AeroDynamic Aviation
Private Pilot Maneuvers Summary
Citabria 7ECA
V1.01

Minimum standards are always – airspeed +-10mph, altitude +-100'; headings +-10 degrees unless otherwise specified. We want to always do much better than that!

1/ Straight and level flight, level turns
- normal cruise approx 2400rpm at sea level, 2500rpm at 5000'
- slow cruise (traffic pattern, ground ref maneuvers), 2200rpm, about 85mph

2/ Climbs and descents, climbing and descending turns
- normal climb: full throttle, carb heat cold, 3-point att., 70mph
- cruise climb: full throttle, carb heat cold, 85mph
- Lean mixture in climb above 3000' in summer above 4000' in winter
- Level off – when reach desired altitude lower nose, accelerate to cruise speed and only then set power to the cruise rpm. Lean mixture as appropriate
- descent – rule of thumb: reduce power 500rpm, lower nose to maintain same speed
- Level off – 100' to 50' above target altitude, add back the power you took away, smoothly bring nose back to level attitude

3/ Steep turns
- Start at or a little below Va, 120mph or so, around 2400rpm
- Clearing turns!
- Eyes front! Roll coordinated and promptly to 45-50 degrees of bank
- As you pass through 30 degrees of bank add throttle and back pressure to prevent nose slicing down – look out of the windshield
- Maintain steep bank, prevent bank increasing or decreasing, keep back pressure to keep nose from dropping, pay attention to view out front and out of side window
- If despite back pressure, nose tries to drop and altitude starts decreasing, reduce bank angle, bring nose back up above the horizon, then increase bank again
- If nose rises too much, check and if necessary increase bank angle. If bank angle ok, relax some of the back pressure – not all of it.
- Start rollout about 20 degrees before target heading, keep bank angle till then, coordinate with rudder

4/ Slow flight (minimum controllable airspeed – target is bottom of green arc +-5kts)
- Carb heat hot, throttle to 1500rpm, keep nose from dropping
- As airspeed drops to 45-55mph left hand should be on throttle
- Add throttle and pitch carefully to control airspeed around 50mph
- Immediately add substantial throttle if altitude starts decreasing, then adjust once problem is solved
- Trim to maintain nose attitude without elevator force
- Turns max 20 degrees of bank, better 10-15.

- Note mushy controls, significant overbanking tendency and a lot of adverse yaw

5/ Power off stalls

- Establish stabilized power off (idle) glide in landing configuration, by:
- Starting from level flight clean
- Carb heat hot, power smoothly to idle – keep nose from dropping so to slow down
- When speed drops to 70mph, adjust nose and descend to maintain 70mph.
- When stabilized, raise nose to normal climb attitude and hold the attitude (the stick will need to be moved backwards continually as speed and control effectiveness reduce)
- Keep left hand on throttle, keep ailerons level, keep nose straight with rudder
- Note the buffet, then the nose drop despite holding elevator back
- As soon as the nose drops, follow it with the stick but just below the previous descent attitude, there's no need to dive.
- If wing drops DO NOT USE AILERON, instead step on the rudder on the high wing side till drop stops, then neutral rudder.
- At the same time add full power, carb heat cold, there will be lots of left yaw tendency and the need for a lot of right rudder, maybe forward elevator too depending on trim
- As soon as speed starts to increase raise the nose to normal climb or level attitude as previously briefed
- Do not exceed 70mph while nose is down or in climb
- Minimum standard is to keep heading within 10 degrees and avoid wing drop of more than 20 degrees

6/ Power on stalls

- Starting from level flight, clean
- Slow down to approx takeoff speed (below 70mph) by carb heat on, power 1500rpm
- Hold nose from dropping, it is fine to put it in climb attitude and climb
- As speed drops below 70mph, add full power, carb heat cold, and raise nose twice as much as normal, around 25 degrees up or so.
- Hold the nose high attitude – wings level, nose straight with rudder, more and more elevator and more and more rudder as plane slows
- Note the buffet, then the nose drop
- Immediately lower nose to just below horizon – no lower than normal descent attitude
- If wing drops DO NOT USE AILERON, instead step on the rudder on the high wing side till drop stops then neutral rudder.
- As soon as airspeed starts increasing, bring nose to either cruise attitude or climb attitude (as specified by examiner)
- Maneuver can also be started from a normal climb, in which case simply raise the nose to 20 degrees and proceed to stall

