



BROWARD COMMUNITY COLLEGE COURSE OUTLINE

LAST REVIEW: 2008-09
2073-2008

NEXT REVIEW: 2013-14
20012-2013

STATUS: A

COURSE TITLE: Commercial Flight I

COMMON COURSE NUMBER: ATF 2200

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN

(per 16 week term)

CLOCK HOURS:

Lecture: 10

Lab: 80

Clinic:

Other:

PREREQUISITE(S): ATF 1100 or Private Pilot Certificate, or instructor's permission

COREQUISITE(S): ATF2600, ATT 2120, ASC2110 and ASC1210

PRE/COREQUISITE(S):

COURSE DESCRIPTION :

This course continues the flight training and experience of Primary Flight. Together with ATF 2210 and ATF 2300, it provides the aeronautical experience required to qualify for the FAA Commercial Pilot Certificate with instrument rating under Federal Aviation Regulations. Flight-training fees are paid directly to the college in advance. Prerequisite: Private Pilot's Certificate, or instructor's permission.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): Area
General Education Requirements – Associate in Science Degree (AS), meets Area(s): Area
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

UNIT TITLES

1. Instrument Rating: Ground Phase
2. Instrument Rating: Air Traffic Control Clearances and Procedures
3. Instrument Rating: Flight by Reference to Instruments
4. Instrument Rating: Navigation Aids
5. Instrument Rating: Instrument Approach Procedures
6. Commercial Pilot: Preflight Preparation
7. Commercial Pilot: Ground Operation
8. Commercial Pilot: Airport and Traffic Pattern Operations
9. Commercial Pilot: Takeoffs and Climbs
10. Commercial Pilot: Flight at Critically Slow Airspeeds
11. Commercial Pilot: Maximum Performance Maneuvers
12. Commercial Pilot: Flight by Reference to Ground Objects
13. Commercial Pilot: Emergency Operations
14. Commercial Pilot: Approaches, Landings, and After Landing Procedures



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EVALUATION:

Student is assessed regarding course outcomes through stage check s evaluating both oral and related flight performance in demonstrating selected FAA Practical Test Standards for the Instrument Rating.



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UNITS

Unit 1: Instrument Rating: Ground Phase

General Outcome:

- 1.0 The student shall** be able to qualify for the FAA Commercial Pilot Certificate with Instrument Rating after successful completion of specific measurable outcomes noted below.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1** Exhibit adequate knowledge of aviation weather information by obtaining, reading, and analyzing the applicable items such as:
- A. Weather reports and forecasts.
 - B. Pilot and radar reports.
 - C. Surface analysis charts.
 - D. Radar summary charts.
 - E. Significant weather prognostics.
 - F. Winds and temperatures aloft.
 - G. Freezing level charts.
 - H. Stability charts.
 - I. Severe weather outlook charts.
 - J. Constant pressure charts.
 - K. Constant pressure prognostics.
 - L. Tables and conversion graphs.
 - M. ATIS reports.
 - N. SIGMETs and AIRMETs.
- 1.2** Correctly analyze the assembled weather information pertaining to the proposed route of flight and destination airport, and determine whether an alternate airport is required, and, if required, whether the selected alternate airport meets the regulatory requirement.
- 1.3** Exhibit adequate knowledge by planning a cross-country flight conforming to the regulatory requirements for instrument flight rules within the airspace in which the flight will be conducted.



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- 1.4 Exhibit adequate knowledge of the aircraft's performance capabilities by calculating the estimated time en route and total fuel requirement based upon such factors as:
 - A. Power settings.
 - B. Operating altitude or flight level.
 - C. Wind.
 - D. Fuel reserve requirements.
- 1.5 Select and correctly interpret the current and applicable en route charts, SID (standard instrument departure), STAR (standard terminal arrival), and standard instrument approach procedure charts.
- 1.6 Obtain and correctly interpret applicable NOTAM information.
- 1.7 Determine the calculated performance is within the aircraft's capability and operating limitations.
- 1.8 Complete and file a flight plan in a manner that accurately reflects the conditions of the proposed flight.
- 1.9 Exhibit adequate knowledge of the applicable aircraft anti-icing/deicing system(s) and their operating methods to include:
 - A. Airframe.
 - B. Propeller/intake.
 - C. Fuel system.
 - D. Pilot-static.
- 1.10 Exhibit adequate knowledge of the applicable aircraft flight instrument system(s) and their operating characteristics to include:
 - A. Pitot-static.
 - B. Altimeter.
 - C. Airspeed indicator.
 - D. Vertical speed indicator.
 - E. Attitude indicator.
 - F. Horizontal situation indicator.
 - G. Magnetic compass.
 - H. Turn-and-slip indicator/turn coordinator.
 - I. Heading indicator.



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- 1.11** Exhibit adequate knowledge of the applicable aircraft navigation system(s) and their operating methods to include:
- A. VOR omnirange (VOR) and related instruments.
 - B. Distance measuring equipment (DME).
 - C. Instrument landing system (ILS)/GPS
 - D. Marker beacon receiver/indicators.
 - E. Transponder/altitude encoding.
 - F. Automatic direction finding (ADF) equipment and related instruments.
- 1.12** Exhibit adequate knowledge of the preflight instrument, avionics, and navigation equipment cockpit check by explaining the reasons for the check and how to detect possible defects.
- 1.13** Perform the preflight instrument, avionics, and navigation equipment cockpit check by following the checklist appropriate to the aircraft flown.
- 1.14** Determine that the aircraft is in condition for safe instrument flight including:
- A. Radio communications equipment.
 - B. Radio navigation equipment including the following, as appropriate, to the aircraft flown:
 - (1) VOR/VORTAC and related receiving equipment as appropriate for aircraft used.
 - (2) ADF and related receiving equipment as appropriate for aircraft used.
 - (3) ILS/GPS receiving equipment as appropriate for aircraft used.
 - C. Magnetic compass.
 - D. Heading indicator.
 - E. Attitude indicator.
 - F. Altimeter.
 - G. Turn-and-slip indicator/turn coordinator.
 - H. Vertical speed indicator.
 - I. Airspeed indicator.
 - J. Clock.



