**Boll Aero Analysis**

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**An Informal Project Report Prepared for:**

**MechEng 270**

**Computer Aided Engineering Laboratory**

**College of Engineering and Applied Science**

**University of Wisconsin—Milwaukee**

**May 8, 2025**

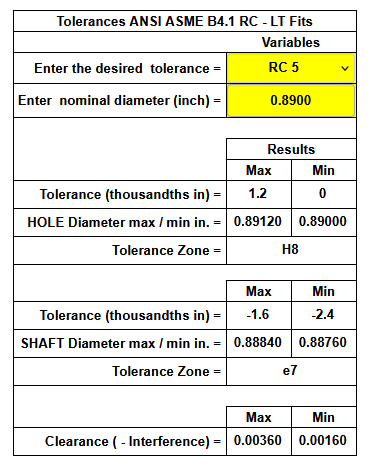
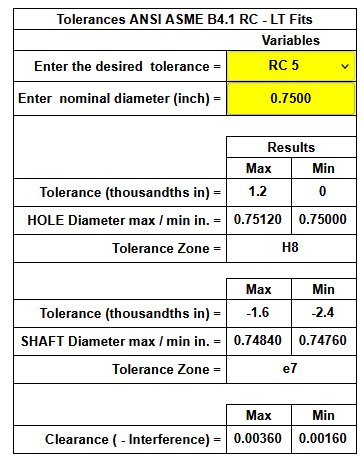
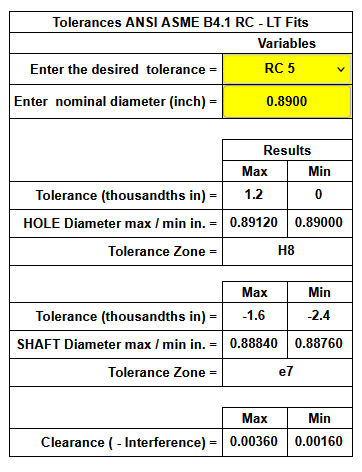
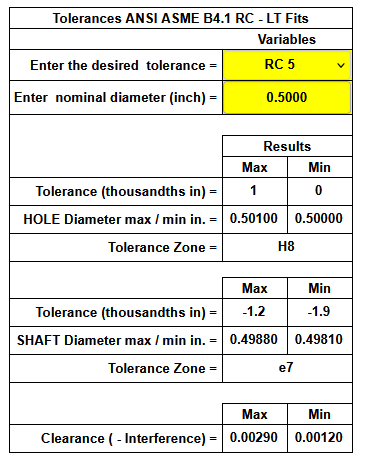
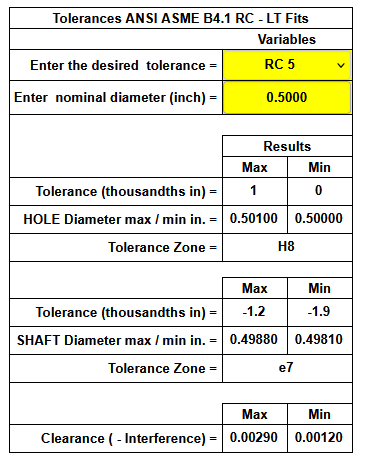
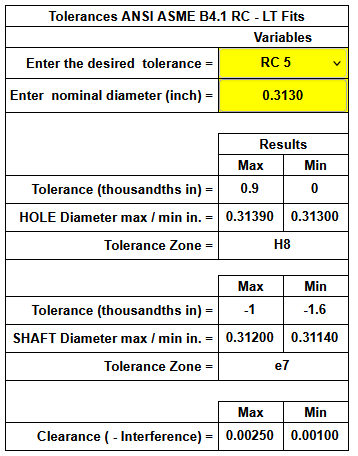
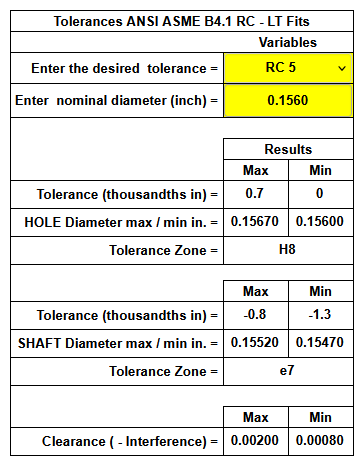
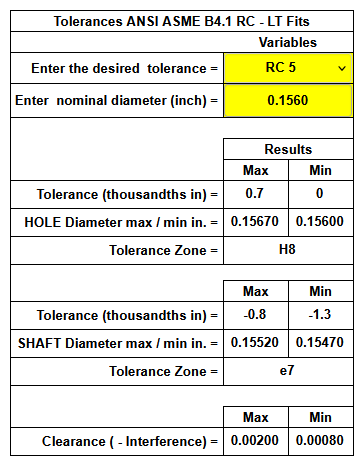
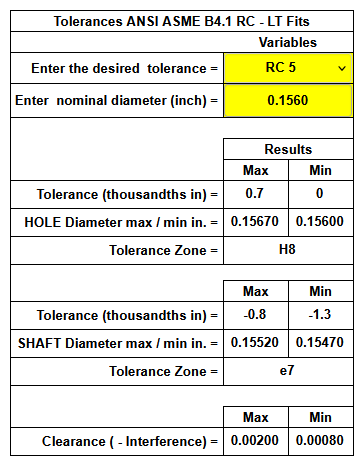
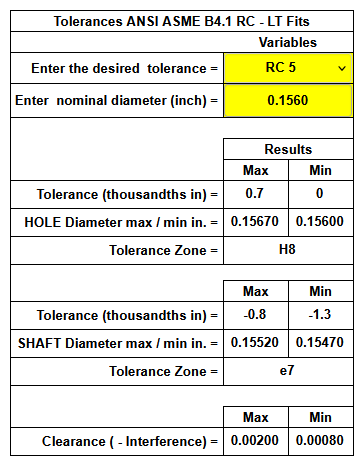
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**I. Project Description**

