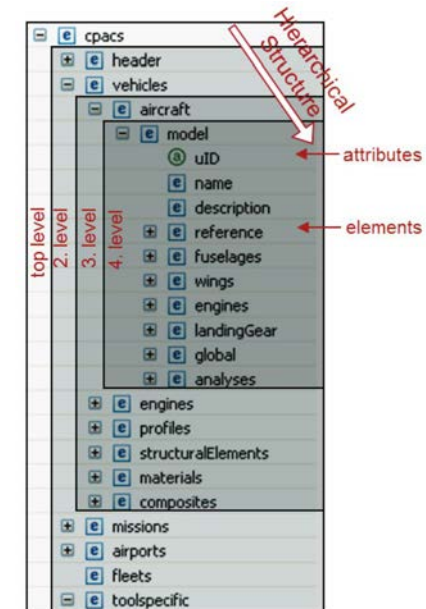
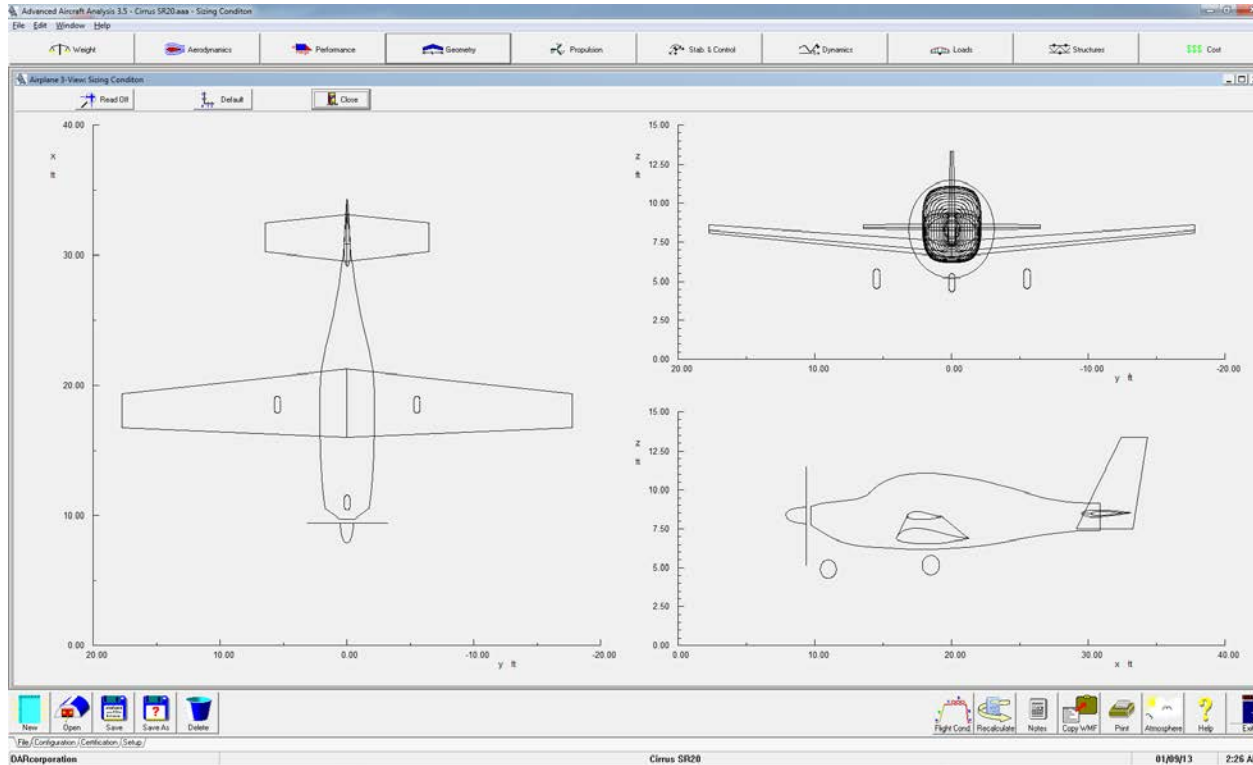


AAA and CPACS Coupling



Willem A.J. Anemaat
President DARcorporation

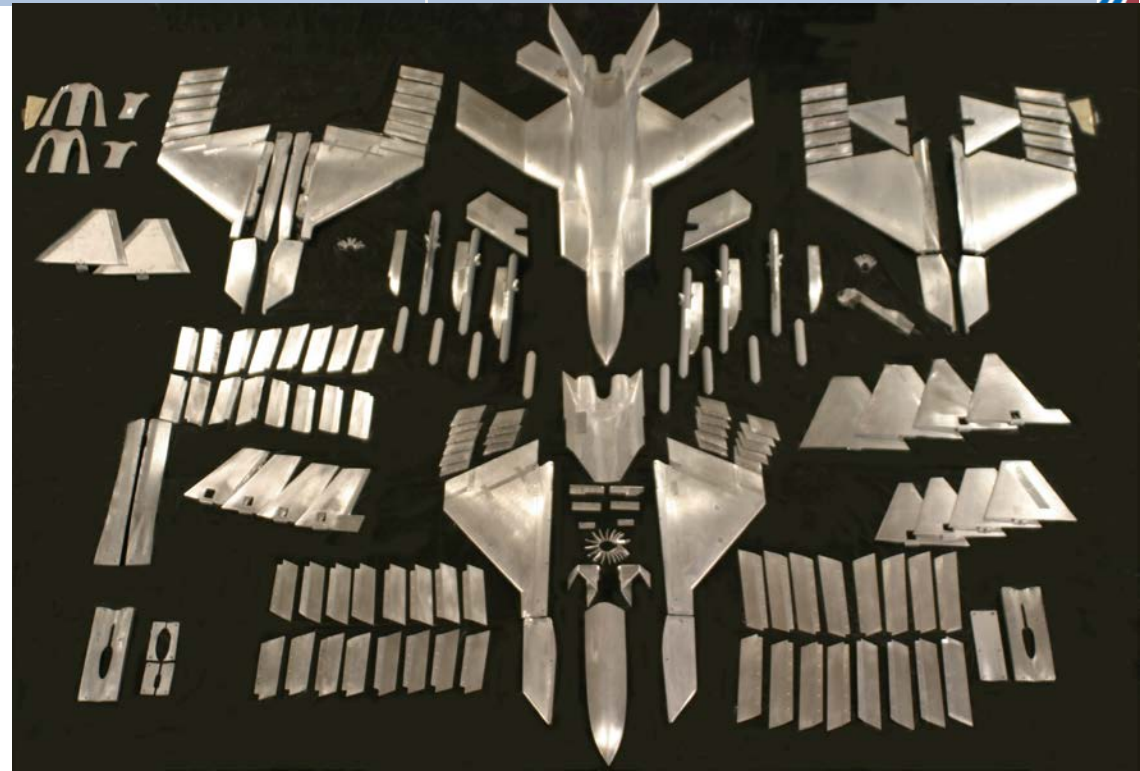
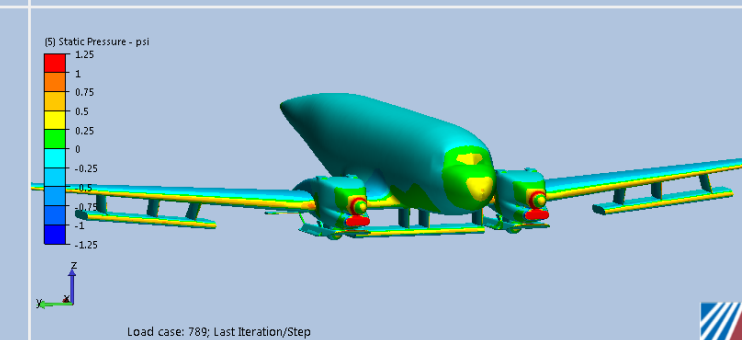
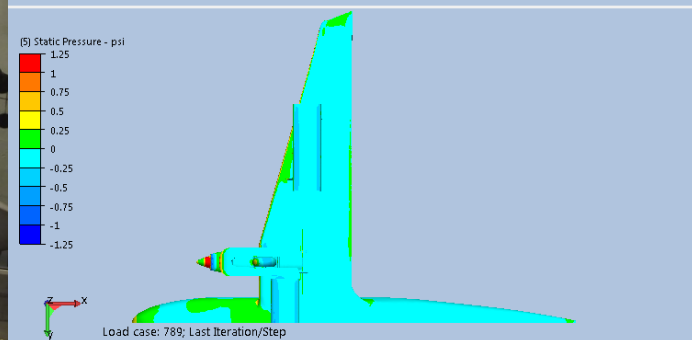
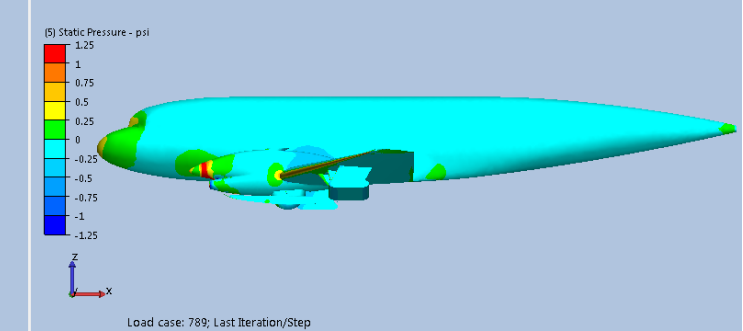
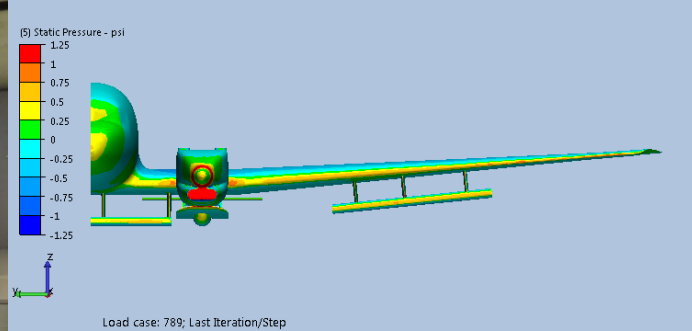


