Tennessee CTE

Aviation II: Advanced Flight

Aviation Safety

1 **Apply the safety concepts learned in previous classes to develop several detailed plans to potential problems faced in flight. To guide the planning, students should ask and then answer the question, "What would I do if……?" in response to problems such as, but not limited to:** 1

- A Aircraft door pops open just after lift off 1A
- B Engine fails at 100 feet AGL on takeoff 1B
- C Engine fails at 500 feet AGL on takeoff 1C
- D Oil on windshield on climb out 1D
- E Fuel being siphoned out of fuel tank on climb out due to an unsecured fuel cap 1E
- F Cabin fire 1F
- G Engine fire 1G
- H Minimum fuel situation 1H
- I Deteriorating weather 1I
- J Sick or unruly passenger 1J

2 **Demonstrate understanding of the five hazardous thoughts and associated antidotes to each of the following: Students will determine if they have one or more of these hazardous thoughts and explain what they do to realize when their decisions may be influenced by a hazardous thought. Students should also explain how they will counteract this thought in order to remain as safe as possible.** 2

- A Anti-authority 2A
- B Impulsivity 2B
- C Invulnerability 2C
- D Macho 2D
- E Resignation 2E

Careers in Aviation

3 **Demonstrate understanding and be able to explain the privileges and FAA requirements for each of the following pilot certificates and ratings:** 3

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- A Certificates 3A
  - i Sport 3AI
  - ii Private 3AII
  - iii Commercial 3AIII
  - iv Airline Transport Pilot (ATP) 3AIV
- B Ratings 3B
  - i Instrument 3BI
  - ii Sea Plane 3BII
  - iii Multi engine 3BIII
  - iv Glider 3BIV
- C License (Mechanic) 3C
  - i Airframe 3CI
  - ii Power Plant 3CII

Systems Problem Solving

4 Describe the functions and characteristics of an airplane's aileron, elevator, and rudder, including the trim system if appropriate. Troubleshoot system problems to safely land aircraft in a variety of situations, including but not limited to: 4

- A Frozen or stuck ailerons 4A
- B Frozen or stuck elevators 4B
- C Frozen or stuck rudder 4C
- D Taking off with a control lock still in place 4D
- E Aileron, elevator, or rudder hooked up backwards 4E

5 Describe the functions and characteristics of an airplane's power plant, and troubleshoot system problems to safely land aircraft in a variety of situations, including but not limited to: 5

- A Partial engine failure 5A
- B Complete engine failure 5B
- C Low oil pressure 5C
- D High oil and/or cylinder head temperature 5D

6 Describe the functions and characteristics of an airplane's instrument systems, and troubleshoot system problems to safely land aircraft in a variety of situations, including but not limited to: 6

- A Blocked pitot system 6A
- B Blocked static system 6B
- C Failed vacuum pump 6C
- D Failed flight gyros 6D

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E Two-way communications failure 6E

7 Describe the functions and characteristics of an airplane's fuel systems, and troubleshoot system problems to safely land aircraft in a variety of situations, including but not limited to: 7

A Low fuel 7A

B Vapor lock 7B

C Contaminated fuel 7C

8 Describe the functions and characteristics of an airplane's electrical systems, and troubleshoot system problems to safely land aircraft in a variety of situations, including, but not limited to: 8

A Alternator/generator failure 8A

B Alternator/generator overcharging 8B

C Electrical fire 8C

D Popped circuit breaker(s) 8D

E Runaway electric trim 8E

F Electrical smoke 8F

Advanced Aerodynamics and Physics of Flight

9 Research, understand, and be able to explain the aerodynamics force that affect an aircraft on the ground and in flight. Anticipate, prevent, and recommend actions to recover from unsafe flight conditions such as, but not limited to: 9

A Becoming airborne at too slow an airspeed in ground effect 9A

B Aircraft stalling at an unsafe altitude 9B

C Aircraft spin 9C

D High density altitude airport operations 9D

10 Explain the effects of high-density altitudes on aircraft takeoff distances, aircraft rate of climb, aircraft angle of climb, Indicated Airspeed (IAS) versus True Airspeed (TAS), and landing distances. 10

Trends and Emerging Technologies

11 Drawing on industry magazines, scholarly research, and news media, explore in an informational essay the chief features, advantages, and disadvantages of emerging aviation technologies, such as unmanned aerial vehicles (UAVs) and mobile technologies gaining prominence in aviation fields. Discuss how these technologies work, how they have impacted (or are expected to impact) the aviation industry, and their impact on aircraft safety. 11

Emergency Procedures

12 Demonstrate the ability to follow an emergency procedure for a low fuel situation. Read, recite, and complete the appropriate memory and non-memory checklists in front of peers or in a mock emergency situation while safely flying the aircraft. 12

