

$$\begin{aligned}
& \left\{ \beta''(t) \rightarrow \right. \\
& \frac{1}{m V(t)} \left(0.5 S \rho \left(1. \sin(\alpha(t)) \sin(\beta(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \right. \right. \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \alpha'(t) - 1. \cos(\alpha(t)) \sin(\beta(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \alpha'(t) - \\
& \quad \sin(\beta(t)) \left(\sin(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) + \cos(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \beta'(t) - \right. \\
& \quad 1. \cos(\alpha(t)) \cos(\beta(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \beta'(t) - 1. \cos(\beta(t)) \sin(\alpha(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \beta'(t) - \\
& \quad 2. \cos(\alpha(t)) \sin(\beta(t)) \left(\sin(\alpha(t)) C_{L\alpha} \alpha'(t) + \cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) - 2 \cos(\alpha(t)) \cos(\beta(t)) \right. \\
& \quad C_{L\alpha} K_{CD} (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) - \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \alpha'(t) + \\
& \quad \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \alpha'(t) - \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta'(t) - \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \beta'(t) - \cos(\alpha(t)) \cos(\beta(t)) C_{Y\beta} \beta(t) \beta'(t) \Big) (t) - \\
& \quad 2. \sin(\alpha(t)) \sin(\beta(t)) \left(-\cos(\alpha(t)) C_{L\alpha} \alpha'(t) + \sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) - 2 \cos(\beta(t)) \sin(\alpha(t)) \right. \\
& \quad C_{L\alpha} K_{CD} (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \alpha'(t) - \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \alpha'(t) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta'(t) - \\
& \quad \sin(\alpha(t)) \sin(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \beta'(t) - \cos(\beta(t)) \sin(\alpha(t)) C_{Y\beta} \beta(t) \beta'(t) \Big) (t) + \\
& \quad 2 \cos(\beta(t)) \left(-2 \sin(\beta(t)) C_{L\alpha} K_{CD} (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) + \cos(\beta(t)) C_{Y\beta} \beta'(t) + \right. \\
& \quad \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \beta'(t) - \sin(\beta(t)) C_{Y\beta} \beta(t) \beta'(t) \Big) (t) V(t)^2 + \\
& \quad 1. S \rho \left(\cos(\beta(t)) \left(\sin(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) + \cos(\beta(t)) C_{Y\beta} \beta(t) \right) (t) - \right. \\
& \quad 1. \cos(\alpha(t)) \sin(\beta(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) - 1. \sin(\alpha(t)) \sin(\beta(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \Big) V'(t) V(t) + \\
& \quad 1. m \left(\sin(\alpha(t)) p'(t) - 1. \cos(\alpha(t)) r'(t) + \cos(\alpha(t)) p(t) \alpha'(t) + 1. r(t) \sin(\alpha(t)) \alpha'(t) \right) \\
& \quad V(t) + 1. \\
& \quad \cos(\alpha(t)) \\
& \quad \sin(\beta(t)) T'(t) + \\
& \quad 1. m \left(p(t) \sin(\alpha(t)) - 1. \cos(\alpha(t)) r(t) \right) V'(t) - \\
& \quad 1. \sin(\alpha(t)) \sin(\beta(t)) T(t) \alpha'(t) + \\
