AE-324, Fundamentals of Atmospheric Flight
Fall 2001
Research Project

Objective:
Using the open literature, determine the capabilities of a given general aviation aircraft.

Motivation:
You work for an aircraft company and would like to know the capabilities of the competition. You and your team members are going to establish what the competition aircraft can do. You need to determine everything that is to be known about a given aircraft, using the information available in the open literature. In those areas where the literature is lacking, such as detailed aerodynamics or performance data, you are to use your skills to estimate the data.

Aircraft:
Any single-engine propeller-driven general aviation aircraft under 12,500 lbf.

Exceptions:
Cessna 152, Piper J-3 Cub, Piper Super Cub, Piper PA-28-236 Dakota
Cirrus SR-20, Moony M-20M, Cessna 172, Cessna 182, Cessna 210
Beech Bonanza

Teams:
You are required to work in teams of three in carrying out the requirements of this project. In real life, when you are employed at company X, you are *assigned* to work with a team. However, since this is probably your first experience with teamwork in an academic setting, you are allowed to choose your own team members. Think of finding a team as looking for a job. **If you are not able to find a team by Friday November 12, you will be assigned to a team at the expense of 5 points taken from teamwork score (see the section on grading).** Makeup of all teams and choices of aircraft will be posted on my office door by Monday November 19.

Tasks to Perform:
You and your team need to determine the following information and present it in a clear and understandable manner in a final report:

1. Complete and detailed geometric information, including flap and control surface sizes.
2. Price(s).
3. The aircraft drag polar. This includes numerical values of $C_{D,0}$ and Oswald efficiency factor along with the graphical representations of lift and drag coefficients.
4. Take-off distance for empty weight, medium weight, and maximum gross take-off weight, all at sea level without any wind.
5. Take-off distances at the medium weight at sea level with zero, 10 mph, and 20 mph of head wind.
6. Hodograph at full power at sea level. Assume maximum weight.
7. Maximum endurance time of the aircraft on a tank of fuel with a full payload.
8. Maximum range of the aircraft on a tank of fuel with a full payload.
9. Absolute and service ceilings with a full payload.
10. A plot showing the rate of climb as a function of airspeeds with full payload at sea level.
11. Time to climb to 5,000 ft, 10,000 ft, and 15,000 ft with full payload.
12. Maximum level flight speed at sea level, 5,000 ft, and 10,000 ft with full payload.
13. The aircraft V-n diagram at sea level with full payload.

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What to Turn in:

- The above information must be presented in a clear and professional manner. Your presentation should clearly indicate the following:
  1. Who did which part. How you divide the work is up to you.
  2. How the information was obtained.
  3. What sources were used to obtain the information.
  4. How the gaps in the information were filled.
- All information must be typed or computer generated.
- The total package must NOT exceed 15 pages.
- The cover of the final report should indicate clearly the aircraft that was studied and names of the team members.

Grading:

- Accuracy and completeness: 70 points
- Presentation style: 15 points
- Teamwork: 15 points

Deadlines:

- Team Formation: November 12, 2001
- Choice of Aircraft: November 19, 2001
- Due Date: December 7, 2001 (class period, no extensions please)

Possible References:

- *Jane's All the World's Aircraft*: This is an annual publication. The library has every issue.
- *AOPA Pilot*: This is a monthly magazine published by Aircraft Owners and Pilots Association.
- *Flying*: This is a monthly magazine.
- *Other sources*! Information available in the open literature only.