7/ Ground reference maneuvers

All maneuvers performed at 1000' AGL, 2200rpm approx 95mph
First turn is to the left

A/ Rectangular Course

- Select large rectangular field (or several fields together)
- Enter on left 45 to downwind
- Stay a third to half mile off to the side (a third to half way up the strut)
- When wing is abeam corner turn left – this is downwind to base, so steepest turn and nose should ends crabbing into wind – towards the field
- Next turn is base to upwind (or final), so shallower
- Next turn is upwind to crosswind, so shallowest (and nose should end crabbing into wind- away from field)
- Next turn is back towards downwind so medium bank.
- During all turns and straight legs maintain same distance from field boundary, adjust ground track as necessary

B/ Circle Round a point

- Select a clear landmark – intersections are good
- Enter on downwind so to make first turn to left
- Same distance from center of intersection as above 1/3rd to half mile
- When abeam the intersection turn promptly – this is the steepest bank
- Maintain distance from intersection so as to fly a circle – bank angle will need to be shallower as we turn into the wind and then when we turn away from the wind the bank will need to be steepened
- Increase back pressure when bank is steeper, reduce with shallower bank – maintain altitude
- When flying directly upwind or downwind the wing will point at the center of the circle, when on the furthest downwind point the nose will be into the wind and the wing should point somewhat behind the center, and when on the furthest upwind segment the wing should be ahread of the center

C/ S turns across road

- Select a road or other straight line at right angle to wind direction
- Enter on downwind right angle to road, plan to make first turn to left
- When directly over the road, promptly start a steepish turn to the left
- Adjust bank so to make the ground track a half circle
- Note statement above regarding where the wingtip points
- Aim to arrive back at the road with nose at right angles to the road
- As arrive back at the road, roll wings level and look left and right, wings should be parallel to the road
- Road is crossed in momentary level flight – the roll should be stopped
- As we cross the road start a gentle bank to the right, making sure we go upwind far enough to make another half circle
- As we turn away from the wind, and towards the road, the bank will need to increase and the backpressure too
- Just before getting to the road again, the plane should be pointing at right angles to the road

- Roll promptly level, look left and right as you cross road
- Roll promptly steeply in the other direction to continue the S turns
- Coordinate with rudder

8/ Takeoffs and Landings in the pattern

A/ Normal takeoff and landing

- Carb heat cold, mixture rich, trim for takeoff
- Roll onto runway centerline
- Elevator 3/4 of full forward (or half way between neutral and full forward)
- Full throttle, check rpm 2225-2425, check oil pressure
- Keep stick in position, once have a sufficient airspeed tail will come up
- Maintain level attitude with steady rearward movement of stick
- Keep eyes on far end of runway
- As plane lifts, keep wings level with ailerons and nose straight with right rudder
- Adjust pitch to the normal 3-point att., should see 70mph, no more
- Will probably need to relax the elevator a little as speed increases
- Make crosswind turn when at least 500' AGL remember to make wind correction and crab into wind
- When reach 1000AGL, lower nose and then reduce power to 2200rpm
- Pre landing check – GUMPS: Gas, Undercarriage down and welded, Mixture rich, Prop/pump controls we don't have, Switches/safety (lights, belts)
- Maintain about half a mile from runway
- Opposite touchdown point, carb heat on, power to idle
- Keep nose from dropping
- Descend at approx 65 (if light) to 70mph (if two on board) (level attitude.)
- When no more than 45 degs past the runway (less if there's a wind), turn base – this is a prompt turn get on with it, 30 degs bank and keep turning till the nose points somewhat towards the runway to compensate for wind.
- Add power if we look low.
- Roll out on final so as to align with extended centerline, crab into wind if we drift sideways
- Adjust pitch carefully to maintain speed, power is used to adjust rate of descent (ideally should be idle all the way) – nose should be level
- Should cross threshold about 50' up
- Power smoothly to idle (if not yet)
- When runway starts flattening in perspective and grass starts rising up to your ears in your peripheral vision – smoothly bring the stick back to stop descent
- As airspeed reduces and plane wants to land, bring and keep nose at the normal 3-point attitude
- Keep straight with rudder – adjust any drift with aileron – at all times
- Hold the nose up attitude steady, with ever more back elevator (just like in a stall) and the plane should land smoothly, ideally on the tailwheel a tiny fraction of a second before the mains touch
- If there is a crosswind, it may land on one main wheel before the other. This is a good thing and indeed required to prevent sideways drift.
- When plane lands, stick all the way back! Smooth but without delay.
- Keep straight, slow down to taxi speed before turning
- Don't adjust anything in cockpit till off the runway and stopped

