

TAKEOFF AND CLIMB

Full throttle = 2700 rpm (static check approx. 2300 rpm)

V_{rot} = 60 mph (2,300 lb) 55 mph (2,000 lb)V_x = 65 mph (2,300 lb) 61 mph (2,000 lb)
(+1 mph per 2,000' MSL)V_y = 80 mph (2,300 lb) 74 mph (2,000 lb)
(-1 mph per 3,000' MSL)

Cruise climb = 85 to 90 mph

CRUISE2,500' 67% BHP 2400 rpm 119 mph TAS 7.6 gal/hr
(approximately 114 mph IAS)5,000' 66% BHP 2450 rpm 121 mph TAS 7.5 gal/hr
(approximately 112 mph IAS)7,500' 65% BHP 2500 rpm 123 mph TAS 7.4 gal/hr
(approximately 109 mph IAS)MANEUVERINGV_a = 122 mph (2,300 lb) 113 mph (2,000 lb)

Best glide = 80 mph (2,300 lb) 74 mph (2,000 lb)

PATTERN AND LANDING

Downwind	approx. 2000 rpm	90 mph	clean
Glide	1300 to 1400 rpm	80 mph	10° flaps
Base Turn	1300 to 1400 rpm	80 mph	20° flaps
Base	1300 to 1400 rpm	70 mph	30° flaps
Final	1300 to 1400 rpm	65 mph (2,300 lb)	40° flaps
Final	1300 to 1400 rpm	60 mph (2,000 lb)	40° flaps

1. Control wheel lock - removed/stowed
2. Circuit breakers - in
3. Avionics switch - off (down)
4. Ignition switch - Off, key removed
5. Alternator - Off
6. Master switch - On
7. Check fuel quantity indicators, stall warning horn, exterior lights, pitot heat (for IFR), and interior lights (for night flight)
8. Flaps - extend 20° for exterior inspection
9. Master switch - Off
10. Required papers (ARROW) - aboard/stowed/displayed

EXTERIOR INSPECTION

1. Left instrument panel air vent and static port - unobstructed
2. Left wing strut & leading edge; air vents, pitot tube, fuel vent
 - a. Landing/taxi lights, wingtip, and wingtip light
 - b. Left aileron, counterweights, hinges, nuts, and rod end
 - c. Left flap, flap tracks, rollers, nuts, and rod end
 - d. Left wing sump drain - sample fuel
3. Left main gear strut, brake line, brake disc and pads, tire condition and inflation (24 psi)
4. Baggage door - unlocked, secure
5. Top of left wing, antenna
6. Left side and top of fuselage, antenna
7. Horizontal stabilizer - condition of top and underside
 - a. Elevator hinge bolts/nuts; securely attached to rt. elevator
8. Left side vert. stabilizer, antenna, rotating beacon, tail light
 - a. Left side of rudder, rudder hinge bolts and nuts
 - b. Right side vertical stabilizer, rudder, antenna
 - c. Rudder actuators (bolts, nuts, and cotter pins)
9. Right elevator; trim-tab bolt/nut/cotter pin; horiz. stabilizer
10. Right side and bottom of fuselage
11. Top of right wing, antenna
12. Right main gear strut, brake line, brake disc and pads, tire condition and inflation (24 psi)
13. Right wing sump drain - sample fuel
 - a. Right flap, flap tracks, rollers, nuts, and rod end
 - b. Right aileron, hinges, nuts, rod end, counterweights
 - c. Right wingtip, light, leading edge, wing strut, and air vent
14. Right instrument panel air vent - unobstructed

