Degree Applicable

Glendale Community College
October 2012

COURSE OUTLINE
Aviation and Transportation 127
Flight Training Maneuvers

I. Catalog Statement

Aviation and Transportation 127 is a classroom based course intended to prepare the student for the Federal Aviation Administration Commercial Pilot Knowledge Examination. Topics addressed will include: Advanced aerodynamics, advanced aircraft weight and balance computations, advanced meteorology, advanced aerospace physiology; Operation of complex and high-performance aircraft including use of constant-speed propellers, retractable landing gear, anti-icing/de-icing, oxygen, and cabin pressurization systems; Federal Aviation Regulations Parts 61, 91 and 135; Maximum performance takeoffs and landings, steep turns, chandelles, lazy eights, and eights on pylons.

Units – 3.0
Lecture Hours – 3.0

Prerequisites: AT 120 or possession of a private pilot's certificate

II. Course Entry Expectations

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Mathematics: 3.

Prior to enrolling in the course, the student should be able to:
1. list and explain the four aerodynamic forces;
2. decode Federal Aviation Administration weather observations and forecasts (METAR and TAF);
3. plan multi-leg visual flight rule flights;
4. solve basic aircraft weight and balance problems.

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:
1. explain complex aerodynamic concepts;
2. decode complex FAA weather observations and forecasts;
3. plan complex multi-leg visual flight rule flights;
4. solve complex aircraft weight and balance problems;
5. explain pertinent regulations contained within 14 CFR, Parts 61, 91 and 135;
6. explain complex aerospace physiology concepts;
7. list and explain procedures for maximum performance takeoffs and landings in complex aircraft;

8. list and explain the prerequisites and minimum flight time requirements for the FAA Commercial Pilot Certificate
9. list and explain procedures for steep turns in complex aircraft;
10. list and explain procedures for chandelles;
11. list and explain procedures for lazy eights;
12. list and explain procedures for eights on pylons.

IV. Course Outline

A. Complex and High Performance Aircraft Systems (10 hours)
   1. Fuel injection
      a. system nomenclature
      b. starting procedures
         (1) cold start
         (2) hot start
      c. leaning procedures
      d. abnormal combustion
         (1) detonation
         (2) pre-ignition
      e. induction icing
   2. Turbochargers
      a. system nomenclature
      b. system theory and operation
   3. Constant-speed propellers
      a. system nomenclature
      b. system theory and operation
   4. Oxygen systems
      a. continuous flow
      b. dilutor-demand
      c. pressure-demand
   5. Cabin Pressurization systems
      a. system nomenclature
      b. system theory and operation
   6. Ice control systems
      a. de-icing boots
      b. thermal anti-ice
      c. liquid anti-ice
   7. Retractable landing gear
      a. electric retraction systems
      b. hydraulic retraction systems
      c. general system nomenclature
      d. retraction system safety
         (1) Vle and Vlo speeds
         (2) squat switches
         (3) gear warning horns and lights
         (4) automatic extension systems

(5) icy runway operations
e. retraction system malfunctions
(1) hand crank systems (hydraulic and non-hydraulic)
(2) carbon-dioxide pressurized systems
(3) freefall systems

B. Aerodynamics (6 hours)
1. aircraft axis
a. vertical
b. longitudinal
c. lateral
2. lift
a. Bernoulli's Principle
b. Newton's 3rd Law
c. Terms:
(1) Airfoil
(2) relative wind
(3) angle of attack
(4) angle of incidence
d. high lift devices
(1) flaps
(2) -slots
(3) -slats
(4) -leading edge flaps
3. drag
a. induced drag
b. parasite drag
(1) form
(2) interference
(3) skin friction
c. lift/drag curve
d. high drag devices
(1) spoilers
(2) speed brakes
(3) chutes
4. thrust
5. weight

C. aircraft stability (1.5 hours)
1. static stability
2. dynamic stability
3. longitudinal stability
4. lateral stability
5. directional stability

