Practice Exercises

Please Read!

The following practice maneuvers are intended to help you better understand the interactions between aerodynamic forces, control inputs, and aircraft behavior. They are also meant to help you learn to recognize (and avoid) situations that can lead to inadvertent stalls and spins.

By necessity, the procedures described are general in nature: Before attempting any of these maneuvers, be familiar with the specific procedures appropriate to the airplane you fly. Also, be aware that some airplanes are not designed or certified to perform certain maneuvers (e.g., spins). Never “push the envelope”—either your own, or that of the airplane!

Finally, we strongly suggest that you bring along a qualified safety pilot (preferably an experienced flight instructor prepared to assume control in the event of a problem) when practicing any maneuvers with which you are not completely familiar or comfortable.

1) AERODYNAMIC DEMONSTRATION

Goal:

- Gain an understanding of the interaction between specific control inputs, aerodynamic forces, and aircraft behavior in various situations

Procedure:

- ✓ Select an entry altitude of at least 2,500 agl
- ✓ Perform clearing turns
- ✓ Configure the aircraft:
  - Mixture rich
  - Fuel on fullest tank
  - Propeller to high rpm (if equipped)
- ✓ Establish trimmed level flight at V_Y

Power

- ✓ Apply full power
  - Note climb at trimmed airspeed, loss of coordination
- ✓ Decrease throttle to idle
  - Note descent at trimmed airspeed, loss of coordination
- ✓ Return to previous configuration

Rudder (Dutch Roll)

- ✓ Apply rudder in one direction, then the other
  - Note roll that occurs as a result of yaw
- ✓ Return to previous configuration

Elevator

- ✓ Establish trimmed, level flight at 100 knots
- ✓ Apply and hold back pressure
  - Note climb with decreasing airspeed, loss of coordination
- ✓ Apply and hold forward pressure
  - Note descent with increasing airspeed, loss of coordination
- ✓ Return to trimmed, level flight at 100 knots

Aileron

- ✓ Apply varying degrees of aileron input without using rudder
  - Note yawing motion opposite the direction of bank (this effect may not be prominent in some aircraft)
- ✓ Return to level flight, then apply aileron and rudder for a coordinated turn
  - Note that the nose “follows” the airplane through the turn (i.e., does not yaw opposite the direction of bank)
- ✓ Return to normal cruise flight

2) MANEUVERING DURING SLOW FLIGHT

Goals:

- Experience the changes in control "feel" and effectiveness as airspeed decreases
- Learn the control inputs required to maneuver the aircraft at low airspeeds without precipitating a stall

Procedure:

- ✓ Select an entry altitude of at least 2,500 agl
- ✓ Perform clearing turns
- ✓ Configure the aircraft:
  - Mixture rich
  - Fuel on fullest tank
  - Propeller to high rpm (if equipped)
- ✓ Reduce power to approximately 1900 rpm or 19" mp (specific power setting will vary with conditions, aircraft type and configuration)
- ✓ Lower flaps to approach setting
- ✓ Maintain straight and level flight as the airplane decelerates
- ✓ Adjust power so that airspeed stabilizes at approximately 1.2 V_{SO}
- ✓ Use throttle and elevator to maintain this airspeed while:
  - Flying straight and level
  - Gently turning at various bank angles (not to exceed 15 degrees)
  - Climbing and descending
- ✓ Recover to normal cruise flight by:
  - Adding power
  - Decreasing angle of attack
  - Raising flaps

Common Mistakes:

- *Using insufficient rudder to correct for torque and p-factor*
- *Banking excessively during turns, leading to a loss of altitude or a stall*
- *Hesitating to make power changes and other corrections*
- *Failing to trim the airplane appropriately*
- *Unintentionally stalling the airplane*

3) POWER-OFF STALLS

Goals:

- Simulate an inadvertent stall during final approach
- Learn to recognize aircraft "feel," sounds, and other hints of an incipient stall
- Learn the control inputs required for effective recovery

Procedure:

- ✓ Select an entry altitude of at least 2,500 agl
- ✓ Perform clearing turns
- ✓ Configure the aircraft:
  - Mixture rich
  - Fuel on fullest tank
  - Propeller to high rpm (if equipped)
- ✓ Reduce power to a normal approach setting (approx. 1500 rpm or 15" mp)
- ✓ Lower flaps to approach setting
- ✓ Establish a descent at normal approach speed
- ✓ Pull the nose up to a landing pitch attitude and hold it there
- ✓ Be alert to indications of a stall (warning horn/light, buffeting, loss of control effectiveness)
- ✓ Recover by simultaneously:
  - Decreasing the angle of attack (relaxing back pressure and/or pushing the yoke forward)
  - Using the rudder to maintain coordination and keep the airplane from "falling off" to one side or the other
  - Adding full power
- ✓ Retract the first notch of wing flaps
- ✓ Transition to a shallow climb attitude
- ✓ After positive rate of climb has been established, retract landing gear (if equipped) and begin retracting wing flaps slowly, one notch at a time
- ✓ Resume normal cruise flight

Common Mistakes:

- *Reacting too slowly, allowing the stall to develop further than intended*
- *Attempting to keep the airplane from "falling off" to the left or right by using the ailerons, rather than the rudder*
- *Applying too much back pressure during the initial recovery and causing a secondary stall*
- *Failing to maintain coordinated flight before and during the stall*
- *Losing an excessive amount of altitude during the stall and recovery*

4) POWER-ON STALLS

Goals:

- Simulate an inadvertent stall during takeoff/climb
- Learn to recognize aircraft "feel," sounds, and other hints of an incipient stall
- Learn the control inputs required for effective recovery
- Demonstrate the fact that a stall can occur at any pitch attitude

Procedure:

- ✓ Select an entry altitude of at least 2,500 agl
- ✓ Perform clearing turns
- ✓ Reduce power to approximately 1500 rpm or 15" mp
- ✓ Configure the aircraft for a normal takeoff/climb:
    - Mixture rich
    - Fuel on fullest tank
    - Propeller to high rpm (if equipped)
- ✓ Pitch for normal takeoff/climb airspeed (V_Y)
- ✓ Set power to at least 65% (in most aircraft, use full throttle)
- ✓ Pitch up to a nose attitude that will induce a stall (normally 15-20 degrees nose-up)
    - Note: If this will result in a pitch angle greater than 30 degrees, use a lower power setting
- ✓ Be alert to indications of a stall (warning horn/light, buffeting, loss of control effectiveness)
- ✓ Recover by simultaneously:
    - Decreasing the angle of attack (relaxing back pressure and/or pushing the yoke forward)
    - Using the rudder to maintain coordination and keep the airplane from "falling off" to one side or the other
    - Adding full power (if not already there)
- ✓ Transition to a normal climb attitude
- ✓ After positive rate of climb has been established, retract landing gear (if equipped)
- ✓ Resume normal cruise flight

Common Mistakes:

- *Reacting too slowly, or failing to apply forward pressure on the yoke as the airplane enters the stall*
- *Attempting to keep the airplane from "falling off" to the left or right by using the ailerons, rather than the rudder*
- *Applying too much back pressure during the initial recovery and causing a secondary stall*
- *Failing to maintain coordinated flight before and during the stall*

5) ACCELERATED STALLS

Goals:

- Simulate an inadvertent stall while maneuvering and "pulling Gs "
- Learn to recognize aircraft "feel," sounds, and other hints of an incipient stall
- Learn the control inputs required for effective recovery
- Demonstrate the fact that an airplane can stall at an airspeed above the 1-G stalling speed

Procedure:

- ✓ Select an entry altitude of at least 3,500 agl
- ✓ Perform clearing turns
- ✓ Reduce power to approximately 1500 rpm or 15" mp
- ✓ Configure the aircraft for the maneuver:
  - Mixture rich
  - Fuel on fullest tank
  - Propeller to high rpm (if equipped)
- ✓ Establish an airspeed of roughly 1.3 V_S (approximately final approach speed)
- ✓ Establish a bank angle of at least 45 degrees
- ✓ Increase pitch to maintain altitude
- ✓ Be alert to indications of a stall (warning horn/light, buffeting, loss of control effectiveness)
- ✓ At the stall break, recover by simultaneously:
  - Decreasing the angle of attack (relaxing back pressure and/or pushing the yoke forward)
  - Leveling the wings
  - Applying rudder to maintain coordination
  - Adding full power
- ✓ Transition to normal cruise flight
- ✓ Note the indicated airspeed at the time of the stall

