$$
\begin{aligned}
\dot{\boldsymbol{r}} &= \rho^{-1}\boldsymbol{p} + \boldsymbol{c} \times \boldsymbol{\omega} \\
\dot{\boldsymbol{d}}_i &= \boldsymbol{\omega} \times \boldsymbol{d}_i \\
\dot{\boldsymbol{p}} &= \boldsymbol{n}' + \boldsymbol{f} \\
\dot{\boldsymbol{\pi}} &= \boldsymbol{p} \times (\boldsymbol{c} \times \boldsymbol{\omega}) + \boldsymbol{m}' + \boldsymbol{r}' \times \boldsymbol{n} + \boldsymbol{\tau}
\end{aligned}
$$