Before Start

Brakes	SET
Seats	ADJUSTED
Seatbelts	FASTENED
Fuel Selectors	MAIN TANKS
Circuit Breakers	CHECK
Radio Master	CHECK OFF
Alternators	OFF
Alt. Static Source	NORMAL
Cowl Flaps	OPEN
Door	SECURE

Engine Starting

Master Switch	ON
Strobes	ON
Propellers	FULL FORWARD

For Hot Start, skip priming

To Prime for Cold Start

-	Throttles	HALFWAY OPEN
-	Mixtures	RICH
-	Fuel Pumps	ON
-	Fuel Flows	Rise to 5 gph (max 5 sec.)
-	Fuel Pumps	OFF

**** Start one engine at a time ****

Mixtures	IDLE CUTOFF
Throttles	½ INCH OPEN
Magnetos (L or R)	ON
Propeller Area	"CLEAR"
Starter (max 30 sec)	ENGAGE L or R
Mixture (L or R)	ADVANCE to RICH while cranking
Throttle	SET 1000 RPM
Oil Pressure	GREEN within 30 seconds
Alternator (L or R)	ON, verify positive

After Start

Alternators	CHECK EACH, then BOTH ON
Vacuum Gauge	CHECK
Radio Master	ON
Mixtures	LEAN FOR TAXI
Lights	AS REQUIRED
Flaps	UP
Fuel gauges	CHECK
Instruments	SET & CHECK
Transponder	ALT & SQUAWK
ATIS & Taxi	CHECK, GET CLEARANCE & BRIEF

Taxiing

Brakes	CHECK
TC, HI, Compass	CHECK

Run-up

Brakes	SET
Flight Controls	FREE & CORRECT
Trim Tabs	SET FOR TAKEOFF
Cowl Flaps	OPEN
Mixtures	RICH
Throttles to 1500 RPM	
- Feather test (L then R)	< 500 RPM drop
- Mag check (L then R)	< 175 drop, < 50 diff, smooth
Throttles to 2000 RPM	
- Cycle each prop x2	Check RPM, MP, Oil Press
- Vacuum	Check (4.8-5.1" Hg)
- Ammeter	Check positive indication
- Oil Temp & Press	Check
Throttles	IDLE, then 1000 RPM
Flight Instruments	CHECK & SET
Landing Gear	DOWN & GREEN
GPS/NAV	SET FOR DEPARTURE
Radios	SET FOR DEPARTURE
Transponder	ALT & SQUAWK
Takeoff Briefing	COMPLETE

This will be a normal (short-field) takeoff, flaps set at 0° (15°), departing runway _____ with an initial climb to _____ feet and heading _____. V_R is 90, V_X is 90, V_Y is 112, V_{MC} is 90, and V_{YSE} is 105 MPH. Ground roll is _____, 50' obstacle clearance is _____, and accelerate-stop is _____. Gear retraction will be at _____ feet.
-For an abnormality at a low airspeed, I will close the throttles, maintain directional control and bring the airplane to a stop on the remaining runway.
-For an emergency before V_{MC}, I will close the throttles, apply maximum breaking, maintain directional control and bring the airplane to a stop on the remaining runway.
-For an engine fire or failure with runway remaining and gear down, I will close the throttles, land straight ahead, and apply maximum breaking.
-For an engine failure with no remaining runway and above V_{MC}, I will pitch for blue line, apply maximum thrust, retract gear and flaps, then identify, verify, and feather the failed engine.
-For an emergency or abnormality with altitude available, I will perform the appropriate checklist.
Emergency training scenarios below 3,000'AGL will be simulated by reducing throttle. Questions?

Before Takeoff

Trim	SET FOR TAKEOFF
Flaps	UP (15° for Short/Soft Field)
Cowl Flaps	OPEN
Mixtures	RICH
Props	FULL FORWARD
Lights	AS REQUIRED
Fuel Pumps & Gauges	ON & CHECKED
Doors & Windows	CLOSED

ENGINE FAILURE DURING CLIMB (at/below 1500' AGL)

Pitch for **Blue Line**	**105 MPH**
Aileron	BANK 3° - 5° into good engine
Rudder	BALL ½ DEFLECTED into good engine
Mix, Props, Throttles	FULL FORWARD
Gear	UP
Flaps	UP
Identify	DEAD FOOT
Verify	CONFIRM by reducing affected throttle

