

CHAPTER 5 NORMAL FLOWS AND CHECKLISTS

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SOP EMPHASIS

MIXTURE GROUND-LEANING (SOP)

Mixture shall be leaned during all ground operations to avoid spark plug fouling and associated problems. The following SOP will be used whenever the aircraft will be at idle power on the ground or taxiing for any amount of time.

MIXTURE GROUND-LEANING SOP

NOTE

When stationary, avoid idling engine below 1000 RPM to avoid spark plug fouling.

THROTTLE..... 1200 RPM
MIXTURE *LEAN UNTIL PEAK RPM*
(If RPM begins to drop, enrichen until peak RPM is restored)
THROTTLE..... 1000 RPM

NOTE

If engine roughness occurs, enrichen the mixture slightly until smooth.

FEET POSITIONING DURING BRAKING, TAXI, TAKEOFF AND LANDING (SOP)

Improper feet positioning on the rudder pedals results in premature wear of brakes and tires. It also increases loss of control possibility during taxi, takeoffs and landings, particularly in crosswinds.

Taxiing

Avoid riding the brakes during taxi. When taxiing in a straight line, keep the feet off the brake portion of the pedals as much as practical. Reduce the power to idle before applying brakes if additional slowdown is required. Use nosewheel steering to turn first, and only apply additional brake in the direction of a turn when a tighter turn radius is desired.

Takeoff and landing

Keep feet entirely off the brakes during takeoff and landing. The balls of the feet should be positioned on the bottom part of the pedals for rudder control only. In this position even a full rudder deflection, if needed, will not engage the brake when the pedal is pressed.

Braking

Whenever brake use is required, and the feet are slid up from the rudder portion to the brake portion of the pedals, be extremely cautious not to have any portion of the foot protruding above the tip of the pedal, and heed the following warning.

WARNING

PA28R200 has a permanently attached torque tube running right above and very close to the rudder pedals, from which they are suspended.

If feet are positioned slightly overhanging the tops of the rudder pedals, it is possible that the pilot will encounter the torque tube when trying to apply rudder pedals and/or brakes, with the resultant inability to move the pedals and complete loss of directional control or braking.

This presents a specific hazard, especially to pilots transitioning from a C172R aircraft, in which slight feet overhang was not an issue due to not having such obstructions near the rudder pedals.

Pilots operating PA28R200 aircraft SHALL familiarize themselves with the aforementioned tube and proper feet positioning on the pedals prior to attempting flight.

REFER TO AFM / POH, Section 7 “Operating Tips”, Paragraph 14



Figure 1: Proper feet position on the rudder pedals and not on brakes

LIVE AIRCRAFT CONCEPT (SOP)

In order to allow in immediate visual confirmation if an aircraft on the ramp is “live”, that is, electrical system is activated for any reason, and/or engine start could be imminent, the ROTATING BEACON or ANTI-COLLISION LIGHT switch (as appropriate to the aircraft) is to remain ON at all times.

That includes all ground and flight operations, and when the aircraft is shut down and secured. The appropriate switch shall be left in the ON position after shutdown. The appropriate switch shall be confirmed in the ON position when starting preflight.

SWITCHING FUEL TANKS (SOP)

In order to ensure uninterrupted engine power, always turn the electric FUEL PUMP ON just before switching tanks, in the air and on the ground, as a good operating practice. After the tank switch, turn the fuel pump off and check fuel flow and pressure indications, to confirm that the new tank is supplying fuel.

Do not allow any fuel tank to run dry in normal operations. To avoid such occurrence, switch tanks every 30 min to 1 hour, or as appropriate in PIC judgment and in accordance with POH / AFM.

Switching tanks should be approached with extreme caution. There is no guarantee that the other tank will function properly, or that the fuel selector does not have a mechanical problem. Thus, whenever moving the fuel selector, it is possible that a short time after (possibly 30 seconds to 1 min) the engine will quit due to fuel starvation.

Thus, do not switch tanks just prior to takeoff, use the fuel tank tested during the runup instead. See the Expanded Before Takeoff / Runup checklist and the Expanded Takeoff checklist of this chapter for more details.

In the air, do not switch tanks at low altitude, close to the ground, if it at all can be avoided. Having sufficient altitude will allow the pilot time to deal with a problem. Switching tanks during the initial stages of descent from cruise altitude should typically provide ample time and altitude margin should anything go wrong.

Keep track of time since the last tank switch, starting with the first tank switch during Engine Runup checklist on the ground. Write down time or otherwise note time reference when the switch occurred, so that the consequent time to switch to the other tank can be determined. Have some sort of reminder that fuel tank switch must take place.

The actual methods for keeping track of time and the reminder for a particular flight are left up to the PIC judgment, but it must be done.

Acceptable methods may include, but are not limited to, starting a timer, writing down fuel time on kneeboard, using a sticky note on the dashboard, or using electronic means, such as the Scheduler function of the GNS430.

Unacceptable methods may include, but are not limited to, having no time reference for when tank switch has occurred or a reminder, and consequently not being able to determine when the next tank switch should occur, or forgetting to switch tanks altogether.

POWER INCREASE AND DECREASE (SOP)

In order to avoid a damaging situation where high manifold pressure throttle setting is used together with a low RPM propeller setting, putting undesired strain on the engine, the following guidelines are provided.

To INCREASE power, generally the flow is right to left, MIXTURE, PROPELLER, THROTTLE (M/P/T).

A good operational practice, whenever maximum power and full forward position of all these controls is desired (such as takeoff, go-around, etc), is to apply all three controls RIGHT TO LEFT (M/P/T) in the order described, regardless of whether the mixture is already rich and the prop is already forward.

For example, if mixture remains forgotten on Takeoff checklist, and the pilot simply applies full power with the throttle, a problematic takeoff with improper mixture setting will result. By always applying M/P/T, in that order, on every takeoff roll, the pilot will remedy the situation.

To DECREASE power, generally the flow is from left to right, THROTTLE, PROPELLER, MIXTURE (T/P/M). For the same reasons as described above, it is a good operating practice, if power reduction is desired, to always reduce the manifold pressure first with the throttle, and only then to move the propeller lever to the desired rpm.

Remember, when it comes to the throttle quadrant:

TO INCREASE POWER: MOVE RIGHT TO LEFT – M↑ / P ↑ / T ↑

TO DECREASE POWER: MOVE LEFT TO RIGHT – T ↓ / P ↓ / M ↓

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PREFLIGHT INSPECTION

General

The complete preflight inspection is conducted prior to the first flight of the day and at any Pilot-in-Command changes. Flight crews should inspect the aircraft with the attitude that the aircraft must prove it is fit to fly, rather than doing so with the assumption that they are going and the airplane “is probably okay.”

Preflight inspection execution and verification

Any inspection must strike a balance between speed and efficiency vs. thoroughness and safety.

When looking at airplane components and complex assemblies, inspect each component one by one. Look at each individual component in turn, rather than trying to take in the entire assembly all at once. Experience shows that looking at a complex assembly at once, rather than individual components, results in missing defective items.

For example, looking at “the gear” and trying to inspect “the gear”, rather than looking at each component of the gear in turn, such as brake pads, brake disk, etc., individually, will probably result in something being missed, such as cracks in the brake disk, leaks or worn out pads, etc.

Limit to 3 (three) or 4 (four) the amount of individual components inspected before verifying with the checklist in-hand. Research has shown that human working memory reliability is limited to about 3 or 4 items at a time. Therefore inspect 3 or 4 items on the checklist, then look at the checklist to ensure nothing was missed, before moving on to the next 3 to 4 items.

If an attempt is made to inspect, for example, 10 items at once, and then verify the same 10 items on the checklist, the chances of missing an item increase dramatically. Since the working memory cannot hold all of those items at once, an item might be missed during the inspection. For example, item 5 was missed. Then, during the verification, since there are 10 items to verify, the individual will have forgotten by then that the item 5 was never actually inspected, since the working memory has “moved on”. As a result, despite the best efforts, using this system has resulted in missing a potentially critical item on the checklist.

A smart pilot realizes limitations of the human mind and adjusts his/her technique accordingly.

Deferring / securing preflight inspection items

While it may be necessary to defer an item occasionally, it is never acceptable to leave a deferred item unattended and/or unsecured. For example, if oil level is checked, and it is determined that a quart of oil must be added, the oil dipstick must be reinstalled and the oil door secured while the pilot completes the rest of the preflight and/or goes in to get oil.

Not doing so runs the risk of forgetting and attempting to depart with an unsecured item, in this case, the oil dipstick.

Another potentially dangerous situation would be to leave a fuel cap off, for whatever reason, while performing other tasks. Never leave the fuel cap unsecured, and reinstall it each time when finished checking the fuel level.

Yet another possibility exists when an object is placed on the surfaces of the aircraft, or next to it, rather than inside it, thinking that one will get it “later”, which may become “never”.

A smart pilot realizes limitations of memory and, as much as practical, always returns each airplane component to flight-ready status after inspection.

Leaving a preflighted aircraft unattended

While it may occasionally be necessary to leave a fully or partially preflighted aircraft, it is never acceptable to just “get in and go” when returning to it, either by the PUI who performed the inspection, or by the PIC/CFI who comes out to join the PUI.

The first consideration is safety and security of the personnel and aircraft on the ramp. The second consideration is to avoid missing any critical items (tie downs, chocks, foreign objects, unsecured doors, etc.) when returning to the aircraft.

Each pilot is responsible to complete his/her own total 360° walkaround of the aircraft to ensure that the aircraft is flight-ready before boarding.

Inspecting unfamiliar vs. previously flown aircraft (turnarounds)

Any aircraft that has been newly assigned to the pilot deserves nothing less than the most careful and complete inspection. Until inspected, it is unknown if the aircraft is airworthy, or what was done with/to it during the preceding flight by someone else, or what may have happened to it on the ground overnight.

A situation where the same aircraft is inspected between flights (a turnaround) by the same PIC who has just flown the aircraft may allow for certain items, in the PIC’s judgment, to be de-emphasized. However, a diligent inspection must still be made of all critical items. The landing gear, tires, propeller, engine, oil, alternator, fuel, etc., have all been used, and although they were found acceptable prior to the previous flight, they may require attention now.

A good approach is to ask oneself what are the critical items, which items were used the most, what will be needed during the consequent flights, and concentrate on those, while paying attention to the overall condition of the aircraft.