B/ Short Field Takeoff and Landing

- Roll onto runway, align with centerline, as close to the start of the runway as possible
- Brakes on, smoothly add full power, check for oil pressure and correct rpm (2225-2425)
- Release brakes and roll with elevator neutral, keep straight with rudder
- Raise the tail once have a sufficient airspeed – you'll feel the stick pushing against your hand – that means it is time to push and lift tail
- At 55mph, smoothly but promptly raise pitch to slightly above the normal 3-point attitude – maintain this attitude
- Target airspeed is Vx - 60mph
- As airplane climbs above (real or simulated) obstacle lower nose to the normal 3-point attitude – around 100' agl (250' msl at RHV) is ok
- Hold the attitude - the airplane should accelerate to Vy – 70mph
- Fly pattern as normal
- When abeam the numbers, first count to 5 slow potatoes, then
- Carb heat on, idle rpm, keep straight with rudder, stop nose from dropping
- When 45 degs from touchdown point, turn base, slow to 60mph
- Turn onto centerline,
- Adjust trim and power as necessary to continue descending at 60mph
- Do not allow plane to get too low and flat – fly a normal or slightly steeper than normal descent angle
- Aiming point is about two airplane lengths closer to you than actual touchdown point
- Pay exquisite attention to attitude (which governs airspeed)
- If descending too much, add power; if not descending enough, reduce power
- Make power changes sooner rather than later – that helps keep them small
- As approach runway, keep some power in, fly lower than usual
- Just before touchdown, power to idle and an abrupt but not large flare
- Plane should touch with little or no float.
- Elevator full back, then pretend to brake as hard as possible
- Add brake pressure progressively so you can let go at any time

C/ Soft Field Takeoff and Landing

- Hold stick back
- Do not stop while taxiing on a runway, align with the centerline
- Smoothly add full power, check RPM and oil pressure
- Hold stick so that the plane lifts off in 3 point attitude – a little back from neutral
- As soon as airplane lifts off, gently level off a few feet above the ground – do not climb
- Accelerate to 60-65 mph in the ground effect, then pitch for a normal 3-point attitude
- Fly pattern as normal
- Abeam the numbers carb heat on, idle RPM
- Pitch for a normal glide (level attitude no more than 70 mph)
- When no more than 45 deg from the touchdown point turn base, maintain attitude for 70 mph

- Check the altitude, add power if it looks low
- Turn final, align with the centerline
- When landing on runway is assured power to idle
- Flare as normal to stop the descent, BUT
- once in the 3 point attitude and not before, add a little power to achieve soft touchdown
- After the touchdown, power to idle, stick fully back
- Do not use brakes on a soft surface

9/ Instrument Flight

A/ Straight and level

- Keep wings level with ailerons using turn and slip indicator
- Check that you are not turning. If necessary add rudder on the side of the high wing on turn coordinator or on the side the ball is
- Check with altimeter and VSI that no climb or descent is happening

B/ Level turns

- Bank till the turn-and-slip indicator needle is at the standard rate mark (about 15 degrees); add a little extra back pressure
- Check the altimeter to make sure there's no climb or descent, raise or lower the pitch a little if needed.
- Check on T&SI that the turn is standard rate, if not adjust bank angle slightly.
- Lead roll out by 5-10 degrees. Remember to compensate for compass errors! Use T&SI to roll level, and make pitch level by checking the altimeter and VSI (if available).

