Check-list to perform the Reverse Engineering

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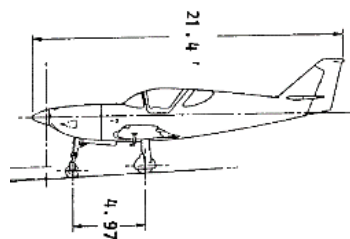
1. Gather information
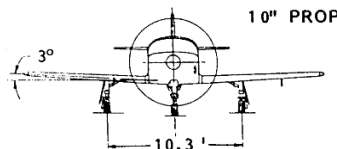
1. 3-View drawings
2. Website of the manufacturer
3. Flight manual
4. Flight test reports
5. TCD (Type Certificate Datasheet) :
    a. https://www.easa.europa.eu/document-library/type-certificates
    b. https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgMakeModel.nsf/MainFrame?OpenFrameset
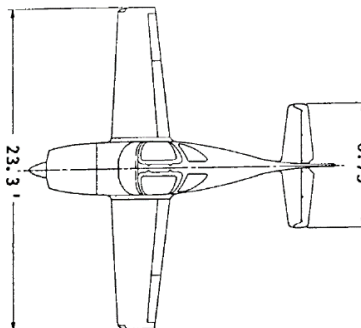
2. Extract from the 3-View drawing :

1. The side view (left)

2. The front view

3. The top view

Rotate if necessary (Paint)

3. Measure from the drawing

1. The length of the fuselage
2. The height of the fuselage
3. The width of the fuselage

4. Create a new dataset and generate the 3D-Model

➔ Airplane/New Airplane

5. Update the shape of the fuselage (Longitudinal Control Lines)

1. **Fuselages/#1/Geometry/Longitudinal Control Lines** < Edit LCLs >
2. Load the background image (Side View)
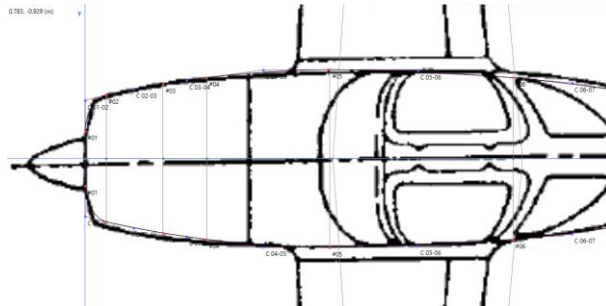   ➔ **Side Background** : Load
3. Resize and move the background image
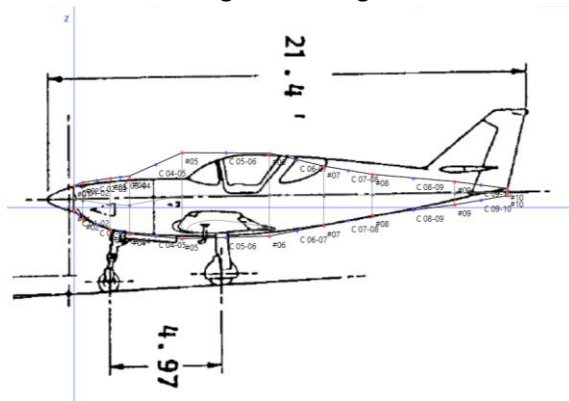
4. Adjust the shape of the fuselage by moving the control points (red & blue)
5. Update the X-Z position of the different components (cf. red lines)
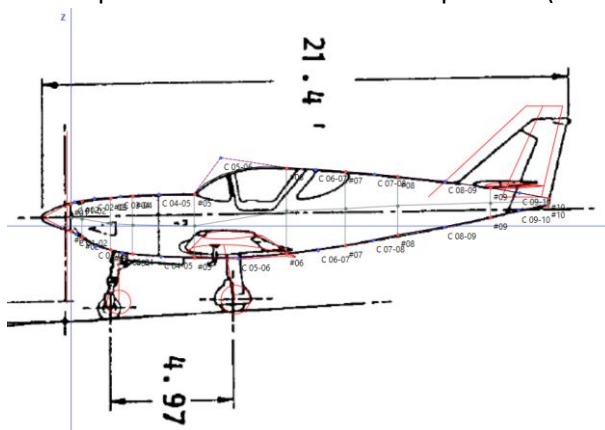
   ➔ **Wings/# 1** : Incidence
   ➔ **Vertical Tails/# 1** : X, Z
   ➔ **Vertical Tails /# 1/Sections/# 1** : Airfoil (cf. https://m-selig.ae.illinois.edu/ads/aircraft.html)
   ➔ **Vertical Tails/# 1/Sections/#1** : Chord,
   ➔ **Vertical Tails/# 1/Sections/#2** : Airfoil, Chord, X, Z
   Check tail area ➔ **Vertical Tails /#1** < Compute Area >
   ➔ **Vertical Tails/# 1/Rudders/# 1** : Relative Chord (i), Relative Chord (o), Position
   ➔ **Landing Gear/Main/Struts/# 1** : Mounted on, Position – Airplane Side X, Position – Wheel Side X, Z
   ➔ **Landing Gear/Main/Struts/# 1/Wheels/# 1** : Tire
   ➔ **Landing Gear/Auxiliary/Struts/# 1** : Position – Airplane Side X, Position – Wheel Side X, Z
   ➔ **Landing Gear/ Auxiliary /Struts/# 1/Wheels/# 1** : Tire
   ➔ **Engines/# 1/Propellers/# 1** : Spinner Diameter, Length
   ➔ **Engines/# 1** : X, Z