Feather (perform on dead engine only)

- Mixture **Verify** & Idle Cut-Off
- Prop **Verify** & Feather
- Climb Pattern altitude or as appropriate
- Return to airport (or one nearby if it's better suited) and review guidance for Single-Engine Approach and Landing in the Pattern

Engine Securing (perform on dead engine only, if time permits)

- Fuel selector **Verify** & OFF
- Fuel pump **Verify** & OFF
- Mags **Verify** & OFF
- Cowl flap CLOSED (open on operating engine)
- Alternator OFF
- Electrical load REDUCE if necessary
- Other engine Monitor temps & reduce power if able
- ATC Declare emergency
- Fuel selector Cross-feed as required
- Review single-engine landing guidance

* Zero thrust = 10" MP & 2200 RPM *

Climb (above 1500' AGL or safe altitude)

Airspeed	130 MPH
Throttles	25" MP
Props	2500 RPM
Lights	AS REQUIRED
Fuel pumps	OFF (one at a time)
Engine instruments	CHECK

Cruise

Throttles (max 75% power)	SET
Props	SET/SYNC
Engine instruments	CHECK & MONITOR
Mixture	LEAN FOR ALTITUDE
Cowl flaps	CLOSED

** Aux fuel tanks may be used in level flight only **

Descent

ATIS/AWOS/ASOS	CHECK
Approach brief	COMPETE
Throttles	DECREASE max 2" per minute
Airspeed	GREEN CHT
Mixtures	ENRICHEN GRADUALLY

Before Landing (5-10 nm out)

Seats	ADJUSTED
Seatbelts	FASTENED
Cabin heater	OFF
Fuel selectors	MAIN TANKS
Mixtures	RICH
Fuel pumps	ON
Landing gear (<130MPH)	DOWN & GREEN
Flaps (<110MPH)	AS REQUIRED (max 15° single-eng)
Approach speed	95 MPH (90 short/soft, 105 single-eng)

After Landing

Fuel pumps	OFF
Lights	AS REQUIRED
Props	FULL FORWARD
Mixtures	LEAN FOR TAXI
Cowl flaps	OPEN
Flaps	UP
Trim	SET FOR TAKEOFF
Taxi clearance	OBTAIN

Shutdown

Throttles	1000 RPM
Radio master	OFF
Alternators	OFF
Mixtures	IDLE CUT-OFF
Lights	ALL OFF
Magnetos	ALL OFF
Master switch	OFF

Securing Aircraft

Cowl flaps	CLOSE
Sunshades	INSTALL
Controls	SECURE
Hobbs & tach	RECORD
Window & door	CLOSE
Pitot cover	INSTALL
Tie Downs & chocks	INSTALL

Engine Power Loss During Flight

Pitch for **Blue Line**	**105 MPH**
Aileron	BANK 3° - 5° into good engine
Rudder	BALL ½ DEFLECTED into good engine
Mix, Props, Throttles	FULL FORWARD
Gear	UP
Flaps	UP
Identify	DEAD FOOT
Verify	Confirm by reducing affected throttle
Prop	Decide to FIX or FEATHER

Fix

- Fuel — Mixtures, Fuel Pumps, √ Qty., Switch Tanks
- Spark — Magnetos ON
- Air — Alt air ON
- Gauges — Check for cause of failure
- If power is restored, fuel pump & alt air OFF

Feather (perform on dead engine only)

- Mixture — **Verify** & Idle Cut-Off
- Prop — **Verify** & Reduce to Feather
- Fuel selector — **Verify** & OFF
- Fuel pump — **Verify** & OFF
- Mags — **Verify** & OFF
- Cowl flap — CLOSED (open on operating engine)
- Alternator — OFF
- Electrical load — REDUCE if necessary
- Other engine — Monitor temps & reduce power if able
- ATC — Declare emergency
- Fuel selector — Cross-feed as required
- Review single-engine landing guidance

  * Zero thrust = 10" MP & 2200 RPM *

Air Start (unfeathering procedure)

Fuel Selector	ON
Magnetos	ON
Throttle	½ INCH OPEN
Prop	Set for Cruise (halfway fwd)
Mixture	RICH
Starter	ENGAGE

