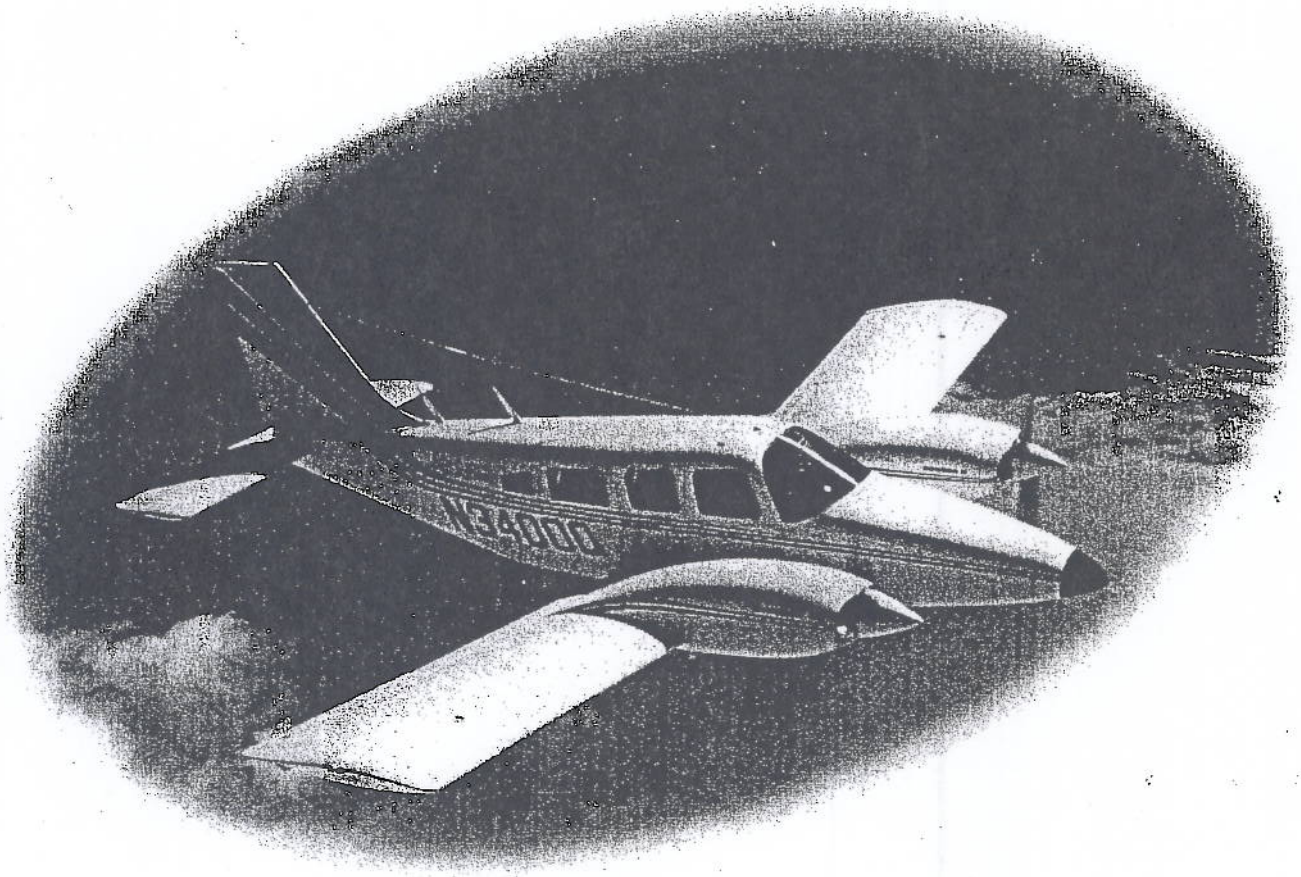


# MANEUVER GUIDE

PIPER

# SENECA II

# VFR and IFR Maneuver's Guide
# PA-34 Seneca II

## Objective:

To explain to ME-students how to execute VFR and IFR maneuvers in a PA-34, with efficiency, accuracy, and smoothness. It is to be studied in advance, not intended as an in-flight reference.

This guide does not override the contents of any applicable PTS or the Aircraft POH.

## Content:



Continued next page.....

# General Engine Operating Philosophy:

**Power Settings:**

The published power charts offer multiple combinations of manifold pressure and rpm settings, for various brake horsepower (BHP) settings. *Within those limitations*, it is advantageous to operate the engine at *low* rpm and a corresponding *high* manifold pressure. Doing so significantly reduces engine wear, noise level, fuel flow, and operating cost - without penalties in performance.

1. The lower number of engine cycles reduces, what is referred to as, *piston mileage* and thus minimizes engine wear
2. Fuel efficiency is better at lower rpm settings since the combustion process has more time for completion at reduced piston speeds.
3. Also, by operating at rpm-settings of, for example, 2000 versus 2400, at a given BHP, one saves 20% tachometer time for each hour flown. This effectively extends the available Hobbs time between 100-hour inspections by 20(!) hours.

**Shock Cooling:**

This phenomenon is caused by rapid temperature changes, and the difference in thermal properties between engine components: As we know, engine cylinders are made of steel while the attached cylinder-head is constructed of aluminum. Steel changes temperature more slowly than aluminum. Thus, it makes common sense that rapid cooling (due to a drastic power reduction) makes the cylinder-head shrink faster than the cylinder. One can easily visualize the consequences of this process: When both components start cooling off, the shrinkage of the cylinder-head is obstructed by the more slowly contracting cylinder. Being made of a weaker material the cylinder-head eventually cracks. (If the materials were switched around, things would be opposite, and we would be concerned about "shock-heating" instead. But being as it is, we are concerned about the cooling process rather than the heating process.)