NOTE

A walk-around shall be conducted during turnarounds by the same PIC in accordance with the Preflight Inspection checklist.

A walk-around shall be conducted by the CFI / PIC when coming out to, and prior to entering, any aircraft to be flown.

A walk-around shall be conducted by the flight crew, in accordance with the checklist, whenever the aircraft has been left unattended.

NOTE

Both the preflight inspection and the walk-around shall be conducted with the checklist in-hand.

COCKPIT AND CABIN

▶ AIRCRAFT ACCEPTANCE	COMPLETE
MAINTENANCE STATUS	VERIFIED / CLEARED
HOBBS / TACH METERS	VERIFIED / RECORDED
POH / AIRCRAFT DOCUMENTS	AVAILABLE / CHECKED
PARKING BRAKE	SET
FLIGHT CONTROLS	FREE / CORRECT
FUEL SELECTOR (feel for detent)	EXERCISE, then FULLEST TANK
FIRE EXTINGUISHER	GREEN ARC / SECURED
TRIM WHEELS (2)	EXERCISE, then TAKEOFF
ALTERNATE ENGINE AIR SOURCE	EXERCISE, then OFF (CLOSED)
MIXTURE	IDLE CUT- OFF
PROPELLER	FULL FWD / MAX RPM
THROTTLE	CLOSED
LANDING GEAR SELECTOR	DOWN
MAGNETOS / IGNITION SWITCH	OFF
ELECTRIC TRIM and AUTOPILOT SWITCHES	OFF
ALTERNATE STATIC AIR VALVE	CHECKED, then OFF
AVIONICS MASTER	OFF
MASTER SWITCH	ON
AVIONICS MASTER / RADIOS	ON / CHECKED
BATTERY VOLTAGE (if installed)	CHECKED
AVIONICS MASTER	OFF
LANDING GEAR LIGHTS	3 GREEN / NO RED
FUEL GAUGES	CHECKED
EXTERIOR / INTERIOR LIGHTS / PITOT HEAT	CHECKED, then OFF
STALL WARNING LIGHT	CHECKED
MASTER SWITCH	OFF
CIRCUIT BREAKERS	CHECKED
CARBON MONOXIDE DETECTOR	CHECK DATE
ELT SWITCH / LIGHT	OFF
FLAPS	CHECK OPERATION, then EXTEND
WINDSHIELD	(if needed) CLEANED

COCKPIT AND CABIN, EXPANDED

► **AIRCRAFT ACCEPTANCE.....COMPLETE**

AIRCRAFT ACCEPTANCE (SOP)

- ✓ Ensure that the aircraft contains all the necessary paperwork and keys, and that the previous Hobbs / Tach times have been filled out.
- ✓ Check that no groundable squawks exist.
- ✓ Approaching the aircraft, check that there is no obvious damage.
- ✓ It may be advisable to check the fuel quantity and oil level immediately upon arrival to the aircraft, as time could be saved by placing a fuel request right away rather than later in the preflight, and by obtaining oil while inside the building for other tasks.
- ✓ If there are any discrepancies, damage or extremely low fuel / oil levels (below required BSU safety minimums), report to Dispatch immediately.

MAINTENANCE STATUS.....VERIFIED / CLEARED

MAINTENANCE STATUS CHECK (SOP)

Maintenance status check contains,
but is not limited to, the following:

- ✓ Check the Annual Inspection date.
- ✓ Check the 100 hr and the 50 hr tachometer times.
- ✓ Check all avionics, Mode C transponder, altimeter, pitot-static and ELT inspection dates and times.
- ✓ Check any applicable Airworthiness Directives.
- ✓ **Verify any inspection times, dates and limits have not been / will not be exceeded during the planned flight.**
- ✓ Check that the GPS database card is present and current (check inside the can if not installed in the GPS unit).
- ✓ Verify VOR check is current.
- ✓ Verify all necessary documents are properly completed and present in the aircraft can.
- ✓ If there are any doubts about aircraft airworthiness status, contact Dispatch immediately.

HOBBS (if installed) / TACH METERS..... RECORDED

Record the current Hobbs meter reading (if installed) and verify it matches the value on the Aircraft Data Sheet. Record the current Tachometer time and verify it matches the value on the Aircraft Data Sheet. Notify Dispatch of any discrepancy.

POH / AIRCRAFT DOCUMENTSAVAILABLE / CHECKED

Check the Airworthiness Certificate, Aircraft Registration, and FCC Radio Station Permit (international flights only). Verify that the correct and complete Pilot's Operating Handbook or Aircraft Flight Manual, Weight and Balance information, and additional appropriate operations manuals (e.g. Garmin G430 GPS manual) are aboard. Verify flight crew possesses appropriate photo identification, current pilot and medical certificates, and all other appropriate required documents.

PARKING BRAKEON

Set the parking brake to ON to prevent inadvertent aircraft movement and to check parking brake operation.

FLIGHT CONTROLS FREE / CORRECT

WHILE HOLDING THE YOKE FIRMLY, release the seatbelt securing the control yoke. SLOWLY RELEASE the yoke to avoid a drop of the stabilator. Verify full freedom and correct movement / displacement of the ailerons and the stabilator.

FUEL SELECTOR (feel for detent)..... EXERCISE, then BOTH

Verify that the fuel selector can be moved freely between LEFT, RIGHT and OFF position, and check the operation of the safety lock. Then, set the fuel selector to the fullest tank. Feel that the fuel selector has engaged the detent when in the LEFT or RIGHT tank position.

FIRE EXTINGUISHER GREEN ARC / SECURED

Check that the fire extinguisher gauge is in the green arc indicating ready for use. Check that the fire extinguisher is secure and will not move inadvertently.

TRIM WHEELS (2) EXERCISE, then TAKEOFF

Verify that trim wheels move freely, then set both stabilator and rudder trim wheels to TAKEOFF, so that the trim tab position on the stabilator can be verified during the exterior preflight.

ALTERNATE ENGINE AIR SOURCE EXERCISE, then OFF (CLOSED)

Verify that the alternate engine air source control moves freely to OPEN (ON), then set it to CLOSED (OFF).

MIXTURE IDLE CUT- OFF

Verify that the mixture control is in full IDLE CUT-OFF position (all the way back).

PROPELLER..... FULL FWD / MAX RPM

Verify that propeller control is in FULL FORWARD, MAXIMUM RPM position.

THROTTLE CLOSED

Verify that the throttle control is in IDLE position (all the way back).

LANDING GEAR SELECTOR..... DOWN

Verify that the landing gear selector handle is DOWN. If the handle is in the UP position, report the discrepancy immediately to BSU Dispatch.

MAGNETOS / IGNITION SWITCH OFF

Verify that the combination MAGNETOS / IGNITION SWITCH is in the OFF position. Do not insert the key. (As a safety measure, inserting the key should be accomplished only immediately prior to the engine start.)

ELECTRIC TRIM and AUTOPILOT SWITCHES OFF

Verify that the electric pitch trim switch above the magneto switch and the autopilot master switch on the autopilot control panel are both OFF.

ALTERNATE STATIC SOURCE CHECKED, then OFF

Activate the alternate static system for at least 3 seconds by turning the alternative static source valve ON (pull to AFT position). While the system is active, check instrument indications to verify that the alternate static source is functioning properly. Turn the alternate static source valve OFF.

AVIONICS MASTER OFF

Verify that avionics master switch is OFF, to prevent damage to avionics later when the master switch is cycled.

CAUTION

Ensure that the Avionics Master switch is OFF before turning the battery master switch ON or OFF. This will prevent any inadvertent electrical charge from damaging the avionics equipment when the electrical system is engaged.

MASTER SWITCH ON

Turn both sides of the red electrical system MASTER SWITCH to ON, in order to check electrically operated systems.

AVIONICS MASTER / RADIOS.....ON / CHECKED

Turn on the avionics master switch and check operation of avionics stack. This step is also required to check battery voltage on the appropriate instrument, if installed (such as JDM-700)

BATTERY VOLTAGE (if installed).....CHECKED

If the particular aircraft is so equipped, battery voltage may be obtained on the appropriate instrument (such as JDM-700). Read the battery voltage and ensure it shows no less than 10 Volts immediately after Master Switch activation. A fully charged battery will show ≈ 12 Volts. If upon arrival to the airplane, the voltage is below 10 Volts with no electrical accessories operating and with the lights OFF, PUI shall inform PIC and/or Dispatch, who will then make a determination to contact Maintenance.

AVIONICS MASTER OFF

Turn the avionics master switch OFF upon conclusion of avionics and battery voltage checks.

LANDING GEAR LIGHTS 3 GREEN / NO RED

Check that all three (3) green landing gear lights are ON and that the red “landing gear unsafe” light is OFF. If any bulb fails to illuminate, first check that NAV LIGHTS are OFF (the landing

gear indicator lights are dimmed when nav lights are on). Troubleshoot further by pulling out and switching the square green landing gear lights to test bulb/socket operation. If issue is not resolved, contact Dispatch for Maintenance assistance.

FUEL GAUGES..... CHECKED / ADEQUATE
 Check fuel gauges to confirm that they are operational

WARNING

Flight crews shall not rely on fuel gauges alone and shall also manually check fuel levels in each tank prior to each flight.

EXTERIOR / INTERIOR LIGHTS and PITOT HEATCHECKED, then OFF
 Check ALL exterior lights outside for proper operation. TURN THE LIGHTS OFF IMMEDIATELY after the required checks are completed before continuing with the rest of the preflight. Failure to do so may result in a good battery being drained to a point where engine start may be difficult or impossible. Turn the pitot heat ON, and, WITHOUT DELAY, verify pitot/static mast is heating properly. Turn pitot heat switch OFF immediately after. Check all interior lights, as required, to assure that adequate lighting exists for the intended operation.

CAUTION

The pitot mast achieves operating temperature quickly and can cause injury. Do NOT operate pitot heat on the ground for more than 30 seconds. Test pitot heat temperature immediately after turning pitot heat switch ON, then return to the cockpit and turn pitot heat OFF.

STALL WARNING LIGHT..... CHECKED
 Check the stall warning vane and corresponding panel stall warning light for proper operation.

MASTER SWITCHOFF
 Upon conclusion of the preflight checks of electrically operated systems, turn both sides of the MASTER SWITCH OFF to prevent the battery from being drained more than necessary.