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K. Power source for gyro instruments.

L. Pitot heat.

1.15 Note any discrepancies and determine whether the aircraft is safe for instrument flight or requires maintenance.



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Unit 2: Instrument Rating: Air Traffic Control Clearances and Procedures

General Outcome:

- 2.0** The student shall be able to perform tasks relative to air traffic control clearances and procedures in the following area: Clearances; compliance with departure, en route, and arrival procedures and clearances; and holding procedures.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1** Exhibit adequate knowledge of the elements of ATC clearances and pilot/controller responsibilities to include tower en route control and clearance void times.
- 2.2** Copy correctly, in a timely manner, the ATC clearance as issued.
- 2.3** Determine that it is possible to comply with ATC clearance.
- 2.4** Interpret correctly that ATC clearance received and, when necessary, request clarification, verification, or change.
- 2.5** Read back correctly, in a timely manner, the ATC clearance in the sequence received.
- 2.6** Use standard phraseology when reading back clearance.
- 2.7** Set the appropriate communication and navigation frequencies and transponder codes in compliance with the ATC clearance.
- 2.8** Exhibit adequate knowledge of SIDs, En Route Low Altitude Charts, Stars, and related pilot/controller responsibilities.
- 2.9** Use the current and appropriate navigation publications for the proposed flight.
- 2.10** Select and use the appropriate communications frequencies; select and identify the navigation aids associated with the proposed flight.
- 2.11** Perform the appropriate aircraft checklist items relative to the phase of flight.
- 2.12** Establish two-way communications with the proper controlling agency, using proper phraseology.
- 2.13** Comply in a timely manner, with all ATC instructions and airspace restrictions.



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- 2.14 Exhibit adequate knowledge of two-way radio communications failure procedures.
- 2.15 Intercept, in a timely manner, all courses, radials, and bearings appropriate to the procedure, route, or clearance.
- 2.16 Maintain the applicable airspeed within ten knots, headings within ten degrees, altitude within 100 feet, and tracks a course, radial, or bearing in a manner where the outcome is never seriously in doubt.
- 2.17 Exhibit adequate knowledge of holding procedures.
- 2.18 Change to the holding airspeed appropriate for the altitude or aircraft when three minutes or less from, but prior to arriving at, the holding fix.
- 2.19 Use FAA recommended entry procedure and holding pattern for a standard, nonstandard, published, or non-published holding pattern.
- 2.20 Recognize arrival at the holding fix and initiate prompt entry into the holding pattern.
- 2.21 Comply with ATC reporting requirements.
- 2.22 Use the proper timing criteria, where applicable, as required by altitude or ATC instructions.
- 2.23 Comply with pattern leg lengths when a DME distance is specified.
- 2.24 Use proper wind correction procedures to maintain the desired pattern and to arrive over the fix as close as possible to a specified time.
- 2.25 Maintain the airspeed within ten knots, altitude within 100 feet, headings within ten degrees, and radials and bearing in a manner where the outcome is never seriously in doubt.



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Unit 3: Instrument Rating: Flight by Reference to Instruments

General Outcome:

The student shall be able to perform tasks relative to flight by reference to instruments in the following areas: straight-and-level flight, change of airspeed, constant airspeed climbs and descents, rate climbs and descents, timed turns to magnetic compass headings, steep turns, and recovery from unusual flight attitudes.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 3.1** Exhibit adequate knowledge of the factors relating to attitude instrument flying during straight-and-level flight.
 - A. Maintain straight-and-level flight in the aircraft configuration specified by the examiner.
 - B. Maintain the heading within ten degrees, altitude within 100 feet, and airspeed within ten knots.
 - C. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, power, and trim corrections.

- 3.2** Exhibit adequate knowledge of the factors relating to attitude instrument flying during change of airspeeds in straight-and-level flight and in turns.
 - A. Establish a proper power setting when changing airspeed.
 - B. Maintain the heading within ten degrees, angle of bank within five degrees when turning, altitude within 100 feet, and airspeed within ten knots.
 - C. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, power, and trim corrections.

- 3.3** Exhibit adequate knowledge of the factors relating to attitude instrument flying during constant airspeed climbs and descents.
 - A. The operating characteristics: A. Demonstrate climbs and descents at a constant airspeed, between specific altitudes in straight or turning flight as specified by the examiner.



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- B. Enter constant airspeed climbs and descents from a specified altitude, airspeed, and heading.
 - C. Establish the appropriate change of pitch and power to establish the desired climb and descent performance.
 - D. Maintain the airspeed within ten knots, heading within ten degrees or, if in a turning maneuver, within five degrees of the desired bank angle.
 - E. Perform the level-off within 100 feet of the desired altitude.
 - F. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, power, and trim corrections.
- 3.4** Exhibit adequate knowledge of the factors relating to attitude instrument flying during rate climbs and descents.
- A. Demonstrate climbs and descents at a constant rate between specified altitudes in straight or turning flight as directed by the examiner.
 - B. Enter rate climbs and descents from a specified altitude, airspeed, and heading.
 - C. Establish the appropriate change of pitch, bank, and power to establish the desired rate of climb or descent.
 - D. Maintain the desired rate of climb and descent within 100 feet per minute, airspeed within ten knots, heading within ten degrees or, if in a turning maneuver, within five degrees of the desired bank angle.
 - E. Perform the level-off within 100 feet of the desired altitude.
 - F. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, power, and trim corrections.
- 3.5** Exhibit adequate knowledge of procedures relating to calibrating the miniature aircraft of the turn coordinator and errors of the magnetic compass, and the performance of timed turns to specified compass headings.
- A. Establish indicated standard rate turns, both right and left.
 - B. Apply the clock correctly to the calibration procedure.
 - C. Change the miniature aircraft position, as necessary, to produce a standard rate turn.



