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Project 3: The Mechanics of Reduced-Gravity Aircraft

Poster Draft & Narrative

**ABSTRACT:**

**QUESTION:**

The mechanics of flight can be abstracted out to four forces: thrust, lift, gravitational, and drag. Reduced-gravity aircraft vary these forces to achieve a parabolic flight path. The aircraft initially thrusts to achieve a significant upward velocity. Next, the aircraft kills the thrust. At this point, the occupants of the aircraft and the plane itself are in free-fall. The occupants are essentially feeling 0G. After the plane has fallen for a certain period of time, the plane again thrusts.

We want to determine how manipulating the thrust force affects the amount of G’s experienced by the occupants of the plane. Ultimately, we want to maximize the amount of time the plane is in free-fall by varying thrust.

**SYSTEM:**

In this model, the reduced-gravity aircraft is abstracted to a point-mass. The four forces experienced by the point-mass are the gravitational force, the drag force, the lift force, and the thrust force. The free-body diagrams below show the direction of the forces in a single parabola of the flight path.

**LIMITATIONS & ASSUMPTIONS:**

* Limitations
  + The model does not take into account the changes in the drag and lift force that are produced by manipulating the wings of the aircraft.
* Assumptions

**OPERATIONAL REGIMES:**

**PUNCHLINE:**

**VALIDATION:**

**FIGURES OF MERIT:**