D. stalls and spins (3 hours)
1. stall aerodynamics (development and effects of W&B)
2. stall recovery

a. power-off stalls (approach)
b. power-on (departure) stalls
3. spin aerodynamics
4. spin recovery
   a. Power
   b. Ailerons
   c. Rudder
   d. Elevator

E. Aircraft performance (3 hours)
1. factors affecting performance
   a. density altitude
   b. surface winds (headwinds, tailwinds, crosswinds)
   c. weight
   d. runway conditions
2. predicting performance
   a. pilot's operating handbook
      (1) takeoff distance charts
      (2) climb performance charts
      (3) cruise performance charts
      (4) descent charts
      (5) landing distance charts
      (6) stall speed charts

F. weight and balance (9 hours)
1. terms
   a. datum
   b. station
   c. arm
   d. moment
   e. formula: W x A = M
   f. maximum ramp weight
   g. maximum takeoff weight
   h. maximum landing weight
2. effects of CG
   a. forward CG
      (1) increased stability (force arm)
      (2) decreased controllability (force arm)
   b. rearward CG
      (1) increased TAS
      (2) increased controllability
      (3) decreased fuel usage
      (4) decreased stability
3. weight and balance documents
   a. weight and balance report (ARRO**W**)
   b. equipment list
      (1) required vs. optional equipment

4. weight and balance calculations
    a. computation method
    b. graph method
    c. table method
    d. weight shifts

G. Meteorology (9 hours)
1. weather factors
    a. atmospheric levels
        (1) troposphere (36K)
        (2) tropopause
        (3) stratosphere (160K)
        (4) mesophere (280K)
        (5) thermosphere
    b. circulation
        (1) highs/lows
        (2) coriolis force
        (3) local convective circulation
    c. moisture
        (1) dewpoint
        (2) relative humidity
    d. atmospheric stability
        (1) dry adiabatic lapse rate
        (2) characteristics of stable/unstable air
    e. clouds
        (1) low clouds
        (2) middle clouds
        (3) high clouds
        (4) clouds with extensive vertical development
    f. air masses
        (1) tropical vs. arctic
        (2) frontal activity (cold, warm, stationary, occluded)
    g. weather hazards
        (1) thunderstorms
        (2) turbulence
        (3) restrictions to visibility
        (4) icing
        (5) hydroplaning
        (6) cold/hot weather operations

H. Federal Aviation Regulations (6 hours)
1. Part 61
2. Part 91
3. Part 135

I. Maximum performance takeoffs and landings (1 hour)
1. short field landings and takeoffs
2. soft field landings and takeoffs

J. Performance Maneuvers (1 hour)
   1. chandelles
   2. lazy eights

K. Ground Reference Maneuver (1 hour)
   1. eights-on-pylons

L. Emergency Procedures (3 hours)
   1. engine failure
   2. fire
   3. radio failure

V. Methods of Presentation

1. Classroom lecture and demonstration
2. Film viewings
1. Demonstrations
2. Peer learning
3. Guest speakers

VI . Assignments and Methods of Evaluation

1. Bi-weekly quizzes
2. mid-term examination
3. final examination

VII. Textbooks

VIII. Student Learning Outcomes:

1. Student will be able to explain complex aerodynamic concepts.
2. Student will be able to decode complex FAA weather observations and forecasts.
3. Student will be able to plan complex multi-leg visual flight rule flights.
4. Student will be able to solve complex aircraft weight and balance problems.
5. Student will be able to explain pertinent regulations contained within 14 CFR, Parts 61, 91 and 135.
6. Student will be able to explain complex aerospace physiology concepts.
7. Student will be able to list and explain procedures for maximum performance takeoffs and landings in complex aircraft.
8. Student will be able to list and explain the prerequisites and minimum flight time requirements for the FAA Commercial Pilot Certificate.
9. Student will be able to list and explain procedures for steep turns in complex aircraft; procedures for chandelles; procedures for lazy eights; and procedures for eights on pylons.