Background

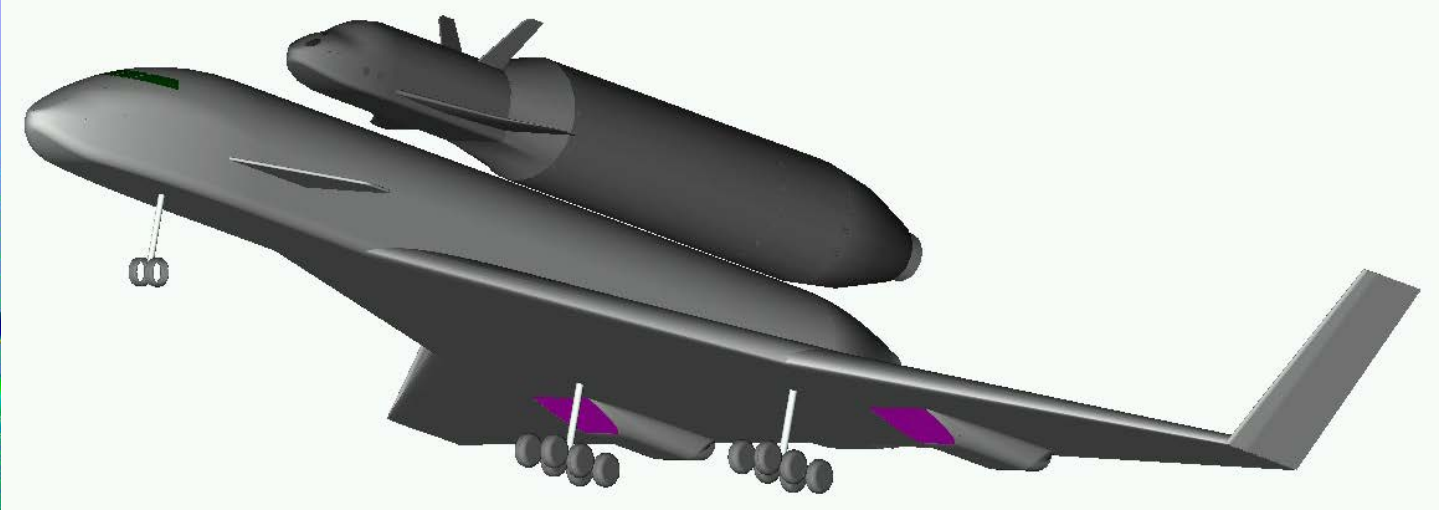
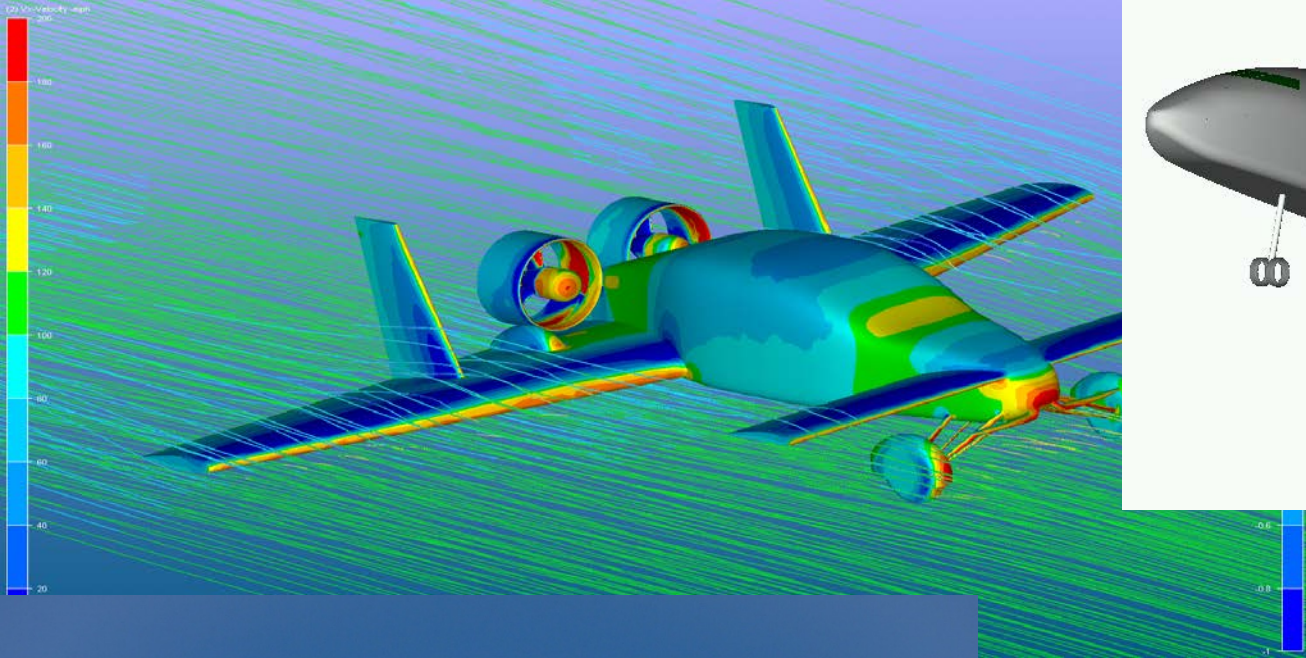
- DARcorporation Formed in 1991 by:
 - Dr. Jan Roskam
 - Dr. Willem A.J. Anemaat
- Mission:

*Integrated Aircraft and Wind Turbine Design,
Development and Engineering Consulting Services*

- Market, Support and Develop Airplane Design and Analysis Software
- Market and Distribute Airplane Design Books written by Jan Roskam
- Airplane Analysis and Design Consulting Services
- Wind Turbine Aerodynamic and Structural Design/Analysis
- Prototype Construction and Testing
- 10 People (9 engineers, 1 Marketing/Sales Manager)







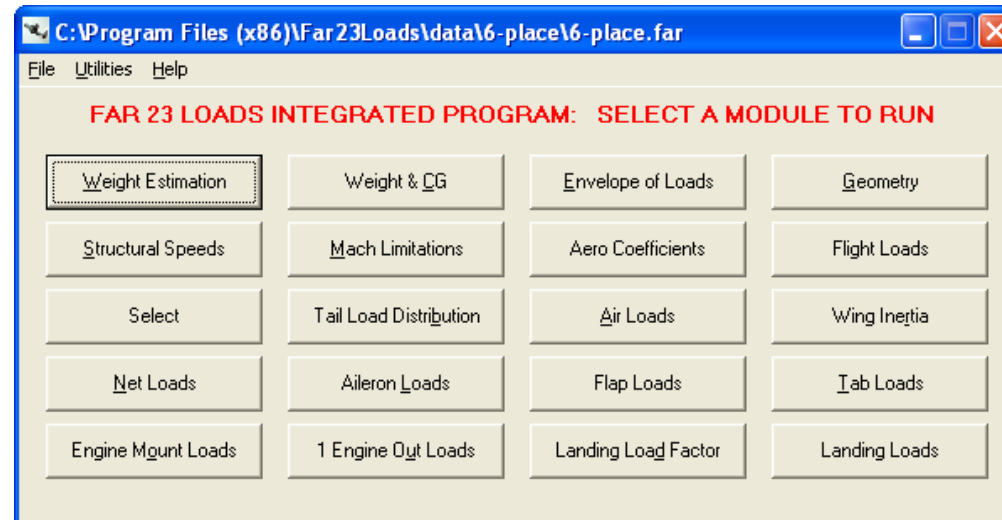
Prototyping and Manufacturing



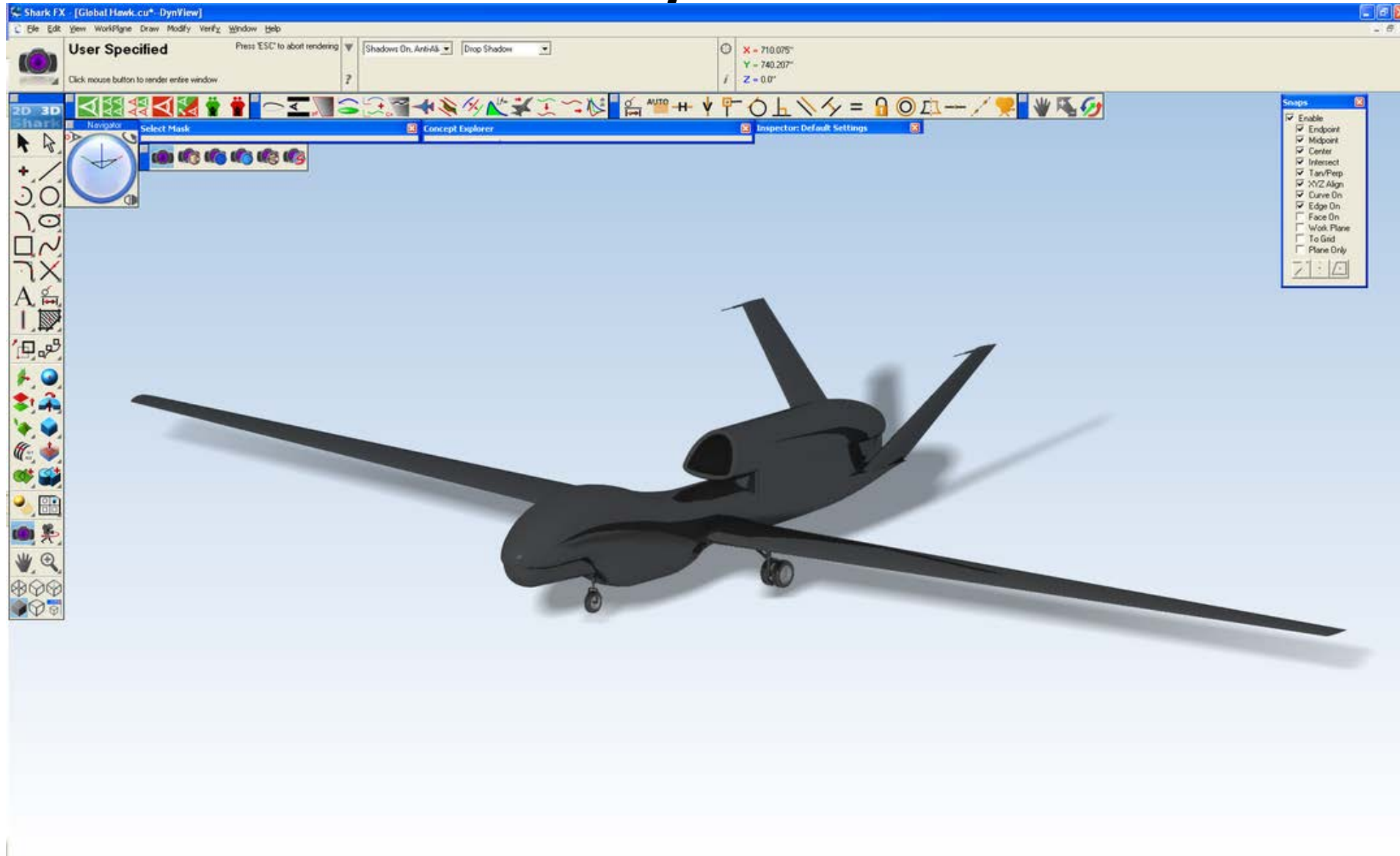
Software

FAR 23 LOADS

