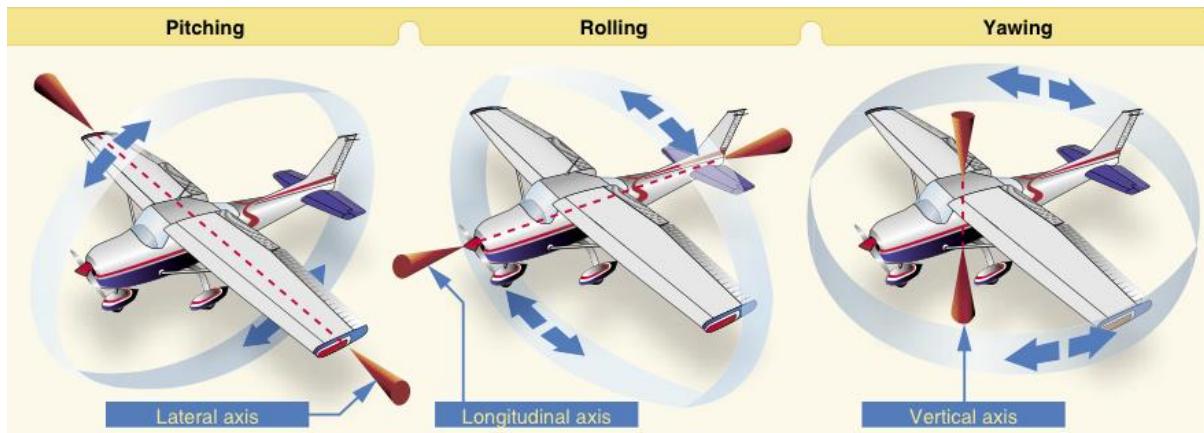


## Assignment #01: Plane Rotation

Coursework %: approximately 10%

*The purpose of this lab is to familiarise you with orientation and rotation formats*



1. This assignment is strictly **individual** (no groupwork).
2. You are required to acquire a model of an aeroplane and use the keyboard and mouse input to display pitch, roll and yaw rotations of the plane.
3. You can use the glm maths library (or other), or create your own. Remember that OpenGL uses column-order matrices so if you are using a math library that assumes row-order, you will have to get the transpose of the resulting matrix. Remember to check the structure of the translation matrix to help figure this out. You can also download the basic cylinder object class from Blackboard, if you would like to use a cylinder to represent the plane.
4. You will be required to **show your working** program to the demonstrator during the lab on the 9<sup>th</sup> February and she will grade you based on what you show her.
5. You will also be required to submit a pdf file with your **report** on Blackboard by the 9<sup>th</sup> February. Submissions must be on Blackboard as we will not be accepting submissions via email. Your submission should include a pdf report with a short written description and screen shots, along with the accompanying code snippets. If you fail to show up for the lab or to submit your report on time, you will be reported as absent and will receive a grade of 0%.
6. Be aware that demonstrating a project that was not created by you is considered **cheating** and will be reported as such. The demonstrator will check if you have an understanding of the code that you have written.

## Examination

Your program should have the following features:

– **Core Features (~50%)**

- *Aircraft model with Euler-angle rotation control (~20%)*
  - The aircraft must rotate using pitch, roll, and yaw controlled via keyboard and/or mouse input.
  - Demonstrate Gimbal Lock
- *Rotation UI feedback (~10%)*
  - A simple on-screen UI or debug display showing the current input angles and their effect on the aircraft orientation.
- *Keyframed flight path animation (~20%)*
  - The aircraft must follow a keyframed trajectory.
  - Basic marks awarded for linear keyframe paths.
  - Higher marks awarded for more advanced paths such as figure-of-eight motion or spline-based interpolation.
  - Students should demonstrate an understanding of how keyframes drive animation.

– **Extra Features (~50%):**

Students should implement additional animation features such as:

- Quaternion-based rotations to overcome gimbal lock (~10%)
- Smooth interpolation of rotations, using LERP and/or SLERP to interpolate orientation changes between keyframes or user inputs. (~20%)
- Motion smoothing techniques, such as ease-in/ease-out behaviour or damping to avoid abrupt motion changes. (~20%)
- Other?

**Note:** The [approximate] marking scheme provided shows the maximum marks that can be obtained for each section if completed perfectly. Merely attempting a section does not imply the full score indicated.