It would be ideal if all engine components continuously operated at the same temperature. This being impossible, the next best option is to keep the temperature gradients between the different engine components at a minimum, during cool-down phases. One accomplishes this with slow power changes and by proper manipulation of the cowl flaps.

Note: Shock Cooling seems to be a controversial issue. According to some, it is not a factor at all in the operation of general aviation engines. Other, equally qualified voices, disagree. We do not know who is right. However, avoiding the potential consequences of shock cooling certainly does not cost anything. So, for the benefit of the doubt, we should operate the engines as if we *knew* that shock cooling was a factor. By doing so we certainly do not cause any damage, and are, at worst, erring on the side of caution. This brings us to the topic of power reductions!

**Power Reductions:**

To prevent the possibility of shock cooling, reduce power no faster than an average of 1" MP per minute, and no more than 2" MP at a time. This is especially important in combination with a high-speed cruise descent. For example, reducing power from 32" MP (cruise) to 20" MP (approach) requires 12 minutes, during which the airplane travels between 25 – 35 miles in no wind. One can accomplish this task by referencing the DME or GPS minute-countdown, as the aircraft approaches the destination airport or initial approach fix. In this example, one would start with the first power reduction at an indicated time twelve minutes out, reduce manifold pressure by 1 inch for every minute, and arrive over the destination airport with 20 inches MP.

**Use of Cowl Flaps:**

Cowl flaps have three distinct purposes:

1. To provide even airflow for cylinder head cooling when the engine is idling on the ground. For this purpose they need to be open, regardless of outside air

temperature. While this may seem counter-intuitive, due to the low CHT indication, this is necessary to prevent hot spots in the cylinder heads.

2. To keep the cylinder temperature in an optimum range while in flight. Typically they are closed during cruise and open during normal climb.
3. To slow the CHT cooling rate during power reductions and airspeed changes. For example, it is better to close the cowl flaps immediately upon reaching Top of Climb, gain speed and then reduce power (rather than to reduce power, gain airspeed and then close the cowl flaps last.)

**Reverse Loading:**

Aircraft piston engines are designed to exert positive torque on the crankshaft. In other words the engine is supposed to be driving the propeller. The opposite, the engine driven by a wind-milling propeller, is referred to as "reverse loading" or "under-boosting." While arguments exist for, and against, shock-cooling, there is no controversy here: *Reverse-loading a high performance piston engine does serious long-term damage.*

Whether an engine is wind-milling (or close to wind-milling) depends on the combination of airspeed, rpm, and manifold pressure: The higher the airspeed, and the higher the rpm, the more manifold pressure is needed to overcome wind-milling forces of the propeller. While 14 inches of manifold pressure setting on short final at 80 KIAS with 1700 rpm, certainly is not a problem, the same setting at 150 KIAS with 2400 rpm, certainly is!

To avoid reverse loading, avoid high rpm settings with low MP-settings at high speeds. During descent and approach, keep the rpm at 2000 as long as possible and hold a manifold pressure of at least 18 - 20 inches.

## "GUMPS"- Check:

This is a common mnemonic to remind the pilot of possible tasks when commencing or ending a maneuver. There are variations of this mnemonic. Use the one that works for you and your instructor. Here is an example that works well for the PA-34:

**E** ngine Instruments
**C** owl Flaps
**G** as (Fuel Selectors, Quantity, Boost Pumps)
**U** ndercarriage
**M** ixtures
**P** ropeller Controls
**S** witches (Landing Lights etc.)

Pilots are encouraged to use this mnemonic frequently in flight as a final step before consulting the checklist. Doing so expedites completion of the written checklist because fewer items will have been forgotten.

# Steep Turns:

**Preparation:**

1. Altitude > 3000 AGL
2. Power 22"/2000rpm
3. Airspeed ≈110 KIAS
4. Clearing Turns
5. ECGUMPS check (no change from cruise configuration necessary)
6. Fly towards a prominent, distant landmark
7. Call out: Heading, Altitude, and Airspeed

**Transition:**

1. **Add throttle 1" – 2" MP**
2. Roll into 45-50 degree bank (according to applicable PTS)
3. Rolling through 30 degrees, apply elevator back-pressure
4. Use AI and external reference points to establish proper pitch and bank attitude

**When Established:**

1. Crosscheck Flight Instruments: 45-50 deg. bank, const. Altitude, Ball in center
2. Make small bank and pitch adjustments to arrest small VSI movements
3. Make small throttle adjustments to hold 110 KIAS
4. Scan Horizon for primary attitude reference and collision avoidance

**Recovery:**

1. 20 degrees prior to original heading: roll smoothly out of the turn
2. **Reduce Throttles back to 22" MP**
3. Rolling through 30 degrees: Relax remaining back elevator pressure
4. Repeat maneuver in opposite direction without pausing at original heading

# Slow Flight in Landing Configuration:

**Preparation:**

1. Altitude > 3000 AGL
2. Power 20"/2000rpm
3. Airspeed ≈105 KIAS
4. Clearing Turns
5. Call out: Heading and Altitude

**Transition:**

1. **Gear Down**
2. **Flaps Full** (below 107 KIAS)
3. **Cowl Flaps Open**
4. **Mixtures Full Rich**
5. Without power changes, let Airspeed bleed off by holding Altitude and Re-trim
6. Apply rudder as necessary to maintain coordinated flight
7. **Props Full Forward** (below 90 KIAS too avoid rpm surge)
8. ECGUMPS check