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- D. Make timed turns to specified compass headings.
 - E. Maintain the altitude within 100 feet, airspeed within ten knots, bank angle five degrees of a standard or half-standard rate turn, and rolls out on specified headings within ten degrees.
 - F. Exhibit adequate knowledge of the factors relating to attitude instrument flying during steep turns.
 - G. Enter a turn using a bank of approximately 45 degrees for an airplane and 30 degrees for a helicopter.
 - H. Maintain the desired angle of bank for either 180 degrees or 360 degrees of turn, both left and right.
 - I. Maintain altitude within 100 feet, airspeed within ten knots, five degrees of desired bank angle, and roll out within ten degrees of the specified heading.
 - J. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, power, and trim corrections.
- 3.6** Exhibit adequate knowledge of the factors relating to attitude instrument flying during recovery from unusual flight attitudes (both nose high and nose low).
- A. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, and power corrections in the correct sequence to return the aircraft to a stabilized level flight attitude.



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Unit 4: Instrument Rating: Navigation Aids

General Outcome:

- 4.0** The student shall be able to perform tasks relative to navigation aids in the following areas: intercepting and tracking VOR/VORTAC radials and DME arcs and intercepting and tracking NDB bearings.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 4.1** Exhibit adequate knowledge of the elements of VOR/VORTAC radial and DME arc interception and tracking.
- A. Tune and correctly identify the VOR/VORTAC facility and/or related instruments.
 - B. Set and correctly orient the radial to be intercepted into the course selector or correctly identify the radial on the RMI.
 - C. Intercept the desired radial at a predetermined angle, inbound or outbound from a VOR/VORTAC facility.
 - D. Maintain while intercepting and tracking VOR/VORTAC radials, within five degrees.
 - E. Apply proper correction to maintain a radial, allowing no more than three-quarter-scale deflection of the CDI or within ten degrees in case of an RMI.
 - F. Determine the aircraft position relative to the VOR/VORTAC facility or related instrumentation.
 - G. Intercept a DME arc and maintain that arc within one nautical mile.
 - H. Recognize VOR/VORTAC receiver or facility failure, and, when required, report the failure to ATC.
- 4.2** Exhibit adequate knowledge of the elements of NDB and related instrumentation bearing interception and tracking.
- A. Tune and correctly identify the NDB facility.
 - B. Set the volume to a level that allows constant monitoring of the NDB facility.
 - C. Determine accurately the relative bearing of the NDB facility.



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- D. Intercept a specific bearing to or from the NDB facility, using appropriate interception procedures.
- E. Maintain, while intercepting and tracking NDB bearings, the airspeed within ten knots, altitude within 100 feet, selected heading within five degrees.
- F. Apply proper correction to maintain a bearing within ten degrees.
- G. Determine the aircraft position relative to the NDB facility.
- H. Recognize ADF receiver or NDB facility failure and/or related instrumentat displays, and, when required, report the failure to ATC.



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Unit 5: Instrument Rating: Instrument Approach Procedures

General Outcome:

5.0 The student shall: Be able to perform tasks relative to instrument approach procedures in the following areas: VOR/VORTAC instrument approach procedure, NDB instrument approach procedure, ILS/GPS instrument approach procedure, missed approach procedures, circling approach procedures, and landing from a straight-in circling approach procedure.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 5.1** Exhibit adequate knowledge of the elements of VOR/VORTAC, or other instrument approach procedure.
- A. Select and comply with the appropriate VOR/VORTAC, or other instrument approach procedure to be performed.
 - B. Establish two-way communications with ATC, as appropriate to the phase of flight or approach segment, and use proper radio communications phraseology and technique.
 - C. Select, tune, identify, and confirm the operational status of ground and aircraft navigation equipment to be used for the approach procedure and appropriate for aircraft flown.
 - D. Comply with all clearances issued by ATC or the examiner.
 - E. Recognize if heading indicator and/or attitude indicator is inaccurate or inoperative, advise controller, and proceed with approach.
 - F. Advise ATC or examiner anytime the aircraft is unable to comply with a clearance.
 - G. Establish the appropriate aircraft configuration and airspeed considering turbulence and wind shear, and complete the aircraft checklist items appropriate to the phase of the flight.
 - H. Maintain, prior to beginning the final approach segment, altitude within 100 feet, heading within ten degrees and allow less than a full-scale deflection of the CDI or within ten degrees in the case of an RMI, and maintain airspeed within ten knots.
 - I. Apply the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required such as:
 - (1) FDC and Class II NOTAMs.



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- (2) Inoperative aircraft and ground navigation equipment.
 - (3) Inoperative visual aids associated with the landing environment.
 - (4) National Weather Service (NWS) reporting factors and criteria.
 - J. Establish a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP, with the aircraft continuously in a position from which descent to a landing on the intended runway can be made at a normal rate using normal maneuvers.
 - K. Allow, while on the final approach segment, no more than a three-quarter-scale deflection of the CDI or within ten degrees in case of an RMI, and maintain airspeed within ten knots.
 - L. Maintain the MDA, when reached, within +100 feet, -0 feet to the MAP.
 - M. Execute the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.
 - N. Execute a normal landing from a straight-in or circling approach when instructed by the examiner.
- 5.2** Exhibit adequate knowledge of the elements of an NDB instrument approach procedure.
- A. Select and comply with the appropriate NDB instrument approach procedure to be performed.
 - B. Establish two-way communications with ATC, as appropriate to the phase of flight or approach segment, and use proper radio communications phraseology.
 - C. Select, tune, identify, confirm, and monitor the operational status of ground and aircraft navigation equipment to be used for the approach procedure.
 - D. Comply with all clearances issued by ATC or the examiner.
 - E. Recognize when heading indicator and/or attitude indicator is inaccurate or inoperative, advise controller, and proceed with approach.
 - F. Advise ATC or the examiner anytime the aircraft is unable to comply with a clearance.
 - G. Establish the appropriate aircraft configuration and airspeed, considering turbulence and wind shear, and complete the aircraft checklist items appropriate to the phase of flight.
 - H. Maintain, prior to beginning the final approach segment, the altitude within 100 feet, heading and bearing within ten degrees, and airspeed within ten knots.