CIRCUIT BREAKERS..... CHECKED
 Verify all circuit breakers are checked, are in, and that any circuit breakers that are disengaged are properly placarded and collared. IF A TRIPPED CIRCUIT BREAKER IS DETECTED (CB is popped out), and appropriate maintenance placard is not present, INFORM DISPATCH. The airplane is not to be flown until appropriate action is taken and the airplane is cleared for return to service by Maintenance. See Ch. 2, Circuit Breaker Policy section, for additional guidance.

CARBON MONOXIDE DETECTOR CHECK DATE
 Check that the carbon monoxide detector is present and indicates the appropriate date.

ELT SWITCH / LIGHT (if installed).....OFF
 Verify that the remote ELT switch in the cockpit (if installed) is set to ARMED but that ELT is not transmitting, and the red light is OFF. If the ELT is transmitting, attempt to turn it off via the ELT switch. Report the activation to Dispatch immediately.

FLAPSCHECK OPERATION, then EXTEND

In increments, fully extend flaps while listening for binding noises and checking for correct operation, indicated by flaps deploying smoothly, evenly, and correct number of degrees. Retract the flaps in increments and check for the same. Then, extend the flaps again, and leave them extended temporarily, so the flaps can be inspected during the exterior portion of the preflight.

CAUTION

DO NOT step on the right flap on the side of the entrance, when it is in any position other than fully retracted (full up).

During preflight, leave flaps in fully retracted (full up) position, except when necessary for the preflight inspection. The right flap is designed to be used as a step only in the up position. As a good operating practice, in general, avoid stepping on the flap, regardless of its position.

WINDSHIELD / WINDOWS (if needed) CLEANED

Clean windows and windscreen as necessary with approved cleaning solution and cloth. DO NOT USE UNAPPROVED CLEANERS, OR ANY CLEANERS CONTAINING ALCOHOL OR AMMONIA. If approved aviation windshield cleaner is not available, a solution of water and regular hand or dish soap can be substituted.

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RIGHT WING

FLAP / AILERON / HINGES / STATIC WICKS (if any)	CHECKED
WING TIP / LIGHTS	CHECKED
LEADING EDGE.....	CHECKED
WING INSPECTION PLATES	SECURE
RIGHT MAIN GEAR / TIRE / BRAKE	CHECKED
TIE DOWN.....	REMOVED
FUEL VENT.....	UNOBSTRUCTED
FUEL DRAIN	DRAINED / CHECKED
FUEL QUANTITY / FUEL CAP	CHECKED / SECURE
FRESH AIR INLET	CHECKED

RIGHT WING, EXPANDED

FLAP / AILERON / HINGES / STATIC WICKS (if any)..... CHECKED
 Check flap, aileron and all hinge points for connections and free movement, verify all are secure and undamaged (e.g. dents, binding). Inspect the flap for damage and excessive play. Ensure the counterweight on the aileron is present and secure. Check the accessible nuts on the aileron and flap activation rods for looseness. Check if the static wicks (if installed) are missing or damaged.

WARNING

Whenever checking the aileron connections, from the underside of the wing, ALWAYS support the aileron firmly with one hand before inserting your fingers into the opening between the aileron and the wing.

Failure to do so will allow the aileron to move, catching fingers between the aileron and the wing’s trailing lower edge. These edges are relatively sharp, and due either to a wind gust or inadvertent movement of the controls by another crewmember, serious injury to the hand / fingers could result.

WING TIP / LIGHTS CHECKED
 Check exterior condition of the wing tip and the wing tip lights. Look for unrepaired cracks and other physical damage

LEADING EDGE CHECKED
 Check the leading edge for dents and other damage.

WING INSPECTION PLATES..... SECURE
 Verify that all wing inspection plates on the underside of the wing are securely in place, and inspect for any missing screws.

RIGHT MAIN GEAR / TIRE / BRAKE CHECKED
 Inspect the main gear components one by one. Look at each individual component in turn in accordance with the SOP, rather than trying to take in the entire main gear assembly all at once. Move the aircraft if necessary to observe the entire tire.

MAIN GEAR INSPECTION (SOP)

Oleo strut extension.....	VERIFY approx. 2.0 inch
Components (actuator, side brace, torque link, springs, down-limit hooks and tabs)...	SECURE
Hub assembly.....	SECURE
Web plate bolts, front and rear	SECURE
Strut housing.....	FREE OF CRACKS
Up- and down- limit tabs	FREE OF CONTAMINATION
All connections (bolts, nuts, cotter pins).....	SECURE
Brake lines and brake caliper assembly.....	NO LEAKS / SECURE
Brake disk.....	NO DAMAGE OR CRACKS
Brake pads wear	(minimum 1/8" remaining) ACCEPTABLE
Tire inner sidewall	NO DAMAGE
Tire tread wear.....	ACCEPTABLE
Tire outer sidewall.....	NO DAMAGE
Air valve cover	SECURE

WARNING

Flight crews shall ground the aircraft if any of the following conditions are present during inspection of the landing gear tires:

- **Tire displays areas of exposed cord or belts**
- **Tire clearly displays visible grooves in the center section of the tire**
- **Tire displays cuts or gouges of undeterminable depth, or displays cuts/gouges that enter the tire cord structure**

TIE DOWN.....REMOVED
Remove and securely store the tie down inside the aircraft.

FUEL VENT.....UNOBSTRUCTED
Check that the fuel vent located on the bottom of the wing is unobstructed and provides free passage of air.

FUEL DRAINDRAINED / CHECKED
Drain the fuel drain/sump on the right underside of the wing. Ensure you draw a large fuel sample from the drain (at least $\approx 1/3$ of the fuel sampling GATS jar). Check the fuel for water, contaminants and correct fuel grade by examining the color. When checking the fuel cap in the following steps, drain clean fuel back into the fuel tank through the mesh screen of the GATS jar.

FUEL QUANTITY / FUEL CAP CHECKED / SECURE
Visually check fuel quantity and color by removing the fuel cap and examining the fuel inside the fuel tank. Due to the design of the tank a dipstick cannot be used. Use the fuel level in relation to tabs inside the tank to determine if the fuel quantity meets minimum requirements.

Be extremely cautious of any fuel level lower than the tabs. Drain the clean fuel from the sample jar back into the tank, as specified earlier. Examine the fuel vent built into the fuel cap. Check the condition of the rubber gasket. Close the fuel cap securely. Do not leave an open fuel cap unattended.

FRESH AIR INLET CHECKED

Check that the fresh air inlet at the root of the right wing is unobstructed and free of contamination.

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OIL LEVEL / DIPSTICK / DOOR.....	CHECKED / SECURE
COWLING.....	SECURE
PROPELLER AND SPINNER.....	CHECKED
COWL AIR INLETS (4).....	CLEAR
ALTERNATOR BELT.....	SECURE
NOSE LANDING GEAR.....	CHECKED
HEATER INTAKE HOSES.....	CHECKED
FUEL DRAIN	DRAINED / CHECKED

NOSE, EXPANDED

OIL LEVEL / DIPSTICK / DOOR..... CHECKED / SECURE

Open the oil door and check inside for any obvious damage / abnormalities. Remove the oil dipstick and check the oil level (**6 quarts minimum, per BSU Policy; refer to AC Information Summary Chapter of this FSM**). Secure the oil dipstick. Close the oil door and check that it latches securely. Never leave the oil dipstick/oil door removed/unsecure and unattended.

COWLING SECURE

Check that cowling is secure, as indicated by the four (4) properly engaged cowl latches Check that the upper cowling is properly attached to the lower cowling.

PROPELLER AND SPINNER CHECKED

Check the propeller and spinner for damage and fluid leaks. Any suspected leak must be evaluated by Maintenance. Systematically run your hand over the propeller blades to check the propeller face, edges and back for damage. Propeller should be free of nicks, cracks, or spurs. Verify that spinner has no damage and is secure. Any propeller nick that is enough to catch on finger moved along the blade should be evaluated by Maintenance before flight.

COWL AIR INLETS (4)..... CLEAR

Check the four (4) front cowl air inlets, for contamination, foreign objects, obstructions and damage. Check the two openings behind the propeller blade that admit the cooling and engine air into the engine compartment. Check the baffle plates and engine cylinder cooling fins inside for the same. Check the round opening (inside one of the larger openings) that leads to the muffler shroud of the cabin heat and defrost system. Check the cowl scoop on the bottom right of the cowling that admits air to the oil cooler, and check the outlet of the air from the oil cooler on the bottom of the cowling.

ALTERNATOR BELT..... SECURE

Check that the alternator belt inside the front cowling is secure by gently tugging on it and ensuring it feels appropriately tight. Inspect the visible portion of the alternator belt for damage, such as fraying, uneven wear and gouges.

NOSE GEAR CHECKED

Inspect the main gear components in turn in accordance with the SOP. Move the aircraft if necessary to observe the entire tire.

NOSE GEAR INSPECTION (SOP)

Oleo strut extension.....	VERIFY ≈ 2.75 inch
Components (actuator, side brace, drag link, springs, down-limit hooks and tabs).....	SECURE
Hub assembly.....	SECURE
Attachment bolts.....	SECURE
Strut housing.....	FREE OF CRACKS
Up- and down- limit tabs.....	FREE OF CONTAMINATION
All connections (bolts, nuts, cotter pins).....	SECURE
Hub assembly.....	SECURE
Tire tread wear.....	ACCEPTABLE
Air valve cover	SECURE

WARNING

Flight crews shall ground the aircraft if any of the following conditions are present during inspection of the landing gear tires:

- **Tire displays areas of exposed cord or belts**
- **Tire clearly displays visible grooves in the center section of the tire**
- **Tire displays cuts or gouges of undeterminable depth, or displays cuts/gouges that enter the tire cord structure**

HEATER INTAKE HOSES..... CHECKED

Inside the nose landing gear wheel well, check the orange intake hoses for damage and secure attachment to the muffler shroud.

FUEL DRAINDRAINED / CHECKED

Drain the fuel drain/sump on the right underside of the wing. Ensure you draw a large fuel sample from the drain (≈ 1/3 of the fuel sampling GATS jar or more). Check the fuel for water, contaminants and correct fuel grade by examining the color. When checking the fuel cap in the following steps, drain clean fuel back into the fuel tank through the mesh screen of the GATS jar.

