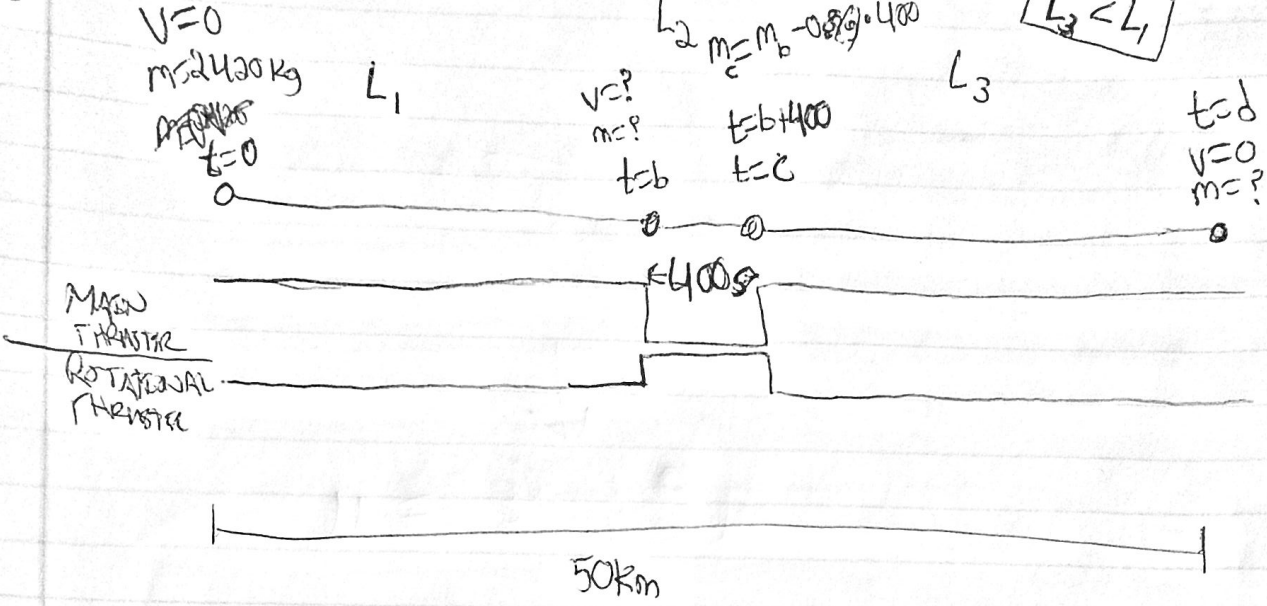
STARTING: 2430 kg F_{MAIN} = 96.8 N D = 50Km $F_{MAIN\,RATE}$ = 1.6 g/s $\vec{p} = m\vec{v}$

ROTATIONAL FUEL RATE = 0.8 g/s, 400s TO ROTATE 180° $F = \frac{dp}{dt}$

$$\int_{t=a}^{t=b} F\,dt = \int_{t=a}^{t=b} \frac{dp}{dt}\,dt \rightarrow F(b-a) = \Delta\vec{p} = \vec{p}(b) - \vec{p}(a)$$

$L_3 < L_1$



$F(b-0) = m_b V_b - m_0 V_0 \rightarrow Fb = m_b V_b \rightarrow F \cdot b = V_b \cdot (m_0 - 0.0016b)$ $\quad kg\cdot\frac{m}{s^2}\cdot s$

$m_b = m_0 - 0.0016b$ $\quad F \cdot b = V_b m_b - V_b \cdot 0.0016b$ $\quad kg\frac{m}{s} =$

$L_1 = \frac{V_b}{2} b \rightarrow \boxed{V_b = \frac{2L_1}{b}}$ $\quad b(F + 0.0016V_b) = V_b \cdot m_0$