Common Mistakes:

- *Abruptly increasing back pressure*
- *Failing to apply enough back pressure*
- *Reacting too slowly, allowing the stall to develop further*
- *Overcompensating during the recovery and putting negative G-loads on the aircraft*

6) CROSS-CONTROLLED STALLS

NOTE: The procedure for demonstrating cross-controlled stalls may result in an unintentional spin. ASF strongly recommends that you bring an instructor who is competent in spins and spin recovery

Goals:

- Simulate an inadvertent stall without proper coordination
- Learn the control inputs required for effective recovery
- Learn what it takes to keep the stall from becoming a spin

Procedure:

- ✓ Select an entry altitude of at least 3,500 agl
- ✓ Perform clearing turns
- ✓ Reduce power to approximately 1500 rpm or 15" mp
- ✓ Configure the aircraft for the maneuver:
  - Mixture rich
  - Fuel on fullest tank
  - Propeller to high rpm (if equipped)
- ✓ Establish a shallow descent at an airspeed of approximately V_Y
- ✓ Apply rudder pressure in one direction and aileron in the other
- ✓ Pitch up to an attitude that will induce a stall
- ✓ Be alert to indications of a stall (warning horn/light, buffeting, loss of control effectiveness)
- ✓ At the first sign of the stall, recover by simultaneously:
  - Decreasing the angle of attack (relaxing back pressure and/or pushing the yoke forward)
  - Leveling the wings with appropriate rudder inputs
  - Regaining coordinated flight
  - Adding full power
- ✓ Transition to normal cruise flight

Common Mistakes:

- *Allowing the stall to develop into a spin*
- *Attempting to stop yawing/rolling movement by using ailerons*
- *Failing to establish a cross-controlled condition*
- *Applying too much back pressure during the initial recovery and causing a secondary stall*

7) NORMAL SPINS

NOTE: Unless you are experienced and proficient in the maneuver, never perform a spin unless accompanied by a qualified safety pilot or instructor. To comply with the regulations, you must wear a properly packed parachute unless you are practicing the spin as part of your training toward an FAA flight instructor certificate

Goals:

- Experience a normal two- to three-turn spin
- Learn the control inputs that cause the airplane to spin
- Learn the control inputs required for proper recovery

Procedure:

- ✓ Select an entry altitude of at least 5,000 agl
- ✓ Perform clearing turns
- ✓ Configure the aircraft for the maneuver:
    - Mixture rich
    - Fuel on fullest tank
    - Propeller to high rpm (if equipped)
- ✓ Reduce power to approximately 1500 rpm or 15" mp
- ✓ Increase pitch until the aircraft is slightly above the normal landing nose attitude
- ✓ Approximately five knots above the normal power-off stall speed, apply full rudder in the direction of the desired spin
- ✓ As the aircraft yaws and rolls in the direction of the rudder input, bring the yoke full back
- ✓ Reduce power to idle
- ✓ Hold rudder and elevator fully deflected for two to three turns
- ✓ Recover from the spin using the method recommended in the pilot's operating handbook. Typical procedures involve:
    - Applying full rudder opposite the direction of the spin rotation
    - Bringing the yoke forward to the neutral position
    - Pitching up firmly (but not abruptly) to stop the dive and regain level flight
    - Adding power and transition to normal cruise flight

Common Mistakes:

- *Leaving too much power in during the spin (this tends to make the airplane spin faster)*
- *During recovery, moving the yoke forward prior to applying opposite rudder (this can increase the rotation speed, and may lead to the spin going "flat")*
- *During recovery, pulling out of the dive too aggressively, stressing the airframe and/or precipitating a stall*