$$\begin{bmatrix} Tcheck \\ b \end{bmatrix} :=$$

$R_{HMINp} \leftarrow R_{HMIN}$

$R_{HMAJp} \leftarrow R_{HMAJ}$

$R_{Hincrp} \leftarrow R_{HMIN}$

$n_{Hp} \leftarrow n_H$

$CR_{Hp} \leftarrow CR_H$

$t_{H0p} \leftarrow t_{H0}$

$t_{Hincrp} \leftarrow 0.0\ in$

$\delta_{Hminp} \leftarrow \delta_{Hmin}$

$\delta_{Hmaxp} \leftarrow \delta_{Hmax}$

$\delta_{Hincrp} \leftarrow \delta_{Hmin}$

$\phi_{Hminp} \leftarrow \phi_{Hmin}$

$\phi_{Hmaxp} \leftarrow \phi_{Hmax}$

$\phi_{Hincrp} \leftarrow \phi_{Hmin}$

$R_{CMINp} \leftarrow R_{CMIN}$

$R_{CMAJp} \leftarrow R_{CMAJ}$

$R_{Cincrp} \leftarrow R_{CMIN}$

$t_{C0p} \leftarrow t_{C0}$

$t_{Cincrp} \leftarrow 0\ in$

$\delta_{Cminp} \leftarrow \delta_{Cmin}$

$\delta_{Cmaxp} \leftarrow \delta_{Cmax}$

$\delta_{Cincrp} \leftarrow \delta_{Cmin}$

$\phi_{Cminp} \leftarrow \phi_{Cmin}$

$\phi_{Cmaxp} \leftarrow \phi_{Cmax}$

$\phi_{Cincrp} \leftarrow \phi_{Cmin}$

$V_{re} \leftarrow 0.3\ in^3$

$\theta \leftarrow 90\ deg$

$T_e \leftarrow 450\ °F$

$T_c \leftarrow 70\ °F$

$T_r \leftarrow \dfrac{T_e + T_c}{2}$

while $R_{HMINp} \le R_{Hincrp} \le R_{HMAJp}$

  while $0 \le t_{Hincrp} \le t_{H0p}$

    while $\delta_{Hminp} \le \delta_{Hincrp} \le \delta_{Hmaxp}$

      while $\phi_{Hminp} \le \phi_{Hincrp} \le \phi_{Hmaxp}$

        while $R_{CMINp} \le R_{Cincrp} \le R_{CMAJp}$

          while $0 \le t_{Cincrp} \le t_{C0p}$

            while $\delta_{Cminp} \le \delta_{Cincrp} \le \delta_{Cmaxp}$

              while $\phi_{Cminp} \le \phi_{Cincrp} \le \phi_{Cmaxp}$

                while $90\ deg \le \theta \le 450\ deg$

$$t_H(\theta) \leftarrow t_{Hincrp} + \delta_{Hincr} \cdot \sin\left(n_H \cdot \left(\theta - \phi_{Hincr}\right)\right)$$

$$R_H(\theta) \leftarrow \frac{R_{Hincr} \cdot R_{HMIN}}{\sqrt{\left(\left(R_{HMIN} \cdot \cos(\theta)\right)^2 + \left(R_{Hincr} \cdot \sin(\theta)\right)^2\right)}}$$

$$w_H(\theta) \leftarrow R_H(\theta) - CR_H$$

$$A_{HT}(\theta) \leftarrow t_H(\theta) \cdot w_H(\theta)$$

$$t_C(\theta) \leftarrow t_{Cincr} + \delta_{Cincr} \cdot \sin\left(n_C \cdot \left(\theta - \phi_{Cincr}\right)\right)$$

$$R_C(\theta) \leftarrow \frac{R_{Cincr} \cdot R_{CMIN}}{\sqrt{\left(\left(R_{CMIN} \cdot \cos(\theta)\right)^2 + \left(R_{Cincr} \cdot \sin(\theta)\right)^2\right)}}$$

$$w_C(\theta) \leftarrow R_C(\theta) - CR_C$$

$$A_{CT}(\theta) \leftarrow t_C(\theta) \cdot w_C(\theta)$$

$$V_{Hplus}(\theta) \leftarrow \begin{cases} \text{if } 90\ deg \le (\theta) \le 270\ deg \\ \quad \int_{90\ deg}^{\theta} \left(\frac{R_H(\theta) + CR_H}{2}\right) \cdot A_{HT}(\theta)\, d\theta \\ \text{if } 270\ deg < (\theta) \le 450\ deg \\ \quad \int_{90\ deg}^{270\ deg} \left(\frac{R_H(\theta) + CR_H}{2}\right) \cdot A_{HT}(\theta)\, d\theta - \int_{90\ deg}^{(\theta - 180\ deg)} \left(\frac{R_H(\theta) + CR_H}{2}\right. \end{cases}$$

