

## Departmental Narrative for Math 104 (Mathematics of Powered Flight)

The material for Math 104 was written explicitly to provide a non-calculus course that conforms in detail to the rubrics of GER-1. These comprise three principal items: (1) calculations, done by hand, using a hand calculator or a digital computer; (2) theoretical explanations of why the procedures used in part (1) actually work; and (3) applications recognizable as such to educated non-mathematicians.

**Calculations:** These are some typical questions:

a) A wind at 20 knots blows from  $200^\circ$  in Spokane where the magnetic variation is  $17^\circ$  East. Calculate the cross-wind on runway 7 at Spokane International Airport.

b) Find the sea-level landing speed of a 200 square foot parachute that is supporting a 150 pound rider.

c) Calculate the distance from Tokyo to San Francisco.

d) Using wind-histories from the National Climate Data Center, determine the optimal orientation for a new runway built to service small aircraft near San Antonio, TX.

e) Using navigational aid information on cockpit gauges, locate an aircraft flying near Topeka, KS.

Examples a) b) and c) require the use of a hand calculator. Example d) uses an FAA supplied computer program and a wind data base. Example e) references the use of a computer flight simulator.

**Theoretical Issues:** Geometric arguments are crucial to most of the problems that students confront in the course. For instance, items a), d) and e) above require an analysis that employs standard plane geometry. The method used to solve problem c) is developed using geometry on a sphere. While this is not a course in chemistry or physics, mathematical models for physical phenomena are another important aspect of the course. Choosing only models that are based on intuition, we expect students to come to grips with the mathematical implications of those models. Example b) above employs exactly such an argument.

**Applications:** It will be obvious from the computational examples given above that this course is almost entirely devoted to applications broadly connected to a particular physical regime.