*Note: Fuel pump may be used just prior to cranking, if needed

Once engine starts set throttle & prop to **15"MP & 2000 RPM**

Mixture	LEAN for altitude
Oil pressure	CHECK
Cowl flaps	AS REQ.
Alternator	ON

Engine Fire in Flight

1. **Engine Fire checklist (on affected engine)**:

Throttle	**Verify** & IDLE
Mixture	**Verify** & IDLE CUTOFF
Fuel selector	**Verify** & OFF
Fuel pump	**Verify** & OFF

2. **Emergency Descent checklist**:

Throttles	BOTH IDLE
Prop	FULL FWD on operating engine
Cowl flaps	CLOSED
Landing gear	DOWN below V_{LE}
Airspeed	Maintain < V_{LE} (150 MPH)

Bank 40-45° to decrease vertical lift, or slip to increase drag. Recover on operating engine once the fire is out or approaching 1500' AGL.

3. **Engine Power Loss & Securing After Engine Fire**:

Pitch for **Blue Line**	**105 MPH**
Aileron	BANK 3° - 5° into good engine
Rudder	BALL ½ DEFLECTED Mix, Prop,
Throttle	FWD on operating engine
Gear	UP or as needed
Flaps	UP
Identify	DEAD FOOT
Verify	Confirm by reducing affected throttle
Affected engine prop	**Verify** & FEATHER
Affected engine mags	**Verify** & OFF
Affected engine alternator	**Verify** & OFF
Affected engine cowl flap	CLOSED (open on operating engine)

4. **See below for single-engine approach & landing guidance**

Single-engine Approach & Landing in the Pattern

Downwind	18-19" MP, 2400 RPM
Abeam #s	16" MP, maintain 105⁺ MPH (> V_{YSE})
Landing gear	Landing assured, down to descend
Flaps	Landing assured, set 15°

Single-engine IFR approach (for guidance only)

Prior to IAP	DESCENT CHECKLIST
Airspeed	Approximately 120 MPH
Throttle (op. engine)	For holding altitude @ 18-20" MP
Throttle (op. engine)	For descent @ 16" MP
Prior to FAF	APPROACH & LANDING CHECKLIST
At FAF/GS	LANDING GEAR DOWN below V_{LE}
Throttle (op. engine)	STABLE DESCENT at 16" MP (500 fpm)
V_{APP}	MAINTAIN 105⁺ MPH (> V_{YSE})

- Once runway is in sight & landing assured, flaps may be lowered to 15°

Flooded Start

Mags	ON
Throttles	OPEN
Mixtures	IDLE CUTOFF
Fuel pumps	OFF
Starter	ENGAGE

- When engine fires, retard throttle & advance mixture

Engine Fire During Start

Starter	CONTINUE CRANKING
Mixture	IDLE CUTOFF
Throttle	OPEN
Fuel pump	OFF
Fuel selector	OFF
Radio	CALL FOR ASSISTANCE
If fire continues	EXTINGUISH

Electrical Fire or Smoke in Flight

Master Switch	OFF
Vents	OPEN
Door	OPEN if necessary
Cabin Heater	OFF
Oxygen (if equipped)	As required

- Land as soon as possible without flaps, V_{APP} 100 MPH

High Oil Temperature

Cowl flaps	OPEN
Mixture	ENRICH
Power	REDUCE if necessary
Airspeed	MAINTAIN > 130 MPH

- If high temps continue or oil pressure is also low, land as soon as possible and investigate cause
- Prepare for Engine Power Loss During Flight

Power Off Landing (Both Engines Out)

Pitch for Best Glide	110 MPH
Landing Site	Select, spiral over if able
Propellers	FEATHER BOTH
Mixtures	IDLE
Magnetos	ALL OFF
Fuel Selectors	BOTH to OFF
Radio	Declare emergency
Landing Gear	DOWN if/when appropriate

Emergency Descent – Oxygen System Failure

Seatbelts	SECURE
Throttles	BOTH IDLE
Props	FULL FWD
Cowl flaps	CLOSED
Landing gear	DOWN below V_{LE}
Airspeed	Maintain < V_{LE} (150 MPH)

- A 2,000 to 3,000 foot/minute descent is adequate to answer the emergency with minimal risk of damage to the engines and discomfort to the passengers.
- Recover at 10,000 MSL or approaching 2000’ AGL.

