

## A&AE 490A/AT490F Flight Testing

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Student instructor pilots will be provided by Aviation Technology.
2. Textbook:      *Flight Testing of Fixed Wing Aircraft*, Ralph D. Kimberlin, AIAA Education Series, 2003
3. Alternate Text: *Performance of Light Aircraft* by John T. Lowry, AIAA, 1999.
4. Seating:        Starting next class, keep the same seat throughout the semester.
5. Eng. Grading    6/8 of grade is based on homework and 6 flight experiments  
                         2/8 of grade is based on the final exam.
6. I reserve the right to raise or lower your grade by as much as one letter grade based on my judgment of your knowledge of the material in this course.
7. Course pre- or co-requisite for engineering students: A&AE 421 Flt. Dyn. and Control.
8. Class attendance is strongly recommended. You are responsible for obtaining notes and assignments on days you miss.
9. We will cover chapters 1-6, 8, 9, 11-13, 15-17, 19-23, 28-33 of the text.

## A&AE 490A/AT490 Bibliography

Advisory Group for Aeronautical Research and Development of NATO (AGARD), *Flight Test Manual*, Volumes I, II, III, ~1954, General Editor, Cortland D. Perkins.

AGARD, *Introduction to Flight Test Engineering*, AGARDograph No. 300, Volume 14 of AGARD Flight Test Techniques Series, 1995 (all the volumes in this series are useful).

AGARD, *Pressure and Flow Measurement*, AGARDograph No. 160, Volume 11 of AGARD Flight Test Instrumentation Series, 1980 (all 17 volumes in this series are useful).

Aiken, William S., Jr., *Standard Nomenclature for Airspeeds with Tables and Charts for Use in Calculation of Airspeed*, NACA Technical Note No. 1120, September 1946, also NACA Technical Report 837, 1946.

Asselin, Mario, *An Introduction to Aircraft Performance*, American Institute of Aeronautics and Astronautics (AIAA) Education Series, 1997.

Biezad, Daniel J., *Integrated Navigation and Guidance Systems*, AIAA Education Series, 1999.

Hodgkinson, John, *Aircraft Handling Qualities*, AIAA Education Series. 1999.

Huston, Wilber B., *Accuracy of Airspeed Measurements and Flight Calibration Procedures*, NACA Report No. 919, 1948.

Kayton, Myron and Fried, Walter R., *Avionics Navigation Systems*, Second Edition, Wiley-Interscience, 1997.

Lan, Chan-Tau and Roskam, Jan, *Airplane Aerodynamics and Performance*, Roskam Aviation and Engineering Corporation, 1980.

Layton, Donald, *Aircraft Performance*, Matrix Publishers, Inc., 1988.

Miele, Angelo, *Flight Mechanics Volume 1 Theory of Flight Paths*, Addison-Wesley Publishing Company, Inc., 1962.

Ojha, S. K., *Flight Performance of Aircraft*, AIAA Education Series, 1995.

Pamadi, Bandu N., *Performance, Stability, Dynamics, and Control of Airplanes*, AIAA Education Series, 1998.

Perkins, Courtland D. and Hage, Robert E., *Airplane Performance Stability and Control*, John Wiley and Sons, Inc., 1949.

Roskam, Jan, *Airplane Flight Dynamics and Automatic Flight Controls, Part I*, Roskam Aviation and Engineering Corporation, 1979.

Smith, Hubert C., *Introduction to Aircraft Flight Test Engineering*, reprinted as JS312647C by Jeppesen Sanderson, Inc., 1988, available by special order at amazon.com or the bookstore. (This text is more understandable but less comprehensive than the textbooks mentioned above.)

Stinton, Darrol, *Flying Qualities and Flight Testing of the Airplane*, AIAA, 1996.

USAF Test Pilot School, *Flight Test Handbook. Performance: Theory and Flight Techniques*, AFFTC-TIH-79-1, 1979 (I don't yet have this).

USAF Test Pilot School, *Flight Test Handbook. Flying Qualities: Theory (Vol. 1) and Flight Test Techniques (Vol. 2)*, AFFTC-TIH-79-2, 1979 (I don't yet have this).