$b = \frac{\frac{2L_1}{b} \cdot m_0}{F + 0.0016\cdot\frac{2L_1}{b}}$ $\quad V_b = \frac{F \cdot b}{m_0 - 0.0016b}$ $\quad \frac{2L_1}{b} = \frac{F \cdot b}{m_0 - 0.0016b}$ $\quad L_2 = \frac{800L_1}{b}$ $\quad b = \frac{800L_1}{L_2}$

$F(d - c) = -m_c \cdot V_b$

$Fd - F(b+400) = -$

$L_1 = \frac{F \cdot b^2}{2(m_0 - 0.0016b)}$ $\quad L_2 = V_b \cdot 400 \rightarrow L_2 = \frac{2L_1}{b} \cdot 400$

$Fd - F(b+400) = (-m_b + 0.0008 \cdot 400) \cdot \frac{2L_1}{b}$

$F(d - (b+400))$

$d = \frac{\frac{2L_1}{F}(-m_b + 0.0008 \cdot 400)}{F \cdot b} + b + 400$

$d = \frac{-2L_1(m_b + 0.32)}{F \cdot b}$

$L_3 = \frac{L_1}{b} \cdot d$

$L_3 = \frac{-2L_1^2(m_b + 0.32)}{F \cdot b^2}$

$L_1 + L_2 + L_3 = 50\,000$ meters

$F(d-c) = -m_c \cdot V_b$

$F \cdot d + m_c V_b = F \cdot c$

$d = c - \frac{m_c \cdot V_b}{F}$

$\frac{F \cdot b^2}{2(m_0 - 0.00166b)} + \frac{800\,F \cdot b}{2(m_0 - 0.00166b)}$

$d = b + 400 - \frac{(m_b - 0.32) \cdot V_b}{F}$

$d = b + 400 - \frac{2L_1}{b}\frac{(m_b - 0.32)}{F}$

$d = b + 400 - \frac{2L_1(m_0 - 0.32)}{F \cdot b}$

$m_b = m_0 - 0.00166b - 0.32$

$d = b + 400 - \frac{2L_1(m_0 - 0.00166b - 0.32)}{F \cdot b}$

$d = b + 400 - \frac{\left(\frac{2F \cdot b^2}{2(m_0 - 0.00166b)}\right)(m_0 - 0.00166b - 0.32)}{F \cdot b}$

$d = b + 400 + b \cdot \left(1 - \frac{0.32}{m_0 - 0.00166b}\right)$

$d = b + 400 - b \cdot \frac{m_0 - 0.00166b - 0.32}{m_0 - 0.00166b}$

$d = b + 400 + b - \frac{0.32b}{m_0 - 0.00166b}$

$d = 2b + 400 - \frac{0.32b}{m_0 - 0.00166b}$

$L_3 = \frac{L_1}{b} \cdot d$

$L_3 = \frac{F \cdot b}{2(m_0 - 0.00166b)} \cdot \left(2b + 400 - \frac{0.32b}{m_0 - 0.00166b}\right)$

MATHEMATICA

$b = 734.319$ s

$L_3 = \frac{F \cdot b}{2(m_0 - 0.00166b)} \cdot \left(2b + 400 - \frac{0.32b}{m_0 - 0.00166b}\right)$

$\frac{2F \cdot b^2 + 400F \cdot b}{2(m_0 - 0.00166b)} - \frac{0.32F \cdot b^2}{2(m_0 - 0.00166b)^2}$

$a = 0, b = 734.319, c = 1134.32$ s

$d = 1868.54$ s

TOTAL TIME $= 1868.54$ s

$L_3 = -\frac{625F \cdot b\,(b^2 + b(300 - 625m_0) - 125000m_0)}{(b - 625m_0)^2}$

Sequence:

1) Burn main thruster for 734.319 seconds
2) Turn around (takes 400s)
3) Burn main thruster for 734.222 seconds.

Distance	Distance
$L_1 = 10789.7$ m	
$L_2 = 11754.8$ m	
$L_3 = 27455.4$ m