Landing gear	RETRACT
Mixture	ENRICH
Throttles	INCREASE SLOWLY (warm engine)
Props	CRUISE

Landing Gear Fault

Master Switch	CHECK ON
Landing Gear Breaker	CHECK - Reset circuit breaker once if open

- If gear operates but no Green Light:

Light Rheostat	CHECK
Nav Lights	OFF
Gear Indicator Light	REPLACE

*Gear light and horn inoperative during electrical failure

- If gear doesn’t operate, Manual Gear Extension:

Airspeed	BELOW 100 MPH
Gear Handle	DOWN
Gear Motor Release Arm	DISENGAGE and push forward through full travel (gear should fall)
Gear Extension Handle	If left socket is not in clear position, place handle in right socket and twist clockwise until left socket in position
Gear Extension Handle	Left socket, extend handle and rotate FULL forward until locked
Gear Indicator Light	Verify GREEN

Door Open in Flight

Airspeed	< 100 MPH
Cabin vents	CLOSE
Storm window	OPEN
Slip airplane	FACE DOOR INTO WIND
Latch	SECURE

- If unable to latch door, land as soon as practical.
- Increase approach and landing speed by 10 MPH.

Before beginning each maneuver, complete the following:
Clear the Area
Heading or Reference
Altitude: > 3000' AGL for maneuvers, > 5000' AGL for stalls
Position: airspace, emergency landing site
Setup: fuel on MAIN tanks

Steep Turns

1. Setup: Cruise (18" MP, 2400 RPM, mix lean, cowl flaps closed, CHAPS)
2. Bank to 50°, increasing back pressure as you pass 30° bank.
3. Increase MP approximately 2".
4. Monitor sight picture, VSI, altitude, ball & bank.
5. Begin rollout 20° before desired heading/reference.
6. Reduce back pressure and power to maintain altitude & speed.

Accelerated Stall

1. Setup: Cruise (15" MP, 2400 RPM, mix lean, cowl flaps closed, CHAPS)
2. Slow to 110-120 MPH.
3. Enter into a 45° bank steep turn, increasing back pressure to hold altitude as you pass 30° bank.
4. At the first indication of stall, reduce angle of attack to break the stall.
5. Level the wings with coordinated rudder and aileron.
6. Return to altitude & complete the Cruise checklist.

Slow Flight

1. Setup: Takeoff or Landing (2400 RPM, mix rich, cowl flaps open, CHAPS)
2. Throttles — 14" MP
3. Landing Gear — Extend below 130 MPH
4. Flaps — Extend below 110 MPH
5. Throttles — 16" MP
6. Pitch — Maintain airspeed of 90 MPH
7. Throttles — As needed to control altitude

Recovery:

8. Pitch — Lower slightly
9. Throttles — 24" MP
10. Landing Gear — Up
11. Flaps — Retract to 15°, then UP
12. Maintain altitude & complete the Cruise checklist.

Power-Off Stall

1. Setup: Landing (2400 RPM, mix rich, cowl flaps open, CHAPS)
2. Throttles — 14" MP
3. Landing Gear — Extend below 130 MPH
4. Flaps — Extend below 110 MPH
5. Throttles — 12" MP
6. Begin a descent to landing at V_{APP} (95 MPH)
7. Once stabilized, begin a roundout and flare.
8. Bring throttles to idle. Recover at first sign of stall.

Recovery:

9. Pitch — Lower to break the stall
10. Throttles — Full Forward
11. Pitch — Climb at V_Y
12. Landing Gear — Up
13. Flaps — Retract to 15°, then UP
14. Return to altitude & complete the Cruise checklist.

Power-On Stall

1. Setup: Takeoff (mix rich, cowl flaps open, CHAPS)
2. Throttles — 14" MP
3. Props — **2100 RPM** maximum
4. Slow to 90 MPH (or as instructed by examiner)
5. Throttles — 21" MP maximum
6. Begin a climb at V_X, then pitch up slightly to try to climb steeper than V_X. Recover at first sign of stall.

Recovery:

7. Pitch — Lower to break the stall
8. Props — 2400 RPM (or full forward if needed)
9. Throttles — 24" MP (or full forward if needed)
10. Return to altitude & complete the Cruise checklist.

Emergency Descent

1. Setup: simulated engine fire (perform Engine Fire in Flight checklist) or oxygen system loss (perform Oxygen System Failure checklist).
2. Throttles — Idle
3. Props — Full Forward
4. Cowl flaps — Closed
5. Landing Gear — Down
6. Airspeed — Below V_{LE} (<150 MPH)
7. Bank 40-45° to decrease vertical lift, or slip to increase drag.
   Recovery: No lower than 2000' AGL.
8. Complete the Cruise or Before Landing checklist, as needed.

