*(described in 18/09/17)*

*(modified on 3/10/17)*

**Non-dimensional Equations of motion are:**

(1)

Where:

All dimensional quantities are originally normalized by :

A symmetrical case is considered and it is:

Equilibrium point is :

Linearizing about that equilibrium point:

…

After all calculations we can describe **the linearized equations as:**

**M**

**Where :**

The natural frequencies can be calculated from :

For the y component we get :

Other frequencies are:

It can be shown (detailed later) that , for certain parameters, we get :

For the case of , I would like to neglect by setting , where .

Back to the starting 3D.O.F E.O.M (1) I will isolate using the 3rd equation, in order to get and use it back in 1st two equations of x,y. and by that getting 2D.O.F dynamics to investigate asymptotically.

The procedure is like this :

From third equation of (1) :

Where