15. Right cowling fasteners - secure **P. 2**
16. Nose gear shock strut extension; scissors, steering arms, and shimmy dampener linkages (bolts/nuts/cotter pins)
a. Tire condition and inflation (26 psi)
17. Right exhaust pipe - secure
18. Prop blades - condition; spinner - all screws secure
19. Cylinder cooling fins; air ducts through rear baffling - clear
20. Air filter - condition; left exhaust pipe - secure
21. Oil quantity - minimum 6 quarts, dipstick secured (6 o'clock)
a. Oil filler cap - secured
b. Fuel strainer drain knob - pull for 4sec. (1st flight of the day), then check strainer valve closed (not dripping)
c. Engine mounts - no cracks, mount attach bolts - secure
d. Oil dipstick access door closed/latched securely
22. Left cowl fasteners - secure
23. Flaps - Up
24. Fuel tanks - check fuel quantity sufficient for planned flight plus reserve; secure fuel caps
25. Windscreen - Clean

BEFORE STARTING ENGINE

1. Seats and seat belts - adjust and lock
2. Spot tracker - power on and tracking
3. Pray
4. Brakes - test hydraulic pressure (pedal resistance)
5. Fuel selector valve - Both

STARTING ENGINE

1. Mixture - Full rich
2. Throttle - Closed
3. Carb heat - Off
4. Master switch - On
5. Primer - 2 to 5 strokes (depending on temp.), then locked
6. Prop area - Clear
7. Brakes - hold (parking brake - off/released)
8. Throttle - open 1/8 inch
9. Ignition switch - Start; after engine starts, release to Both
10. Oil Pressure - check (pressure within 30 seconds)
11. Alternator switch - On
12. Rotating beacon - On
12. Avionics switch - on (up); Radios - set; Transponder - Alt

ENGINE FIRE IN FLIGHT

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1. Throttle – IDLE
2. Mixture – FULL LEAN
3. Fuel selector valve – OFF
4. Primer – IN and LOCKED
5. Cabin heat and air – CLOSE (except wing root vents)
6. Radio – 121.5 MAYDAY
7. Master switch – OFF

If fire is not extinguished

8. Emergency descent – EXECUTE [p. 10]
9. DO NOT RESTART ENGINE
10. Forced landing – EXECUTE [p. 9]

ELECTRICAL FIRE IN FLIGHT

1. Master switch – OFF
2. Avionics master – OFF
3. Electrical switches – OFF
4. Vents/cabin air/cabin heat – CLOSED
5. Fire extinguisher – ACTIVATE if needed
6. Cabin – VENTILATE after discharging extinguisher in closed cabin

If fire is out and power is needed:

7. Master switch – ON
8. Circuit breakers – CHECK for faulty circuit (*do not reset*)
9. Radios/Electrical – ON (*one at a time, looking for fire*)
10. Vents – OPEN (*only when fire is out*)

CABIN FIRE

1. Master switch – OFF
2. Vents/cabin air/cabin heat – CLOSED (to avoid draft)
3. Fire extinguisher – ACTIVATE
4. Cabin – VENTILATE after discharging extinguisher in closed cabin
5. Land the airplane as soon as practical to inspect for damage

WING FIRE

1. Navigation light switch – OFF
2. Pitot heat switch – OFF
3. Landing/taxi light switch – OFF
4. Emergency descent – EXECUTE [p. 10]

Sideslip to keep flames away from fuel tanks and cabin. Land as soon as possible, using flaps only as required for final approach and touchdown.

PRECAUTIONARY LANDING (with power)

P. 10

1. Radio – 121.5 PAN-PAN
2. Passengers – BRIEF
 - a. Seat belts/harness – TIGHT
 - b. Doors – OPEN and LOCKED (handles forward)
3. CHOOSE LANDING SITE and DRAG IT [p. 7]
4. Avionics master – OFF
5. Electrical equipment – OFF

On Final

6. Flaps – 40°
7. Approach speed – 60-65 MPH
8. Touchdown – GENTLY WITH POWER
9. Throttle – IDLE
10. Yoke – FULL AFT
11. Mixture – FULL LEAN
12. Master Switch – OFF
13. Ignition switch – OFF
14. Brakes – AS REQUIRED

DITCHING (as close as possible to land or boats)