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	13 **Demonstrate the ability to follow an emergency procedure for an aircraft fire situation. Read, recite, and complete the appropriate memory and non-memory checklists in front of peers or in a mock emergency situation while safely flying the aircraft.** 13
	14 **Demonstrate the ability to follow an emergency procedure for a medical emergency situation. Read, recite, and complete the appropriate memory and non-memory checklists in front of peers or in a mock emergency situation while safely flying the aircraft.** 14
	15 **Demonstrate the ability to follow an emergency procedure for a deteriorating weather situation. Read, recite, and complete the appropriate memory and non-memory checklists in front of peers or in a mock emergency situation while safely flying the aircraft.** 15
	16 **Demonstrate the ability to follow an emergency procedure for a two-way radio failure situation. Read, recite, and complete the appropriate memory and non-memory checklists in front of peers or in a mock emergency situation while safely flying the aircraft.** 16
	17 **Demonstrate the ability to follow an emergency procedure for a partial or complete engine failure situation. Read, recite, and complete the appropriate memory and non-memory checklists in front of peers or in a mock emergency situation while safely flying the aircraft.** 17
Problems with Aircraft Performance and Weight & Balance	**18** **Consult the manufacturer's approved limits for an aircraft's center of gravity. Explain the associated problems when the aircraft's center of gravity is forward or aft of the approved limits. Given a designated degree of imbalance, determine and demonstrate in a mock setting how to move passengers and/or cargo to bring the center of gravity within the manufacturer's approved takeoff CG envelope. Correctly use a moment index to plot these changes on a loading graph to aid in the demonstration, attending to appropriate units, quantities, and terminology.** 18
	19 **Consult the manufacturer's approved maximum takeoff weight. Explain the associated problems when the aircraft's takeoff weight is greater than approved by the manufacturer. Calculate the proper reduction in weight for various combinations of passengers and cargo; be "able and willing" to reduce the payload as needed to bring the aircraft within the manufacturer's approved takeoff weight.** 19
Cross-Country Planning	**20** **Determine the different factors involved in planning the best route on each leg of a cross- country flight. For each factor, describe why it should be considered when determining the route, citing, by contrast, what could go wrong if the factor was not considered. Examples include the following:** 20 A Shortest distance 20A B Lowest terrain 20B

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C Best emergency landing options 20C

D Smoothest air 20D

21 Determine the different factors involved in calculating the best altitude to fly on each leg of a cross-country flight. Given a specific route, calculate optimum altitude for all stages of a cross-country flight, incorporating consideration of the factors identified above and relying on sectional and world aeronautical charts, aircraft specifications, and other resources to make proper determinations. Factors may include the following: 21

A VFR – Easterly heading (odd thousand + 500') or Westerly heading (even thousand + 500') 21A

B IFR – Easterly heading (odd thousand) or Westerly heading (even thousand) (below FL 290) 21B

C Distance between departure airport and destination airport 21C

D Headwind/tailwind components at different altitudes 21D

E Terrain features 21E

F Emergency landing options 21F

G Smoothest air 21G

H Pressurized versus non-pressurized aircraft 21H

22 Given a specific flight route, determine the headwind/tailwind component on each leg of a cross-country flight. Specifically, 22

A Determine forecast winds aloft for each leg 22A

B Determine best altitude for each leg 22B

C Determine headwind/tailwind component for each leg 22C

23 Given a specific flight route, determine the estimated groundspeed on each leg of a cross- country flight. Specifically, 23

A Determine altitude 23A

B Determine true airspeed (TAS) 23B

C Determine headwind/tailwind component 23C

D Determine crosswind component 23D

E Determine estimated groundspeed (GS) 23E

24 Given a specific flight route, determine the estimated magnetic heading required for each leg of a cross-country flight. Specifically, 24

A Determine True Course (TC) / Magnetic Course (MC) 24A

B Determine crosswind component 24B

C Determine True Heading (TH) 24C

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D Determine amount of variation; show how to add variation if it is a Westerly variation and subtract variation if it is an Easterly variation 24D

E Determine Magnetic Heading (MH) 24E

25 Citing relevant examples and supporting texts, explain to both a lay audience and a technical audience the concept of estimated time enroute (ETE) and the effect of flying through different time zones. For a given scenario, determine and communicate departure and arrival times in local times and GMT. 25

26 Correctly simulate how to complete, file, activate, and close or cancel a VFR flight plan, following proper procedures and determining the information requested in each box of the flight plan. 26

27 Research, role play, communicate, and write about the factors involved in correctly departing from and arriving at an airport. For each of the following, consult and cite the Airman's Information Manual and FAA guidelines when modeling the behaviors necessary for successful takeoff and landing, including communications with ground control, air traffic control, any passengers, and relevant superiors, peers, and authorities: 27

- A Controlled airport – Departure 27A
  - i ATIS 27AI
  - ii Clearance delivery (assigned headings, altitudes, transponder codes, departure frequencies) 27AII
  - iii Ground control (taxi instructions) 27AIII
  - iv Tower (VFR flight plan activation) 27AIV
  - v Departure control 27AV
- B Controlled airport – Arrival 27B
  - i ATIS 27BI
  - ii Approach control (tower) 27BII
  - iii VFR flight plan closure 27BIII
  - iv Ground Control (taxi instructions) 27BIV
- C Non-controlled airport – Departure 27C
  - i AWOS 27CI
  - ii CTAF / Unicom (pre-taxi communication, pre-takeoff communication) 27CII
  - iii Proceeding on course 27CIII
  - iv VFR Activation with FSS 27CIV
- D Non-controlled airport – Arrival 27D
  - i AWOS 27DI
  - ii CTAF / Unicom (airport advisory, pre-pattern communication, pattern communication, base communication, clearing runway communication) 27DII
  - iii VFR flight plan closure with FSS via radio or telephone 27DIII

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Federal Aviation Regulations (FARs)	28	**Demonstrate understanding and be able to explain important FARs that relate to Private Pilot operations included in the following, citing specific text and wording from the regulations. Articulate why these regulations are necessary and analyze how the FAA has structured the FARs in order to quickly retrieve such information in the future.** 28 A FAR Part 1 38A B FAR Part 21 38B C FAR Part 39 28C D FAR Part 43 28D E FAR Part 61 28E F FAR Part 71 28F G FAR Part 91 28G H NTSB Part 830 28H
Judgment Training	29	**Continue to explore and demonstrate understanding of proper techniques for improving pilot judgment and decision-making skills in every aspect of the pre-flight, in-flight, and post- flight stages.** 29
FAA Private Pilot Written Exam Preparation	30	**Students will demonstrate mastery of corresponding course content for the FAA Private Pilot written exam when achieving a score of 80% on a practice 60-question exam.** 30