```
ClearAll["Global`*"]
```

In[118]:=
```
mAirComp = (mAirCyl + mAirBypass)
```

Out[118]=
$$\text{mAirBypass} + \text{mAirCyl}$$

In[119]:=
```
mEgTurbo = (mAirBypass + mEgCyl)
```

Out[119]=
$$\text{mAirBypass} + \text{mEgCyl}$$

In[120]:=
```
mEgCyl = (mAirCyl - mFuelCyl)
```

Out[120]=
$$\text{mAirCyl} - \text{mFuelCyl}$$

In[121]:=
```
cpMix = ((cpAir * mAirBypass + cpEg * mEgCyl) / (mAirBypass + mEgCyl))
```

Out[121]=
$$\frac{\text{cpAir mAirBypass} + \text{cpEg} \left(\text{mAirCyl} - \text{mFuelCyl}\right)}{\text{mAirBypass} + \text{mAirCyl} - \text{mFuelCyl}}$$

In[122]:=
```
hComp = (cpAir * (TcompIN - TcompOUT))
```

Out[122]=
$$\text{cpAir} \left(\text{TcompIN} - \text{TcompOUT}\right)$$

In[123]:=
```
f = mAirComp * hComp - ( (mEgTurbo * cpMix * (TturbIN - TturbOUT) * etaTurbo))
```

Out[123]=
$$\text{cpAir} \left(\text{mAirBypass} + \text{mAirCyl}\right) \left(\text{TcompIN} - \text{TcompOUT}\right) - \text{etaTurbo} \left(\text{cpAir mAirBypass} + \text{cpEg} \left(\text{mAirCyl} - \text{mFuelCyl}\right)\right) \left(\text{TturbIN} - \text{TturbOUT}\right)$$

In[124]:=
```
g = mAirBypass * cpAir * (TcompOUT - T0) +
  mEgCyl * cpEg * (TcylOUT - T0) - (mEgTurbo * cpMix * (TturbIN - T0))
```

Out[124]=
$$\text{cpAir mAirBypass} \left(-\text{T0} + \text{TcompOUT}\right) + \text{cpEg} \left(\text{mAirCyl} - \text{mFuelCyl}\right) \left(-\text{T0} + \text{TcylOUT}\right) - \left(\text{cpAir mAirBypass} + \text{cpEg} \left(\text{mAirCyl} - \text{mFuelCyl}\right)\right) \left(-\text{T0} + \text{TturbIN}\right)$$

In[127]:=
```
Solve[g == 0 && f == 0, {mAirBypass, TturbIN}]
```

Out[127]=
$$\left\{\left\{\text{mAirBypass} \to \left(-\text{cpAir mAirCyl TcompIN} + \text{cpAir mAirCyl TcompOUT} + \text{cpEg etaTurbo mAirCyl TcylOUT} - \text{cpEg etaTurbo mFuelCyl TcylOUT} - \text{cpEg etaTurbo mAirCyl TturbOUT} + \text{cpEg etaTurbo mFuelCyl TturbOUT}\right) / \left(\text{cpAir} \left(\text{TcompIN} - \text{TcompOUT} - \text{etaTurbo TcompOUT} + \text{etaTurbo TturbOUT}\right)\right),\right.$$
$$\text{TturbIN} \to \left(\text{cpAir mAirCyl TcompIN TcompOUT} - \text{cpAir mAirCyl TcompOUT}^2 - \text{cpEg mAirCyl TcompIN TcylOUT} + \text{cpEg mFuelCyl TcompIN TcylOUT} + \text{cpEg mAirCyl TcompOUT TcylOUT} - \text{cpEg mFuelCyl TcompOUT TcylOUT} + \text{cpEg etaTurbo mAirCyl TcompOUT TturbOUT} - \text{cpEg etaTurbo mFuelCyl TcompOUT TturbOUT} - \text{cpEg etaTurbo mAirCyl TcylOUT TturbOUT} + \text{cpEg etaTurbo mFuelCyl TcylOUT TturbOUT}\right) /$$
$$\left.\left(\text{cpAir mAirCyl TcompIN} - \text{cpEg mAirCyl TcompIN} + \text{cpEg mFuelCyl TcompIN} - \text{cpAir mAirCyl TcompOUT} + \text{cpEg mAirCyl TcompOUT} + \text{cpEg etaTurbo mAirCyl TcompOUT} - \text{cpEg mFuelCyl TcompOUT} - \text{cpEg etaTurbo mFuelCyl TcompOUT} - \text{cpEg etaTurbo mAirCyl TcylOUT} + \text{cpEg etaTurbo mFuelCyl TcylOUT}\right)\right\}\right\}$$

In[132]:=
```
TturbinIN := Simplify[
  (cpAir mAirCyl TcompIN TcompOUT - cpAir mAirCyl TcompOUT^2 - cpEg mAirCyl TcompIN
      TcylOUT + cpEg mFuelCyl TcompIN TcylOUT + cpEg mAirCyl TcompOUT TcylOUT -
    cpEg mFuelCyl TcompOUT TcylOUT + cpEg etaTurbo mAirCyl TcompOUT TturbOUT -
    cpEg etaTurbo mFuelCyl TcompOUT TturbOUT - cpEg etaTurbo mAirCyl
     TcylOUT TturbOUT + cpEg etaTurbo mFuelCyl TcylOUT TturbOUT) /
   (cpAir mAirCyl TcompIN - cpEg mAirCyl TcompIN + cpEg mFuelCyl TcompIN -
    cpAir mAirCyl TcompOUT + cpEg mAirCyl TcompOUT + cpEg etaTurbo mAirCyl TcompOUT -
    cpEg mFuelCyl TcompOUT - cpEg etaTurbo mFuelCyl TcompOUT -
    cpEg etaTurbo mAirCyl TcylOUT + cpEg etaTurbo mFuelCyl TcylOUT)]
```

In[133]:=
```
mAirBypass := Simplify[
  (- cpAir mAirCyl TcompIN + cpAir mAirCyl TcompOUT + cpEg etaTurbo mAirCyl TcylOUT -
    cpEg etaTurbo mFuelCyl TcylOUT - cpEg etaTurbo mAirCyl TturbOUT +
    cpEg etaTurbo mFuelCyl TturbOUT) /
   (cpAir (TcompIN - TcompOUT - etaTurbo TcompOUT + etaTurbo TturbOUT))]
```

In[139]:=
```
mAirBypass
```

Out[139]=
```
(cpAir mAirCyl (- TcompIN + TcompOUT) +
   cpEg etaTurbo (mAirCyl - mFuelCyl) (TcylOUT - TturbOUT)) /
 (cpAir (TcompIN - (1 + etaTurbo) TcompOUT + etaTurbo TturbOUT))
```

In[138]:=
```
TturbinIN
```

Out[138]=
```
(cpAir mAirCyl (TcompIN - TcompOUT) TcompOUT -
   cpEg (mAirCyl - mFuelCyl) (TcompIN TcylOUT +
      etaTurbo TcylOUT TturbOUT - TcompOUT (TcylOUT + etaTurbo TturbOUT))) /
 (cpAir mAirCyl (TcompIN - TcompOUT) - cpEg (mAirCyl - mFuelCyl)
    (TcompIN - (1 + etaTurbo) TcompOUT + etaTurbo TcylOUT))
```