**When Established:**

1. Airspeed 60 KIAS +/- 5kts , Heading +/- 10 degrees and Altitude +/- 100ft
2. Control altitude variations with throttle adjustments, as necessary
3. Perform shallow turns (15-20 degree bank) to specified headings

**Recovery:**

1. By Hand: Verify Mixtures Rich, Props Forward, **Throttles: 35" – 39" MP**
2. **Flaps 25**
3. Positive Rate (=Airspeed Increase:) **Gear Up**
4. Hold Altitude: **Flaps UP**
5. As Airspeed increases : **Reduce Throttles to 20" MP / Props 2000 rpm**
6. **Cowl Flaps Closed**
7. ECGUMPS check

# Power-Off Landing Stall:

**Preparation:**

6. Altitude 3500 AGL
7. Power 20"/2000rpm
8. Airspeed ≈105 KIAS
9. Clearing Turns
10. Call out: Heading and Stall Altitude (>3000AGL)

**Transition:**

1. **Gear Down**
2. **Flaps Full** (below 107 KIAS)
3. **Cowl Flaps Open**
4. **Mixtures Full Rich**
5. **Throttles 15"MP**
6. Holding Altitude, let Airspeed bleed off below 90 KIAS
7. **Props Full Forward** (delaying this task until this point prevents surge)
8. Descend at 80 KIAS
9. ECGUMPS check
10. At the specified Stall Altitude, level off by Increasing pitch attitude to first indication of stall

**Recovery:**

1. Relax some elevator back-pressure to break the stall, at the same time:
2. **Throttles: 35" – 39" MP** (avoid over-boost!)
3. **Flaps 25**
4. Positive Rate (=Airspeed or Altitude Increase:) **Gear Up**
5. Maintain 75 –80 KIAS to regain any altitude lost (if any)
6. At stall altitude: **Flaps UP**
7. As Airspeed increases : **Reduce Throttles to 20" MP/ Props 2000 rpm**
8. **Cowl Flaps Closed**
9. ECGUMPS check

# Power-On Departure Stall

**Preparation:**

1. Altitude >3000 AGL
2. Power 20"/2000rpm
3. Airspeed ≈105 KIAS
4. Clearing Turns
5. Call out: Heading and Altitude

**Transition:**

1. **Cowl Flaps Open**
2. **Mixtures Full Rich**
3. **Throttles 15"MP**
4. **Flaps 0 - 25** (as specified by instructor)
5. Let Airspeed bleed off by holding Altitude
6. **Props Full Forward** (below 90 KIAS)
7. ECGUMPS check
8. **Throttles >32" MP (** 65% BHP minimum according to PTS)
9. Establish pitch attitude of about 20 degrees
10. Roll into a 15 degree bank
11. Increase elevator back-pressure to hold pitch attitude until first indication of stall
12. Apply rudder to maintain ball in center

**Recovery:**

1. **Throttles: 35" – 39" MP** Simultaneously: Relax elevator back-pressure and apply rudder to level the wings.
2. **Positive Rate: Verify Gear Up**
3. **Flaps Up**
4. Hold Altitude
5. As Airspeed increases : **Reduce Throttles to 20" MP/ Props 2000 rpm**
6. **Cowl Flaps Closed**
7. ECGUMPS check

# Takeoff Briefing:

The Takeoff Briefing establishes the proper mindset and situational awareness of the pilot and the crew prior to every takeoff. It should cover the following items:

1. Type of Takeoff
2. Liftoff Speed and Initial Climb Speed
3. Anticipated SE-Performance
4. Conditions for an Abort and Point of Gear Retraction (Gear Retraction means: "GO!")
5. General Action Plan in Case of a Malfunction
6. Normal Departure

Example:

"This will be a **Short Field Takeoff, Flaps 25,**
Lift off at **66**, climb at **75**.
We are light, it is warm, SE performance will **be fair to good**.
If there is **any abnormality during the takeoff roll**, I will **abort**.
In case of an **engine failure prior to beginning gear retraction**, I will **abort**.
Will **retract gear immediately after positive rate** of climb
In case of an emergency after Takeoff, **Memory Items, Left traffic, Return for Landing!**
**Otherwise Climb to 3000, Heading 290!"**

It is important to conduct this briefing even if the pilot is the only occupant of the aircraft. By briefing himself, the pilot is forced to think the takeoff through in detail thus preventing a complacent mindset.

# Normal Takeoff:

This procedure applies when neither runway length, nor rising terrain in the initial climb, are a concern.

**Before Brake Release:**

1. "Before Takeoff" Check and "Runway Items" Check complete
2. Throttles: 25" MP
3. Engine Gauges: Check

**After Brake Release:**

4. Throttles: 35" –39" MP (Caution: Avoid Over-boost!)
5. Maintain Directional control with rudder inputs
6. Call-outs: "Airspeed Alive," - "Redline - Rotate"
7. Lift off at 70 KIAS

**After Lift-Off:**

8. Call out **"Positive Rate – Gear UP": Retract Gear** (on very long runways gear retraction may be delayed until the point where a landing on the same runway can be ruled out.)
9. Hold a constant pitch attitude and let airspeed build
10. Call out: "Blue Line!"