LEFT WING

FRESH AIR INLET.....	UNOBSTRUCTED
FUEL DRAIN	DRAINED / CHECKED
FUEL VENT	UNOBSTRUCTED
FUEL QUANTITY / FUEL CAP	CHECKED / SECURE
WING INSPECTION PLATES	CHECKED
LEFT MAIN GEAR / TIRE / BRAKE	CHECKED
PITOT / STATIC MAST.....	CHECKED
TIE DOWN.....	REMOVED
STALL WARNING VANE.....	CHECKED
LEADING EDGE	CHECKED
WING TIP / LIGHTS.....	CHECKED
STATIC WICKS (if any)/ AILERON / FLAP / HINGES	CHECKED

LEFT WING. EXPANDED

FRESH AIR INLET **CHECKED**

Check that the fresh air inlet at the root of the left wing is unobstructed and free of contamination.

FUEL DRAIN **DRAINED / CHECKED**

Drain the fuel drain/sump on the right underside of the wing. Ensure you draw a large fuel sample from the drain (at least $\approx 1/3$ of the fuel sampling GATS jar). Check the fuel for water, contaminants and correct fuel grade by examining the color. When checking the fuel cap in the following steps, drain clean fuel back into the fuel tank through the mesh screen of the GATS jar.

FUEL VENT..... **UNOBSTRUCTED**

Check that the fuel vent located on the bottom of the wing is unobstructed and provides free passage of air..

FUEL QUANTITY / FUEL CAP **CHECKED / SECURE**

Visually check fuel quantity and color by removing the fuel cap and examining the fuel inside the fuel tank. Due to the design of the tank a dipstick cannot be used. Use the fuel level in relation to tabs inside the tank to determine if the fuel quantity meets minimum requirements.

Be extremely cautious of any fuel level lower than the tabs. Drain the clean fuel from the sample jar back into the tank, as specified earlier. Examine the fuel vent built into the fuel cap. Check the condition of the rubber gasket. Close the fuel cap securely. Do not leave an open fuel cap unattended.

WING INSPECTION PLATES **SECURE**

Verify that all wing inspection plates on the underside of the wing are securely in place, and inspect for any missing screws.

LEFT MAIN GEAR / TIRE / BRAKE **CHECKED**

Inspect the main gear components one by one. Look at each individual component in turn in accordance with the SOP, rather than trying to take in the entire main gear assembly all at once. Move the aircraft if necessary to observe the entire tire.

MAIN GEAR INSPECTION (SOP)

Oleo strut extension.....	VERIFY approx. 2.0 inch
Components (actuator, side brace, torque link, springs, down-limit hooks and tabs)...	SECURE
Hub assembly.....	SECURE
Web plate bolts, front and rear	SECURE
Strut housing.....	FREE OF CRACKS
Up- and down- limit tabs	FREE OF CONTAMINATION
All connections (bolts, nuts, cotter pins).....	SECURE
Brake lines and brake caliper assembly.....	NO LEAKS / SECURE
Brake disk.....	NO DAMAGE OR CRACKS
Brake pads wear.....	(minimum 1/8" remaining) ACCEPTABLE
Tire inner sidewall.....	NO DAMAGE
Tire tread wear.....	ACCEPTABLE
Tire outer sidewall	NO DAMAGE
Air valve cover	SECURE

WARNING

Flight crews shall ground the aircraft if any of the following conditions are present during inspection of the landing gear tires:

- **Tire displays areas of exposed cord or belts**
- **Tire clearly displays visible grooves in the center section of the tire**
- **Tire displays cuts or gouges of undeterminable depth, or displays cuts/gouges that enter the tire cord structure**

PITOT / STATIC MAST CHECKED

Check the pitot/static mast under the wing for damage, and the hole(s) for obstructions and contamination.

TIE DOWN..... REMOVED

Remove and securely store the tie down inside the aircraft.

STALL WARNING VANE..... CHECKED

Check that the stall warning vane on the leading edge is free to move and is not damaged.

LEADING EDGE CHECKED

Check the leading edge for dents and other damage. Check the LANDING and TAXI light assembly for physical damage.

WING TIP / LIGHTS CHECKED

Check exterior condition of the wing tip and the wing tip lights. Look for unrepaired cracks and other physical damage.

STATIC WICKS (if installed) / AILERON / FLAP / HINGES CHECKED

Check if the static wicks (if installed) are missing or damaged. Check aileron, flap and all hinge points for connections and free movement, verify all are secure and undamaged (e.g. dents, binding). Inspect the flap for damage and excessive play. Ensure the counterweight on the aileron is present and secure. Check the accessible nuts on the aileron and flap activation rods for looseness.

WARNING

Whenever checking the aileron connections from the underside of the wing, ALWAYS support the aileron firmly with one hand before inserting your fingers into the opening between the aileron and the wing.

Failure to do so will allow the aileron to move, catching fingers between the aileron and the wing's trailing lower edge. These edges are relatively sharp, and due either to a wind gust or inadvertent movement of the controls by another crewmember, serious injury to the hand / fingers could result.

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FUSELAGE and EMPENNAGE

FUSELAGE LEFT / TOP ANTENNAS	CHECKED
STABILATOR / TRIM TAB / STATIC WICKS (if installed)	CHECKED
VERTICAL STABILIZER / ANTENNAS	CHECKED
RUDDER / STATIC WICKS (if installed).....	CHECKED
TAIL TIE DOWN	REMOVED
FUSELAGE RIGHT / TOP ANTENNAS.....	CHECKED
FUSELAGE BOTTOM / VENTS / BOTTOM ANTENNAS.....	CHECKED
BAGGAGE DOOR.....	SECURE

360° WALK AROUND..... COMPLETE

FUSELAGE and EMPENNAGE, EXPANDED

FUESELAGE LEFT / TOP ANTENNAS..... CHECKED

Check the left side of the fuselage for damage. Check that all external antennas on top of the fuselage are secure and free of damage.

STABILATOR / TRIM TAB / STATIC WICKS (if installed)..... CHECKED

Check both left and right sides of the stabilator, the trim / servo tab and the static wicks (if installed). Examine for damage, looseness, freedom of movement, and surface condition, Check all hinges, attachment points and all visible connections. Check that the trim tab is in agreement with the pitch trim wheel setting in the cockpit. Lift up the stabilator and check the underside, including the trim / servo tab connections. Ensure all nuts and safety pins are secure. When moving the stabilator, ensure that the trim / servo tab is also moving in the correct direction and the correct amount of travel. Check if the static wicks (if installed) are missing or damaged. Check inside the tail cone for foreign objects, such as bird nests, etc. Observe stabilator stops and accompanying cables to the extent possible.

VERTICAL STABILIZER and ANTENNAS CHECKED

Check the vertical stabilizer and accompanying antennas for damage.

RUDDER / STATIC WICKS (if installed) CHECKED

Check the rudder control surface and the static wicks (if installed). Examine the rudder for damage, looseness, freedom of movement and surface condition. Check all hinges, attachment points and all visible connections. Check if the static wicks(if installed) are missing or damaged.

TAIL TIE DOWN..... REMOVED

Remove and securely store the tail tie-down inside the airplane.

FUESELAGE RIGHT / TOP ANTENNAS CHECKED

Check the right side of the fuselage for damage. Check that all external antennas on top of the fuselage are secure and free of damage. Check that the ELT access / inspection panels (if any) are secure.

FUESELAGE BOTTOM / VENTS / BOTTOM ANTENNAS CHECKED

Check the underside of the fuselage for damage. Check the vents protruding from the bottom for obstructions and damage. Check that all external antennas on the bottom of the fuselage are secure and free of damage.

BAGGAGE DOOR..... SECURE

Ensure that the baggage door by the airplane entrance is securely latched. If any cargo is carried, it must also be locked. Never leave an unsecured baggage door unattended.

360° WALK AROUND COMPLETED

Conduct a complete walk-around just prior to entering the airplane. Pay particular attention to any potentially missed items, such as tie-downs, wheel chocks, unlatched oil/baggage doors, fuel caps or unsecured/foreign objects on the aircraft surfaces and on the ground nearby.

IF AIRCRAFT IS TO BE LEFT UNATTENDED

TIE DOWN(s) / WHEEL CHOCKS..... INSTALLED
 FUEL CAPS / OIL DIPSTICK / DOORS..... SECURE

- AFTER RETURNING TO THE AIRCRAFT -

TIE DOWN(s) / WHEEL CHOCKS..... REMOVED
360° WALK AROUND COMPLETE

IF AIRCRAFT IS TO BE LEFT UNATTENDED, EXPANDED

TIE DOWN(s) or WHEEL CHOCKS..... INSTALLED

Secure the plane against movement by installing, at minimum, the tail tie down and/or wheel chocks. Use the parking brake if no tie down location or wheel chocks are available.

FUEL CAPS / OIL DIPSTICK / DOORS SECURE

Ensure that all fuel caps, oil dipstick, oil door and aircraft doors are secure.

- AFTER RETURNING TO THE AIRCRAFT -

TIE DOWN(s) / WHEEL CHOCKS REMOVED

Remove all tie downs and wheel chocks, and store securely.

360° WALK AROUND COMPLETE

Perform a complete walkaround of the aircraft, checking for potentially missed items, such as tie downs, fuel caps, oil dipstick and door, baggage door, etc. Also, check for foreign objects on the surfaces of the aircraft, as well as on the ground next to the aircraft.

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NORMAL PROCEDURES

BEFORE START

PARKING BRAKE SET
 PASSENGER BRIEF COMPLETE
 SEATBELTS / SHOULDER HARNESSSES ON / CHECKED
 FLAPS RETRACTED /UP
 FUEL SELECTOR (feel for detent) LOWEST TANK
 ALTERNATE ENGINE AIR OFF (CLOSED)
 MIXTURE IDLE CUT-OFF
 PROPELLER FULL FORWARD
 THROTTLE OPEN 1/2 INCH
 LANDING GEAR SELECTOR DOWN
 LIGHTS (as required) ON

BEFORE START, EXPANDED

PARKING BRAKE **SET**
 Verify that Parking Brake is ON to assist in preventing aircraft from moving during start.

