**Linearization and Approximations**

In this task we will be linearizing the airplane equations of motion to be able to use the tools we studied in Linear control systems theory (e.g. Transfer Functions, Root locus, bode plot, etc.); in order to analyze the airplane dynamics and hence, design a suitable control system as per design requirements.

**Linearization of 12 EOM for a fixed wing A/C**

12 EOM for a fixed wing Aircraft

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| Applying Small disturbance theory | | | | |
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Where the initial condition as following:

**Forces:**

The following set of **linear** equations represents the **change** in the Aerodynamic & thrust forces & moments, they are function of:

* Stability Derivatives.
* Control Derivatives.
* The perturbation change in the states and the control surfaces deflections from their values at the trim condition.