

Objective:

- Design and fabricate a complex shape that meets given design targets.
- Analyze the volume of the complex shape vs. the surface area given the relative magnitude of the object's vertical dimension (height).

**Product Delivery:**

27 May (Periods 1-3-5), 28 May (Periods 4-6)

Grading (32 maximum points, graded against Activity, Homework, and Assessment)

29-31: Model within design values, delivered on time, consistent with 2-D sketch, accurate scale factor, predicted actual cord lengths, similar to actual shape, leading edge, trailing edge, and top surface curved, volume vs. surface area analyzed.

26 - 28: Model within design values, delivered on time, consistent with 2-D sketch, accurate scale factor, predicted actual cord lengths, similar to actual shape, leading, trailing edge, and top surface curved.

23 - 25: Model within design values, delivered on time, consistent with 2-D sketch, similar to actual shape, accurate scale factor, predicted actual cord lengths.

**Incremental Deliverables**

- Spreadsheet - Design Target: 13 May (1-3-5), 14 May (4-6)
- Scale Model 2-D sketch: 18 May (1-3-5), 19 May (4-6)
- Scale factor and predicted cord calculations for actual aircraft: 20 May (1-3-5), 21 May (4-6)
- Scale Model Delivery & surface area vs. volume analysis

Materials

- Either balsa wood or plywood (no more than 0.25" thickness (0.64cm). Balsa wood is cheaper and easier to cut and sand.
- sandpaper (hand sander would be better if you use hardwood)

Tasks

- Receive design point (04-05May)
- Create Design Point Spreadsheet, and iterate(guess) until you 'hit' your desired values. Need to see at least 10 iterations in your spreadsheet. Measurements should be metric (centimeters)
- **Span must be less than 28 cm** (landscape width of an 8 ½ by 11 sheet of paper)
- When you 'hit' your values, highlight that row in your spreadsheet (use a contrasting color).
- Mr. Ford will provide you the actual aircraft from which your values come, and you acquire a photo of that aircraft to help you create a sketch that meets your values and looks like the real thing, as well as research the actual wingspan to determine your scale factor
- Calculate the cord lengths of the actual wing based on your scale factor (assuming similarity)
- Create a 2-D sketch (drawing) of your scale model using the values you generated. *Use the sketching tools in your document application.*
- Use the sketch as the template for fabricating your model from either balsa or hardwood.
- Calculate the volume of your scale model, and analyze the volume to the surface area, focusing on the relatively small vertical dimension (height), and how that affects the volume vs. the area.

Expectations

Analysis/descriptions shall be typed, 12 pitch, double-spaced, Times New Roman font. All submitted filenames shall begin with your period number, followed by your last name, first initial-title, e.g.: 3FordP-Design Spreadsheet.xlsx (.xlsx if Excel)