**At 500' AGL:**

11. Throttles - 32" MP, Props - 2450 rpm
12. Trim for 105 KIAS
13. Complete Climb Check

# Short Field Takeoff (Flaps 25):

This procedure applies when short runways and/or obstructions in the initial climb are a factor.

**Before Brake Release:**

1. "Before Takeoff" Check and "Runway Items" Check complete
2. Flaps: Verify 25
3. Brakes: Apply
4. **Throttles: 25" MP**
5. Engine Gauges: Check

**After Brake Release:**

6. **Throttles: 35" –39" MP (Caution: Avoid Over-boost!)**
7. Maintain Directional control with rudder inputs
8. Call-outs: "Airspeed Alive," - "Redline: Rotate"
9. Lift off at 66 - 70 KIAS
10. Pitch for 75-80 KIAS
11. **Call out "Positive Rate – Gear UP": Retract Gear**
12. **: Flaps Up** and accelerate (When well clear of obstructions)
13. Call out: "Blue Line!"

**At 500' AGL:**

14. : **Throttles - 32" MP, Props - 2450 rpm**
15. Trim for 105 KIAS
16. Complete Climb Check

# Traffic Pattern Two Engines:

**Upwind Leg**

1. Takeoff Procedure complete, announce, and turn crosswind at 700' AGL

**Crosswind Leg:**

2. Reduce **Throttle to 25"MP** in anticipation of reaching Traffic Pattern Altitude
3. Reaching 1000 AGL: **Throttle 20" MP** and **Props 2000 RPM**
4. Extend the Crosswind leg far enough to put the runway outside the engine nacelle for sufficient view
5. Announce Turning Downwind

**Downwind:**

6. **Cowl Flaps Closed**
7. Reduce **Throttles to 18" MP** and check Gear Warning Horn
8. Maintain 100 KIAS

**Abeam Touchdown Zone:**

9. **Gear Down** (keep hand on gear lever until "three green" observed)
10. **Flaps 10**
11. **Throttles 15" MP**
12. Descend at Airspeed 95 (short) or 100 (normal) KIAS
13. Extend Downwind to 45 degree point
14. Announce Turning Base

**Base Leg:**

15. **Flaps 25**
16. Airspeed: 85 (short) or 90 (normal) KIAS
17. **Props Forward** (delaying this task up to this point avoids rpm surge)
18. Announce Turning Final

**Final Approach:**

19. **Flaps Full**
20. Airspeed: 70 -75 (short) or 75- 80 (normal) KIAS
21. Landing Check Complete ("Red, Blue, and Green")
22. Proceed with Applicable Landing Procedure

## Normal Landing:

This procedure applies when runway length and conditions are not a particular concern.

1. Turning Final: Flaps Full (Unless a strong crosswind persists)
2. Airspeed: 75 – 85 KIAS (depending on weight and wind conditions)
3. Throttles 12" – 15 " (depending on headwind and vertical currents)
4. Hold VASI glide path if available and monitor vertical speed
5. Use conventional methods to counteract any crosswind that may be present
6. About 10' – 15 'AGL smoothly retard throttles*
7. Throttle retardation should be complete at about 3' – 5' AGL
8. Maintain same pitch attitude by applying some elevator back-pressure
9. Do not attempt to hold the airplane off until attaining full-up elevator deflection since this is known to produce hard landings.
10. With a mild nose-high attitude, let the airplane settle to the ground
11. Follow through with proper crosswind techniques while maintaining the centerline with rudder control.
12. Do not apply brakes unless necessary
13. Clear the runway, stop, and perform "After Landing" check

*In strong crosswinds, the pilot may lead power retardation on the downwind engine while keeping partial power applied on the upwind engine, until the aircraft is on the ground. This technique makes more rudder-travel available to correct for strong crosswinds. However, the additional engine thrust increases overall landing distance.

## Short Field Landing:

This procedure applies when runway length and conditions are near the aircraft's performance limitations.

1. Turning Final: Flaps Full (Unless a strong crosswind persists)
2. Airspeed: 72 – 78 KIAS (depending on weight and wind conditions)
3. Throttles 12" – 15 " (depending on headwind and vertical currents)
4. Hold a steady aim point slightly short of the desired touch down spot with power corrections
5. Use conventional methods to counteract any crosswind that may be present
6. About 5' -10' AGL smoothly retard throttles
7. Maintain same pitch attitude by applying some elevator back-pressure
8. Do not attempt to hold the airplane off until attaining full-up elevator deflection since this is known to produce hard landings.
9. With a mild nose-high attitude, let the airplane settle to the ground
10. Follow through with proper crosswind techniques while maintaining the centerline with rudder control.
11. Retract Flaps and Apply brakes
12. Clear the runway, stop, and perform After Landing check

Note: The final approach speed for landings in general is well below Vyse of 89 KIAS. To some pilots this may be of concern. They wonder: what if an engine fails on final?

Since touching down at 89 KIAS is not an option, any landing requires slowing below 89 KIAS at *some* point. Delaying the deceleration below 89 KIAS into the flare results in excessive floating. And since a normal glide angle can easily be maintained at 75-80 KIAS, even on one engine, Vyse is no longer critical. So long as the pilot realizes that he/she is committed to land upon reaching a critical combination of airspeed and altitude, flying a twin this way is no more dangerous than flying a single.