6. Load the background image (Top View)
    → **Top Background** : Load

7. Resize and move the background image

8. Adjust the shape of the fuselage by moving the control points (red & blue)
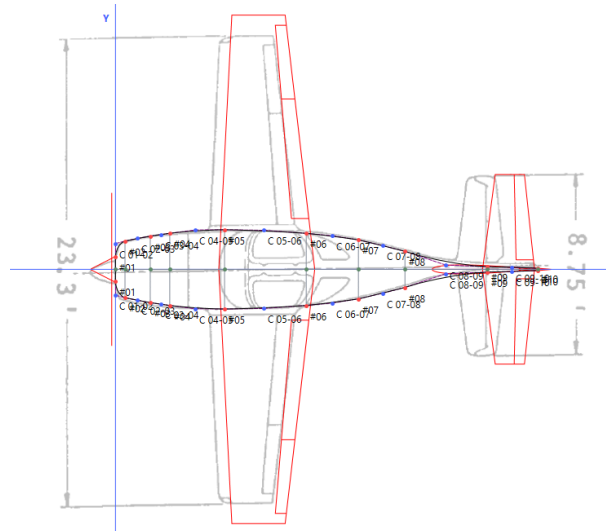9. Update the X-position of the different components (cf. red lines)

→ **Wings/# 1** : X
→ **Wings/# 1/Sections/#1** : Airfoil, Chord
→ **Wings/# 1/Sections/#2** : Airfoil, Chord, X, Y
Check wing area → **Wings/#1** < Compute Area >
→ **Wings/# 1/Control Surfaces/Ailerons/# 1** : Relative Chord (i), Relative Chord (o), Position inboard, Position outboard
→ **Wings/# 1/High Lift Devices/Flaps/# 1** : Relative Chord (i), Relative Chord (o), Position inboard, Position outboard
→ **Wings/# 1/High Lift Devices/Settings/# 1 Cruise** : Flaps, Maximum Speed
→ **Wings/# 1/High Lift Devices/Settings/# 2 Takeoff** : Flaps, Maximum Speed
→ **Wings/# 1/High Lift Devices/Settings/# 3 Landing** : Flaps, Maximum Speed
→ **Horizontal Tails/# 1** : X
→ **Horizontal Tails/# 1/Sections/#1** : Airfoil, Chord
→ **Horizontal Tails/# 1/Sections/#2** : Airfoil, Chord, X, Y
Check tail area → **Horizontal Tails /#1** < Compute Area >
→ **Horizontal Tails/# 1/Elevators/# 1** : Relative Chord (i), Relative Chord (o), Position inboard, Position outboard

