Torque and Tension Project

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Boeing

- Founded by William E. Boeing in 1914
- The 747 fleet has logged more than 42 billion nautical miles (77.8 billion kilometers), equivalent to 101,500 trips from the Earth to the moon and back
- On average, make 42 planes a month
- A 747-400 has six million parts, half of which are fasteners
Plan

• Examine related specifications. Review materials (allow, lubrication, etc.) and test equipment.

• Understand the role of lubricants used in aerospace bolt (removable) applications.

• Determine the torque/tension relationship of several lubricants.

• Compare experimental data with test machine data.
Team Jobs

Torquer
- Measures torque
- Measures tension

Lubricator
- Puts together components
- Puts lubricant

Wrencher
- Holds wrench
- Removes bolts

Cleaner
- Cleans surface
- Cleans bolt

Recorder
- Records data
- Analyzes data
Steel bolt, silver plated steel nut, no lubricant

\[ K = 24.77 \]
Steel bolt, molybdenum disulfide steel, no lubricant

K = 17.55
Steel bolt, silver plated steel nut, aeroshell grease (lubricant)

Torque (lb f/in) vs. Tension (lbs)

K = 31.23
Steel bolt, silver plated steel nut, Cor-Ban 027L (lubricant)

\[ K = 22.55 \]
Steel bolt, silver plated steel nut, pure nickel special (lubricant)

\[ K = 27.79 \]
Steel bolt, silver plated steel nut, braycote grease (lubricant)

\[ K = 26.16 \]
## Data Analysis

<table>
<thead>
<tr>
<th>K Value</th>
<th>Ours:</th>
<th>Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>molybenum disulfide</td>
<td>24.77</td>
<td>30.93</td>
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<tr>
<td>silver plating</td>
<td>17.55</td>
<td>16.37</td>
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<tr>
<td>aerospace grease</td>
<td>31.23</td>
<td>30.54</td>
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<tr>
<td>cor-ban</td>
<td>22.55</td>
<td>33.46</td>
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<tr>
<td>never seez</td>
<td>27.79</td>
<td>31.84</td>
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<tr>
<td>baycote</td>
<td>26.16</td>
<td>31.09</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>30% Max Tension Torque</th>
<th>Ours:</th>
<th>Machine</th>
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</thead>
<tbody>
<tr>
<td>molybenum disulfide</td>
<td>97.86</td>
<td>78.37</td>
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<td>silver plating</td>
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<td>cor-ban</td>
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<tr>
<td>baycote</td>
<td>92.66</td>
<td>77.97</td>
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