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- I. Apply the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required such as:
 - (1) FDC and Class II NOTAMs.
 - (2) Inoperative aircraft and ground navigation equipment.
 - (3) Inoperative visual aids associated with the landing environment.
 - (4) National Weather Service (NWS) reporting factors and criteria.
 - J. Establish a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP with the aircraft continuously in a position from which descent to a landing on the intended runway can be made at a normal rate using normal maneuvers.
 - K. Maintain while on the final approach segment, a deviation of not more than ten degrees from the desired bearing, and maintain airspeed within ten knots.
 - L. Maintain the MDA, when reached, within +100 feet, -0 feet to the MAP.
 - M. Execute the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.
 - N. Execute a normal landing from a straight-in or circling approach when instructed by ATC or the examiner.
- 5.3** Exhibit adequate knowledge of the elements of an ILS/GPS instrument approach procedure.
- A. Select and comply with the appropriate ILS/GPS instrument approach procedure.
 - B. Establish two-way communications with ATC, as appropriate to the phase of flight or approach segment, and use proper radio communications phraseology and technique.
 - C. Select, tune, identify, and confirm the operational status of ground and aircraft navigation equipment to be used for the approach procedure.
 - D. Comply with all clearances issued by ATC or the examiner
 - E. Advise ATC or examiner anytime the aircraft is unable to comply with a clearance.



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- F. Establish the appropriate aircraft configuration and airspeed, considering turbulence and wind shear, and complete the aircraft checklist items appropriate to the phase of flight.
 - G. Maintain prior to beginning the final approach segment, desired altitude within 100 feet, heading or course within ten degrees, and airspeed within ten knots.
 - H. Apply the necessary adjustments to the published DH and visibility criteria for the aircraft approach category when required such as:
 - (1) FDC and Class II NOTAMs.
 - (2) Inoperative aircraft and ground navigation equipment.
 - (3) Inoperative visual aids associated with the landing environment.
 - (4) National Weather Service (NWS) reporting factors and criteria.
 - I. Establish an initial rate of descent at the point where the electronic glide slope is intercepted, which approximates that required for the aircraft to follow the glide slope.
 - J. Allow, while on the final approach segment, no more than three-quarter-scale deflection of either the localizer or glide slope indications, and maintain the desired airspeed within ten knots.
 - K. Initiate immediately the missed approach procedure when, at the DH, the required visual references for the intended runway are not distinctly visible and identifiable.
 - L. Transition to a normal landing approach when the aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers.
- 5.4** Exhibit adequate knowledge of missed approach procedures associated with standard instrument approaches.
- A. Initiate the missed approach promptly by applying power, establishing a climb attitude, and reducing drag in accordance with the manufacturer's recommendations.
 - B. Report to ATC beginning the missed approach procedure.
 - C. Comply with the published or alternate missed approach procedure.



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- D. Advise ATC or examiner anytime the aircraft is unable to comply with a clearance, restriction, or climb gradient.
 - E. Follow the recommended checklist items appropriate to the go-around procedure.
 - F. Request, if appropriate, ATC clearance to the alternate airport, clearance limit, or as directed by the examiner.
 - G. Maintain the recommended airspeed within ten knots; heading, course, or bearing within ten degrees; and altitude(s) within 100 feet during the missed approach procedure.
- 5.5** Exhibit adequate knowledge of the elements of a circling approach procedure.
- A. Select and comply with the appropriate circling approach procedure considering turbulence and wind shear and considering the maneuvering capabilities of the aircraft.
 - B. Confirm the direction of traffic and adhere to all restrictions and instructions issued by ATC and the examiner.
 - C. Not exceed the visibility criteria or descend below the appropriate circling altitude until in a position from which a descent to a normal landing can be made.
- 5.6** Exhibit adequate knowledge of the pilot's responsibilities, and the environmental, operational, and meteorological factors which affect a landing from a straight-in or a circling approach.
- A. Transition at the DH, MDA, or VDP to a visual flight condition, and perform a normal landing with normal maneuvering.
 - B. Adhere to all ATC (or examiner) advisories such as: NOTAMs, wind shear, wake turbulence, runway surface, braking conditions, and other operational considerations.
 - C. Complete appropriate checklist for the prelanding and landing phase.
 - D. Maintain positive aircraft control throughout the complete landing maneuver.



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Unit 6: Commercial Pilot: Preflight Preparation

General Outcome:

- 1.0 The student shall:** Be able to perform tasks relative to preflight preparation in the following areas: certificates and documents, obtaining weather information, operation of airplane systems, emergency procedures, determining performance and limitations, cross-country flight planning, night flight operations, and aero medical factors.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 6.1** Exhibit commercial pilot knowledge by explaining the appropriate:
- A. Pilot certificate privileges and limitations applicable to flights for compensation or hire.
 - B. Medical certificate, class, and duration.
 - C. Personal pilot logbook or flight record.
- 6.2** Exhibit commercial pilot knowledge by locating and explaining the significance and importance of the:
- A. Airworthiness and registration certificates.
 - B. Operating limitations, handbooks, and manuals.
 - C. Equipment list.
 - D. Weight and balance data.
 - E. Maintenance requirements, tests, and appropriate records applicable to flights for hire including preventive maintenance and maintenance that may be performed by the pilot.
- 6.3** Exhibit commercial pilot knowledge of aviation weather information including high altitude weather and weather activity over wide geographical areas, by promptly and systematically obtaining, reading, and analyzing:
- A. Weather reports and forecasts.
 - B. Weather charts.



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- C. Significant weather prognostics.
 - D. Constant pressure prognostics.
 - E. Pilot weather reports.
 - F. SIGMENTs AND AIRMETs, including wind shear reports.
 - G. Notices to Airmen.
- 6.4 Exhibit commercial pilot knowledge and awareness by explaining aviation weather hazards.
- 6.5 Use critical judgment in making a competent go/no-go decision based on the weather information.
- 6.6 Exhibit commercial pilot knowledge by accurately explaining the applicable normal operating procedures and limitations of the airplane's systems using correct terminology in identifying components, including:
- A. Primary flight controls and trims.
 - B. Wing flaps, leading edge devices, and spoilers.
 - C. Pitot static system and associated flight instruments.
 - D. Vacuum system and associated flight instruments.
 - E. Landing gear (reaction system, indicators, brakes and tires, and nose wheel steering).
 - F. Power plant (controls and indicators, induction, carburetion and fuel injection, exhaust and turbo charging, cooling, and fire detection).
 - G. Propeller (type and controls).
 - H. Fuel system (capacity, pumps, controls, and indicators; fueling procedures; approved grade, color, and additives; drain valves; and low-level warning).
 - I. Oil system (capacity, grade, and indicators).
 - J. Hydraulic system (controls and indicators and pumps and regulators).
 - K. Electrical system (controls and indicators; alternators or generators; battery, auxiliary power unit; circuit protection; external and internal lighting; and associated flight instruments).