1. Transponder – 7700
2. Radio – 121.5 MAYDAY
3. Passengers – BRIEF
 - a. Heavy objects – SECURE or JETTISON
 - b. Seat belts/harness – TIGHT
 - c. Doors – OPEN and LOCKED (handles forward)
 - d. Face – CUSHION
4. Establish glide
 - a. With power – set approximately 1400 rpm, Flaps – 40°, establish 300 ft/min descent at 60-65 MPH;
 - b. Engine out – 70 MPH, flaps 10°
5. Approach: PARALLEL TO SWELLS or ON BACKSIDE
6. Touchdown – as slowly (near stall) as possible
7. EVACUATE airplane
8. Life vest/raft – INFLATE (after exiting airplane)

EMERGENCY DESCENT

1. Carburetor heat – FULLY ON
2. Throttle – IDLE
3. Bank – STEEP BANK will help nose drop to a very steep pitch
4. Flaps – FULL DOWN (below 100 MPH)
5. Pitch – LOWER NOSE
6. Back pressure on yoke to control airspeed:
do not exceed 100 mph (V_{FE})
7. Throttle – CLEAR ENGINE periodically (except for fire)

BEFORE TAKEOFF

P. 3

1. Flight controls - check
2. Fuel selector valve - Both
3. Trim - Takeoff
4. Mixture - Full rich
5. Cabin doors and window - closed and locked
6. Throttle - 1700 rpm; check mags (125 max drop/75 max diff.)
 - a. Carb heat - check, then off
 - b. Engine instruments/suction gauge - within green arcs
7. Flight instruments, radios, and GPS - set
8. Transponder - code set, Altitude
9. Review takeoff data and engine failure procedures

RUNWAY LINEUP

1. Align aircraft on centerline; set DG compass to rwy. heading
2. Check windsock, anticipate/set crosswind controls

NORMAL TAKEOFF (Flaps Up)

1. Throttle - smoothly to full open (approximately 2300 rpm)
2. Airspeed indicator - check for movement
3. Yoke - lift nosewheel at 55 mph (light wt.), 60 mph (max wt.)

NORMAL (V_y) CLIMB or CRUISE CLIMB

1. Set pitch for 80 mph (-1 mph per 3,000' MSL) **or** 85-90 mph
2. Throttle - Full open
3. Trim
4. Mixture (above 3,000' MSL/density alt.) - Lean for max rpm

LEVEL OFF/CRUISE

1. Set pitch for level flight at planned cruise airspeed
2. Throttle - set for cruise (typically 2400-2500 rpm)
3. Trim
4. Mixture - Lean
5. Fuel selector valve (above 5,000' MSL) - Left or Right, then alternate as required during cruise flight

DESCENT (LET-DOWN)

1. Plan a descent point (altitude to lose, distance to go)
2. Throttle - as required (-500 rpm gives approx. -500 ft/min.)
3. Carb heat - On if below 1500 rpm
4. Mixture - enrich periodically as necessary

BEFORE LANDING - DOWNWIND

P. 4

1. Airspeed - 90 mph (approximately 2000 rpm)
2. Trim
3. Fuel selector valve - Both
4. Mixture - Full rich
5. Carb heat - Fully on

ABEAM TOUCHDOWN POINT

1. Throttle - set 1300 to 1400 rpm
2. Flaps - 10°
3. Trim for 80-mph glide

TURNING BASE

Flaps - 20°

BASE

1. Airspeed - 70 mph
2. Flaps - 30°
3. Trim

FINAL

1. Flaps - 40°
2. Airspeed - 60 mph (light weight) to 65 mph (max weight)
3. Trim

LANDING

1. Throttle - idle
2. Touchdown on main wheels, lower nose gently
3. Braking - minimum required

GO-AROUND/REJECTED LANDING

1. Throttle - smoothly to full open (check rpm not past redline)
2. Carb heat - Off
3. Set pitch to takeoff attitude to climb and accelerate
4. Trim - nose down trim as necessary to help control pitch-up
5. Flaps - raise to approximately 20°
6. At 70 mph retract flaps and set pitch for V_y (80 mph) climb

STOP-AND-GO - AFTER LANDING/BEFORE TAKEOFF

1. Brake normally to a stop
2. Flaps - retract
3. Carb heat - Off
4. Trim - Takeoff

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ROUGH-RUNNING ENGINE (no indication of engine damage)

