Module – 3

BASIS OF FLIGHT MECHANICS

Syllabus:

Basis of flight mechanics, Forces applying on an airplane, Load factor, Load factor experimentation flight, Lift and propulsion equation, Climb and descent.

MCQs

1. What is the study of flight mechanics primarily concerned with?

a) Aerodynamics

b) Aerospace engineering

c) Forces and motion of aircraft

d) Rocket propulsion

2. Which of the following forces acts perpendicular to the direction of motion?

a) Thrust

b) Lift

c) Weight

d) Drag

3. The load factor is defined as the ratio of:

a) Lift to weight

b) Thrust to drag

c) Weight to lift

d) Load factor does not involve these ratios

4. Load factor is a measure of:

a) The aircraft's stability

b) The structural stress on the aircraft

c) The speed of the aircraft

d) The pilot's skill level

5. Which of the following factors can affect the load factor experienced by an aircraft?

a) Maneuvering

b) Turbulence

c) Weight of the aircraft

d) All of the above

6. Load factor experimentation flight involves:

a) Testing the limits of an aircraft's structural integrity

b) Experimenting with different propulsion systems

c) Investigating the effects of lift on flight performance

d) None of the above

7. The lift equation states that lift is proportional to:

a) The weight of the aircraft

b) The speed of the aircraft

c) The angle of attack

d) All of the above

8. Which of the following factors can increase lift?

a) Increasing the angle of attack

b) Increasing the speed of the aircraft

c) Increasing the wing area

d) All of the above

9. What is the primary force that propels an aircraft forward?

a) Drag

b) Thrust

c) Weight

d) Lift

10. The climb of an aircraft refers to:

a) The upward movement of the aircraft

b) The downward movement of the aircraft

c) The forward movement of the aircraft

d) The backward movement of the aircraft

11. The descent of an aircraft refers to:

a) The upward movement of the aircraft

b) The downward movement of the aircraft

c) The forward movement of the aircraft

d) The backward movement of the aircraft

12. Which of the following factors can affect the climb performance of an aircraft?

a) Weight of the aircraft

b) Angle of climb

c) Power of the engine

d) All of the above

13. The ratio of the change in altitude to the distance traveled horizontally during a climb is called:

a) Climb rate

b) Glide ratio

c) Angle of climb

d) Climb gradient

14. During a descent, the aircraft's potential energy is converted into:

a) Kinetic energy

b) Thrust

c) Lift

d) Drag

15. Which of the following factors can affect the descent performance of an aircraft?

a) Weight of the aircraft

b) Angle of descent

c) Air density

d) All of the above

16. The primary purpose of an airplane wing is to:

a) Generate lift

b) Generate thrust

c) Maintain stability

d) Reduce drag

17. Which of the following statements about the forces on an airplane is true?

a) Lift and drag act in the same direction

b) Thrust and weight act in the same direction

c) Lift and weight act in opposite directions

d) Thrust and drag act in opposite directions

18. The load factor experienced by an airplane during straight and level flight is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor does not apply to straight and level flight

19. The load factor during a coordinated turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor does not apply to turns

20. The load factor during a 60° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor cannot be determined based on the bank angle