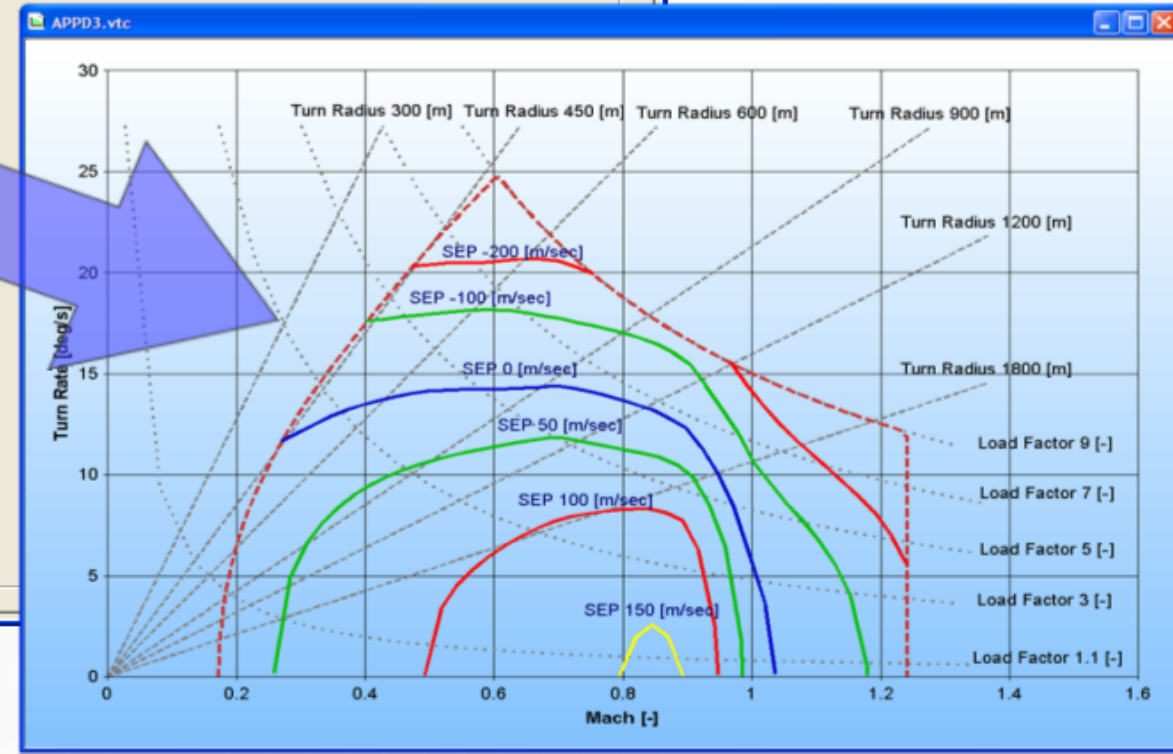
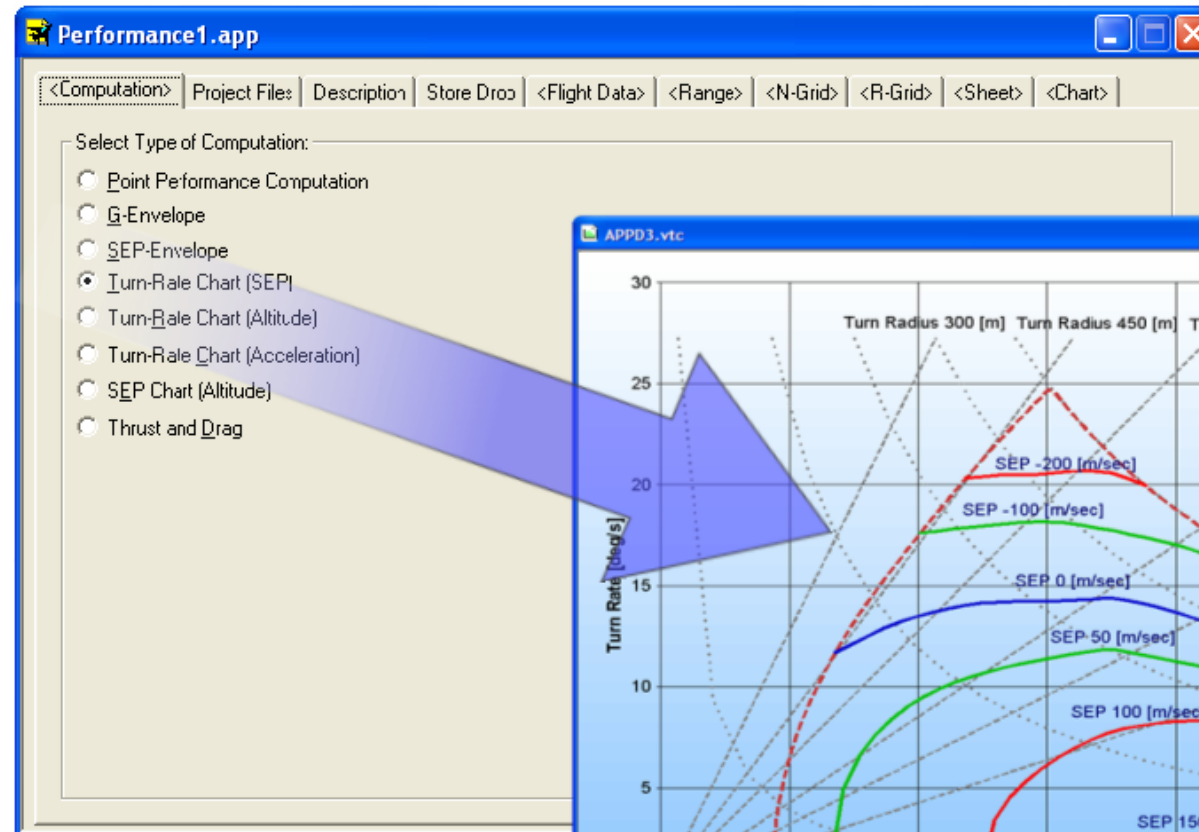
- Provides a procedure to calculate the loads on an airplane according to the Code of Federal Regulations, Title 14 – Aeronautics and Space, Chapter I – Federal Aviation Administration, Subchapter C – Aircraft, Part 23 – Airworthiness Standards, Normal, Utility, Acrobatic and Commuter Category Airplanes, Subpart C – Structures.
- Loads on the airplane are determined by the three view drawing, the chosen maximum take-off weight and the chosen category and load factor.



Shark/AeroPack



Airplane Performance Program (APP)