& \quad 1. \cos(\alpha(t)) \cos(\beta(t)) T(t) \beta'(t) + \\
& \quad 1. g m \left(-1. \cos(\alpha(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\beta(t)) \alpha'(t) - \sin(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \alpha'(t) - \right. \\
& \quad 1. \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \beta'(t) + \cos(\alpha(t)) \cos(\beta(t)) \sin(\theta(t)) \beta'(t) - \\
& \quad \cos(\theta(t)) \sin(\beta(t)) \sin(\phi(t)) \beta'(t) + \cos(\alpha(t)) \cos(\theta(t)) \sin(\beta(t)) \theta'(t) + \\
& \quad 1. \cos(\phi(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \theta'(t) - \cos(\beta(t)) \sin(\theta(t)) \sin(\phi(t)) \theta'(t) + \\
& \quad \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \phi'(t) + 1. \cos(\theta(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\phi(t)) \phi'(t) \Big) - \\
& \quad \frac{1}{m V(t)^2} \left(0.5 S \rho \left(\cos(\beta(t)) \left(\sin(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) + \cos(\beta(t)) C_{Y\beta} \beta(t) \right) (t) - \right. \right. \\
& \quad 1. \cos(\alpha(t)) \sin(\beta(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) - 1. \sin(\alpha(t)) \sin(\beta(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big) (t) \Big) V(t)^2 + \\
& \quad 1. m \left(p(t) \sin(\alpha(t)) - 1. \cos(\alpha(t)) r(t) \right) V(t) + 1. g m \left(-1. \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \sin(\beta(t)) + \right. \\
& \quad \cos(\alpha(t)) \sin(\theta(t)) \sin(\beta(t)) + \cos(\beta(t)) \cos(\theta(t)) \sin(\phi(t)) \Big) + 1. \cos(\alpha(t)) \sin(\beta(t)) T(t) V'(t) \Big) \Big\}
\end{aligned}$$

$$\begin{aligned}
& \left\{ \left\{ \alpha''(t) \rightarrow \right. \right. \\
& - \frac{1}{m V(t)^2} \sec(\beta(t)) \left(0.5 S \rho \left(\cos(\alpha(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \right. \right. \\
& \quad \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) - 1. \sin(\alpha(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\alpha(t)) \right. \\
& \quad \left. \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) \right) V(t)^2 + \\
& \quad 1. m \left(\cos(\beta(t)) q(t) - 1. \cos(\alpha(t)) p(t) \sin(\beta(t)) - 1. r(t) \sin(\alpha(t)) \sin(\beta(t)) \right) V(t) + \\
& \quad 1. g m \left(\cos(\alpha(t)) \cos(\theta(t)) \cos(\phi(t)) + \sin(\alpha(t)) \sin(\theta(t)) \right) + 1. \sin(\alpha(t)) T(t) \Big) V'(t) + \frac{1}{m V(t)} \sec(\beta(t)) \tan(\beta(t)) \\
& \left(0.5 S \rho \left(\cos(\alpha(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \right. \right. \\
& \quad \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) - 1. \sin(\alpha(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \left. \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) \right) V(t)^2 + \\
& \quad 1. m \left(\cos(\beta(t)) q(t) - 1. \cos(\alpha(t)) p(t) \sin(\beta(t)) - 1. r(t) \sin(\alpha(t)) \sin(\beta(t)) \right) V(t) + \\
& \quad 1. g m \left(\cos(\alpha(t)) \cos(\theta(t)) \cos(\phi(t)) + \sin(\alpha(t)) \sin(\theta(t)) \right) + 1. \sin(\alpha(t)) T(t) \Big) \beta'(t) + \frac{1}{m V(t)} \\
