Breguet Range

Spring 16.82

March 2, 2016

Assumptions

1. Constant speed during each flight section
2. Constant BSFC
3. The ln can be approximated using a Taylor-series expansion

Variables

$$
\begin{array}{l}
C_D \\
C_L \\
R \\
S \\
W_{end}[3] \\
\eta_{prop}[3] \\
\rho \\
V[3] \\
t[2] \\
R \\
BSFC
\end{array}
$$

Constraints

$$
\begin{bmatrix}
z_{bre(1)} \geq 0.1432 \frac{\text{BSFC} C_D V_{(1)} t_{(1)}}{C_L \eta_{prop_{(1)}}} \\
z_{bre(2)} \geq 0.1432 \frac{\text{BSFC} C_D V_{(2)} t_{(1)}}{C_L \eta_{prop_{(2)}}}
\end{bmatrix}
$$

$$
z_{bre(0)} \geq 0.003069 \frac{\text{BSFC} C_D R}{C_L \eta_{prop_{(0)}}}
$$

$$
\begin{bmatrix}
\frac{W_{fuel_{(0)}}}{W_{end_{(0)}}} \geq 0.1667 z_{bre_{(0)}}^3 + 0.5 z_{bre_{(0)}}^2 + z_{bre(0)} \\
\frac{W_{fuel_{(1)}}}{W_{end_{(1)}}} \geq 0.1667 z_{bre_{(1)}}^3 + 0.5 z_{bre_{(1)}}^2 + z_{bre(1)} \\
\frac{W_{fuel_{(2)}}}{W_{end_{(2)}}} \geq 0.1667 z_{bre_{(2)}}^3 + 0.5 z_{bre_{(2)}}^2 + z_{bre(2)}
\end{bmatrix}
$$