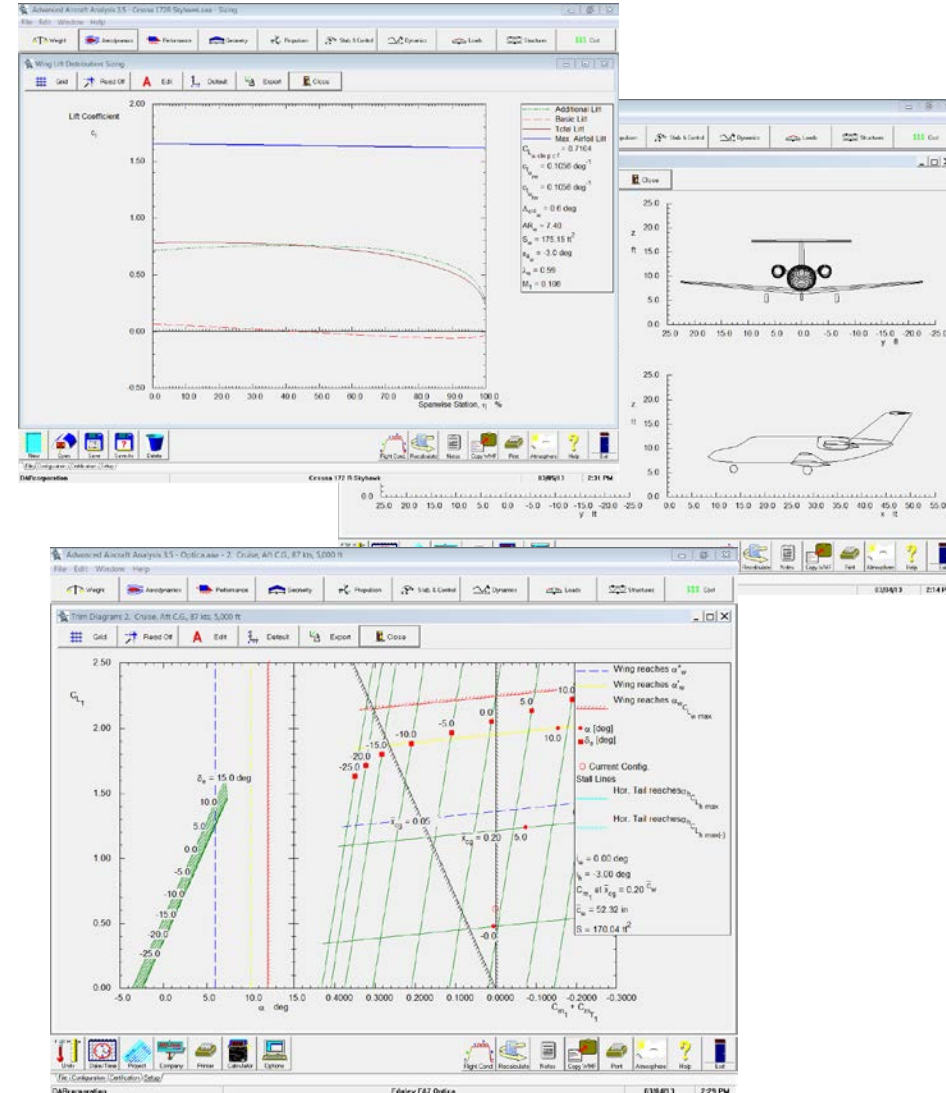
Advanced Aircraft Analysis (AAA)



AAA

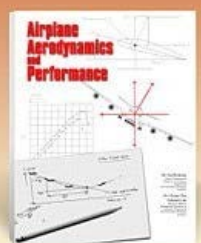
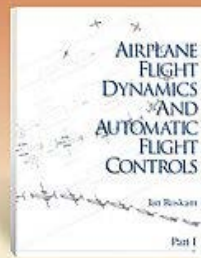
10 Independent modules for aircraft Design and Analysis:

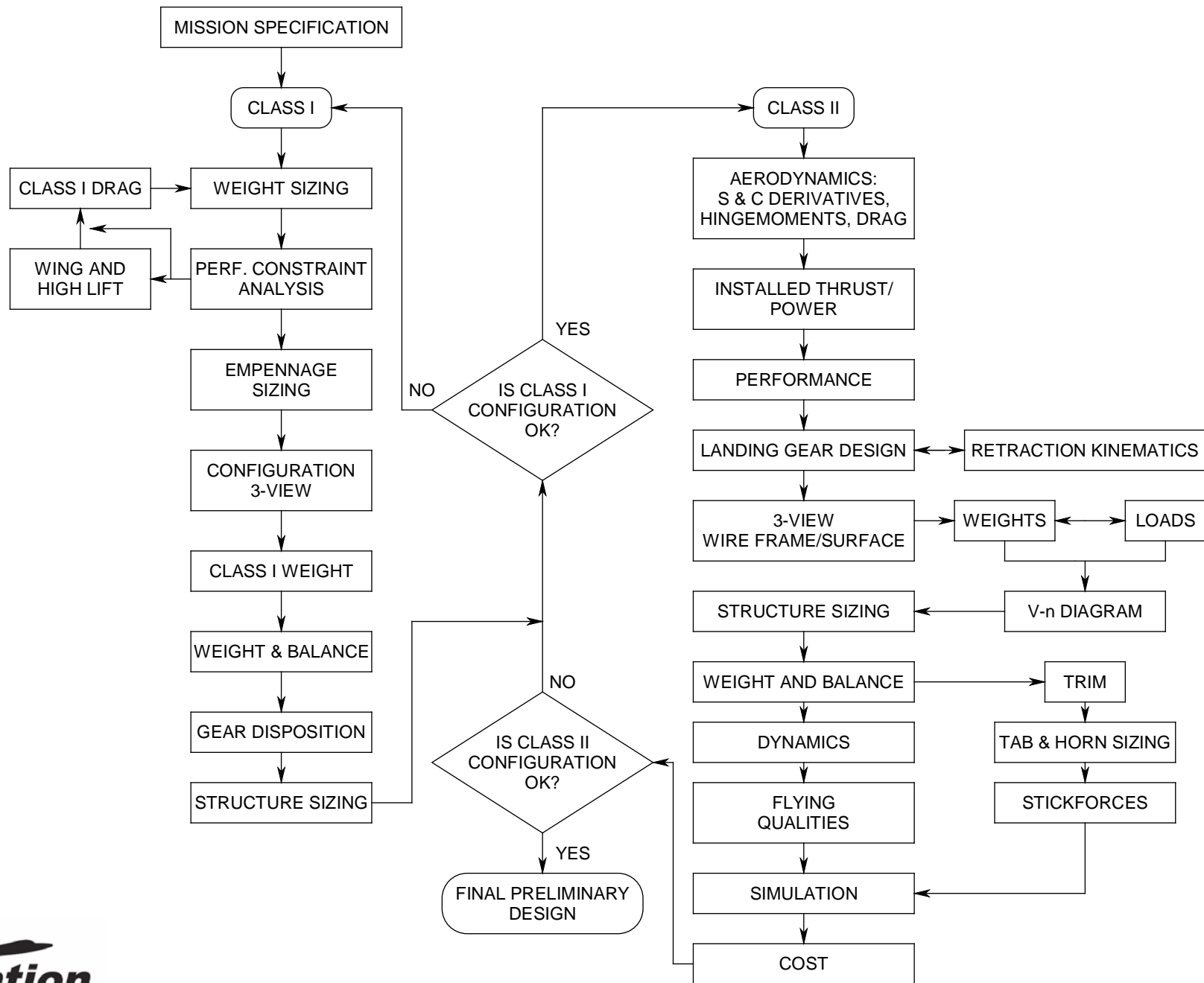
- Weight
- Aerodynamics, Performance,
- Geometry
- Propulsion
- Stability & Control
- Dynamics
- Loads
- Structure
- Cost