21. Which of the following factors can affect the lift equation?

a) Air density

b) Wing area

c) Velocity of the aircraft

d) All of the above

22. The term "angle of attack" refers to:

a) The angle between the wing and the horizontal axis

b) The angle between the wing and the vertical axis

c) The angle between the wing and the airflow

d) The angle between the wing and the thrust vector

23. What is the purpose of the propulsion equation?

a) To calculate the thrust required for level flight

b) To calculate the drag acting on the aircraft

c) To determine the power required for the engine

d) To analyze the efficiency of the propulsion system

24. Which of the following factors can affect the climb rate of an aircraft?

a) Power of the engine

b) Angle of climb

c) Weight of the aircraft

d) All of the above

25. The glide ratio is defined as the ratio of:

a) Lift to drag

b) Thrust to weight

c) Weight to lift

d) Glide ratio does not involve these ratios

26. What is the relationship between thrust and drag in level flight?

a) Thrust is greater than drag

b) Thrust is equal to drag

c) Thrust is less than drag

d) The relationship varies depending on the aircraft's speed

27. Which of the following factors can increase drag?

a) Increasing the speed of the aircraft

b) Increasing the wing area

c) Increasing the angle of attack

d) All of the above

28. Which of the following forces acts opposite to the direction of motion?

a) Thrust

b) Lift

c) Weight

d) Drag

29. The primary purpose of an aircraft's propulsion system is to:

a) Generate lift

b) Generate thrust

c) Maintain stability

d) Reduce drag

30. Which of the following factors can affect the descent rate of an aircraft?

a) Power of the engine

b) Angle of descent

c) Weight of the aircraft

d) All of the above

31. The load factor during a 30° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor cannot be determined based on the bank angle

32. The load factor during a 90° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor cannot be determined based on the bank angle

33. Which of the following factors can affect the lift-to-drag ratio of an aircraft?

a) Wing shape

b) Surface roughness

c) Angle of attack

d) All of the above

34. What is the relationship between angle of attack and lift?

a) As angle of attack increases, lift decreases

b) As angle of attack increases, lift remains constant

c) As angle of attack increases, lift increases

d) There is no relationship between angle of attack and lift

35. The term "stall" refers to:

a) The loss of lift due to excessive angle of attack

b) The loss of thrust in the propulsion system

c) The loss of stability in flight

d) The loss of control by the pilot

36. Which of the following statements about lift is true?

a) Lift acts in the same direction as weight

b) Lift acts perpendicular to the direction of motion

c) Lift acts opposite to the direction of motion

d) Lift acts parallel to the direction of motion

37. The term "thrust" refers to:

a) The force that opposes motion

b) The force that propels an aircraft forward

c) The force that acts vertically upward

d) The force that acts vertically downward

38. What is the relationship between angle of attack and drag?

a) As angle of attack increases, drag decreases

b) As angle of attack increases, drag remains constant

c) As angle of attack increases, drag increases

d) There is no relationship between angle of attack and drag

39. The term "drag" refers to:

a) The force that opposes motion

b) The force that propels an aircraft forward

c) The force that acts vertically upward

d) The force that acts vertically downward

40. Which of the following statements about drag is true?

a) Drag acts in the same direction as thrust

b) Drag acts perpendicular to the direction of motion

c) Drag acts opposite to the direction of motion

d) Drag acts parallel to the direction of motion

41. The term "weight" refers to:

a) The force that opposes motion

b) The force that propels an aircraft forward

c) The force that acts vertically upward

d) The force that acts vertically downward

42. What is the relationship between weight and lift in level flight?

a) Weight is greater than lift

b) Weight is equal to lift

c) Weight is less than lift

d) The relationship varies depending on the aircraft's speed

43. The term "load factor" refers to:

a) The ratio of lift to weight

b) The ratio of thrust to drag

c) The ratio of weight to lift

d) The ratio of the maximum load to the structural limit

44. The load factor during a coordinated turn is primarily determined by:

a) The angle of bank

b) The angle of attack

c) The airspeed of the aircraft

d) The weight of the aircraft

45. What is the relationship between load factor and stall speed?

a) Load factor has no effect on stall speed

b) Load factor decreases stall speed

c) Load factor increases stall speed

d) The relationship between load factor and stall speed is complex

46. The load factor during a 45° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor cannot be determined based on the bank angle