& \sec(\beta(t)) \left(0.5 S \rho \left(-1. \cos(\alpha(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \right. \right. \\
& \quad \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) \alpha'(t) - \sin(\alpha(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \left. \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) \alpha'(t) - \right. \\
& \quad 2. \sin(\alpha(t)) \left(\sin(\alpha(t)) C_{L\alpha} \alpha'(t) + \cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) - 2 \cos(\alpha(t)) \cos(\beta(t)) C_{L\alpha} \right. \\
& \quad \left. K_{CD} (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) - \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \alpha'(t) + \right. \\
& \quad \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \alpha'(t) - \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta'(t) - \\
& \quad \left. \cos(\alpha(t)) \sin(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \beta'(t) - \cos(\alpha(t)) \cos(\beta(t)) C_{Y\beta} \beta(t) \beta'(t) \Big)(t) + \right. \\
& \quad \left. 2 \cos(\alpha(t)) \left(-\cos(\alpha(t)) C_{L\alpha} \alpha'(t) + \sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) - 2 \cos(\beta(t)) \sin(\alpha(t)) C_{L\alpha} \right. \right. \\
& \quad \left. K_{CD} (C_{L0} + C_{L\alpha} \alpha(t)) \alpha'(t) + \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \alpha'(t) - \right. \\
& \quad \left. \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \alpha'(t) - \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta'(t) - \sin(\alpha(t)) \sin(\beta(t)) \right. \\
& \quad \left. \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) \beta'(t) - \cos(\beta(t)) \sin(\alpha(t)) C_{Y\beta} \beta(t) \beta'(t) \Big)(t) \right) V(t)^2 + \\
& \quad 1. S \rho \left(\cos(\alpha(t)) \left(-\cos(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \cos(\beta(t)) \sin(\alpha(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \right. \right. \\
& \quad \sin(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) - 1. \sin(\alpha(t)) \left(\sin(\alpha(t)) (C_{L0} + C_{L\alpha} \alpha(t)) + \right. \\
& \quad \left. \cos(\alpha(t)) \cos(\beta(t)) \left(-K_{CD} (C_{L0} + C_{L\alpha} \alpha(t))^2 - C_{D0} \right) - \cos(\alpha(t)) \sin(\beta(t)) C_{Y\beta} \beta(t) \Big)(t) \right) V'(t) V(t) + \\
& \quad 1. m \left(-1. \cos(\alpha(t)) \sin(\beta(t)) p'(t) + \cos(\beta(t)) q'(t) - 1. \sin(\alpha(t)) \sin(\beta(t)) r'(t) - \right. \\
& \quad \quad 1. \cos(\alpha(t)) r(t) \sin(\beta(t)) \alpha'(t) + 1. p(t) \sin(\alpha(t)) \sin(\beta(t)) \alpha'(t) - \\
& \quad \quad 1. \cos(\alpha(t)) \cos(\beta(t)) p(t) \beta'(t) - 1. \cos(\beta(t)) r(t) \sin(\alpha(t)) \beta'(t) - q(t) \sin(\beta(t)) \beta'(t) \Big) V(t) + \\
& \quad 1. \sin(\alpha(t)) T'(t) + 1. m \left(\cos(\beta(t)) q(t) - 1. \cos(\alpha(t)) p(t) \sin(\beta(t)) - 1. r(t) \sin(\alpha(t)) \sin(\beta(t)) \right) V'(t) + \\
& \quad 1. \cos(\alpha(t)) T(t) \alpha'(t) + \\
& \quad 1. g m \left(-\cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \alpha'(t) + \cos(\alpha(t)) \sin(\theta(t)) \alpha'(t) + \cos(\theta(t)) \sin(\alpha(t)) \theta'(t) - \right. \\