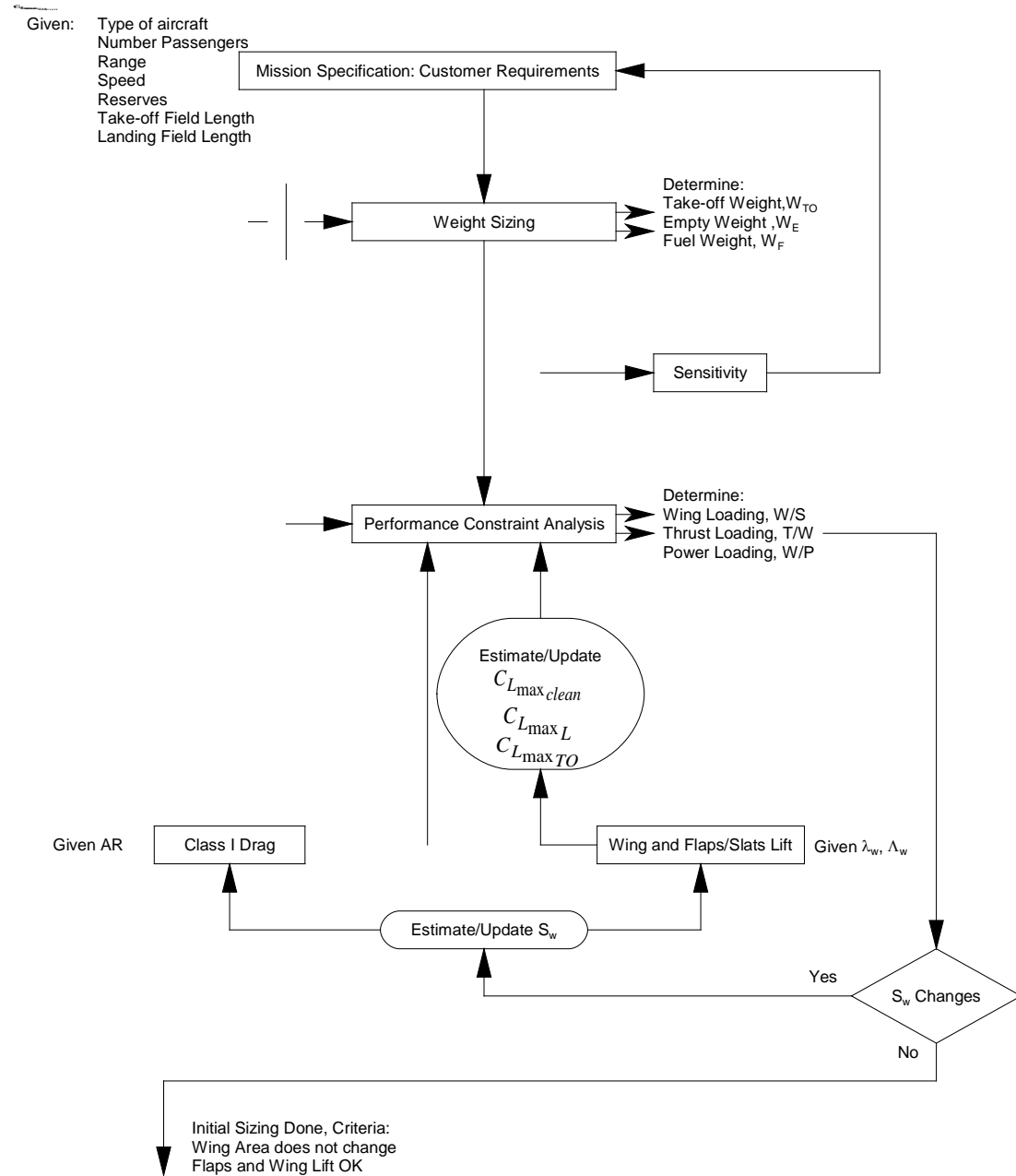


Advanced Aircraft Analysis (AAA)

- Aircraft Conceptual/Preliminary design software
- Methods defined in
 - Dr. Jan Roskam's 8 Part Design series
 - Airplane Flight Dynamics and Automatic Flight Controls, Parts I and II, by Dr. Jan Roskam
 - Airplane Aerodynamics and Performance, by Dr. C.T. Lan and Dr. Jan Roskam
 - Federal Aviation Regulations
 - DATCOM Methods
 - DAR Methods
- Fixed Wing: Tail Aft, Canard Only, Three Surface
- Military, Civil







AAA Data Organization

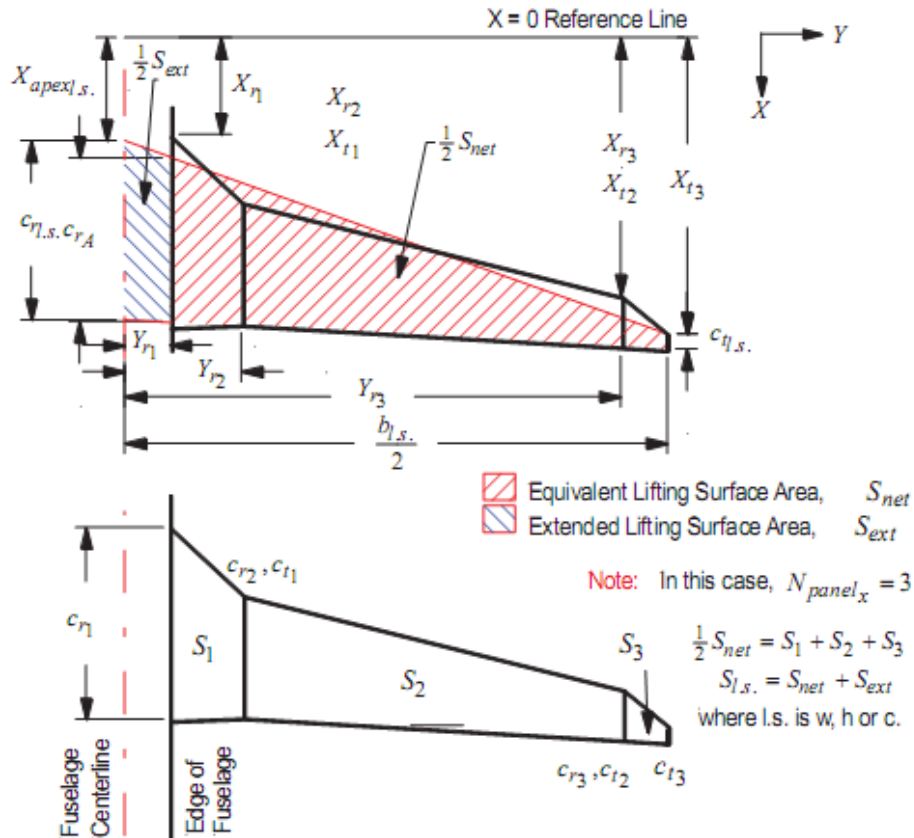
- DAR Proprietary Currently (Does not Need to Be)
- Borland Paradox Based (Data Tables, uses BDE)
- ASCII (.ini, 64k limit) File for Data Tracking
- Combined in Zip-file: AAA Project File
- Issues:
 - BDE will be Discontinued
 - BDE Causes Installation and Run-time Problems
 - Slow

AAA Data Organization Continued

- Approximately 5,000 Parameters
- Organized in two Groups:
 - Flight Condition Dependent
 - Flight Condition Independent
- User Defined Flight Conditions:
 - Up to 97 Conditions Now
 - Next Release: limited to hard-disk space
- Export/Import:
 - ASCII
 - Excell
 - Export to AeroPack: ASCII (ini) .geo file