USAF Test Pilot School, *Stability and Control, Volume I of II, Stability and Control Flight Test Techniques*, AFFTC-TIH-74-2, July 1974.

### **Flight Test Teams:**

We will attempt to develop some of the flight test culture in this course using well-integrated teams of AAE and AT students where possible. We will fly experiments in the Frasca 242 fixed base Simulator, the Cessna 182 aircraft and the Boeing 727 moving base simulator)

3 people per team, maximum of 10 teams (30 students fly).

No more than one Aviation Technology student per team

Each team must have at least one pilot.

Roles (to be alternated among the three students on a team)

Pilot (left seat)

Co-pilot/Test engineer (right seat)

Test Manager (at the Frasca Graphical Instructor Station (GISSt desk))

The Frasca 242 Simulator is located in the Holleman-Niswonger Simulator Center, west of HGR 6 at the Purdue U. Airport.

Students are to organize themselves into teams and propose your teams to the faculty for their approval. Teams should determine which simulator session work for them. We will have to coordinate among ourselves in order to fill the available time slots.

In a week where we are conducting flight operations (e.g. in the simulator), we will not meet for Thursday class. Students will instead show up at the appropriate time for their simulator session.

## **AAE 490A/AT490F Schedule**

### Week Activity

- 1 Lectures: Andrisani
- 2 Lectures: Bernie Wulle (Flying an Aircraft)
- 3 Lectures: Andrisani
- 4 General Familiarization Flight (Frasca 242 Simulator)
- 5 Experiment #1: Stall Speed and CLmax (Frasca 242)
- 6 General Familiarization Flight (Cessna-182)
- 7 Experiment # 2: Performance (Frasca 242)
- 8 Experiment #3 Airspeed Calibration (Cessna-182)
- 9 Lectures: Andrisani
- 10 Spring Break
- 11 Experiment # 4: Performance (Cessna-182)
- 12 Lectures: Andrisani
- 13 Experiment # 5: Dynamic Perf. (Cessna-182)
- 14 General Familiarization Flt (Boeing 727 Moving Base Sim.)
- 15 Exp # 6: Lateral Directional Flying Qualities (Boeing 727 Sim.)
- 16 Dead Week (Lectures: Andrisani)

### **Notes:**

- There will be only 10 teams of 3 undergraduate students each.**
- 1 Hopefully each team will have 1 AT student and 2 AAE students**
- 2 Each team will have one student with piloting experience, preferable an AT student.**
- 3 There will be 9 flight experiences.**
- 4 Six flight experiences involve experiments requiring team write-ups.**
- Individual homework and team write-ups and peer evaluation**
- 5 determine the course grade. There will be a final exam.**
- 6 AT students are graded by Professor Wulle using appropriate grading criteria.**

## Useful Web Sites Relating to Flight Testing

US Navy

<http://flighttest.navair.navy.mil/>

USAF Edwards Air Force Base

<http://www.edwards.af.mil/>

<http://afftc.edwards.af.mil/>

[NASA](#)

<http://www.dfrc.nasa.gov>

<http://www.dfrc.nasa.gov/trc/ftintro/index.html>

Society of Flight Test Engineers

<http://www.sfte.org/>

Society of Experimental Test Pilots

<http://www.netport.com/setp/>

Calspan

<http://www.calspan.com/flight.html>

National Test Pilot School

<http://www.ntps.com/>

International Test and Evaluation  
Association (ITEA)

<http://www.itea.org/>

Experimental Aircraft Association

<http://www.eaa.org/>

FEDERAL AVIATION  
ADMINISTRATION

<http://www.faa.gov/>

<http://www.lockheedmartin.com/>

<http://www.boeing.com/>

Federal Aviation Regulations

[http://www.faa.gov/avr/AFS/FARS/far\\_idx.htm](http://www.faa.gov/avr/AFS/FARS/far_idx.htm)

Private Pilot Training

[http://lights.chtm.unm.edu/~sারণan/aviation/training/training.html](http://lights.chtm.unm.edu/~sarangan/aviation/training/training.html)

Jeppesen

<http://www.jeppesen.com>