1. Mixture – ADJUST
(If still rough, magneto or magneto timing may be a problem...)
2. Ignition – SELECT EACH MAGNETO INDIVIDUALLY
3. If roughness disappears, leave ignition on that magneto
4. Land as soon as practical

GRADUAL LOSS OF POWER (usually carburetor ice)

1. Carburetor heat – FULLY ON
2. Mixture – ADJUST

SUDDEN LOSS OF POWER (usually fuel starvation)

1. Fuel selector valve – LEFT or RIGHT for 1 min., then switch to opposite side
2. Mixture – RICH

ENGINE FAILURE DURING FLIGHT

1. Pitch – SET FOR 80 MPH and TRIM
2. Carburetor Heat – FULLY ON
3. Fuel Selector Valve – LEFT or RIGHT for 1 min., then switch to opposite side
4. Mixture – RICH
5. Primer – IN and LOCKED
6. Landing field – SELECT and MANEUVER TOWARD IT
7. Ignition switch – BOTH (or START if propeller is stopped)
8. If power not restored – EXECUTE FORCED LANDING [below]

FORCED LANDING (without power)

1. Transponder – 7700
2. Radio – 121.5 MAYDAY
3. Passengers – BRIEF
 - a. Seat belts – TIGHTEN
 - b. Doors – OPEN and LOCKED (handles forward)
4. Mixture – FULL LEAN
5. Fuel Selector Valve – OFF
6. Ignition switch – OFF
7. Flaps – AS REQUIRED (maneuvering)
8. Final approach speed – 60-65 MPH
9. Flaps – 40°
10. Master Switch – OFF
11. Touchdown – as slowly (near stall) as possible
12. Yoke – FULL AFT
13. Brakes – AS REQUIRED

BASIC IN-FLIGHT EMERGENCY PROCEDURES

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1. **MAINTAIN AIRCRAFT CONTROL**
2. **ANALYZE THE SITUATION AND TAKE PROPER ACTION**
3. **LAND AS SOON AS PRACTICAL**

ENGINE FIRE DURING START ON THE GROUND

1. **Ignition – START** (continuing cranking pulls flames into engine)

If engine starts:

2. Throttle – 1700 RPM for a few minutes
3. Engine – SHUTDOWN and inspect for damage

If engine fails to start:

4. Throttle – FULL OPEN
5. Mixture – FULL LEAN
6. Ignition – START (continuing cranking for another 30 seconds)
7. Engine – SECURE
 - a. Fuel selector valve – OFF
 - b. Ignition switch – OFF
8. Radio – CALL FOR ASSISTANCE
9. Master switch – OFF
10. Aircraft – EVACUATE
11. Fire extinguisher – USE TO EXTINGUISH FIRE
12. Aircraft – INSPECT for fire damage (*repair damage or replace damaged components or wiring before attempting another flight*)

ENGINE FAILURE DURING TAKEOFF RUN

1. **Throttle – IDLE**
2. **Brakes – APPLY**
3. **Wing Flaps – RETRACT (if stopping distance critical)**
4. Mixture – FULL LEAN
5. Ignition Switch – OFF
6. Radio – Inform tower/CTAF of aborted takeoff
7. Master switch – OFF (if departing runway surface)

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. **Lower nose – maintain 75 to 80 MPH**
2. **Choose landing site STRAIGHT AHEAD**
3. Mixture – FULL LEAN
4. Fuel Selector Valve – OFF
5. Ignition switch – OFF
6. Doors – OPEN and LOCKED (handles forward)
7. Wing Flaps – AS REQUIRED
8. Radio – Make MAYDAY call if able
9. Master Switch – OFF
10. Approach – 60-65 MPH

BEFORE TAKEOFF (MULTIPLE PATTERNS)

P. 5

1. Fuel selector valve - Both
2. Trim - Takeoff
3. Mixture - Full rich
4. Carb heat - Off
5. Cabin window - Closed and locked