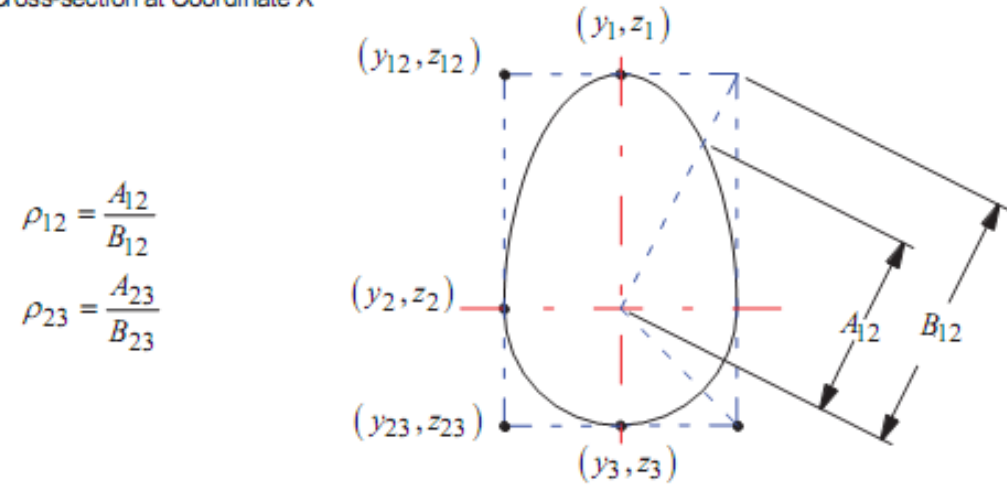
AAA Geometry Modeling

- **Lifting surfaces** defined by individual panels



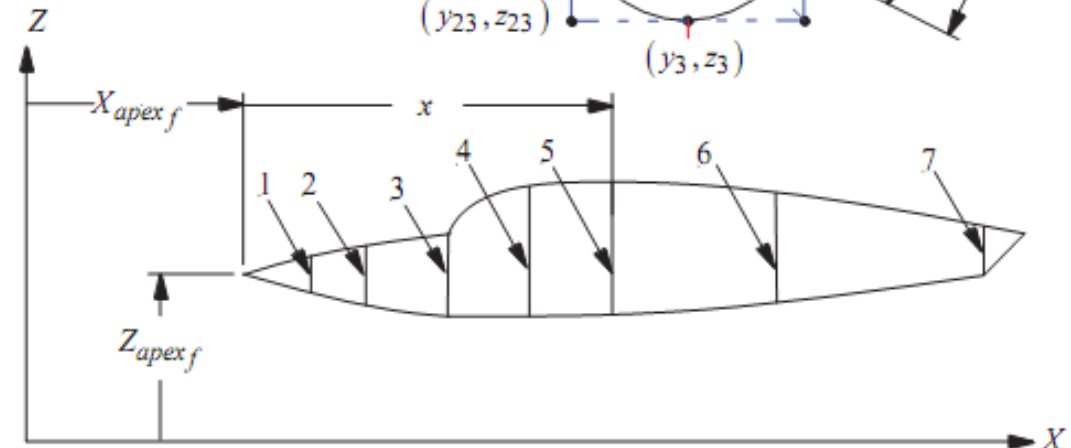
- **Bodies (Fuselage, Nacelle, Stores, Tailbooms, Floats)** modeled by series of cross sections defined by four conic sections