C/ Climb

- Looking at the T&SI, add full power and just enough right rudder to keep the ball centered
- Raise nose and keep wings level with ailerons
- For short climb do not trim, just increase back pressure as plane slows to keep 70mph, for long climbs retrim
- At the target altitude, lower nose to level pitch with altimeter and VSI and speed up to previous airspeed, then reset power back to where it was. Pitch forces will change – keep wings level.
- Retrim if needed – same amount as trimmed up in the first place

D/ Descent

- Looking at the ball, reduce power at least 500rpm (learn to do it by ear) and just enough left rudder to keep the ball centered
- Lower the nose, keep wings level with ailerons using T&SI
- Check power is indeed reduced at least 500rpm
- Check airspeed, should be the same as in level flight; if increasing bring nose up a little, if decreasing down about the same
- Keep 500FPM descent rate using VSI if available.
- For prolonged descents retrim but only when speed stabilized
- Lead leveloff by 50-70'. Add power back to where it was in level flight
- Plane will raise its nose – you adjust it as needed
- Retrim if needed

E/ Climbing and descending turns

- First start a climb or descent as above, then start a turn as above, do not try both at once
- Lead rollout by 5-10 degrees, lead leveloff from descent by 50-10', do not lead leveloff from climb

G/ Unusual attitude recognition and recovery

- Airspeed indicator quickest and surest way to identify what is happening
- Airspeed high and increasing – you are descending
    - Reduce power to idle
    - Use T&SI to roll level
    - Adjust pitch until airspeed starts decreasing – no more

        - May need to pull, or push depending on airspeed and trim
        - When airspeed below normal cruise, add power and climb at Vy
    - Airspeed low and decreasing – you are climbing and in danger of stall/spin
        - Full power and push the nose till you feel light
        - Do not use ailerons
        - When airspeed starts to increase, only then roll level using the T&SI
        - When airspeed reaches Vy, climb out at Vy if needed, or speed up to cruise at level flight

H/ Emergency descent through clouds – ONLY IF CEILING IS 1000' OR MORE

- Before entering cloud deck
    - If able to, declare emergency to ATC, or squawk 7700
    - Carb heat on, power 1500rpm;
    - Trim for about 70mph;
    - take and keep hands off ailerons; practice keeping wings level with rudder alone
- As descend into cloud, continue keeping wings level with rudder, check the T&SI
- When see ground, adjust power for level flight – approx 2200rpm, find a suitable place to land and land

10/ Emergency descent

- Carb heat hot, power to idle
- Roll to 45 – 50 degrees of bank
- Lower nose to achieve and hold 120mph (just below the start of yellow arc)

10(a)/ Emergency Descent in case of engine fire

- Fuel valve off, mixture to idle cutoff, mags off
- Full right rudder and hold it there
- Push left wing down to keep going straight and nose over to 120mph and hold it there to blow fire out – you will need a lot of control forces, remember speed is good
- Once fire is out proceed with emergency descent as above and engine out landing
- DO NOT TRY TO RESTART ENGINE

11/ Engine failure in flight

A/ Engine failure on takeoff

- Pitch for the best glide, level attitude, maintain at least 65 mph
- Do NOT attempt to turn back!
- If sufficient runway remains, close the throttle, land, apply maximum brakes
- If no runway is available, select a suitable landing area straight ahead and land

B/ Engine failure in flight

- Pitch for the best glide, level attitude maintain at least 65 mph, trim as needed
- Look for a suitable landing area
- If time permits, try to troubleshoot/restart the engine:
    - Carb heat – ON
    - Throttle - full power
    - Mixture – full rich or as appropriate for altitude

        - Fuel pump (if equipped) - ON
        - Fuel shut off valve – verify ON
        - Primer – check IN and LOCKED – try pumping primer
        - Magneto switches – check both ON (up) – try one at a time
    - If no restart, do an emergency landing:
        - Mixture – IDLE
        - Fuel shut-off valve – CLOSED
        - Magneto switches – OFF
        - Transponder 7700
        - Radio – MAYDAY on 121.5
        - Attempt to position an aircraft 1500-2000' AGL over the intended point of landing
        - Enter the downwind leg, should be at approximately 1000' abeam the intended point of landing
        - Maintain 70 mph, trim as necessary
        - Turn base and final just like a normal pattern
        - Turn off all electrical switches
        - Unlatch the door
        - Do a normal 3-point landing

12/ Electrical fire

- Electrical switches – ALL OFF except magnetos
- Air vents/windows – OPEN to remove smoke
- Use fire extinguisher if needed (and available)
- If fire continues, LAND IMMEDIATELY
- If the electrical power is required for the rest of the flight, turn on the master switch. Turn on desired circuit switches one by one, allow sufficient time to identify the faulty circuit and turn it off if smoke reappears