CAUTION

*The parking brake alone should not be relied on to prevent aircraft movement, and should only be used as a secondary backup. Always **apply** and **hold** main brakes during engine start, and anytime the aircraft is stationary with engine running.*

PASSENGER BRIEF (SOP) **COMPLETED**

Passenger Brief SOP

Passenger brief must be oriented toward passengers who may not have any previous aviation experience. Perform a standard brief tailoring it appropriately to the flight:

1. Brief the passengers as required by 14 CFR FAR 91.107 on the following:
 - Seatbelts and shoulder harnesses
 1. HOW to use
 2. WHEN to use
2. In the brief, include the following, as appropriate:
 - EMERGENCY EXITS location and operation
 - Instructions to be followed in case of EMERGENCY
 - Emergency equipment (e.g. fire extinguisher) location and operation
 - Survival equipment / first aid kit location and use
 - TRAFFIC AVOIDANCE - how to assist the pilot with traffic
 - Cabin vents operation
 - Any other pertinent information for the flight

SEATBELTS / SHOULDER HARNESSSES ON / CHECKED

Verify that both the flight crew and the passengers have their seatbelts and shoulder harnesses fastened securely, as required by FAR 91.107

FLAPSRETRACTED / UP

Verify that wing flaps are retracted and are in the full UP position after the exterior preflight inspection has been complete.

FUEL SELECTOR (feel for detent) LOWEST TANK

Verify that the fuel selector is set to the lowest tank for engine start and securely engaged in the detent. This will ensure that, when the tank is switched to the other, fullest tank for the runup and the takeoff, both tanks have a chance to be used prior to takeoff to verify that they are operational.

ALTERNATE ENGINE AIR OFF (CLOSED)

Verify that the alternate engine air source is OFF (in the CLOSED position). This will ensure that the air reaching the engine is the filtered air form the normal air source.

MIXTURE.....IDLE CUT-OFF

Verify that the mixture is in the IDLE CUT-OFF (full back) position

PROPELLERFULL FORWARD

Verify that the propeller level is in FULL FORWARD, MAXIMUM RPM position.

THROTTLE.....OPEN 1/2 INCH

Verify that the throttle is open \approx 1/4 INCH to allow for sufficient fuel/air for both engine prime and engine start. Guard against opening the throttle excessively. Only a small fraction of throttle movement is required.

LANDING GEAR SELECTOR..... DOWN

Verify that the landing gear lever is down prior to engine start.

LIGHTS.....(as required) ON

Turn ON appropriate lights to warn others about impending engine start and to comply with appropriate regulations regarding lights during ground and flight operations.

DAYTIME: Turn ON the BEACON light, and, if appropriate, the STROBE / ANTI-COLLISION lights, and leave them on for anti-collision purposes for the entire flight, as required by FAR 91.209(b). One permitted exception is strobe lights should be turned off on the ground when they adversely affect ground personnel or other pilots.

NIGHTTIME: In addition to the BEACON light, turn on the NAV lights and leave them on if any portion of the flight can potentially occur during the period between sunset and sunrise, as required by FAR 91.209(a). If appropriate, you may momentarily turn on the STROBES and/or LANDING/ TAXI light to warn others about the impending engine start and to clear the area, but then turn these lights OFF to avoid blinding others on the ramp, as appropriate.

NOTE

Even if departing prior to sunset on a flight that may potentially extend beyond it, it is advisable to turn the NAV LIGHTS ON immediately, to avoid forgetting to do it later in the flight when the sunset occurs.

ENGINE START

MASTER SWITCH ON
 ENGINE PRIME (SOP)..... (if and as required) COMPLETE
 ENGINE START (SOP) COMPLETE
 OIL PRESSURE / TEMPERATURE CHECKED
 AVIONICS SWITCHON
 AMMETER..... CHECKED
 VOLTAGE..... CHECKED
 AVIONICS SWITCHON
 ► COCKPIT COMMUNICATIONS CHECK..... COMPLETE
 MIXTURE (as required) LEANED FOR TAXI

ENGINE START, EXPANDED

MASTER SWITCH **ON**
 Turn ON the master switch to provide electrical power for the engine, priming, starting and the lights.

ENGINE PRIME (SOP).....**(as required) COMPLETED**
 This step may be skipped if the aircraft has flown in the previous 30 min and the engine is HOT. In those situations, attempt to start the engine without priming first, and only prime if the start attempt fails. Prime the engine if the aircraft has not flown recently, and the engine is COLD.

CAUTION

Avoid over-priming the engine. Do not allow the fuel pump to continue running with mixture in FULL RICH position after fuel flow indication has stabilized (3-5 seconds).

ENGINE PRIME SOP

MIXTURE..... **IDLE CUT-OFF**
THROTTLE..... **OPEN 1/2 INCH**
FUEL PUMP **ON**
MIXTURE..... **FULL RICH**
FUEL FLOW **(3 to 5 seconds) OBSERVED AND STABILIZED**
MIXTURE..... **IDLE CUT-OFF**
FUEL PUMP **OFF**

ENGINE PRIME SOP, EXPANDED

MIXTURE..... **IDLE CUT-OFF**
 Verify the mixture is in the IDLE CUT-OFF position in preparation for the prime.

THROTTLE **OPEN 1/2 INCH**
 Verify that the throttle is open 1/2 inch to allow the fuel to enter the engine during later steps. Skipping or missing this step will result in inadequate prime.

FUEL PUMP **ON**
 Turn the fuel pump ON to provide necessary fuel pressure for priming.

MIXTURE..... **FULL RICH**
 Move the mixture to FULL RICH position to allow the fuel to enter the engine.

FUEL FLOW **(3 to 5 seconds) OBSERVED AND STABILIZED**
 Look for fuel flow indications on the engine’s fuel flow gauge. If the fuel flow is not observed, it may be due to the throttle being in closed position instead of being open 1/2 inch. If this occurs, shut off the fuel pump, recheck the throttle and restart the Engine Prime SOP from the beginning.

MIXTURE..... **IDLE CUT-OFF**
 Move the mixture to IDLE CUT-OFF position immediately after the fuel flow indications are observed, to avoid flooding the engine with excess fuel.

FUEL PUMP **OFF**
 Turn the auxiliary fuel pump OFF once the priming sequence has been complete.

ENGINE START (SOP) **COMPLETED**

ENGINE START SOP

NORMAL START

Engine is **COLD** or **HOT**, but **NOT** flooded.
 Engine prime is complete when engine is **COLD**.
 Engine prime is not required when engine is **HOT**.

MIXTURE **IDLE CUT-OFF**
THROTTLE **OPEN 1/2 INCH**
PROPELLER AREA **CLEAR**
STARTER..... **(10 seconds maximum) ENGAGE**
MIXTURE **ADVANCE AS ENGINE STARTS TO FULL RICH**
THROTTLE **1000 RPM**

NORMAL START, EXPANDED

MIXTURE **IDLE CUT-OFF**
 Verify MIXTURE is in IDLE CUT-OFF position in preparation for engine start.

THROTTLE **OPEN 1/2 INCH**
 Verify that the throttle is open 1/2 inch for engine start.

PROPELLER AREA **CLEAR**
 Clear the propeller area. Both **VISUALLY** scan the area and **AUDIBLY** announce with a **LOUD VOICE** through the open window to “**CLEAR PROP!!**”
Do not immediately engage the starter! First, listen for a response for a few moments, to ensure no response is forthcoming.

STARTER..... **(10 seconds maximum) ENGAGE**
 Engage the starter with the key in the ignition switch. If the engine starts, proceed to the next step. If the engine does not start within **10 seconds** of cranking, allow the starter to cool for **20 seconds** before cranking the engine again. Attempt this engine cranking sequence a maximum total of **three times**. If the engine still does not start, allow the starter to cool for **10 minutes**. Repeat the starting sequence complying with the above limitations. If after the additional 3 cranking attempts of up to 10 seconds, with 20 second breaks in between, the engine still does not start, inform Dispatch / Maintenance.

NOTE

In cold weather, a cold engine may not start at all. If this is the suspected cause of the problem, additional priming may be required in accordance with Engine Prime SOP.

MIXTURE..... ADVANCE AS ENGINE STARTS
 As the engine starts, advance mixture to FULL RICH smoothly to provide the engine with continuous fuel flow. The engine may have sufficient fuel for the engine start from priming, but will quickly run out of fuel and stop if this step is not accomplished in a timely manner.

THROTTLE..... 1000 RPM
 Set the throttle to 1000 RPM to avoid either excessively high or low engine idling.

.FLOODED START
Engine is flooded with excess fuel, typically from over-priming.

- DO NOT PRIME THE ENGINE WITH ADDITIONAL FUEL -
FUEL PUMP VERIFY OFF
MIXTURE..... IDLE CUT-OFF
THROTTLE FULL FORWARD
PROPELLER AREA..... CLEAR
STARTER (10 seconds maximum) ENGAGE
MIXTURE ADVANCE TO FULL RICH AS ENGINE STARTS
THROTTLE CLOSE PROMPTLY, then 1000 RPM

FLOODED START , EXPANDED

DO NOT PRIME THE ENGINE WITH ADDITIONAL FUEL

Typically, when proper procedures are followed and the engine does not start (if there is no mechanical/electrical abnormality), it is most likely either under-primed or over-primed (flooded). Priming the engine more in such a situation with an already possibly flooded engine will only exacerbate the problem. If flooding is suspected, follow the flooded start procedures first, before deciding on the further course of action. If under-priming is the cause, it will be easy to remedy once flooding is eliminated as the possible cause for lack of engine start.

FUEL PUMP VERIFY OFF
 Verify the auxiliary fuel pump is OFF to avoid adding excess fuel to the already flooded engine.

MIXTURE..... IDLE CUT-OFF
 Verify MIXTURE is in IDLE CUT-OFF position in preparation for engine start and to prevent additional fuel from reaching flooded engine immediately after start.

THROTTLE FULL FORWARD
Verify that the throttle is fully open (FULL FORWARD) for flooded engine start, to allow maximum amount of air to enter the engine to mix with the fuel already there. Keep in mind the need to reduce the throttle to idle PROMPTLY once the engine is started in the consequent steps.

PROPELLER AREA CLEAR
Clear the propeller area. Both **VISUALLY** scan the area and **AUDIABLY** announce with a **LOUD VOICE** through the open window to “**CLEAR PROP!!**”
Do not immediately engage the starter! First, listen for a response for a few moments, to ensure no response is forthcoming.