& \quad \left. \left. \cos(\alpha(t)) \cos(\phi(t)) \sin(\theta(t)) \theta'(t) - \cos(\alpha(t)) \cos(\theta(t)) \sin(\phi(t)) \phi'(t) \right) \right) \Big\} \Big\}
\end{aligned}$$

$$\begin{aligned}
& \{ \{ \psi''(t) \rightarrow \tan(\theta_w(t)) \theta_w'(t) (\psi'(t) - \psi_w'(t)) \sec^2(\psi(t) - \psi_w(t)) - \cos(\beta(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\phi(t)) \alpha'(t)^2 \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\phi(t)) \sec(\theta_w(t)) \sin(\beta(t)) \beta'(t)^2 \sec(\psi(t) - \psi_w(t)) - \cos(\beta(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\phi(t)) \beta'(t)^2 \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\phi(t)) \sec(\theta_w(t)) \sin(\beta(t)) \phi'(t)^2 \sec(\psi(t) - \psi_w(t)) - \cos(\beta(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\phi(t)) \phi'(t)^2 \sec(\psi(t) - \psi_w(t)) - \\
& 2 \cos(\alpha(t)) \sec(\theta_w(t)) \sin(\beta(t)) \sin(\phi(t)) \alpha'(t) \beta'(t) \sec(\psi(t) - \psi_w(t)) + 2 \cos(\alpha(t)) \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \\
& \alpha'(t) \phi'(t) \sec(\psi(t) - \psi_w(t)) - 2 \cos(\phi(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\beta(t)) \beta'(t) \phi'(t) \sec(\psi(t) - \psi_w(t)) + \\
& 2 \cos(\beta(t)) \sec(\theta_w(t)) \sin(\phi(t)) \beta'(t) \phi'(t) \sec(\psi(t) - \psi_w(t)) + \cos(\alpha(t)) \cos(\beta(t)) \sec(\theta_w(t)) \sin(\phi(t)) \tan(\theta_w(t)) \\
& \alpha'(t) \theta_w'(t) \sec(\psi(t) - \psi_w(t)) - \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \tan(\theta_w(t)) \beta'(t) \theta_w'(t) \sec(\psi(t) - \psi_w(t)) - \\
& \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\phi(t)) \tan(\theta_w(t)) \beta'(t) \theta_w'(t) \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \tan(\theta_w(t)) \phi'(t) \theta_w'(t) \sec(\psi(t) - \psi_w(t)) + \\
& \sec(\theta_w(t)) \sin(\beta(t)) \sin(\phi(t)) \tan(\theta_w(t)) \phi'(t) \theta_w'(t) \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\alpha(t)) \cos(\beta(t)) \sec(\theta_w(t)) \sin(\phi(t)) \tan(\psi(t) - \psi_w(t)) \alpha'(t) (\psi'(t) - \psi_w'(t)) \sec(\psi(t) - \psi_w(t)) - \\
& \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \tan(\psi(t) - \psi_w(t)) \beta'(t) (\psi'(t) - \psi_w'(t)) \sec(\psi(t) - \psi_w(t)) - \\
& \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\phi(t)) \tan(\psi(t) - \psi_w(t)) \beta'(t) (\psi'(t) - \psi_w'(t)) \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \tan(\psi(t) - \psi_w(t)) \phi'(t) (\psi'(t) - \psi_w'(t)) \sec(\psi(t) - \psi_w(t)) + \\
& \sec(\theta_w(t)) \sin(\beta(t)) \sin(\phi(t)) \tan(\psi(t) - \psi_w(t)) \phi'(t) (\psi'(t) - \psi_w'(t)) \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\alpha(t)) \cos(\beta(t)) \sec(\theta_w(t)) \sin(\phi(t)) \alpha''(t) \sec(\psi(t) - \psi_w(t)) - \\
& \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \beta''(t) \sec(\psi(t) - \psi_w(t)) - \sec(\theta_w(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\phi(t)) \beta''(t) \sec(\psi(t) - \psi_w(t)) + \\
