PRIVATE PILOT

VIII. AREA OF OPERATION: SLOW FLIGHT AND STALLS

A. TASK: MANEUVERING DURING SLOW FLIGHT

OBJECTIVE

To determine that the applicant:

1. Exhibits knowledge of the elements related to maneuvering during slow flight.
2. Selects an entry altitude that will allow the task to be completed no lower than 1,500 feet (460 meters) AGL.
3. Establishes and maintains an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power, would result in an immediate stall.
4. Accomplishes coordinated straight-and-level flight, turns, climbs, and descents with landing gear and flap configurations specified by the examiner.
5. Divides attention between airplane control and orientation.
6. Maintains the specified altitude +/-100 feet (30 meters), specified heading +/-10°, airspeed +10/-0 knots, and specified angle of bank +/-10°.

ELEMENTS

1. A certain minimum airspeed is required to maintain lift and control of an airplane, and is dependent on factors such as gross weight, load factors, and existing density altitude.
2. Minimum Controllable Airspeed (MCA): An airspeed at which any further increase in angle of attack or load factor, or reduction in power will cause an immediate stall.
3. Slow flight results in sloppy controls, ragged response to control inputs and difficulty in maintaining altitude.
4. Maneuvering at MCA should be performed using both instrument indications (especially the ASI) and outside reference.
5. A "feel" for the airplane at very low airspeeds must be developed to avoid inadvertent stalls and to operate the airplane with precision.
6. Transition from cruise to MCA:
    a. Gradually reduce the throttle from cruise power.
    b. While airspeed decreases, raise the nose to maintain altitude.
    c. After reaching V_{LOE}, extend the landing gear and perform gear down checks.
    d. After reaching V_{FE}, extend the full flaps allowable.
    e. Adjust pitch attitude to maintain altitude (especially during flap extension).
    f. Approaching V_{SO}, increase power to that required for MCA.
    g. Note the elevator feel and the sound of the reduced airflow around the airplane.
    h. Note the increased need for right rudder to counter left turning tendencies.
    i. Retrim the airplane as often as necessary to compensate for control pressure changes.
7. Maintaining MCA:
    a. Continually cross-check the AI, altimeter and ASI as well as outside references.
    b. Flight slower than the minimum drag airspeed (maximum lift-to-drag ratio, L/D_{MAX}) results in "speed instability," causing further reductions of airspeed with even slight turbulence.
    c. As airspeed reduces slower than L/D_{MAX}, drag increases and further exacerbates airspeed reduction unless additional power is applied (or the nose is lowered).
    d. Flight slower than L/D_{MAX} is in the "area of reverse command" (slower airspeed requires more power, faster airspeed requires less power) or "behind the power curve."
    e. Unless more power is applied (or the nose lowered) after entering the area of reverse command, the airspeed will continue to decay and the airplane will stall.
    f. During turns, power and pitch need to be increased to maintain altitude at MCA.
    g. At any airspeed, the tendency to stall increases when the bank is increased. While banking at MCA, an accelerated stall can be entered with little or no warning.
    h. A stall can also occur as a result of abrupt or rough control movements when flying at MCA.
    i. Turn, descend or climb at MCA by adjusting power.

8. Transition from MCA to cruise:
    a. Gradually increase the throttle.
    b. As airspeed increases lower the nose to maintain altitude.
    c. Gradually retract the flaps prior to V_{FE} (abruptly raising the flaps while at MCA will result in lift suddenly being lost, causing the airplane to lose altitude ("that sinking feeling") or possibly stall.
    d. Adjust pitch attitude to maintain altitude (especially during flap retraction).
    e. Retract the landing gear prior to V_{LOR}.
    f. Approaching cruise, set power to normal cruise setting.
    g. Note the return of normal elevator feel and the sound of increased airflow around the airplane.
    h. Note the reduced left turning tendencies and reduced need for right rudder.
    i. Retrim the airplane for cruise flight.

COMMON ERRORS

a. Failure to adequately clear the area.
b. Inadequate back-elevator pressure as power is reduced, resulting in altitude loss.
c. Excessive back-elevator pressure as power is reduced, resulting in a climb, followed by a rapid reduction in airspeed and "mushing."
d. Failure to establish specified gear and flap configuration.
e. Improper entry technique.
f. Failure to establish and maintain the specified airspeed.
g. Excessive variations in altitude and heading when a constant altitude and heading are specified.
h. Rough or uncoordinated control technique.
i. Improper correction for torque effect.
j. Inadequate rudder compensation for adverse yaw during turns.
k. Fixation on the airspeed indicator.
l. Failure to anticipate changes in lift as flaps are extended or retracted.
m. Improper trim technique.
n. Inadequate power management.
o. Inability to adequately divide attention between airplane control and orientation.
p. Unintentional stalls.
q. Inappropriate removal of hand from throttle.

REFERENCES

1. FAA-H-8083-3A, Airplane Flying Handbook, Chapter 4.
2. POH / AFM, Pilot Operating Handbook / FAA-Approved Airplane Flight Manual.