**Capable of flying 750 nmi mission fully loaded**

**Cruise at 325 knots**

**Capable of flying 3,300 nmi mission when empty**

**Take off from a 5,000' runway**

**Expected to enter into service by 2029**

**Design a medium-sized, twin turboprop dedicated air freighter**

**Materials decreases the aircraft's environmental impact as research suggests their lifetime impact (including industry as, currently, aircraft account for 11% of U.S transportation emissions. The usage of composites also reduces the need for heavy machinery to maneuver any cargo.**

**Swing-tail design produces issues with maintaining electrical, hydraulic, and fuel connections**

**Fuselage too large and drag inducing**

**Inefficient nose and tail taper**

**A breakdown of the parasitic drag contribution for each major aerodynamic component of the aircraft is shown above.**

**This chart shows the flight envelope of the Boeing freighter aircraft. Once pushed outside of the bands of the lines, the aircraft will either stall or sustain structural damages.**

**This aircraft will be state-of-the-art freighter airplane of its kind when launched into the market. It will be able to fly more cargo further than any medium sized turboprop currently existing. This platform will also travel faster than most aircraft of its payload capacity. With a significantly improved fuel efficiency, the operation cost will be far lower than aircraft currently in the civilian and military markets. The increase in speed will allow quicker turn-around times and a resulting increase in revenue.**

**The largest positive impact that this design will have on the environment is its increased fuel efficiency. Since it will be the most fuel efficient aircraft of its type, it will release the least amount of greenhouse gasses into the atmosphere. This is an important step in reducing the carbon footprint of the rapidly growing cargo industry as, currently, aircraft account for 11% of U.S transportation emissions. The usage of composites materials decreases the aircraft's environmental impact as research suggest their lifetime impact (including energy expended in manufacturing as well as disposability) is less than that of conventional metals.**

**The graph above shows the flight envelopes of the Boeing freighter aircraft. Once pushed outside of the bands of the lines, the aircraft will either stall or sustain structural damages.**

**The graph above shows the flight envelopes of the Boeing freighter aircraft. Once pushed outside of the bands of the lines, the aircraft will either stall or sustain structural damages.**

**The breakdown of the time on the aircraft must spend on the ground between missions can be seen in the above graph. A major goal of this project was to keep this turn-around time as low as possible so that the short cargo Boeing freighter aircraft can be in operation more frequently for revenue purposes.**

**Significant Driving Factors:**
- Non-recurring development costs (engineering, FAA certification, unique production tooling, etc.)
- Necessary production rate to reach financial stability
- Changes in aircraft fuel costs over the operating years
- Civilian and military market analysis to determine project feasibility

**General Characteristics**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Boeing</th>
<th>Airbus</th>
<th>Bombardier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Payload Range</td>
<td>752 nmi</td>
<td>750 nmi</td>
<td>N/A</td>
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<tr>
<td>Ferry Range</td>
<td>3,303 nmi</td>
<td>3,300 nmi</td>
<td>N/A</td>
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<tr>
<td>Max Cruise Velocity</td>
<td>353.5 knots</td>
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</tr>
<tr>
<td>Cruise Velocity</td>
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<td>Fuel Capacity</td>
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<td>Power Plant</td>
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<td>2025</td>
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<tr>
<td>Power</td>
<td>6,200 shp (each)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Propeller</td>
<td>DOWTY R408 6-blade composite</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Weight Distribution by System/Component**

**Drag Build-up**

**Distribution of weight based off of each major component or category of components in the aircraft. This was generated using a statistical method from Daniel Raymer’s book on aircraft design.**

**Payload Range Chart**

**V/n Diagram**

**Turn Around Time**

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**University of Washington Faculty**

Daniel Wilson
Jan Ruuko

**References**

Federal Aviation Administration
Center for Biological Diversity
Russel Hibiya

**Aircraft Design: A Conceptual Approach**

Daniel Raymer