6. Update the shape of the fuselage (Control Stations)

➔ **Fuselages/#1/Geometry/Control Stations**

1. Select the largest control station (#6)
   ➔ **Fuselages/#1/Geometry/Control Stations/# 6** < Edit Shape >
2. Load the background image (Front View)
   ➔ **Background** : Load
   ➔ Resize and move the background image
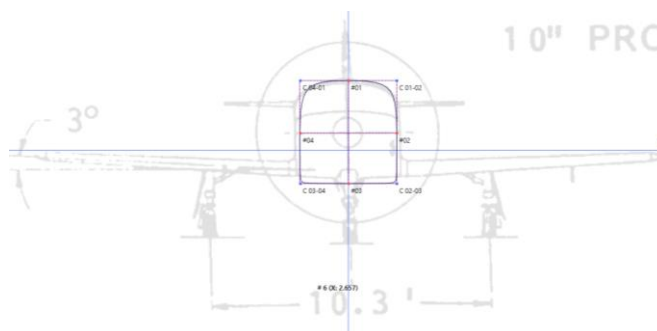
3. Adjust the shape of the section by changing the CSP (Conic Shape Parameter) of the conics C 01-02 & C 02-03
   ➔ **Fuselages/# 1/Geometry/Control Stations/# 6/C 01-02** : CSP
   ➔ **Fuselages/# 1/Geometry/Control Stations/# 6/C 02-03** : CSP
4. Extend the modification to other sections
   ➔ **Fuselages/# 1/Geometry/Control Stations/# 6** < Force all Sections to have the Shape of the Current One >
5. Update the Y-Z position of the different components (cf. red lines)
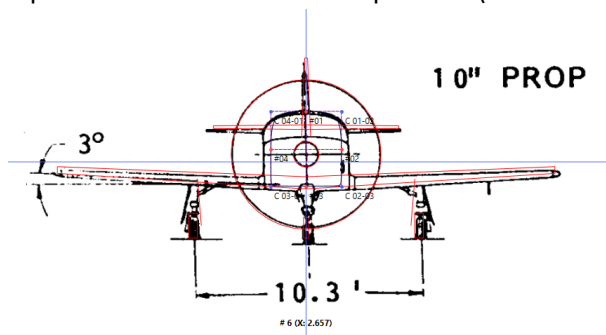
   ➔ **Wings/# 1** : Z
   ➔ **Wings/# 1/Sections/#2** : Z
   ➔ **Horizontal Tails/# 1** : Z
   ➔ **Horizontal Tails/# 1/Sections/#2** : Z
   ➔ **Engines/# 1/Propellers/# 1** : Diameter
   ➔ **Landing Gear/Main/Struts/# 1** : Mounted on, Position – Airplane Side Y, Position – Wheel Side Y

7. Update the powerplant:

➔ **Engines/# 1** : Model
➔ **Engines/# 1/Propellers/# 1** : Type, Number of blades

8. Update the systems

➔ Select the systems to analyze
➔ **Systems/Fuel** : Capacity (Maximum) Standard

9. Update weight and loading

➔ **Weight & Loading** : MEW, MLW, MTOW, Fuel, Payload

10. Update performance

➔ Select the performance to analyze
➔ **Performance/Stall/# 1** : Altitude, CG Position, Weight, Flight Speed
➔ **Performance/Stall/# 2** : Altitude, CG Position, Weight, Flight Speed
➔ **Performance/Cruise/# 1** : Altitude, CG Position, Weight, Flight Speed, Range, Power Setting
➔ **Performance/Takeoff/# 1** : CG Position, Flap Deflection, Weight, Headwind Speed, Load Factor, Rotation Speed, Takeoff Run, Takeoff to 15m, Runway altitude, Runway Slope, Runway Surface
➔ **Performance/Landing/# 1** : Has Brakes ON, CG Position, Flap Deflection, Weight, Headwind Speed, Landing from 15m, Landing Run, Load Factor, Touch-Down Speed, Runway altitude, Runway Slope, Runway Surface
➔ **Performance/Maximum Rate of Climb** : Altitude, CG Position, Weight, Flight Speed, Rate of Climb

11. Update the cost

➔ **Cost**: Price

12. Update processing

➔ **Processing**: Mass Equation