This project analyzes the Boll Aero toy airplane engine. A CAD model was created in CREO. The model was analyzed for tolerances, geometric tolerances, and the maximum load on the conrod during one rotation at 2400 RPM.

**II. Analyses Performed**

1. Tolerancing
   1. Crankcase and back plate
   2. Crankcase and cylinder 
   3. Crankcase and main bearing 
   4. Cylinder and piston 
   5. Cylinder and contra piston 
   6. Main bearing and crank shaft
   7. Piston and gudgeon pin 
   8. Conrod and gudgeon pin 
   9. Crankshaft and crank pin 
   10. Conrod and crank pin 
2. Geometric Tolerancing
   1. The tolerancing for the crankcase has Surface A set to flatness within 0.002 in., Hole B set to perpendicularity with A within 0.002 in., and Hole C set to perpendicularity with A within 0.002 in.
   2. The tolerancing for the backplate has Surface D set to flatness within 0.002 in., and Hole Set E set to perpendicularity with D within 0.002 in.
   3. The tolerancing for the main bearing has Surface F set to flatness within 0.002 in., and Hole Set G set to perpendicularity with F within 0.002 in.
   4. The tolerancing for the cylinder head has Surface H set to flatness within 0.002 in., and Hole Set I set to perpendicularity with H within 0.002 in.
3. Dynamic Analysis

A dynamic analysis was performed on the machine. The crankshaft was driven by a servo motor at 2400 RPM = 14400 deg/s. The graphs for the maximum radial force at the top and bottom connections of the conrod are shown below.

A graph of a measurement

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**Figure 1**: Radial Force for the Top of the Conrod

A graph of a measurement

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**Figure 2**: Radial Force for the Bottom of the Conrod

Per the graphs, the maximum force on the conrod occurred at the bottom at 0.045 s and was 60 lbf.

**III. Appendices**

Appendix A: Updated Drawings with Geometric Tolerancing

A blueprint of a mechanical design

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**Figure 3**: Crankcase Drawing

A screenshot of a computer program

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**Figure 4**: Backplate

A blueprint of a machine

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**Figure 5**: Main Bearing Housing

A blueprint of a mechanical design

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**Figure 6**: Cylinder Head