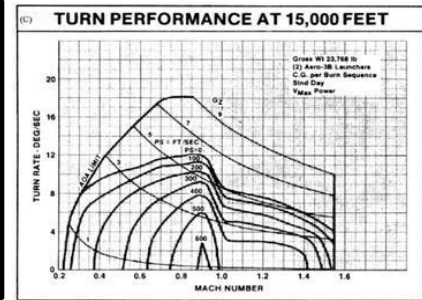


Purdue University
School of Aeronautics and Astronautics
AAE 590 Atmospheric Flight Mechanics (Fixed Wing)



F-16A (Block 15)

Instructor: Bruce Alstrom PhD (ralstrom@purdue.edu)

Office: ARMS 3217

Course Description:

In this comprehensive course, the student will be exposed to and learn the mathematical foundations of fixed wing aircraft flight mechanics and performance. The student will learn how to calculate the performance characteristics for fixed wing aircraft powered by piston-props, turboprops and jet engines (turbofans and turbojets). The student is expected to have an elementary understanding of aerodynamics, aircraft configurations, mechanical systems and a basic understanding of aircraft instrumentation. This course is suitable for the undergraduate aerospace engineer and graduate student who wish to specialize in the flight sciences (which includes flight test engineering). This course is applicable to both military and civilian aircraft.

This course is open to graduate students, seniors and juniors

General Course Outline:

- Lift and Drag characteristics, components of drag. Drag polars. Aerodynamic Center, Mach effects.
- Elementary piston, turboprop and turbofan/jet engine characteristics, power, thrust, specific fuel consumption variations with speed and altitude.
- Propeller characteristics, power and thrust coefficient variation with pitch and advance ratio in power and beta modes
- Performance in terms of thrust and power for steady level flight, climb and descent. Shallow and steep climbs. Climb profiles. Time and fuel to climb (both propeller driven and jet aircraft), Range and Endurance
- Maneuvers: Turn performance (horizontal and vertical planes), steady and unsteady turns, simultaneous pitch, roll and yaw in climb and descent. Sudden pull-up, buffet boundaries and V-n diagrams (structural envelopes) and Energy-Maneuverability diagrams (the doghouse plot)
- Elements of Take off and Landing performance.