MAE142 Air Vehicle Systems
Presentation Project Format and Options

1 Presentation Project Plan

As indicated in class, given the limited time for development, these projects will necessarily be quite open-ended, and there is no expected level of progress that you need to achieve. The final result should be a presentation of your results, where the quality of the presentation and results should be commensurate with the person-hours available for your teams. Each team will have 15-20 minutes for the presentation of their results.

2 Project Options

The general form of the three possible projects is as follows.

2.1 Longitudinal dynamics for a subsonic air vehicle

For this project, you should seek first to understand the variable definitions and development leading to the dynamics models in Tewari, *Advanced Control of Aircraft, Rockets, and Spacecraft,* Sections 3.5 (including if possible, subsection 3.5.1). Simulation of the aircraft models, possibly with some input disturbances, should be undertaken. Presentation of all of the above, along with associated discussion of the results would be the final goal.

2.2 Longitudinal dynamics for a hypersonic air vehicle

For this project, you should seek to understand the variable definitions and development in Liu, Manzie and Dower, "Constraint Handling of an Air-breathing Hypersonic Vehicle via Predictive Reference Management", Section 5, Command governor with online linearization. Some material from the previous sections, and possibly the references, might be required for that task. (Section 4 considers a different, nonlinear, more-technical approach, and should be skipped.) Simulation should be undertaken, and comparison of your results with those in the paper should be made.

2.3 Satellite constellation for air vehicle navigation

For this project, you should select a satellite constellation, preferably consisting of geostationary, geosynchronous and/or low-Earth orbit (LEO) satellites. You should assume that the standard GPS satellite system is not operational, and that you wish to provide a satellite-aided navigation over the region given by latitude from zero to 30 degrees, longitude zero to 30 degrees. Using the Kalman filter (see the Bryson and Ho material on our website) for aircraft navigation, combined with signal time-of-arrival measurements (as is used by GPS), determine the resulting expected navigation quality in terms of covariance of aircraft position (and possibly velocity). As with the other project options, the limited effort available should guide the task plan, including severely reduced aircraft dynamics and observation models, such as for example, linearly moving, or even stationary(!), vehicles.

3 Grading

The grade will be generated according to the following rubric.

- Analysis - 6 points
- Coding and simulation - 5 points
- Presentation (including time-limit adherence) - 5 points
- Providing a breakdown of the effort - 1 point
- Attendance (for all talks) - 2 points
- Asking questions - 1 point.