STARTER..... (10 seconds maximum) ENGAGE
Engage the starter with the key in the ignition switch. If the engine starts, proceed to the next step. If the engine does not start within **10 seconds** of cranking, allow the starter to cool for **20 seconds** before cranking the engine again. Attempt this engine cranking sequence a maximum total of **three times**. If the engine still does not start, allow the starter to cool for **10 minutes**. Repeat the starting sequence complying with the above limitations. If after the additional 3 cranking attempts of up to 10 seconds, with 20 second breaks in between, the engine still does not start, inform Dispatch / Maintenance.

MIXTUREADVANCE AS ENGINE STARTS
As the engine starts, advance mixture to FULL RICH smoothly to provide the engine with continuous fuel flow. The engine will quickly run out of fuel and stop if this step is not timely accomplished.

THROTTLECLOSE PROMPTLY, then 1000 RPM
As the engine starts, RETARD the throttle promptly to prevent excessively high RPM that could result from the flooded start procedure. Once the engine is running smoothly, set the throttle to 1000 RPM to avoid either excessively high or low engine idling.

OIL PRESSURE / TEMPERATURE CHECKED
Check that oil pressure comes up into the green arc within **30 seconds** (in extremely cold weather, it may take up to **1 minute**). If the oil pressure does not show an indication within the specified window, shut down the engine and inform Dispatch / Maintenance. Check the oil temperature for normal indications, as appropriate.

AVIONICS SWITCHON
Turn the avionics switch ON to provide power to the communication and navigation equipment. Verify that the intercom is functional by addressing, in turn, each of the other crewmembers and passengers. This step is also required to be able to check voltage in the following step on the appropriate instrument, if installed (such as JDM-700).

► **COCKPIT COMMUNICATIONS CHECK..... COMPLETE**

Cockpit Communications Check (SOP)

Pilot 1: "How do you hear me?"

Pilot 2 / Passenger: "Loud and clear, you - me?"

Pilot 1: "Loud and clear."

....Repeat for other crewmembers and passengers

AMMETER CHECKED

With the throttle set to at least 1000 RPM, Check that the ammeter (loadmeter) is indicating appropriate alternator output (load). A zero indication (zero load) would imply that the alternator is not producing electrical current.

NOTE

The standard ammeter on the PA28R200 is of a loadmeter type (i.e. it indicates total load placed on the alternator, rather than battery charge/ discharge)

A zero indication on the ammeter implies a problem with the alternator not producing any electrical current, or possibly a problem with the ammeter gauge itself. If alternator output cannot be verified and the situation remedied, shutdown the engine and inform Dispatch / Maintenance.

A high continuous load indication on the ammeter for no apparent reason (≈30 AMP or more) immediately following engine start may indicate that starter did not disengage and is "hung" (still running in conjunction with the engine). If depleted battery and electrical accessories do not account for the high load, and a hung starter is suspected, shutdown the engine. and inform Dispatch / Maintenance.

VOLTAGE CHECKED

Check that the VOLTAGE readout indicates ≈14 Volts on the appropriate instrument, if installed (such as JDM-700). Refer to Preflight Checklist>Cabin Check>Battery Voltage Check for information on how to read the appropriate instrument, or consult the AFM / POH).

MIXTURE(as required) LEANED FOR TAXI

If appropriate, lean the mixture for taxi to prevent fouling of spark plugs from excessively rich mixture during low RPM ground operations in accordance with Mixture Ground Leaning SOP of this chapter.

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BEFORE TAXI

AVIONICS / TRANSPONDER SET / CHECKED
 FLIGHT INSTRUMENTS / ALTIMETER / HDG SET / CHECKED
 PARKING BRAKE OFF
 ► TAXI AREA..... CLEAR

BEFORE TAXI, EXPANDED

AVIONICS / TRANSPONDER..... SET / CHECKED

Set and check the avionics. Use a left to right, top to bottom flow. Begin with the top radios and continue down until arriving at the transponder. Set the frequencies to be used into the communication and navigation radios. Set the transponder with the appropriate squawk code. Test the transponder by engaging the TEST mode (TST), and then returning it to ALT. Obtain and write down ATIS / AWOS / ASOS or other information appropriate to the type of the airport / airspace operated in.

FLIGHT INSTRUMENTS / ALTIMETER / HDG SET / CHECKED

Using a left to right, top to bottom flow, set and check flight instruments in accordance with the SOP. Announce the instrument name and the expected indication / setting.

Flight Instruments Before Taxi Check (SOP)

- Verify clock is operating properly and set to the correct time.
- Verify magnetic compass case is full of fluid, card is floating freely, and compass deviation card is legible.
- Verify ASI indicates zero.
- Set attitude indicator (AI) for straight and level flight; verify horizon is level.
- Set altimeter to the current local altimeter setting and verify within 75' of the local field elevation. If altimeter setting is not available, set to local field elevation.
- Verify the turn coordinator shows wings level and no warning flag.
- Check that the slip/skid indicator a.k.a. inclinometer (ball) is centered.
- Check the heading indicator against the magnetic compass and set it as appropriate.
- Note any variations from zero on vertical speed indicator (VSI).
- Set the backup heading indicator (if installed) to the compass heading.

PARKING BRAKE OFF

Release the parking brake in preparation for moving the aircraft.

► TAXI AREA..... CLEAR

Scan the taxi area to make sure it is clear before starting to taxi.

TAXI

BRAKES CHECKED
 INSTRUMENTS TAXI CHECKS (SOP) COMPLETED

TAXI, EXPANDED

Minimizing risk during taxi (SOP)

PIC is responsible to ensure that the flight crew maintains maximum visual vigilance/collision avoidance during all taxi operations.

Flight crews shall avoid any head-down time until well clear of other parked aircraft, vehicles (e.g. fuel trucks) and other obstructions.

BRAKES..... CHECKED

Both PF and PMF must take turns to check the main brakes as soon as the aircraft begins to move. After adding enough power to begin rolling, PF will reduce the power to idle and apply both brakes to evaluate their effectiveness. The PMF will then conduct a similar check immediately after positively exchanging aircraft controls with the PF.

INSTRUMENTS TAXI CHECKS (SOP)..... COMPLETED

Using a left to right, top to bottom flow pattern, perform the flight instrument checks that require the aircraft to be moving. Perform these checks when clear of the parking ramp, and away from all obstructions and obstacles.

INSTRUMENTS TAXI CHECKS (SOP)

- Magnetic Compass Swings freely during turns, indicates known headings
- Attitude Indicator Erect/stable within 5 min, ≤ 5° of bank during turns
- Turn Coordinator Miniature airplane banks in direction of turns
- Slip/skid Indicator (the ball) Moves freely to the OUTSIDE of turns
- Heading Indicator Turns freely in direction for turns and indicates known headings

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BEFORE TAKEOFF / RUNUP

▶ **MAIN BRAKES (BOTH PILOTS)**..... **HELD**
 PARKING BRAKE **SET**
 FLIGHT CONTROLS **FREE / CORRECT**
 TRIM (2) **SET FOR TAKEOFF / CHECKED**
 FUEL SELECTOR (feel for detent) **FULLEST TANK**

MIXTURE **FULL RICH**
 PROPELLER **FULL FORWARD**
 THROTTLE **2,000 RPM**
 MAGNETOS (R\BOTH\L\BOTH) (100-150/50 max diff)/**CHECKED**, then **BOTH**
 ALTERNATE ENGINE AIR (check **NO RPM DROP**) **ON**, then **OFF (CLOSED)**
 PROP GOVERNOR (to 1700 RPM x 4) **EXERCISED / CHECKED**
 OIL PRSSURE / TEMPERATURE **CHECKED**
 ALTERNATOR OUTPUT / VOLTAGE (if installed) **CHECKED**
 FUEL GAUGES **CHECKED**
 VACUUM GAUGE (4.9 - 5.1 HG) **CHECKED**
 AUX. VACUUM SYSTEM (if installed) **CHECKED**, then **OFF**
 THROTTLE **CHECK IDLE**
 MIXTURE (as required) **LEANED FOR TAXI**

AVIONICS / TRANSPONDER **DEPARTURE**
 FLIGHT INSTRUMENTS **DEPARTURE**
 DEPARTURE BRIEF **COMPLETE**

BEFORE TAKEOFF / RUN-UP, EXPANDED

▶ *Upon arriving to the Run-up area and coming to a complete stop, verify that the **items on the TAXI checklist have been completed**, as appropriate.*

▶ **MAIN BRAKES (BOTH PILOTS)**..... **HELD**
Both pilots must have their feet on the toe brake pedals to ensure the aircraft is secured against forward movement. Even when choosing to engage the parking brake, never rely on the parking brake alone to keep aircraft from moving on the ground.

PARKING BRAKE **SET**
 Verify that Parking Brake is ON to assist in preventing aircraft from moving during runup.

FLIGHT CONTROLS..... **FREE / CORRECT**
 Check that the stabilator and ailerons cockpit controls move all the way to their designed limits freely, smoothly and without binding. At the same time, check that the outside control surface deflections correctly correspond to the cockpit control movements. Pilot conducting the checks during this and following checks should request assistance from the other front-seat occupant to view and verify proper movement of outside control surfaces, as needed.

NOTE

In the PA28R200, due to the rudder control linkage design, do NOT forcibly move the rudder pedals when aircraft is stationary. To check for proper rudder deflection, obtain assistance from the second pilot / passenger to observe the rudder deflection while the first pilot is taxiing and turning the aircraft using the rudder pedals.

The following flight control flow checks every possible combination of deflections, as well as full range of movement. It is sometimes referred to as the box pattern or “making the box” because the sequence of flight controls movements approximates tracing four sides of a box.

To assist in quicker determination of correct control deflections, remember:

The aileron should be UP on the side of the yoke handle that is DOWN (think OPPOSITES). The stabilator should be DOWN when yoke is FORWARD, and it should be UP when the yoke is AFT.

FLIGHT CONTROLS BEFORE TAKEOFF CHECK (SOP)

- Yoke full forward and hold Stabilator down
- Yoke full left and hold Left aileron up, right aileron down.
- Yoke full back and holdAilerons – no change, Stabilator up
- Yoke full right and hold Left aileron down, right aileron up, Stabilator up
- Yoke Full forward and hold Ailerons – no change, Stabilator down

NOTE: Rudder deflection should be checked as per previous note above.

TRIM (2).....SET FOR TAKEOFF / CHECKED OUTSIDE

Verify that the manual trim wheel is set for TAKEOFF by aligning the mark appropriately with the takeoff indicator. Then, VISUALLY confirm OUTSIDE that the trim tab on the stabilator is in takeoff position, when the stabilator is neutral. This assures that the cockpit trim indicator can be trusted. Check that the rudder trim is set for TAKEOFF.