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- L. Environmental system (heating, cooling and ventilation, controls and indicators, and oxygen and pressurization).
 - M. Ice prevention and elimination.
 - N. Avionics.
- 6.7** Exhibit commercial pilot knowledge by correctly explaining the applicable emergency procedures including:
- A. Emergency checklist.
 - B. Partial power loss.
 - C. Engine failure (before lift-off, after lift-off, during climb and cruise, and restart).
 - D. Emergency landing (precautionary, without power, ditching).
 - E. Engine roughness or overheat.
 - F. Loss of oil pressure.
 - G. Smoke and fire (engine, cabin, electrical, and environmental).
 - H. Icing (airframe, power plant).
 - I. Pressurization.
 - J. Emergency descent.
 - K. Pitot static system and associated instruments.
 - L. Vacuum system and associated instruments.
 - M. Electrical.
 - N. Landing gear.
 - O. Wing flaps (asymmetrical position).
 - P. Inadvertent door opening.
 - Q. Emergency exits.



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- 6.8** Exhibit commercial pilot knowledge by explaining performance and limitations including a thorough knowledge of the adverse effects of exceeding the limits.
- A. Demonstrate proficient use of the appropriate performance charts, tables, and data including cruise control, range, and endurance.
 - B. Determine the airplane's performance in all phases of flight.
 - C. Describe the effects of seasonal and atmospheric conditions on the airplane's performance.
 - D. Compute weight and balance, including adding, removing, and shifting weight, and determine if the weight and center of gravity will remain within limits during all phases of flight.
 - E. Use sound judgment in making a competent decision on whether the required performance is within the airplane's capabilities and operating limitations.
- 6.9** Exhibit commercial pilot knowledge by promptly and systematically planning a VFR cross-country flight nears the maximum range of the airplane, considering payload and fuel including one leg for night operations.
- A. Select and use current and appropriate aeronautical charts.
 - B. Plot a course of the intended route of flight, including fuel stops, available alternates, and suitable course of action for various situations.
 - C. Select prominent en route checkpoints.
 - D. Select most favorable altitudes of flight levels, considering weather conditions and equipment capabilities.
 - E. Compute flight time, headings, and fuel requirements.
 - F. Select appropriate radio aids for navigation and communications.
 - G. Identify airspace, obstruction(s), and terrain features.
 - H. Extract and record pertinent information from Airport/Facility Directory and other flight publications, including NOTAM and airport information.
 - I. Complete a navigation log.
 - J. Complete and simulate filing a VFR flight plan.



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- 6.10** Exhibit commercial pilot knowledge by explaining night visual perception including:
- A. Function of various parts of the eye essential for night vision.
 - B. Adaptation of the eye to changing light conditions.
 - C. Correct use of the eye to accommodate changing light conditions.
 - D. Coping with illusions created by various light conditions.
 - E. Effects of pilot's physical condition on visual perception.
 - F. Aids for increasing vision effectiveness.
- 6.11** Exhibit commercial pilot knowledge by explaining personal equipment recommended for night flight operations including:
- A. Types and use of various lighting.
 - B. Arrangement of equipment.
- 6.12** Exhibit commercial pilot knowledge by explaining the airplane's lighting and equipment for night flight operations including:
- A. Required equipment.
 - B. Additional equipment recommended.
 - C. External light interpretation.
- 6.13** Exhibit commercial pilot knowledge by explaining airport and navigation lighting including:
- A. Meaning of various lights.
 - B. Determining status of lights.
 - C. Airborne activation of runway lights.
- 6.14** Exhibit commercial pilot knowledge by explaining the airplane's night operations including:
- A. Preparation and preflight.
 - B. Starting taxiing and run-up.



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- C. Takeoff and departure.
- D. Orientation and navigation.
- E. Night emergencies.
- F. Approaches and landings.

6.15 Exhibit knowledge of the elements related to aero medical factors including:

- A. Hypoxia.
- B. Hyperventilation.
- C. Middle ear and sinus problems.
- D. Spatial disorientation.
- E. Motion sickness.
- F. The effects of alcohol and drugs.
- G. Carbon monoxide poisoning.
- H. Stress and fatigue.

6.16 Exhibit knowledge of nitrogen excesses during scuba dives, and explain how this affects a pilot and passenger during flight.



Common Course Number: ATF 2200

Unit 7: Commercial Pilot: Ground Operations

General Outcome:

7.0 The student shall: Be able to perform tasks relevant to ground operations in the following areas: visual inspection, cockpit management, engine ignition, taxiing, and pre-takeoff check.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 7.1** Exhibit knowledge of airplane visual inspection by explaining the reasons for the inspection, what items should be inspected, and how to detect possible defects.
- A. Inspect the airplane by systematically following an appropriate checklist.
 - B. Verify that the airplane is in condition for safe flight emphasizing:
 - (1) Fuel quantity, grade, and type.
 - (2) Fuel contamination safeguards.
 - (3) Fuel tank venting.
 - (4) Oil quantity, grade, and type.
 - (5) Fuel, oil, and hydraulic leaks.
 - (6) Oxygen supply, if appropriate.
 - (7) Flight controls.
 - (8) Structural damage including exhaust system.
 - (9) Tie down, control lock, and wheel chock removal.
 - (10) Lighting.
 - (11) Ice and frost removal.