## Go Around Two Engines:

1. Verify Mixtures Full Rich
2. Verify Propeller Controls Full Forward
3. **Throttles 35 – 39 " MP**
4. Pitch to Climb Attitude
5. **Flaps 25**
6. **Positive rate: Gear Up**
7. Airspeed 75 - 90 KIAS (depending on obstructions to be cleared)
8. **Flaps Up**
9. Cowl Flaps Open
10. Side-step if applicable to avoid conflicting traffic

# Engine Failure during Initial Climb:

This is the most critical type of engine failure. The pilot must do everything right to avert a disaster. This is done best by performing the necessary tasks deliberately. It is better to do things slowly, than to rush and possibly omit a life-saving item.

**Aircraft Control:**

1. ***Instantly*** establish Zero Side Slip by ***simultaneously:***

- **Stopping yaw** with aggressive application of rudder
- **Lowering the nose** to the horizon (Airspeed 75 KIAS absolute minimum)
- **Banking about 3 degrees into the applied rudder**

(At this point the pilot might forget everything else, including his/her own name. If the pilot does nothing but the above three steps, the airplane will transition into a shallow descent and impact the ground in a controlled, most likely survivable, manner – not much different from an emergency landing after an engine failure in a single. The pilot therefore must continue to maintain aircraft control at all cost! The following items may not allow him/her to compromise this elemental task.

**Verification of Maximum Power:**

2. **Mixtures Full Rich**
3. **Props Forward**
4. **Throttles Forward not to exceed 39" MP** (the MP of the failed engine will likely not achieve more than barometric pressure)

**Drag Reduction:**

5. **Gear Up**
6. **Flaps Up**

(So far the pilot has not yet contemplated which engine has failed. This task follows:)

**Identification of Failed Engine:**

7. **Identify:** Callout: **"Dead Foot – Dead Engine!"**
8. **Verify:** Corresponding **Throttle- Retard** (If yaw results, advance it again! You have either pulled back the wrong engine, or the affected engine is still producing partial power! Do nothing else until at a safer altitude!)
9. **Feather corresponding Propeller** ("And it better be the correct one!")
10. If performance insufficient: Maneuver cautiously for Off-Airport Landing

# Vmc Demonstration

**Preparation:**

6. Altitude >3000 AGL
7. Power 20"/2000rpm
8. Airspeed ≈105 KIAS
9. Clearing Turns
10. Call out: Heading and Altitude

**Simulation of Engine Failure:**

11. Left or Right **Throttle Idle** (no critical engine)
12. Complete **Engine Failure Memory Items** up to but not including Feathering
13. ECGUMPS check (**Cowl Flap on Operative Engine Open**)

    Now Aircraft should be flying with zero side slip in clean configuration with maximum power on operative engine and the other engine wind-milling

**Demonstration of Loss of Control:**

14. Apply elevator back-pressure to steadily Reduce Airspeed
15. Apply Rudder Deflection to control yaw with decreasing speed
16. Continue until yaw can no longer be controlled, or to the first indication of a stall, whichever occurs first
17. Callout: "Vmc – Recover!" Note: At a sufficiently high density-altitude Vmc and Vs fall together, causing the risk for an unintentional spin. Instructors may decide to limit rudder travel to artificially raise Vmc to a safe value. Student Actions remain the same.

**Recovery**

18. Lower the Nose to the Horizon to reverse Airspeed Trend
19. **Slightly Reduce Power** on Operative Engine
20. Regain Directional Control
21. **Advance Power to 39"MP** as aircraft accelerates towards Blue Line,

**Return to Normal Flight:**

22. Smoothly **restore power** on wind-milling engine (allow for warm-up)
23. Reduce **"Operative" Engine Power to Cruise**
24. ECGUMPS check (**Cowl Flaps Closed**)

# Traffic Pattern Single Engine:

This procedure is very much the same as a normal pattern. Rather than re-inventing the wheel, it is advantageous to stick with the familiar. The key is to get it right the first time!

**Upwind Leg**

1. Emergency Procedures complete, announce, and turn crosswind at 700' AGL
2. Maintain 90 KIAS

**Crosswind Leg:**

3. Reaching 1000 AGL: **Throttle 30" MP** or as necessary
4. Maintain 90 - 100 KIAS
5. Extend the Crosswind leg far enough to put the runway outside the engine nacelle for sufficient view
6. Announce Turning Downwind

**Downwind:**

7. Maintain 90 - 100 KIAS
8. Complete Emergency Checklist if time permits

**Abeam Touchdown Zone:**

9. **Gear Down** (keep hand on gear lever until "three green" observed)
   Note: Gear Extension may be delayed to Base Leg if struggling to maintain altitude.
10. **Throttle 25" MP**
11. Descend at Airspeed 90 – 95 KIAS
12. Extend Downwind to 45 degree point
13. Announce Turning Base

**Base Leg:**

14. **Flaps 10** (if descent profile normal)
15. Airspeed: 85 - 90 KIAS
16. Announce Turning Final

**Final Approach:**

17. **Flaps 25**
18. Airspeed: 70 -75 (short) or 75- 80 (normal) KIAS
19. Landing Check Complete ("Red, Blue, and Green")
23. Flaps Full (once landing is assured)

## Single Engine Landing:

When landing Single Engine, fight the temptation to rush the approach. Getting it right the first time is imperative! Also resist the urge to carry excessive speed and altitude into the final approach, all for the sake of "safety." You might wind up high, fast, and long, all at the same time - without the option of going around!

When landing with a feathered propeller, wind-milling drag is absent, thus total landing distance increases anyway. It is therefore best to keep the approach profile as normal as possible.