SHORT-FIELD TAKEOFF

1. Flaps - Up
2. Brakes - Hold
3. Throttle - Smoothly in to full open (approximately 2300 rpm); at higher elevations lean for max rpm
4. Brakes - Release
5. Yoke - lift nosewheel at 60 mph
6. Set pitch for 65 mph **until obstacles cleared** (V_x at S.L., + 1 mph per 2,000' MSL)
7. Set pitch for normal V_y (80 mph) or cruise (85-90 mph) climb

SHORT-FIELD LANDING

1. Airspeed - 60 mph
2. Flaps - 40°
3. At touchdown - lower nosewheel to ground, retract flaps
4. Yoke - bring to full aft as you apply heavy braking as required

SOFT-FIELD TAKEOFF

1. Flaps - 10° (prior to entering takeoff surface)
2. Yoke - full aft and hold it there until nosewheel lifts off
3. Taxi onto airstrip and align without stopping
4. Throttle - smoothly advance to full open as aircraft aligns
5. Aircraft will fly off at min airspeed (below 40 mph)
6. Yoke - ease forward to level off in ground effect
7. Accelerate to 60 mph and begin normal climb
8. At 70 mph retract flaps and set pitch for normal climb speed

SOFT-FIELD LANDING

1. Airspeed - 60 mph (light weight) to 65 mph (max weight)
2. Flaps - 40°
3. Make a gentle touchdown with a little power
4. Yoke - bring to full aft
5. Flaps - leave down
6. Throttle - as necessary to keep aircraft rolling

NO-FLAP LANDING

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1. Base airspeed - 70 mph (light weight) to 75 mph (max wt.)
2. Final airspeed - 65 mph (light weight) to 70 mph (max wt.)
3. Braking - as necessary (do not plan to use normal turn-off)

SIMULATED ENGINE-OUT (S.E.O.) LANDING

ABEAM TOUCHDOWN POINT

1. Carb heat - fully on
2. Throttle - idle
3. Flaps - 10°
4. Trim for 80-mph glide

BASE

1. Fly tighter base to insure making runway
2. Airspeed - 75 to 80 mph
3. Flaps - use judiciously to control airspeed and glidepath

FINAL

1. Airspeed - 65 mph (light weight) to 70 mph (max weight)
2. Flaps - as required; do not select 40° until landing assured

AFTER LANDING (clear of runway)

1. Flaps - Retract
2. Carb heat - Off
3. Pitot heat - Off
4. Landing light - Off
5. Spot tracker (last landing) - \sqrt OK button until green light on
6. Flight plan (if applicable) - Close

ENGINE SHUTDOWN

1. Throttle - Idle
2. Avionics switch - Off
3. Alternator switch - Off
4. Ignition switch - L, then R, then Off, then back to Both (mag grounding check)
5. Mixture - Full lean
6. Ignition switch - Off (after prop stops turning)
7. Master switch - Off
8. Key - remove from ignition
9. Spot tracker - Off

DRAGGING A FIELD

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Assess the field suitability with **Wind LASSO**

Wind (strength and direction)

L - Length

A - Altitude (elevation to figure pattern altitude, density altitude)

S - Slope (upslope/downslope and sideslope)

S - Surface condition (grass [length], dirt, gravel, sand, ruts, etc.)

O - Obstructions (rocks, stumps, etc. on the field; also

obstructions on the final approach and departure corridors)

1. Overfly the field along its length at a safe altitude
2. If the field is on a slope, fly from uphill to downhill
3. Airspeed - 70 mph IAS; Flaps - 20°
4. Estimate length of field (100 ft/sec times number of seconds):
 - c. Fly IAS of 70 mph minus 1 mph per 1,000' MSL (60 kts)
 - d. Time the pass over the field in seconds, multiply by 100
 - e. The product is the approximate length of the field in feet
 - f. To compensate for unknown winds, time passes in opposite directions (terrain slope permitting) and take the average
5. Make low pass(es) at approx. 50' AGL to assess field slope, surface condition, and obstructions