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- (12) Security of baggage, cargo, and equipment.
 - C. Demonstrate proper management of the fuel system.
 - D. Note any discrepancy and accurately judge whether the airplane is safe for flight or requires maintenance.
- 7.2** Exhibit commercial pilot knowledge of cockpit management by explaining efficient cockpit management procedures, securing cargo, and related safety factors.
- A. Organize and arrange material and equipment in a manner that makes them readily available.
 - B. Adjust and lock the pedals and pilot's seat to a safe position and assure full control movement.
 - C. Ensure that safety belts and shoulder harnesses are fastened.
 - D. Brief occupants on the use of safety belts and emergency procedures.
- 7.3** Exhibit commercial pilot knowledge by explaining correct engine starting procedures including the use of an external power source, hand propping procedures, starting under various atmospheric conditions, and the effects of using incorrect starting procedures.
- A. Perform all items by systematically following the before-starting and starting checklists.
 - B. Demonstrate commercial pilot competence in the care and use of equipment.
 - C. Accomplish correct starting procedure with emphasis on:
 - (1) Positioning the airplane to avoid creating hazards.
 - (2) Determining that the area is clear.
 - (3) Adjusting the engine controls.
 - (4) Setting the brakes.
 - (5) Preventing airplane movement after the engine start.
 - (6) Avoiding excessive engine RPM and temperatures.
 - (7) Checking the engine instruments after engine start.



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- 7.4** Exhibit commercial pilot knowledge by explaining all aspects of safe taxi procedures, including the effect of wind on the airplane during taxiing.
- A. Follow the prescribed taxi checklist, if pertinent.
 - B. Perform a brake check immediately after airplane begins movement, and thereafter use proper braking technique.
 - C. Comply with markings, signals and clearances, and follow the proper taxi route.
 - D. Demonstrate proficiency in maintaining correct and positive control of the airplane direction and speed, considering existing conditions.
 - E. Position flight controls properly, considering wind.
 - F. Maintain awareness of the location and movement of all other aircraft and vehicles along the taxi path and in the traffic pattern.
 - G. Apply right-of-way rules and provide adequate spacing.
 - H. Avoid creating hazards to persons or property.
- 7.5** Exhibit commercial pilot knowledge of the pre-takeoff check by thoroughly explaining the reasons for checking the items and how to detect possible malfunctions.
- A. Position the airplane properly considering other aircraft, the surface conditions, possible hazards, and wind.
 - B. Divide attention inside and outside of the cockpit.
 - C. Ensure that the engine temperatures and pressures are suitable for run-up and takeoff, and avoid any tendency to overheat the engine.
 - D. Perform a critical and systematic check by following the checklist.
 - E. State the instrument reading, when appropriate, after identifying a checklist item.
 - F. Ensure that the airplane is in safe operating condition emphasizing:
 - (1) Flight controls and instruments.
 - (2) Instruments in normal operating range.
 - (3) Engine and propeller operation.



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- (4) Carburetor ice check, if applicable.
- (5) Fuel valves positioned properly.
- (6) Seats adjusted and locked for all occupants.
- (7) Safety belts and shoulder harnesses fastened and adjusted for all occupants.
- (8) Doors and windows secured.
- (9) Recognize indications of any discrepancy and accurately judge whether the airplane is safe for flight or requires maintenance.
- (10) Review the critical takeoff performance airspeeds and expected takeoff distances.
- (11) Describe takeoff emergency procedures.
- (12) Obtain and interpret takeoff and departure clearances.
- (13) Note takeoff time.



Common Course Number: ATF 2200

Unit 8: Commercial Pilot: Airport and Traffic Pattern Operations

General Outcome:

8.0 The student shall: The students should be able to perform tasks relative to airport and traffic pattern operations in the following areas: radio communications and ATC light signals, traffic pattern operations, and airport and runway marking and lighting.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 8.1** Exhibit competency in radio communications and ATC light signal interpretation including:
- A. Selecting the appropriate frequencies for the facilities to be used.
 - B. Transmitting requests and reports correctly using the recommended standard phraseology.
 - C. Receiving, acknowledging, and complying with radio communications.
 - D. Using prescribed procedures following radio communications failure.
- 8.2** Exhibit competency during traffic pattern operation at controlled and uncontrolled airports including:
- A. Collision and wind-shear avoidance procedures.
 - B. Following the established traffic pattern procedures correctly and consistently adhering to instructions or rules.
 - C. Correcting for wind drift to follow the appropriate ground track.
 - D. Maintaining adequate spacing from other traffic.
 - E. Maintaining the traffic pattern altitude, % 100 feet.
 - F. Maintaining the specified airspeed, % 10 knots.
 - G. Completing the prelanding cockpit checklist.
 - H. Maintaining orientation with the runway in use.



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- 8.3** Exhibit commercial pilot competency by:
- A. Identifying, interpreting, and conforming to airport, runway, and taxiway marking aids.
 - B. Identifying, interpreting, and conforming to airport lighting aids.



Common Course Number: ATF 2200

Unit 9: Commercial Pilot: Takeoffs and Climbs

General Outcome:

9.0 The student shall: The students should be able to perform tasks relative to takeoffs and climbs in the following areas: normal and crosswind takeoffs and climbs, maximum performance takeoff and climb, and soft-field takeoff and climb.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 9.1** Exhibit knowledge by explaining the elements of normal and crosswind takeoffs and climbs, including airspeeds, configurations, and emergency procedures.
- A. Adjust the mixture control as recommended for the existing conditions.
 - B. Note any obstructions or other hazards in the takeoff path and review takeoff performance.
 - C. Verify wind condition.
 - D. Align the airplane on the runway centerline.
 - E. Apply aileron deflection in the proper direction, as necessary.
 - F. Advance the throttle smoothly and positively to maximum allowable power.
 - G. Check engine instruments.
 - H. Maintain positive directional control on the runway centerline.
 - I. Adjust aileron deflection during acceleration, as necessary.
 - J. Rotate at the recommended airspeed and establish wind-drift correction, as necessary.
 - K. Establish the pitch attitude for V_Y and maintain $V_Y = \pm 5$ knots.
 - L. Retract the wing flaps as recommended or at a safe altitude.
 - M. Retract the landing gear after a positive rate of climb has been established and a safe landing can no longer be accomplished on the remaining runway or as recommended.
 - N. Maintain takeoff power to a safe maneuvering altitude and set specified power.