When planning to land in a strong, direct crosswind, plan to land with the operative engine upwind. This allows using throttle for directional control.

Once on the ground, taxi characteristics with one engine inoperative may prevent the pilot from taxiing normally: At low taxi speeds, turns into the operative engine may be impossible, especially when applying power. If possible, coordinate with ATC or other traffic in advance, to allow turns preferably into the dead engine and to avoid stops.

1. Turning Final: **Flaps 25** (Unless a strong crosswind persists)
2. Airspeed: **Normal + 5 KIAS** (depending on weight and wind conditions)
3. **Throttles 12" – 17 "MP** (depending on headwind and vertical currents)
4. Verify: Gear Down, Landing check complete!
5. Hold VASI glide path if available and monitor vertical speed for trend
6. Religiously avoid falling below glide path!
7. Use conventional methods to counteract any crosswind that may be present, remembering that crabbing causes less drag than side-slipping.
8. On very, very, short final: **Flaps Full,** hold pitch attitude (resulting in the loss of the extra 5 KIAS)
9. About 10'AGL, as entering the flare, **smoothly retard throttle** (anticipate yaw into operative engine,) touch down, and roll out using normal techniques
10. Apply brakes as necessary
11. Clear the runway, stop (?), and perform "After Landing" check

## Go Around Single Engine:

**Warning:** Due to aircraft weight, airspeed, descent rate, surrounding terrain, and ambient conditions, even a perfectly executed attempt for a single-engine-go-around may be unsuccessful. Therefore it is advisable to commence a Single Engine approach where and when the potential need for a go-around is unlikely. When doubts about a successful landing arise, it is best to initiate the go around sooner rather than later. However, at some point other options become preferable: Side-stepping into the grass or a parallel taxiway, or landing long and rolling off the runway end at low speed.

1. **Mixture: Verify Full Rich**
2. **Prop Control: Verify Full Forward**
3. **Power 39 " MP**, control yaw with rudder
4. Initially, pitch to Level Attitude but not higher
5. **"Positive rate"** (Airspeed and/or Altitude Increase): **Gear Up**
6. **Flaps Up**
7. Climb at 90 KIAS
8. **Cowl Flap: Verify Open**

# Configuration / Power Settings

## Two Engines:

| | KIAS | Pitch | V/S | MP | RPM |
|---|---|---|---|---|---|
| **Initial Climb** (clean, CF open) | 105 | +10 | +1000 | 32" | 2450 |
| **Cruise-Climb** (clean, CF as req.) | 115 | +5 | +800 | 32" | 2400 |
| **Cruise** (clean, CF closed) | 150 | 0 | 0 | 32" | 2200 |
| **Apch. Level** (clean, CF closed) | 115 | +2 | 0 | 22" | 2000 |
| **Apch. Step Down** (clean, CF closed) | 140 | -5 | -1000 | 20"-22" | 2000 |
| **Precision Appch. Desc.** (Gear Down, Flaps 10-20, CF as req.) | 105 | -5 | -500 | 17" | 2450 |
| **Non-Prec. Apch. Desc.** (Gear Down, Flaps 10-20, CF as req.) | 105 | -7 | -800 | 15" | 2450 |
| **Circle To Land** (Gear Down, Flaps 10, CF as req.) | 95 | +3 | 0 | 22" | 2400 |

Note: When operating high performance engines, it is considered best to avoid frequent power changes. Thus, when possible, all level segments and descents in the approach phase occur at approximately the same power setting (here: 20"-22"MP / 2000 rpm.)

# Configuration / Power Settings
# Single Engine

| | KIAS | Pitch | V/S | MP | RPM |
|---|---|---|---|---|---|
| **Climb** (clean, CF open) | 90 | +5 | +200 | 39" | max |
| **Apch. Level** (= Circle to land) (clean, CF open) | 95 | +2 | 0 | 30" | max |
| **Apch. Step Down** (clean, CF open) | 95 | -2 | -500 | 17" | max |
| **Precision Appch. Desc.** (Gear Down, Flaps 10) | 95 | 0 | -500 | 22" | max |
| **Non-Prec. Apch. Desc.** (Gear Down, Flaps 10) | 95 | -5 | -700 | 20" | max |
| **Circle To Land** (= Appch Level) (Clean, CF open) | 95 | +2 | 0 | 30" | max |

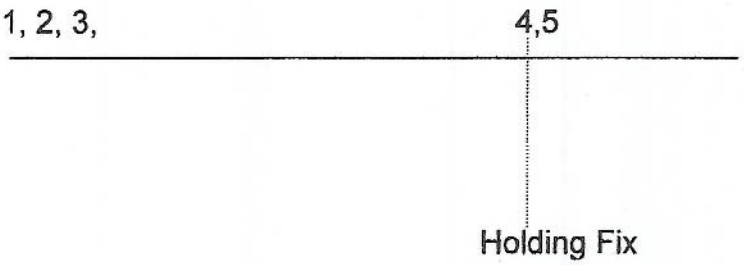
Note: For Single Engine Flight, Airspeeds greater than 90-100 KIAS stress the remaining engine more than necessary. Any less than 90 KIAS compromises climb performance and rudder authority.

# Holding:

The purpose of holding en-route or at an IAF is to delay your arrival, usually due to other air traffic. Minimizing time in the hold is desirable. Since traffic behind you is not usually the issue, initiate an airspeed reduction at the first opportunity.