FUEL SELECTOR (feel for detent).....FULLEST TANK

Set the fuel selector to the FULLEST tank. Ensure it is properly engaged in this position by feeling the selector in the detent. Comply with the Switching Fuel Tanks SOP in this chapter. Have a time reference / reminder of when to switch to the other tank in-flight. The fuel tank tested during the runup will be the fuel tank used during takeoff. Avoid switching tanks just before takeoff, for if there is a problem with the new tank, it may not exhibit itself until after takeoff had commenced and aircraft had just become airborne.

CAUTION

During ground tests of the PA28R200 Arrow fuel system, it was determined that with the engine running at idle power, a period of approximately 30 – 45 seconds passed between the moment the fuel selector was placed in the OFF position, and when the engine lost power due to fuel exhaustion.

Flight crews are cautioned against switching fuel tanks immediately prior to conducting any takeoff, due to the possibility of fuel exhaustion shortly after takeoff roll has begun.

MIXTURE FULL RICH

Move the mixture to FULL RICH for engine run-up.

PROPELLER..... FULL FORWARD

Verify that the propeller level is in FULL FORWARD, MAXIMUM RPM position.

THROTTLE 2,000 RPM

Set the throttle to 2,000 RPM for system checks.

MAGNETOS (R\BOTH\L\BOTH)(100-150/50 max diff)/CHECKED, on BOTH

One at a time, check both magnetos. First, switch to the RIGHT magneto by moving the ignition switch two clicks LEFT. Allow 2 seconds to stabilize, then observe the RPM drop AND evaluate how smoothly the engine runs on a single magneto. Return the key to BOTH. Repeat for the LEFT magneto. Typical RPM drop is \approx 100 RPM. Maximum allowable RPM drop is 150 RPM. Maximum acceptable difference between magneto drops is 50 RPM.

NOTE

If RPM drop exceeds specified limits (Max. 150 RPM drop/Max. 50 RPM difference) and the engine operates rough on a single magneto, attempt to clear (“burn off”) the fouled spark plug(s) as follows:

Set magnetos to BOTH, propeller to FULL FORWARD and mixture to FULL RICH.
Increase the throttle to run the engine at 2100 RPM.
Lean the mixture to maximum lean for peak RPM.
Note the time, and run the engine for 45-60 seconds.

Retest the magnetos. If the RPM drop remains excessive, attempt the “burn-off” procedure once more. If the condition remains, return the aircraft for maintenance.

ALTERNATE ENGINE AIR (check NO RPM DROP).....ON, then OFF (CLOSED)

Move the alternate engine air source control to OPEN (ON) position. Check that there is NO drop in RPM (due to the alternate air source design, unlike some other similar aircraft, the alternate air is not warmer than regular air and should produce NO rpm drop) . Check that the engines continue running smoothly. Return the alternate air control to CLOSED (OFF) position. Check that the RPM does not change.

PROP GOVERNOR (to 1700 rpm x 3)EXERCISED / CHECKED

Exercise the propeller governor and perform the following checks as per the SOP below.

NOTE

Do not allow greater than 500 RPM decrease during the propeller exercise sequence.

PROPELLER GOVERNOR CHECKS (SOP)

1. Set the propeller control three (3) times from 2000 RPM to 1700 RPM, then back to 2000 RPM while checking that:
 - ✓ RPM decreases, then increases
 - ✓ Manifold pressure increases, then decreases
 - ✓ Oil pressure decreases, then increases
 - ✓ The aircraft shows no indication of oil leakage on the engine cowling or wings
2. Set the propellers to 1700 RPM.
3. Increase manifold pressure by 1 inch.
 - ✓ Check that governor maintains 1700 RPM (thus indicating it is functioning properly)
4. Set the propellers to full forward.
5. Adjust the throttles to maintain 2000 RPM.

OIL TEMPERATURE / PRESSURE CHECKED

Verify that oil pressure and oil temperature are indicating as appropriate. Oil pressure should be in the green, while the temperature indications would depend on, among other things, the amount of time the aircraft has been running, the temperature before engine start, and ambient temperature.

ALTERNATOR OUTPUT / VOLTAGE (if installed) CHECKED

Check that the ammeter indicates above 0, confirming that the alternator is functioning and producing load, and that the load is not excessive. Add electrical load by turning on available lights and note ammeter indications. A zero indication would imply that the alternator is not producing electrical current. Crosscheck ammeter indications against voltage (if appropriate indicator is installed, such as JDM-700) if alternator output is questionable. Alternator output should be \approx 14Volts. A \approx 12 Volts indication at 2000 RPM would indicate that the battery alone is supplying the electrical power. If troubleshoot attempts are unsuccessful, return the aircraft for maintenance. (See the note in the Engine Start procedure, Ammeter check, for additional information)

CAUTION

Departing on a flight without a functioning alternator is prohibited.

FUEL GAUGES CHECKED

Check fuel gauges to ensure their operation and approximate indication of known fuel level.

NOTE

In accordance with FAA regulations, fuel quantity indicators must only reflect an accurate level of fuel when the fuel tanks are empty.

VACUUM GAUGE (4.9"-5.1")..... CHECKED

Check that the vacuum gauges indicate between 4.9" and 5.1". A reading outside of this range at 2000 RPM would indicate the need for maintenance before any IFR flight.

AUXILIARY VACUUM SYSTEM (if installed).....CHECKED, then OFF

If installed, activate the auxiliary vacuum system and check for proper vacuum indications. Turn the auxiliary vacuum system off to resume normal vacuum system operation.

THROTTLE CHECK IDLE

Set the throttle to idle by pulling the throttle all the way OUT. Check to ensure that the engine will continue to run. A typical idle RPM range should be between 500-800 RPM.

Note that during this idle check, low vacuum and low alternator output indications may occur, due to excessively low engine speed. Setting the throttle back to 1000 RPM after this check should restore normal indications and confirm the systems are operational.

MIXTURE (as required) LEANED FOR TAXI

If appropriate, lean the mixture for taxi to prevent fouling of spark plugs from excessively rich mixture during low RPM ground operations in accordance with Mixture Ground Leaning SOP of this chapter.

AVIONICS / TRANSPONDER..... DEPARTURE

Verify that avionics and transponder are SET for departure. Using most recently received information (such as new ATIS, recently obtained clearance, etc.), update as necessary.

- ▶ *Set the GPS for primary navigation to intended clearance limit (IFR) or initial waypoint along a pre-planned VFR flight plan.*
- ▶ *Verify that an IFR route or VFR flight plan is entered into the GPS.*
- ▶ *Set localizer frequency for departure airport and front course on OBS 1.*
- ▶ *Use OBS 2 for positional awareness using nearest VOR, as appropriate.*

FLIGHT / NAV INSTRUMENTS..... DEPARTURE

Verify that flight and navigation instruments are SET for departure.

DEPARTURE BRIEF..... COMPLETED

Departure brief is primarily for the flight crew, but any information applicable to passengers must be included. The appropriate pilot will conduct the departure brief in accordance with, but not limited to, the following SOP.

Departure brief (SOP)

1. Who is the PF, who is the PMF and who is the PIC?
2. How is the control exchange handled?
3. Sterile cockpit procedures?
4. Expected taxi route?
5. Runway length, conditions and wind on takeoff?
6. Takeoff emergencies? / Bridgewater Standard Departure
7. Airspeeds? /Rotation / Climb / Emergencies
8. Altitudes and route, as appropriate.
9. VFR / IFR Check.
10. Any pertinent passenger/crew information or questions?

Departure brief, expanded

1. Who is the PF, who is the PMF and who is the PIC?
 - Determine who is the PF and who is the PMF for the takeoff and first leg
 - Determine who is the overall PIC for the flight, regardless of who is PF / PMF
2. How is the control exchange handled?
 - Brief positive three-way exchange of flight controls.
3. Sterile cockpit procedures?
 - Brief sterile cockpit procedures for the specific flight.
4. Expected taxi route?
 - Brief the expected taxi route to the takeoff runway.
5. Runway length, condition and wind on takeoff?
 - Brief runway length and condition, as well as any obstructions.
 - Brief surface wind and crosswind conditions expected on takeoff, if any.
6. Takeoff emergencies? / Bridgewater Standard Departure
 - Brief takeoff emergencies, as per Bridgewater Standard Departure.
7. Airspeeds? /Rotation / Climb / Emergencies
 - Brief normal airspeeds to be used for takeoff and initial climb, as well as emergency airspeeds.
8. Altitudes and route, as appropriate
 - Brief altitude and route for at least the first leg of the flight, if applicable.
9. VFR / IFR Check
 - If flying VFR confirm that VFR departure is possible.
 - Confirm that the transponder is set to the appropriate VFR code.
 - If flying IFR
 - Confirm clearance obtained
 - The aircraft clock is SET and operating as required by FAR 91.205
 - Confirm that t aircraft navigation and communication radios are SET to the appropriate departure frequencies
 - Confirm that the transponder is SET to the appropriate code
 - Confirm procedure in the event of loss of communication with ATC
 - Confirm that the flight instruments are operating properly
11. Any pertinent passenger/crew information or questions?
 - Address the passengers with any pertinent information not covered previously during passenger brief and ask if anyone has any questions.

Bridgewater Standard departure (SOP):

By stating “Bridgewater Standard Departure” the BSU Flight Crew members confirm with one another that they both understand and are prepared to execute the departure emergency procedures.

BSU Standard emergency flows will be followed and backed up with the checklists if time permits. In case of an actual emergency, the lesson will be terminated and the flight crew will work as a team to bring the flight to a safe conclusion. The following general guidelines should be observed but will not substitute sound judgment and PIC authority to take whatever action necessary to meet the extent of an emergency.

Any abnormalities before V_R – abort takeoff and taxi off active runway.

Engine failure after rotation with usable runway remaining – land on it.

Engine failure below 1000’ AGL - establish best glide, pick a spot straight ahead and land under control using shallow banks and normal maneuvers.

Engine failure at or above 1000’ AGL – establish best glide, troubleshoot the failed engine if time permits and consider the possibility of returning to the airport or another landing area.

Sample Departure Briefing

In this example, the pilot conducting the brief is the student (PF/PUI).
The instructor is the PIC and, initially, the PMF.