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- O. Maintain a straight track over the extended runway centerline until a turn is required.
- P. Complete the after-takeoff checklist.

9.2 Exhibit knowledge by explaining the elements of a maximum performance takeoff and climb, including the significance of appropriate airspeeds, configurations, emergency procedures, and expected performance for existing operating conditions.

- A. Select the recommended wing flap setting.
- B. Adjust the mixture control as recommended for the existing conditions.
- C. Review takeoff performance capabilities considering obstructions.
- D. Position the airplane for maximum runway availability and align it with the runway centerline.
- E. Advance the throttle smoothly and positively to maximum allowable power.
- F. Check engine instruments.
- G. Maintain positive directional control on the runway centerline.
- H. Rotate at the recommended airspeed and accelerate to V_X .
- I. Climb at V_X or the recommended airspeed, +5 -0 knots, until obstacle is cleared, or to at least 50 feet above the surface, then accelerate to V_Y and maintain V_Y , +5 knots.

9.3 Exhibit commercial pilot knowledge by explaining the elements of a soft-field takeoff and climb, including the significance of appropriate airspeeds and configurations, emergency procedures, and hazards associated with attempting to climb at airspeeds less than V_X .

- A. Select the recommended wing flap setting.
- B. Adjust the mixture control as recommended for the existing conditions.
- C. Note any obstruction or other hazards in the takeoff path and review takeoff performance.
- D. Taxi onto the takeoff surface at a speed consistent with safety.
- E. Align the airplane on the takeoff path without stopping and advance the throttle smoothly and positively to maximum allowable power.



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- F. Check engine instruments.
- G. Adjust and maintain a pitch attitude which transfers the weight from the wheels to the wings as rapidly as possible.
- H. Maintain positive directional control along the center of the takeoff path.
- I. Lift off at the lowest possible airspeed and remain in ground effect while accelerating.
- J. Accelerate to and maintain $V_X +5 -0$ knots, if obstructions must be cleared, otherwise to $V_Y, +5$ knots.
- K. Retract the wing flaps as recommended or at a safe altitude.
- L. Retract the landing gear after a positive rate of climb has been established and a safe landing can no longer be accomplished on the remaining landing area.
- M. Maintain takeoff power to a safe maneuvering altitude and set specified power.
- N. Maintain a straight track over the extended takeoff path until a turn is required.
- O. Complete the after-takeoff checklist.



Common Course Number: ATF 2200

Unit 10: Commercial Pilot: Flight at Critically Slow Airspeeds

General Outcome:

10.0 The student shall: Be able to perform tasks relative to flight at critically slow airspeed in the following areas: imminent stalls and maneuvers during slow flight.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 10.1** Exhibit commercial pilot knowledge by explaining the aerodynamic factors associated with imminent stalls in various configurations.
- A. Select an entry altitude that will allow recoveries to be completed no lower than 1,500 feet AGL.
 - B. Stabilize the airplane during entry at the airspeed, configuration, and power setting appropriate to the flight situation from which the imminent stall is to be demonstrated.
 - C. Maintain the specified heading, +/-10 degrees, in straight flight; the specified angle of bank, +10 degrees, in turning flight.
 - D. Establish a pitch attitude that will induce an imminent stall.
 - E. Apply proper control to maintain coordinated flight.
 - F. Recognize and recover promptly at the first indication of buffeting or decay of control effectiveness with or without power applications as directed.
 - G. Recover with minimum loss of altitude consistent with safety during power-on recoveries; recovers to the glide airspeed, +10 knots, during power-off recoveries.
 - H. Resume the specified airspeed and retract wing flaps and landing gear, as appropriate.
 - I. Avoid full stalls, excessive pitch changes, spirals, spins, or flight below 1,500 feet AGL.
- 10.2** Exhibit knowledge by explaining the flight characteristics and controllability associated with maneuvering during slow flight.
- A. Select an entry altitude that will allow the maneuver to be performed no lower than 1,500 feet AGL.



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- B. Establish and maintain slow flight, specified gear position (as appropriate), various flap settings, and angles of bank, during straight-and-level flight and level turns.
- C. Maintain a specified altitude, +/-50 feet.
- D. Maintain a specified heading during straight flight, +/-10 degrees.
- E. Maintain a specified bank angle, +/-5 degrees, during turning flight.
- F. Maintain airspeed of 5 knots (+5 knots) above stall speed.



Common Course Number: ATF 2200

Unit 11: Commercial Pilot: Maximum Performance Maneuvers

General Outcome:

11.0 The student shall: Be able to perform tasks relative to maximum performance maneuvers in the following areas: steep power turns, chandelles, lazy eights, and steep spirals.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 11.1** Exhibit knowledge by explaining the performance factors associated with steep power turns, including load factor and angle-of-bank limitations, effect on stall speed, power required, and over banking tendency.
- A. Select an altitude that will allow the maneuver to be performed no lower than 1,500 feet AGL.
 - B. Establish the recommended entry airspeed.
 - C. Enter a 360 degree turn maintaining a bank angle of 50 degrees, +/-5 degrees, in smooth, stabilized, coordinated flight.
 - D. Recognize the need to apply smooth, coordinated control to maintain the specified altitude, +/-100 feet, and the specified airspeed, +/-10 knots.
 - E. Divide attention between airplane control and orientation.
 - F. After completing a 360-degree turn, roll out at the entry-heading, +/-10 degrees.
 - G. Avoid any indication of a stall or tendency to exceed the structural limits of the airplane during the turns.
 - H. Perform steep turns both right and left.
- 11.2** Exhibit commercial pilot knowledge by explaining the performance factors associated with chandelles, including how maximum flight performance can be obtained.
- A. Select an altitude that will allow the maneuver to be performed no lower than 1,500 feet AGL.
 - B. Establish the recommended entry configuration, power, and airspeed (not to exceed V_A).