1. Notify ATC of airspeed reduction
2. Reduce MP 2" every 2 minutes and rpm to 2000 until in "Approach Level"
3. Brief Holding Entry as soon as possible
4. Over-fly Holding Fix at "Approach Level", if possible, and execute Hold
5. Note Fuel Flow, Fuel Remaining, and EFC-time

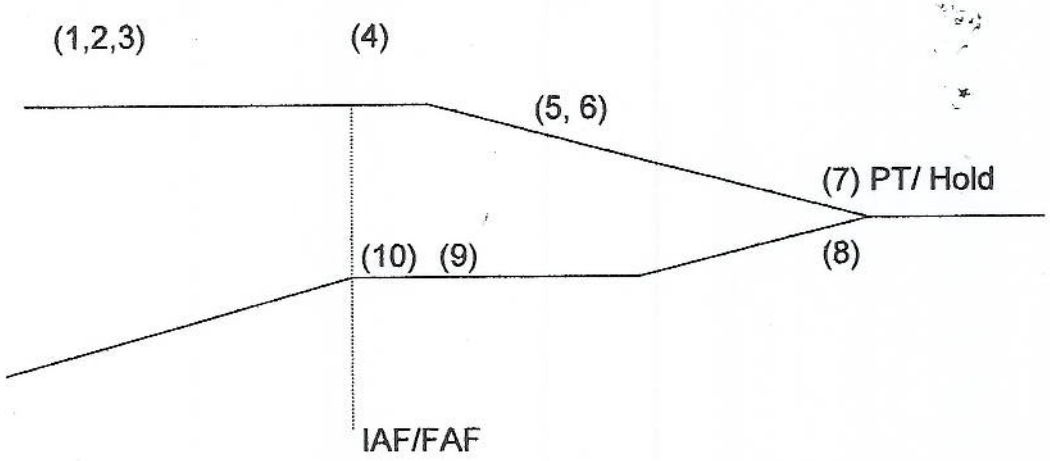
**Profile View Holding:**



# Full Approach with Procedure Turn:

1. Initiate Airspeed Reduction towards "Approach Level" at appropriate time.
2. Brief Approach while continuing Power Reductions
3. Descent and Approach Check Complete
4. Over-fly IAF in "Approach Level" Configuration
5. Use DME and/or Timing to stay within procedure turn limits
6. Established outbound, pitch and re-trim for "Approach Step-Down" if a descent is required.
7. Level off at the new altitude and re-trim for "Approach Level"
8. Continue using this technique for further step-downs to the FAF unless the descent gradient necessary exceeds 350 ft/nm.
9. Prior to reaching FAF: Before Landing Check (holding on Gear, Props, and Flaps)
10. Reaching FAF: establish Final Approach Configuration (Precision or Non-Precision, as necessary)

Profile View of Full Approach with Procedure Turn:

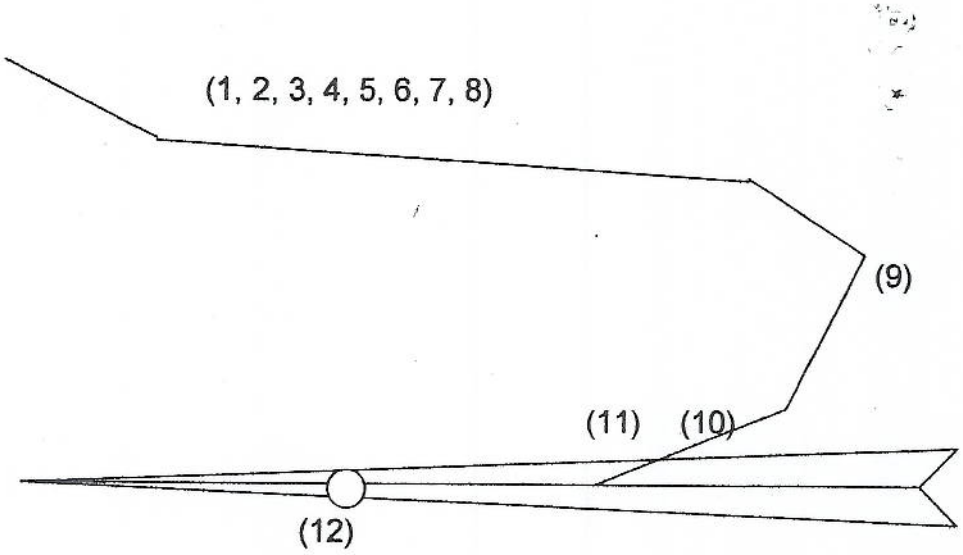



When descent gradients in excess of 350 ft/nm are required it may be necessary to reduce power and/or bring the airplane into the landing configuration (gear and/or flaps) to achieve a steeper descent.