47. Which of the following factors can affect the lift-to-drag ratio of an aircraft?

a) Wing shape

b) Surface roughness

c) Angle of attack

d) All of the above

48. What is the relationship between lift and drag in level flight?

a) Lift is greater than drag

b) Lift is equal to drag

c) Lift is less than drag

d) The relationship varies depending on the aircraft's speed

49. Which of the following factors can increase thrust?

a) Increasing the speed of the aircraft

b) Increasing the engine power

c) Increasing the weight of the aircraft

d) All of the above

50. The term "thrust-to-weight ratio" refers to:

a) The ratio of thrust to lift

b) The ratio of thrust to drag

c) The ratio of thrust to weight

d) The ratio of thrust to speed

51. Which of the following factors can affect the descent angle of an aircraft?

a) Power of the engine

b) Angle of descent

c) Weight of the aircraft

d) All of the above

52. The lift equation does not consider which of the following factors?

a) Wing area

b) Air density

c) Angle of attack

d) Weight of the aircraft

53. Which of the following factors can affect the thrust required for level flight?

a) Weight of the aircraft

b) Angle of climb

c) Power of the engine

d) All of the above

54. The glide ratio is a measure of:

a) The aircraft's climb performance

b) The aircraft's descent performance

c) The aircraft's lift-to-drag ratio

d) The aircraft's maneuvering ability

55. The angle of climb is defined as the angle between:

a) The aircraft's flight path and the horizontal axis

b) The aircraft's flight path and the vertical axis

c) The aircraft's flight path and the airflow

d) The aircraft's flight path and the thrust vector

56. The angle of descent is defined as the angle between:

a) The aircraft's flight path and the horizontal axis

b) The aircraft's flight path and the vertical axis

c) The aircraft's flight path and the airflow

d) The aircraft's flight path and the thrust vector

57. Which of the following factors can affect the climb gradient of an aircraft?

a) Power of the engine

b) Angle of climb

c) Weight of the aircraft

d) All of the above

58. The lift-to-drag ratio is a measure of:

a) The aircraft's climb performance

b) The aircraft's descent performance

c) The aircraft's maneuvering ability

d) The aircraft's aerodynamic efficiency

59. The term "angle of bank" refers to:

a) The angle between the wing and the horizontal axis

b) The angle between the wing and the vertical axis

c) The angle between the wing and the airflow

d) The angle between the wing and the thrust vector

60. What is the relationship between angle of bank and load factor?

a) As angle of bank increases, load factor decreases

b) As angle of bank increases, load factor remains constant

c) As angle of bank increases, load factor increases

d) There is no relationship between angle of bank and load factor

61. The term "climb rate" refers to:

a) The ratio of the change in altitude to the distance traveled horizontally during a climb

b) The ratio of the change in altitude to the time taken to climb

c) The ratio of the change in distance traveled horizontally to the change in altitude

d) The ratio of the change in time taken to climb to the change in altitude

62. Which of the following factors can affect the climb rate of an aircraft?

a) Weight of the aircraft

b) Angle of climb

c) Power of the engine

d) All of the above

63. The descent rate is defined as the ratio of:

a) The change in altitude to the distance traveled horizontally during a descent

b) The change in altitude to the time taken to descend

c) The change in distance traveled horizontally to the change in altitude

d) The change in time taken to descend to the change in altitude

64. Which of the following factors can affect the descent rate of an aircraft?

a) Power of the engine

b) Angle of descent

c) Weight of the aircraft

d) All of the above

65. The primary purpose of an aircraft's wing is to generate:

a) Lift

b) Thrust

c) Stability

d) Drag

66. Which of the following statements about the forces on an aircraft is true?

a) Lift and drag act in the same direction

b) Thrust and weight act in the same direction

c) Lift and weight act in opposite directions

d) Thrust and drag act in opposite directions

67. The load factor during straight and level flight is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor does not apply to straight and level flight

68. The load factor during a 45° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor cannot be determined based on the bank angle

69. Which of the following factors can affect the lift equation?

a) Air density

b) Wing area

c) Velocity of the aircraft

d) All of the above

70. The term "angle of attack" refers to:

a) The angle between the wing and the horizontal axis

b) The angle between the wing and the vertical axis

c) The angle between the wing and the airflow

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71. What is the purpose of the propulsion equation?