& \cos(\beta(t)) \cos(\phi(t)) \sec(\theta_w(t)) \sin(\alpha(t)) \phi''(t) \sec(\psi(t) - \psi_w(t)) + \sec(\theta_w(t)) \sin(\beta(t)) \sin(\phi(t)) \phi''(t) \sec(\psi(t) - \psi_w(t)) + \\
& \sec^2(\theta_w(t)) \tan(\psi(t) - \psi_w(t)) \theta_w'(t)^2 + \tan(\theta_w(t)) \tan(\psi(t) - \psi_w(t)) \theta_w''(t) + \psi_w''(t) \} \}
\end{aligned}$$

$$\left\{ \left\{ \theta'' \rightarrow \right. \right. \\
- \left(\left((-\text{cB cT sA } \alpha' - \text{cA cB cF sT } \alpha' - \text{cA cT sB } \beta' + \text{cF sA sB sT } \beta' + \text{cB sF sT } \beta' - \text{cB cF cT sA } \theta' + \text{cT sB sF } \theta' - \text{cA cB sT } \theta' + \text{cF sB sT } \phi' + \text{cB sA sF sT } \phi') \right. \right. \\
\left. \left. (-\text{cA cB cF cT } \alpha' + \text{cB sA sT } \alpha' + \text{cF cT sA sB } \beta' + \text{cB cT sF } \beta' + \text{cA sB sT } \beta' + \text{cF cT sB } \phi' + \text{cB cT sA sF } \phi' + \text{cPw } \psi_w') \right) / (\text{cA cB cT} - \text{cB cF sA sT} + \text{sB sF sT})^2 \right) + \\
\left(\text{cB cF cT sA } (\alpha')^2 + \text{cA cB sT } (\alpha')^2 + 2 \text{cA cF cT sB } \alpha' \beta' - 2 \text{sA sB sT } \alpha' \beta' + \text{cB cF cT sA } (\beta')^2 - \right. \\
\left. \text{cT sB sF } (\beta')^2 + \text{cA cB sT } (\beta')^2 + \text{cB cT sA } \alpha' \theta' + \text{cA cB cF sT } \alpha' \theta' + \text{cA cT sB } \beta' \theta' - \right. \\
\left. \text{cF sA sB sT } \beta' \theta' - \text{cB sF sT } \beta' \theta' + 2 \text{cA cB cT sF } \alpha' \phi' + 2 \text{cB cF cT } \beta' \phi' - 2 \text{cT sA sB sF } \beta' \phi' - \right. \\
\left. \text{cF sB sT } \theta' \phi' - \text{cB sA sF sT } \theta' \phi' + \text{cB cF cT sA } (\phi')^2 - \text{cT sB sF } (\phi')^2 - \text{sPw } (\psi_w')^2 - \right. \\
\left. \text{cA cB cF cT } \alpha'' + \text{cB sA sT } \alpha'' + \text{cF cT sA sB } \beta'' + \text{cB cT sF } \beta'' + \text{cA sB sT } \beta'' + \right. \\
\left. \text{cF cT sB } \phi'' + \text{cB cT sA sF } \phi'' + \text{cPw } \psi_w'' \right) / (\text{cA cB cT} - \text{cB cF sA sT} + \text{sB sF sT}) \left. \right\} \left. \right\}$$

Out[642]//TraditionalForm=

$$\left\{ \left\{ \theta''(t) \rightarrow \right. \right. \\
\left(\cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \alpha'(t)^2 + \cos(\alpha(t)) \cos(\beta(t)) \sin(\theta(t)) \alpha'(t)^2 + 2 \cos(\alpha(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\beta(t)) \right. \\
\left. \beta'(t) \alpha'(t) - 2 \sin(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \beta'(t) \alpha'(t) + \cos(\beta(t)) \cos(\theta(t)) \sin(\alpha(t)) \theta'(t) \alpha'(t) + \right. \\
\left. \cos(\alpha(t)) \cos(\beta(t)) \cos(\phi(t)) \sin(\theta(t)) \theta'(t) \alpha'(t) + 2 \cos(\alpha(t)) \cos(\beta(t)) \cos(\theta(t)) \sin(\phi(t)) \phi'(t) \alpha'(t) + \right. \\
\left. \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \beta'(t)^2 + \cos(\alpha(t)) \cos(\beta(t)) \sin(\theta(t)) \beta'(t)^2 - \right. \\