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COURSE OUTLINE

Common Course Number: ATF 2200

- C. Establish the angle of bank at approximately 30 degrees.
- D. Simultaneously apply specified power and pitch to maintain a smooth, coordinated, climbing turn to the 90 degree point with a constant bank angle.
- E. Execute a coordinated constant rate of roll-out from the 90 degree point to the 180 degree point maintaining specified power and a constant pitch attitude.
- F. Complete roll-out at the 180 degree point, +/-10 degrees, just above a stall airspeed, and maintain that airspeed momentarily avoiding a stall.
- G. Resume straight-and-level flight with minimum loss of altitude.

11.3 Exhibit commercial pilot knowledge by explaining the performance factors associated with lazy eights, including how maximum flight performance can be obtained.

- A. Select an altitude that will allow the maneuver to be performed no lower than 1,500 feet AGL and selects the reference point.
- B. Established the recommended entry power and airspeed.
- C. Enter a coordinated climbing turn in the direction of the 45 degree reference point, attaining the maximum pitch-up attitude and proper bank passing through that point.
- D. Continue the coordinated turn from the 45-degree reference point to the 90-degree reference point, decreasing the pitch attitude while increasing the bank to an angle of approximately 30 degrees.
- E. Complete 90 degree of turn with the maximum angle of bank, minimum airspeed and pitch attitude with the longitudinal axis passing through the reference point.
- F. Continue the coordinated descending turn from the 90 degree reference point to the 135 degree reference point, decreasing the bank to the proper angle passing through the 135 degree reference point.
- G. Continue the coordinated turn from the 135 degree reference point to the 180 degree reference point, increasing the pitch attitude and decreasing angle of bank attaining level flight and original airspeed and altitude passing through the 180 degree reference point.
- H. Enter a coordinated climbing turn in the opposite direction toward the selected reference points to complete the second half of the symmetrical loop.
- I. Achieve the following throughout the maneuver:



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- (1) Constant change of pitch and roll rate.
 - (2) Altitude tolerance at the 90 degree point, +/-100 feet.
 - (3) Altitude tolerance at the 180 degree point, +/-100 feet from entry altitude.
 - (4) Airspeed tolerance at the 90 degree point, +/-10 knots.
 - (5) Airspeed tolerance at the 180 degree point, %10 knots from entry airspeed.
 - (6) Heading tolerance at the 180 degree point +/-10 degrees.
- J. Continue the maneuver through the number of symmetrical loops specified and resume straight-and-level flight.
- 11.4** Exhibit commercial pilot knowledge by explaining the performance factors associated with steep spirals while maintaining the airplane's position in relation to a point on the surface.
- A. Select an altitude sufficient to continue through a series of at least three 360 degree turns.
 - B. Select a suitable ground reference point.
 - C. Establish a spiral with steepest angle of bank, 50 to 55 degrees, at the recommended airspeed, and with the specified radius of turn.
 - D. Maintain a constant radius around the selected reference point through coordinated control.
 - E. Divide attention between airplane control, planning flight path, and orientation.
 - F. Maintain the specified airspeed, +/-10 knots.
 - G. Recover toward a definite object or specific heading, which leads into a pattern over an area that could be used for a forced landing.



Common Course Number: ATF 2200

Unit 12: Commercial Pilot: Flight by Reference to Ground Objects

General Outcome:

- 12.0 The student shall:** The students should be able to perform tasks relative to flight by reference to ground objects in the following areas: eights around pylons and eights-on-pylons.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 12.1** Exhibit knowledge by explaining the procedures associated with eights around pylons and wind-effect correction throughout the maneuver.
- A. Select suitable ground reference points that will permit approximately three to five seconds of straight-and-level flight between the pylons.
 - B. Enter the maneuver in the proper direction and altitude (600 to 1,000 feet AGL) and a bank angle of approximately 30 to 40 degrees at the steepest point.
 - C. Divide attention between coordinated airplane control and ground track.
 - D. Apply the necessary wind-effect corrections to track a constant distance from each pylon.
 - E. Maintain the specified altitude, % 100 feet, and airspeed, % 10 knots.
- 12.2** Exhibit commercial pilot knowledge by explaining the procedures associated with eights-on-pylons and corrections used to maintain the line-of-sight reference line on the pylon.
- A. Select suitable pylons that will permit approximately three to five seconds of straight-and-level flight between the pylons.
 - B. Enter the maneuver properly at the appropriate altitude and airspeed and at a bank angle of approximately 30 to 40 degrees at the steepest point.
 - C. Divide attention between accurate coordinated airplane control and outside visual references.
 - D. Apply the necessary corrections so that the line-of-sight reference line remains on the pylon with minimum longitudinal and vertical movement.
 - E. Hold pylon using appropriate pivotal altitude avoiding slips or skids.



Common Course Number: ATF 2200

Unit 13: Commercial Pilot: Emergency Operations

General Outcome:

13.0 The student shall: Be able to perform tasks relative to emergency operations in the following areas: emergency approach and landing (simulated) and systems and equipment malfunctions .

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 13.1** Exhibit knowledge by explaining approach and landing procedures to be used in various emergencies.
- A. Establish and maintain the recommended best-glide airspeed, +/-5 knots, and configuration during simulated emergencies.
 - B. Select a suitable landing area within gliding distance.
 - C. Plan and follow a flight pattern to the selected landing area considering altitude, wind, terrain, obstructions, and other factors.
 - D. Follow an appropriate emergency checklist.
 - E. Attempt to determine the reason for the simulated malfunction.
 - F. Maintain correct coordinated control of the airplane.
- 13.2** Exhibit commercial pilot knowledge by explaining causes, indications, and pilot actions for various systems and equipment malfunctions.
- A. Analyze the situation and take appropriate action for simulated emergencies such as:
 - (1) Partial power loss.
 - (2) Rough running engine or overheat.
 - (3) Loss of oil pressure.
 - (4) Carburetor or induction icing.
 - (5) Fuel starvation.



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- (6) Fire in flight.
- (7) Electrical system malfunction.
- (8) Gear or flap malfunction.
- (9) Door opening in flight.
- (10) trim inoperative.
- (11) Loss of pressurization.
- (12) Other malfunctions.