse:noseHeight	0	# zloc of center of nose

ESP/wingPmtrs.udc

DESPMTR	wing:area	4240	# area
DESPMTR	wing:aspect	9.00	# aspect ratio

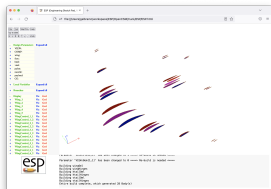
ESP/htailPmtrs.udc

DESPMTR	htail:vc	0.55	# htail volume coefficient
DESPMTR	htail:length	85	# distance between htail root and wing root

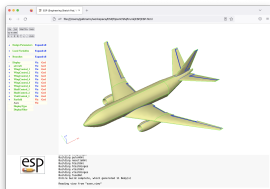


- Views construct analysis specific geometry
- Implemented as user-defined components (UDCs)
 - viewVlm.udc → avlAIM
 - transport.csm → viewCfdViscous.udc → fun3dAIM
 - viewCantilever.udc → nastranAIM
- View attributes geometry with suitable CAPS attributes

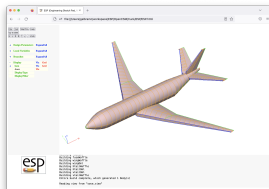
ESP/transport.csm



ESP/viewVlm.udc



ESP/viewCfdViscous.udc



ESP/viewCantilever.udc

- Switches for VIEWs (ESP/transport.csm)

```
# define the views
CFGPMTR  VIEW:Concept      1
CFGPMTR  VIEW:Vlm          0

CFGPMTR  VIEW:CfdInviscid   0
CFGPMTR  VIEW:CfdViscous    0
```

- Switches for COMPONENTs (ESP/transport_init.udc)

```
# make a list of the components
CFGPMTR  COMP:wing         1
CFGPMTR  COMP:fuse         1
CFGPMTR  COMP:htail        1
CFGPMTR  COMP:vtail        1
```

- Design Parameters: fusePmtrs.udc, wingPmtrs.udc...
- Compute derived quantities: fuseCalc.udc, wingCalc.udc...

Models

- Geometric models, created by combinations of primitives
 - wingVlm.udc – cross-sectional cuts
 - wingCfdInviscis.udc – outer mold line, deflected control surfaces
 - wingCfdViscous.udc – outer mold line, free-flying control surfaces
 - wingBem.udc – built-up element model, built by intersecting a waffle with OML
- Assign CAPS attributes using attribute “tags”

Primitives

- Lowest-level geometries
 - wingOml.udc – outer mold line
 - wingWaffle.udc – arrangement of spars and ribs
 - wingHinges.udc – location of hinge lines for control surfaces

- Coupled analysis requires multiple simultaneous analysis geometries
- Achieved with multiple active views

CFGPMTR VIEW:Cantilever 1



- Training UDC views are flexible, but not universal
 - Designed for ESP/transport.csm
- Views are a powerful method for organizing multi-analysis geometry
 - Views should be customized for projects
- More details about the transport.csm in ESP training

Transport Views

- Use the ESP GUI (not editor) with ESP/transport.csm to:
 - Toggle each view one at a time

transport Views

- Using the ESP GUI (not the editor), toggle the views:
VIEW:Concept 0
VIEW:SimplySupport 1
- Toggle the **Viz** for the Nodes to turn them on
- Use the ESP GUI DisplayFilter to inspect the attribute names:
 - capsGroup
 - capsConnect
 - capsConnectLink
 - capsLoad