\left. \cos(\theta(t)) \sin(\beta(t)) \sin(\phi(t)) \beta'(t)^2 + \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \phi'(t)^2 - \right. \\
\left. \cos(\theta(t)) \sin(\beta(t)) \sin(\phi(t)) \phi'(t)^2 - \sin(\psi_w(t)) \psi_w'(t)^2 + \cos(\alpha(t)) \cos(\theta(t)) \sin(\beta(t)) \beta'(t) \theta'(t) - \right. \\
\left. \cos(\phi(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \beta'(t) \theta'(t) - \cos(\beta(t)) \sin(\theta(t)) \sin(\phi(t)) \beta'(t) \theta'(t) + \right. \\
\left. 2 \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \beta'(t) \phi'(t) - 2 \cos(\theta(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\phi(t)) \beta'(t) \phi'(t) - \right. \\
\left. \cos(\phi(t)) \sin(\beta(t)) \sin(\theta(t)) \theta'(t) \phi'(t) - \cos(\beta(t)) \sin(\alpha(t)) \sin(\theta(t)) \sin(\phi(t)) \theta'(t) \phi'(t) - \right. \\
\left. \cos(\alpha(t)) \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \alpha''(t) + \cos(\beta(t)) \sin(\alpha(t)) \sin(\theta(t)) \alpha''(t) + \right. \\
\left. \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \sin(\beta(t)) \beta''(t) + \cos(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \beta''(t) + \cos(\beta(t)) \cos(\theta(t)) \sin(\phi(t)) \beta''(t) + \right. \\
\left. \cos(\theta(t)) \cos(\phi(t)) \sin(\beta(t)) \phi''(t) + \cos(\beta(t)) \cos(\theta(t)) \sin(\alpha(t)) \sin(\phi(t)) \phi''(t) + \cos(\psi_w(t)) \psi_w''(t) \right) / \\
\left(\cos(\alpha(t)) \cos(\beta(t)) \cos(\theta(t)) - \cos(\beta(t)) \cos(\phi(t)) \sin(\alpha(t)) \sin(\theta(t)) + \sin(\beta(t)) \sin(\theta(t)) \sin(\phi(t)) \right) - \\
\left((-\cos(\beta(t)) \cos(\theta(t)) \sin(\alpha(t)) \alpha'(t) - \cos(\alpha(t)) \cos(\beta(t)) \cos(\phi(t)) \sin(\theta(t)) \alpha'(t) - \cos(\alpha(t)) \cos(\theta(t)) \sin(\beta(t)) \beta'(t) + \right. \\
\left. \cos(\phi(t)) \sin(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \beta'(t) + \cos(\beta(t)) \sin(\theta(t)) \sin(\phi(t)) \beta'(t) - \right. \\
\left. \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \sin(\alpha(t)) \theta'(t) - \cos(\alpha(t)) \cos(\beta(t)) \sin(\theta(t)) \theta'(t) + \right. \\
\left. \cos(\theta(t)) \sin(\beta(t)) \sin(\phi(t)) \theta'(t) + \cos(\phi(t)) \sin(\beta(t)) \sin(\theta(t)) \phi'(t) + \cos(\beta(t)) \sin(\alpha(t)) \sin(\theta(t)) \sin(\phi(t)) \phi'(t) \right) \\
\left(-\cos(\alpha(t)) \cos(\beta(t)) \cos(\theta(t)) \cos(\phi(t)) \alpha'(t) + \cos(\beta(t)) \sin(\alpha(t)) \sin(\theta(t)) \alpha'(t) + \cos(\theta(t)) \cos(\phi(t)) \right. \\
\left. \sin(\alpha(t)) \sin(\beta(t)) \beta'(t) + \cos(\alpha(t)) \sin(\beta(t)) \sin(\theta(t)) \beta'(t) + \cos(\beta(t)) \cos(\theta(t)) \sin(\phi(t)) \beta'(t) + \right. \\
\left. \cos(\theta(t)) \cos(\phi(t)) \sin(\beta(t)) \phi'(t) + \cos(\beta(t)) \cos(\theta(t)) \sin(\alpha(t)) \sin(\phi(t)) \phi'(t) + \cos(\psi_w(t)) \psi_w'(t) \right) / \\
\left(\cos(\alpha(t)) \cos(\beta(t)) \cos(\theta(t)) - \cos(\beta(t)) \cos(\phi(t)) \sin(\alpha(t)) \sin(\theta(t)) + \sin(\beta(t)) \sin(\theta(t)) \sin(\phi(t)) \right)^2 \left. \right\} \left. \right\}$$