$$V_{Hminus}(\theta) \leftarrow \begin{cases} \text{if } 90\ deg \le (\theta) \le 270\ deg \\ \quad \int_{90\ deg}^{270\ deg} \left(\frac{R_H(\theta) + CR_H}{2}\right) \cdot A_{HT}(\theta)\, d\theta - \int_{90\ deg}^{\theta} \left(\frac{R_H(\theta) + CR_H}{2}\right. \\ \text{if } 270\ deg < (\theta) \le 450\ deg \\ \quad \int_{270\ deg}^{\theta} \left(\frac{R_H(\theta) + CR_H}{2}\right) \cdot A_{HT}(\theta)\, d\theta \end{cases}$$

$$V_{Cplus}(\theta) \leftarrow \begin{cases} \text{if } 90\ deg \le (\theta) \le 270\ deg \\ \quad \int_{90\ deg}^{\theta} \left(\frac{R_C(\theta) + CR_C}{2}\right) \cdot A_{CT}(\theta)\, d\theta \\ \text{if } 270\ deg < (\theta) \le 450\ deg \\ \quad \int_{270\ deg}^{450\ deg} \left(\frac{R_C(\theta) + CR_C}{2}\right) \cdot A_{CT}(\theta)\, d\theta - \int_{270\ deg}^{\theta} \left(\frac{R_C(\theta) + CR_C}{2}\right) \end{cases}$$

$$V_{Cminus}(\theta) \leftarrow \begin{cases} \text{if } 90\ deg \le (\theta) \le 270\ deg \\ \quad \int_{90\ deg}^{270\ deg} \left(\frac{R_C(\theta) + CR_C}{2} \right) \cdot A_{CT}(\theta)\, d\theta - \int_{90\ deg}^{\theta} \left(\frac{R_C(\theta) + CR_C}{2} \right) \\ \text{if } 270\ deg < (\theta) \le 450\ deg \\ \quad \int_{270\ deg}^{\theta} \left(\frac{R_C(\theta) + CR_C}{2} \right) \cdot A_{CT}(\theta)\, d\theta \end{cases}$$

$$V1(\theta) \leftarrow V_{Hplus}(\theta) + V_{Cminus}(\theta)$$

$$V2(\theta) \leftarrow V_{Hminus}(\theta) + V_{Cplus}(\theta)$$

$$V3(\theta) \leftarrow V1(\theta)$$

$$V4(\theta) \leftarrow V2(\theta)$$

$$V_{T1234}(\theta) \leftarrow V1(\theta) + V2(\theta) + V3(\theta) + V4(\theta) + (2 \cdot V_{re})$$

$$m_{te} \leftarrow \left(\frac{1\ atm}{R \cdot (70\ °F)} \right) \cdot V1(270\ deg)$$

$$m_{e1}(\theta) \leftarrow \frac{T_c \cdot T_r \cdot V_{Hplus}(\theta) \cdot m_{te}}{T_c \cdot T_r \cdot V_{Hplus}(\theta) + T_c \cdot V_{re} \cdot T_e + T_r \cdot V_{Cminus}(\theta) \cdot T_e}$$

$$m_{c1}(\theta) \leftarrow \frac{T_r \cdot V_{Cminus}(\theta) \cdot T_e \cdot m_{te}}{T_c \cdot T_r \cdot V_{Hplus}(\theta) + T_c \cdot V_{re} \cdot T_e + T_r \cdot V_{Cminus}(\theta) \cdot T_e}$$

$$m_{re}(\theta) \leftarrow \frac{T_c \cdot V_{Hplus}(\theta) \cdot T_e \cdot m_{te}}{T_c \cdot T_r \cdot V_{Hplus}(\theta) + T_c \cdot V_{re} \cdot T_e + T_r \cdot V_{Hplus}(\theta) \cdot T_e}$$

$$m_{t1}(\theta) \leftarrow m_{e1}(\theta) + m_{c1}(\theta) + m_{re}(\theta)$$

$$Pe1(\theta) \leftarrow \frac{m_{e1}(\theta) \cdot R \cdot T_e}{V_{Hplus}(\theta)}$$

$$Pc1(\theta) \leftarrow \frac{m_{c1}(\theta) \cdot R \cdot T_c}{V_{Cminus}(\theta)}$$

$$m_{t2} \leftarrow \left(\frac{(1\ atm)}{R \cdot (70\ °F)} \right) \cdot V2(270\ deg)$$