V_{MC} Demo

1. Setup: Takeoff climb (gear & flaps up, mix rich, cowl flaps open, CHAPS)
2. Throttles — 14" MP
3. Props — Full Forward
4. Airspeed — Slow to V_{YSE} /V_{SSE}
5. Trim — Takeoff position
6. Left Throttle — Slowly reduce to Idle
7. Airspeed — Maintain V_{YSE}
8. Bank 2-3° (no more than 5°) into operating engine.
9. Verify ball is deflected half toward operating engine.
10. Right Throttle — Slowly Increase to Full Forward
11. Pitch attitude — Increase to lose 1 MPH/sec
12. Directional control — Maintain with aileron & rudder

    Recovery: At first indication of loss of control (unable to maintain heading +/-20° with aileron/rudder **or** stall warning)
    - Simultaneously reduce pitch and power, then neutralize rudder & aileron
13. Airspeed — Pitch for V_{XSE} or V_{YSE}
14. Directional control — Maintain with aileron & rudder
15. Right Throttle — Slowly apply full power
16. Left Throttle — Slowly warm engine (15" MP/2000 RPM)
17. Return to altitude & complete the Cruise checklist.

Drag Demo

1. Setup: Climb (2400 RPM, mix rich, cowl flaps open, CHAPS)
2. Throttles — 14" MP
3. Cowl flaps — L closed, R open
4. Airspeed — Slow to V_{YSE}
5. Left Prop & Throttle — Set zero thrust (10" MP/2200 RPM)
6. Right Prop & Throttle — Increase to FULL FWD
7. Bank 2-3° (no more than 5°) into operating engine
8. Airspeed — Reduce below V_{YSE}, note VSI change
9. Airspeed — Return to V_{YSE}
10. Airspeed — Increase above V_{YSE}, note VSI,
11. Airspeed — Return to V_{YSE}
12. Landing Gear — Extend, note VSI change
13. Flaps — Extend to 15°, note VSI change
14. Flaps — Extend to 27°, note VSI change
15. Landing Gear — Retract, note VSI change
16. Flaps — Retract to 15°, then UP, note VSI
17. Windmill the Left Engine — Note VSI change
18. Return to altitude & complete the Cruise checklist.

Engine Failure Before V_{MC}

1. Setup: Begin a normal or short-field takeoff
    - At indication of engine failure (no faster than 50% of V_{MC}):
2. Throttles — IDLE
3. Directional control — MAINTAIN
4. Brakes — As required

Engine Failure After Liftoff (no lower than 400' AGL)

1. Setup: Takeoff climb (gear & flaps up, mix rich, cowl flaps open)
2. Takeoff briefing — Complete
3. Begin a normal takeoff climb (25"/2500 or full fwd)

   ***Note: CFI will use throttle to simulate failed engine, airspeed > 105**
    - At indication of engine failure:
4. Pitch for **Blue Line** — **105 MPH**
5. Aileron — BANK 3° - 5° into good engine
6. Rudder — BALL ½ DEFLECTED
7. Mix, Props, Throttles — FULL FORWARD
8. Gear — UP
9. Flaps — UP
10. Identify — DEAD FOOT
11. Verify — CONFIRM by reducing affected throttle

- The remaining items will be simulated only:

Feather (simulated on dead engine only)

12. Mixture — **Verify** & begin to lean (CFI will stop it)
13. Prop — **Verify** & begin to reduce to Feather

    CFI will set zero thrust (10" MP & 2200 RPM)
14. Climb — Pattern altitude or as appropriate
15. Return to airport (or one nearby if better suited) and review guidance for Single-engine Approach and Landing in Pattern

Engine Securing (perform on dead engine only, if time permits)

16. Fuel selector — **Verify** & OFF
17. Fuel pump — **Verify** & OFF
18. Mags — **Verify** & OFF
19. Cowl flap — CLOSED (open on operating engine)
20. Alternator — OFF
21. Electrical load — REDUCE if necessary
22. Other engine — Monitor & reduce power if able
23. ATC — Declare emergency
24. Fuel selector — Cross-feed as required
25. Review single-engine landing guidance