# Vectored Approach:

1. Initiate Airspeed Reduction towards "Approach Level"
2. Brief Approach while continuing Power Reductions
3. Descent and Approach Check Complete
4. Comply with ATC altitude,- and heading assignments
5. Pitch and re-trim for "Approach Step-Down" for all descents.
6. Level off at the assigned altitudes and re-trim for "Approach Level"
7. Continue using this technique for further step-downs to the FAF unless the descent gradient necessary exceeds 350 ft/nm.
8. Maintain Positional Awareness by using VOR, DME, and ADF information
9. On Base leg: Before Landing Check (holding on Gear, Props, and Flaps)
10. Receive Final Vector, Altitude Assignment, and Approach Clearance
11. Intercept Final Approach Course
12. Reaching FAF: establish Final Approach Configuration (Precision or Non-Precision, as necessary)

**Plan View of Vectored Approach:**



## Precision Final Approach Segment:

1. From Approach Level: Gear Down , Propeller Controls to 2400 RPM, (MP drops automatically to about 17"MP)
2. Extend Flaps 20 degrees
3. Maintain 105 KIAS at 400- 500 ft/min
4. Tweak Throttles and or Flaps as necessary for wind situation
5. Hold GS and Localizer with small pressure inputs (pitch changes should not be visible on AI, and should not exceed 200 ft/min.)
6. Runway in sight: Power 12"MP, Props Forward, Flaps full,
7. Maintain GS, reduce Airspeed to 80 KIAS, crosscheck VSI at night and/or low visibility

## Non-Precision Final Approach Segment:

1. From Approach Level: Gear Down , Propeller Controls to 2400 RPM, (MP drops automatically to about 17"MP)
2. Extend Flaps 20 degrees
3. Reduce Power to 15" MP
4. Maintain 105 KIAS at 700 ft/min (do not exceed 1000 ft/min.)
5. Tweak Throttles and or Flaps as necessary
6. Runway in sight: Power 12"MP, Props Forward, Flaps full,
8. Maintain VASI, reduce Airspeed to 80 KIAS, crosscheck VSI at night and/or low visibility

## Missed Approach Two Engines:

1. Verify Mixtures Full Rich
2. Propeller Controls Full Forward
3. Power 35 – 39 " MP
4. Pitch to Climb Attitude
5. Positive rate: Gear Up
6. Flaps Up
7. Airspeed 105 KIAS
8. Cowl Flaps Open

## Missed Approach Single Engine:

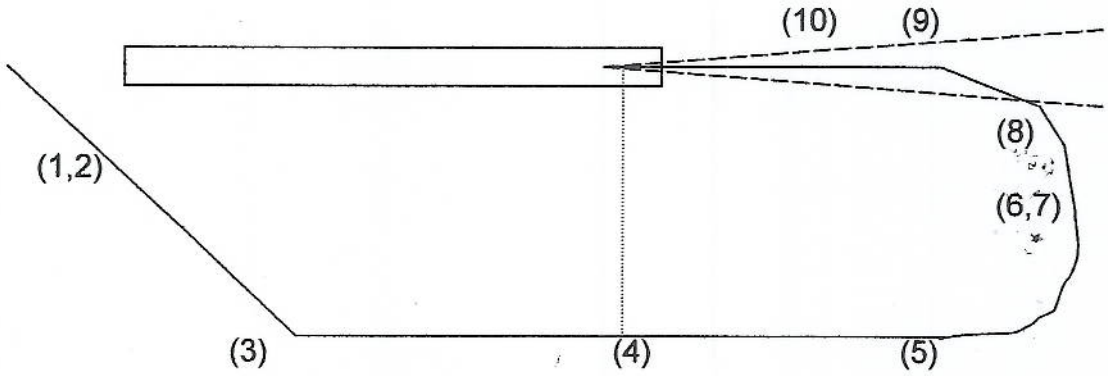
**Warning:** Due to aircraft weight, terrain, and ambient conditions, even a perfectly executed SE-go around attempt may be unsuccessful. Therefore it is advisable to commence a Single Engine approach only at locations where weather conditions preclude the need for a missed approach. If this option does not exist the pilot should consider executing the nearest precision approach (ILS or PAR) and flying it all the way to the ground.

1. Verify Mixture Full Rich
2. Verify Propeller Control Full Forward
3. Power 39 " MP
4. Initially, pitch to Level Attitude but not higher
5. "Positive rate" (Airspeed and/or Altitude Increase): Gear Up
6. Verify Flaps Up
7. Climb at 90 KIAS
8. Cowl Flaps Verify Open

## Circle to Land Two Engines:

1. Establish Circling Configuration (Gear down, Flaps 10)
2. Level at Circling Altitude +50 feet
3. Establish runway spacing (1.5 mile maximum) and wind correction angle
4. Abeam touch down zone, start timer
5. One mile from runway end (about 30 seconds elapsed time): turn base leg,
6. On Base: Flaps 20, Propellers Forward, 85 KIAS
7. Maintain altitude until within 10 degrees of extended runway centerline
8. If VASI available, establish glide accordingly. Otherwise estimate 300-400 feet AGL per mile from touch down.
9. Flaps Full, Landing Check Complete
10. Stabilize at 75 – 80 KIAS

**Plan View Circle to Land Two Engine and Single Engine:**



## Circle to Land Single Engine:

1. Establish SE-Circling Configuration (Gear + Flaps Up)
   (Note the difference in gear configuration between circling with two engines versus circling with one engine. If the gear was down during the final approach segment, retract it again for the circling maneuver to reduce drag.
2. Level at Circling Altitude +50 feet
3. Establish runway spacing (1.5 mile maximum) and wind correction angle
4. Abeam touch down zone, **start timer**
5. One mile from runway end (about 30-40 seconds elapsed time): 30 degree bank towards runway
6. On Base: Gear Down, Flaps 10 –20, shallow bank angle as necessary
7. Maintain altitude until within 10 degrees of extended runway centerline
8. If VASI available, establish glide accordingly. Otherwise be 300-400 feet AGL for every mile from touch down.
9. Short Final: Flaps Full, Landing Check Complete
10. Stabilize at 80 KIAS