Cross-section at Coordinate X

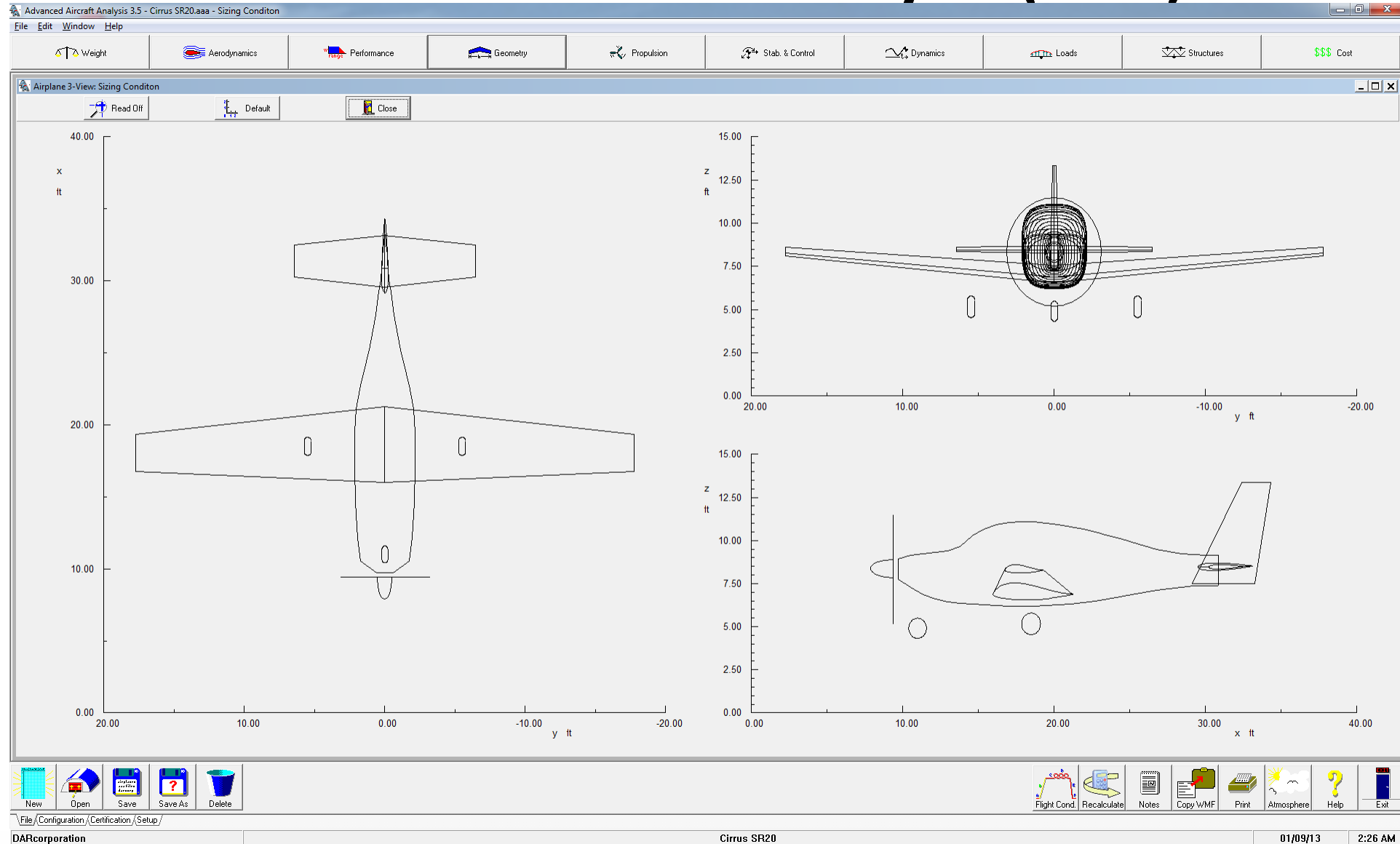


$$\rho_{12} = \frac{A_{12}}{B_{12}}$$

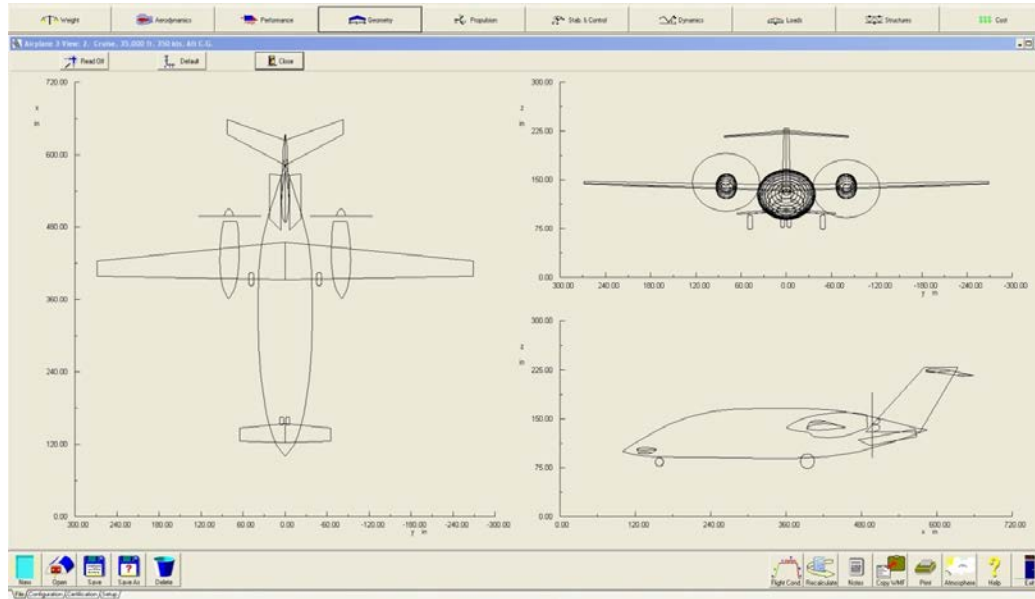
$$\rho_{23} = \frac{A_{23}}{B_{23}}$$



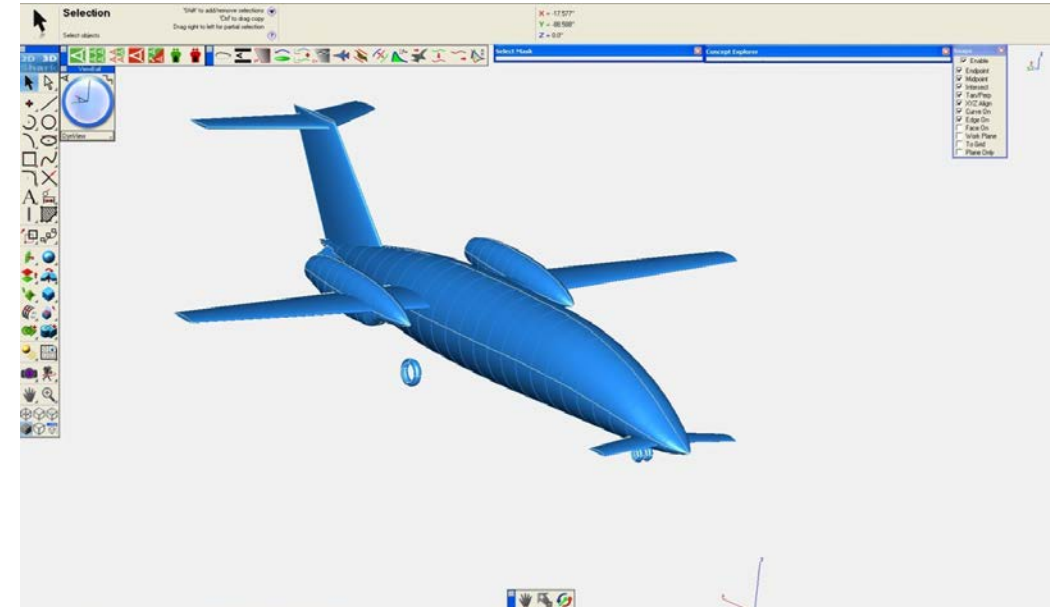
Advanced Aircraft Analysis (AAA)



Geometry Data Exchange



AAA geo Format Export



Shark/AeroPack geo Format Import

Initial Data Exchange Work with KTH

Collaborative Aircraft Design using AAA and CEASIOM Linked by CPACS Namespace

A. Rizzi, P. Meng

Royal Insititute of Technology, Sweden

B. Nagel, D. Boehnke

German Aerospace Center (DLR), Germany

W. A. J. Anemaat, J. Carroll

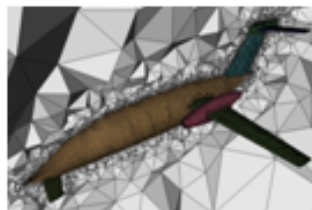
Design Analysis and Research Corporation, USA

Presented at **CEAS 2013 The International Conference of the European Aerospace Societies**

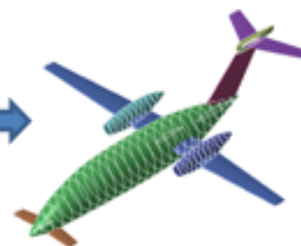
Non-Meshable /
AAA Analysis



Meshable /
Multi-Fi Analysis



CAD /
PLM



IGES

geo2cpacs

AAA *.geo

IGES

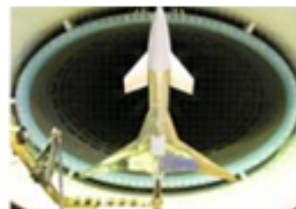
CPACS

Mesh
sumo, TetGen

Structures
NeoCASS

Flight Sim, S&C
SDSA

CFD
AMB, Edge



CPACS and AAA

- B. Nagel, D. Böhnke, V. Gollnick, P. Schmollgruber, A. Rizzi, G. La Rocca, J.J. Alonso, *Communication in Aircraft Design: Can we establish a Common Language?*, 28th International Congress of the Aeronautical Sciences, Brisbane, Australia, 2012.
- Intern from Germany, Ms. Stine Bubner (3 months in Spring 2014)
- Supervised by Erwin Moerland of DLR

CPACS and AAA

- 110 Pages of Mapping Information
- DAR Memo 996: Export AAA - CPACS (5)
- DAR Memo 997: Geometry Information Conversion from AAA to CPACS (58)
- DAR Memo 998: Weight Information Conversion from AAA to CPACS (17)
- DAR Memo 999: CPACS Aerodynamics Information (5)
- DAR Memo 1000: CPACS Loads Information (8)
- DAR Memo 1001: CPACS Systems Information (7)
- DAR Memo 1002: Propulsion Information Conversion from AAA to CPACS (10)

Status

- AAA Variable Mapping to CPACS Definition: Finished
 - AAA CPACS Geometry Implementation will start in Spring 2015
 - Release 2016 as AAA 4.0 (or 4.1)
 - After Geometry Investigate Weight and Aerodynamics
-
- Parallel Development: Smart Aircraft Modeler (SAM), CPACS for Geometry (2 Year Development)

Thank You

Questions?



Airplane Design: Mistakes Made and Lessons Learned

AEROSPACE
SHORT COURSES

Live Webinar
11 a.m. CST, December 9, 2014
Willem A.J. Anemaat

DATE:	Tuesday, December 9, 2014
DURATION:	One hour (45 minute presentation, 15 minute Q&A)
TIME:	9:00 a.m. Pacific/Mountain time (PST/MST) 10:00 a.m. Mountain time (MST) 11:00 a.m. Central time (CST) 12:00 p.m. Eastern time (EST)