a) To calculate the thrust required for level flight

b) To calculate the drag acting on the aircraft

c) To determine the power required for the engine

d) To analyze the efficiency of the propulsion system

72. Which of the following factors can affect the climb rate of an aircraft?

a) Power of the engine

b) Angle of climb

c) Weight of the aircraft

d) All of the above

73. The glide ratio is defined as the ratio of:

a) Lift to drag

b) Thrust to weight

c) Weight to lift

d) Glide ratio does not involve these ratios

74. What is the relationship between thrust and drag in level flight?

a) Thrust is greater than drag

b) Thrust is equal to drag

c) Thrust is less than drag

d) The relationship varies depending on the aircraft's speed

75. Which of the following factors can increase drag?

a) Increasing the speed of the aircraft

b) Increasing the wing area

c) Increasing the angle of attack

d) All of the above

76. Which of the following forces acts opposite to the direction of motion?

a) Thrust

b) Lift

c) Weight

d) Drag

77. The primary purpose of an aircraft's propulsion system is to:

a) Generate lift

b) Generate thrust

c) Maintain stability

d) Reduce drag

78. Which of the following factors can affect the descent rate of an aircraft?

a) Power of the engine

b) Angle of descent

c) Weight of the aircraft

d) All of the above

79. The load factor during a 30° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

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80. The load factor during a 90° banked turn is:

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c) Less than 1

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81. Which of the following factors can affect the lift-to-drag ratio of an aircraft?

a) Wing shape

b) Surface roughness

c) Angle of attack

d) All of the above

82. What is the relationship between angle of attack and lift?

a) As angle of attack increases, lift decreases

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d) There is no relationship between angle of attack and drag

87. The term "drag" refers to:

a) The force that opposes motion

b) The force that propels an aircraft forward

c) The force that acts vertically upward

d) The force that acts vertically downward

88. Which of the following statements about drag is true?

a) Drag acts in the same direction as thrust

b) Drag acts perpendicular to the direction of motion

c) Drag acts opposite to the direction of motion

d) Drag acts parallel to the direction of motion

89. The term "weight" refers to:

a) The force that opposes motion

b) The force that propels an aircraft forward

c) The force that acts vertically upward

d) The force that acts vertically downward

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a) The angle of bank

b) The angle of attack

c) The airspeed of the aircraft

d) The weight of the aircraft

93. What is the relationship between load factor and stall speed?

a) Load factor has no effect on stall speed

b) Load factor decreases stall speed

c) Load factor increases stall speed

d) The relationship between load factor and stall speed is complex

94. The load factor during a 45° banked turn is:

a) Equal to 1

b) Greater than 1

c) Less than 1

d) Load factor cannot be determined based on the bank angle

95. Which of the following factors can affect the lift-to-drag ratio of an aircraft?

a) Wing shape

b) Surface roughness

c) Angle of attack

d) All of the above

96. What is the relationship between lift and drag in level flight?

a) Lift is greater than drag

b) Lift is equal to drag

c) Lift is less than drag

d) The relationship varies depending on the aircraft's speed

97. Which of the following factors can increase thrust?

a) Increasing the speed of the aircraft

b) Increasing the engine power

c) Increasing the weight of the aircraft

d) All of the above

98. The term "thrust-to-weight ratio" refers to:

a) The ratio of thrust to lift

b) The ratio of thrust to drag

c) The ratio of thrust to weight

d) The ratio of thrust to speed

99. Which of the following factors can affect the descent angle of an aircraft?

a) Angle of descent

b) Air density

c) Weight of the aircraft

d) All of the above

100. The lift-to-drag ratio is a measure of:

a) The aircraft's climb performance

b) The aircraft's descent performance

c) The aircraft's maneuvering ability

d) The aircraft's aerodynamic efficiency

101. The term "angle of attack" refers to the angle between the:

a) Wing and the horizontal axis

b) Wing and the vertical axis

c) Wing and the airflow

d) Wing and the thrust vector

102. Which of the following forces opposes the motion of an aircraft?

a) Thrust

b) Lift

c) Weight

d) Drag

103. The primary purpose of an aircraft's control surfaces, such as ailerons and elevators, is to:

a) Generate lift

b) Generate thrust

c) Control the aircraft's attitude and movement

d) Reduce drag

104. What is the relationship between angle of attack and lift for a given airspeed and wing configuration?

a) Lift increases with angle of attack up to a certain point, then decreases

b) Lift decreases with angle of attack up to a certain point, then increases

c) Lift remains constant regardless of the angle of attack

d) There is no relationship between angle of attack and lift