$$m_{e2}(\theta) \leftarrow \frac{T_c \cdot T_r \cdot V_{Hminus}(\theta) \cdot m_{t2}}{T_c \cdot T_r \cdot V_{Hminus}(\theta) + T_c \cdot V_{re} \cdot T_e + T_r \cdot V_{Cplus}(\theta) \cdot T_e}$$

$$m_{c2}(\theta) \leftarrow \frac{T_r \cdot V_{Cplus}(\theta) \cdot T_e \cdot m_{t2}}{T_c \cdot T_r \cdot V_{Hminus}(\theta) + T_c \cdot V_{re} \cdot T_e + T_r \cdot V_{Cplus}(\theta) \cdot T_e}$$

$$m_{re}(\theta) \leftarrow \frac{T_c \cdot V_{Hplus}(\theta) \cdot T_e \cdot m_{t2}}{T_c \cdot T_r \cdot V_{Hminus}(\theta) + T_c \cdot V_{re} \cdot T_e + T_r \cdot V_{Hminus}(\theta) \cdot T_e}$$

$$m_{t2}(\theta) \leftarrow m_{e2}(\theta) + m_{c2}(\theta) + m_{re}(\theta)$$

$$Pe2(\theta) \leftarrow \frac{m_{e2}(\theta) \cdot R \cdot T_e}{V_{Hminus}(\theta)}$$

$$Pc2(\theta) \leftarrow \frac{m_{c2}(\theta) \cdot R \cdot T_c}{V_{Cplus}(\theta)}$$

$$T_{qH1}(\theta) \leftarrow \left(\frac{R_H(\theta) + CR_H}{2}\right) \cdot A_{HT}(\theta) \cdot Pe1(\theta)$$

$$T_{qH2}(\theta) \leftarrow -\left(\frac{R_H(\theta) + CR_H}{2}\right) \cdot A_{HT}(\theta) \cdot Pe2(\theta)$$

$$T_{qH3}(\theta) \leftarrow T_{qH1}(\theta)$$

$$T_{qH4}(\theta) \leftarrow T_{qH2}(\theta)$$

$$T_{qHTotal}(\theta) \leftarrow T_{qH1}(\theta) + T_{qH2}(\theta) + T_{qH3}(\theta) + T_{qH4}(\theta)$$

$$T_{qC1}(\theta) \leftarrow \left(\frac{R_C(\theta) + CR_C}{2}\right) \cdot A_{CT}(\theta) \cdot Pe2(\theta)$$

$$T_{qC2}(\theta) \leftarrow -\left(\frac{R_C(\theta) + CR_C}{2}\right) \cdot A_{CT}(\theta) \cdot Pe1(\theta)$$

$$T_{qC3}(\theta) \leftarrow T_{qC1}(\theta)$$

$$T_{qC4}(\theta) \leftarrow T_{qC2}(\theta)$$

$$T_{qCTotal}(\theta) \leftarrow T_{qC1}(\theta) + T_{qC2}(\theta) + T_{qC3}(\theta) + T_{qC4}(\theta)$$

$$TqTotal(\theta) \leftarrow T_{qHTotal}(\theta) + T_{qCTotal}(\theta)$$

if $TqTotal(\theta) > Tcheck$

$$Tcheck \leftarrow TqTotal(\theta)$$

continue

$$\theta \leftarrow \theta + 0.1\ deg$$

$$\theta \leftarrow 90\ deg$$

$$\phi_{Cincr} \leftarrow \phi_{Cincr} + 0.1$$

$$\phi_{Cincr} \leftarrow \phi_{Cmin}$$

$$\delta_{Cincr} \leftarrow \delta_{Cincr} + 0.1$$

$$\delta_{Cincr} \leftarrow \delta_{Cmin}$$

$$t_{Cincr} \leftarrow t_{Cincr} + 0.1$$

$$t_{Cincr} \leftarrow 0$$

$$R_{Cincr} \leftarrow R_{Cincr} + 0.1$$

$$R_{Cincr} \leftarrow R_{CMIN}$$

$$\phi_{Hincr} \leftarrow \phi_{Hincr} + 0.1$$

$$\phi_{Hincr} \leftarrow \phi_{Hmin}$$

$$\delta_{Hincr} \leftarrow \delta_{Hincr} + 0.1\ in$$

$$\delta_{Hincr} \leftarrow \delta_{Hmin}$$

$$t_{Hincr} \leftarrow t_{Hincr} + 0.1\ in$$

$$t_{Hincr} \leftarrow 0$$

$$R_{Hincr} \leftarrow R_{Hincr} + 0.1\ in$$

$$stack(Tcheck, \delta_{Hincr})$$