- ✓ “I will be flying the plane and you are the PIC”
- ✓ “Positive three-way exchange of flight controls at all times”
- ✓ “Sterile cockpit below 1000’ AGL unless instructionally necessary”
- ✓ “Expecting taxi to Runway 23 for a normal takeoff”
- ✓ “Runway 23 is 5000’ long and dry, and there will be right crosswind”
- ✓ “Bridgewater Standard departure “ (expand if necessary with specifics)
- ✓ “Rotating at ... MPH; climbing at ... MPH; best glide airspeed is ... MPH” (state actual airspeeds for the operation)
- ✓ “Northbound VFR departure after reaching 1000’ AGL to practice area Charlie”
- ✓ “Any questions? “

TAKEOFF / AT RUNWAY

- DOORS / WINDOWS..... LATCHED
 - TRIM TAKEOFF
 - FLAPS.....TAKEOFF / CONFIRMED
 - ALTERNATE ENIGINE AIR CLOSED
 - ENGINE INSTRUMENTS CHECKED
 - HDG and RWY HDG..... SET / CHECKED
-
- MIXTURE..... RICH
 - PROPELLER FULL FORWARD
 - FUEL PUMP ON
 - LIGHTS / PITOT HEAT..... (as required) ON
 - TRANSPONDER ALT
 - ▶ TAKEOFF ROLL CHECKS..... COMPLETE

TAKEOFF / AT RUNWAY, EXPANDED

- DOORS / WINDOWS LATCHED**
Verify that the window and the cabin door are closed and latched securely for departure. On the cabin door, secure the side latch first, followed by the top latch. If both latches cannot be secured, do not depart, but return the aircraft for maintenance.
- TRIM TAKEOFF**
Set the trim to the appropriate TAKEOFF position.
- FLAPSTAKEOFF / CONFIRMED OUTSIDE**
Set flaps for TAKEOFF and confirm visually by looking outside that actual flaps position on both left and right side corresponds to the desired flap lever setting.
- ALTERNATE ENGINE AIR OFF (CLOSED)**
Verify that the alternate engine air source is in the CLOSED (OFF) position.
- ENGINE INSTRUMENTS CHECKED**
Recheck the engine instruments, including oil pressure and temperature, to ensure normal indications prior to takeoff.
- HDG and RWY HDG SET / CHECKED**
Recheck the heading indicator against the compass and reset to the correct heading if necessary. It is normal for the heading indicator to have precessed during taxi operations, and to be significantly off the actual heading. Set the heading bug to the departure runway, if appropriate.

▶ *Pilots are reminded that the ATC expects prompt compliance after takeoff clearance has been issued/received. The PF may choose to perform the following steps after takeoff clearance has been received (towered airports) or when ready to enter the departure runway (non-towered airports), but do not delay unnecessarily. In all cases, these steps will be accomplished prior to the aircraft moving from the hold short line.*

MIXTURE RICH

Set the MIXTURE control to FULL RICH (full forward) position. Refer to the POH / AFM for operations at airports above 3000 feet density altitude.

PROPELLER FULL FORWARD

Verify that the propeller is set to FULL FORWARD, MAXIMUM RPM position for takeoff.

FUEL PUMP.....ON

Turn the auxiliary electric fuel pump ON to provide backup to the engine-driven fuel pump on takeoff.

LIGHTS / PITOT HEAT.....(as required) ON

Ensure the BEACON light remains on at all times. Utilize the LANDING, TAXI, ANTI-COLLISION / STROBE and RECOGNITION lights (if installed and as appropriate) for maximum visibility on takeoff. Verify that NAV lights are ON if at night. Turn the pitot heat ON if visible moisture is present and pitot mast blockage possibility exists.

TRANSPONDER ALT

Set the transponder to ALTITUDE reporting mode (ALT) in order to transmit the transponder code (Mode A) and the altitude readout (Mode C).

- ▶ **TAKEOFF ROLL CHECKS..... COMPLETE**
*Complete the takeoff roll checks and perform the appropriate callouts.
 Abort takeoff if the checks are unsatisfactory.*

TAKEOFF ROLL Checks (SOP)

CORRECT RUNWAY VERIFIED
POWER INDICATIONS NORMAL
ENGINE INSTRUMENTS NORMAL
AIRSPEED ALIVE

TAKEOFF ROLL Checks, Expanded

CORRECT RUNWAY VERIFIED

To ensure takeoff is conducted on the correct runway, crosscheck the painted runway numbers against the heading indicator and the magnetic compass. Do this check once established on the runway centerline and before applying takeoff power.

POWER INDICATIONS NORMAL

Immediately upon applying full power, check for full power indications (≈ 29” MP at sea level).

ENGINE INSTRUMENTS NORMAL

As the airplane starts the takeoff roll, check the oil pressure, engine temperatures and fuel flow indicators.

AIRSPEED ALIVE

Check that the airspeed indicator needle indicates proper movement.

CLIMB

FLAPS UP
 GEAR UP
 ENGINE INSTRUMENTS CHECKED
 TRANSPONDER CORRECT CODE / ALT

1000' AGL

▶ *AIRSPEED (as required) CRUISE CLIMB*

CLIMB POWER..... (as required) SET
 FUEL PUMP OFF
 FUEL FLOW and PRESSURE CHECKED

CLIMB, EXPANDED

▶ *Begin the Climb checklist when passing through 500' AGL.*

FLAPS UP
 Verify that the wing flaps are fully retracted when it is safe to do so.

GEAR UP
 Verify that the landing gear is up and stowed when it is safe to do so.

ENGINE INSTRUMENTS CHECKED / MONITOR
 Check engine instrument indications, paying particular attention to oil pressure and oil temperature. Check the fuel flow and fuel pressure for normal indications. Any serious abnormality at this point would necessitate a carefully considered and immediate action while engine power is still available. Monitor engine instruments, particularly the temperatures, throughout the climb to guard against overheating the engine.

TRANSPONDER VERIFY on ALT
 Check the transponder and verify that it is set to the ALT mode and is transmitting a correct VFR/IFR squawk code.

1000' AGL

- ▶ *Perform the following steps after reaching 1000' AGL, to allow for safe altitude margin should any problems develop due to power and configuration changes.*
- ▶ *AIRSPEED (as required) CRUISE CLIMB*
Upon departing the traffic pattern, if conditions permit, transition to cruise climb airspeed. This will provide increased collision avoidance in busy terminal / training areas by allowing greater visibility over the nose. It will also provide for better engine cooling due to increased airflow through the engine.

CLIMB POWER..... (as required) SET

If continuing to climb, set climb power by first setting the THROTTLE to 25” of manifold pressure, and then adjusting the PROPELLER to 2500 RPM, unless continuous maximum thrust is desired due to obstacles or other appropriate / safety reasons. If remaining in the pattern, set the power to maintain level flight at 110-120 MPH (approximately 19” MP / 2400 RPM).

FUEL PUMP(as required) ON / OFF

If climbing and departing the traffic pattern, turn off the fuel pump, otherwise, leave the pump on for the upcoming landing. Wait a few moments after turning off the fuel pump, while observing fuel flow and fuel pressure to ensure that the engine driven pump is capable of supplying sufficient fuel to the engine.

FUEL FLOW and PRESSURE..... CHECKED

Check the fuel flow and fuel pressure indications to ensure that the engine driven fuel pump is functioning properly.

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CRUISE

CRUISE POWERSET
 MIXTURE..... (as required) LEANED
 LIGHTS..... (as required) ON

► *Perform the following steps immediately and throughout the remainder of the flight.*

ENGINE INSTRUMENTSMONITOR
 HEADING INDICATOR (every 20 min) CHECKED / ALIGNED
 FUEL SELECTORMONITOR TIME BETWEEN TANKS

CRUISE, EXPANDED

CRUISE POWERSET

Comply with the Power Increase and Decrease SOP of this chapter. Set power (throttle and propeller) for cruise, transition flight to PX area or for the maneuvers. Use a predetermined desired combination of MP and RPM in accordance with the type of operation, POH / AFM and the Chapter 5, Maneuvers of this manual.

MIXTURE..... (as required) LEANED

Lean the mixture, as required and in accordance with the POH / AFM and the engine operating instructions. Doing so will obtain the best fuel flow for the segment to be flown, as appropriate to the density altitude and operating conditions. Reference fuel flow gauges and exhaust gas temperature (EGT) gauges to achieve optimal setting.

LIGHTS..... (as required) ON

Turn or leave ON appropriate lights (as installed) to maximize aircraft visibility and to comply with the regulations regarding lights during flight operations.

DAYTIME: In addition to BEACON LIGHT, verify that ANTI-COLLISION / STROBE LIGHTS are ON and leave them on for anti-collision purposes for the entire flight, as required by FAR 91.209(b). One exception is strobe lights should be turned off in flight when there are adverse reflections from clouds. If appropriate, leave the LANDING and/or TAXI lights ON while remaining within 10 miles of any airport or in areas of reduced visibility and where flocks of birds may be expected, in accordance with FAA Guidance (operation “Lights On”, see AIM 4-3-23)

NIGHTTIME: Verify that STROBE LIGHTS are ON in accordance with the guidance in previous paragraph. If appropriate, leave the LANDING and/or TAXI lights ON, as dictated by operational conditions and as necessary for maximum aircraft visibility. Verify that NAV LIGHTS are ON and leave them on if any portion of the flight can potentially occur during the period between sunset and sunrise, as required by FAR 91.209(a).

► *Perform the following steps immediately and throughout the remainder of the flight.*

ENGINE INSTRUMENTSMONITOR

Check and continuously monitor engine instrument indications, paying particular attention to oil pressure, oil temperature and cylinder head temperature (if installed) indications.

HEADING INDICATOR / COMPASS (every 20 min)..... ALIGNED

Check and verify that heading indicator accurately reflects magnetic compass heading. Reset if necessary. Check the heading indicator against the compass about every **20 minutes**. More frequent checks may be necessary under turbulent conditions or during maneuvers.

FUEL SELECTOR..... MONITOR TIME BETWEEN TANKS

Comply with the Switching Fuel Tanks SOP of this chapter. Check the time since the last tank switch, and monitor time remaining until the next tank switch.

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DESCENT / APPROACH

SEATBELTS CHECKED
 FUEL SELECTOR (feel for detent) PROPER TANK
 AUTOPILOT OFF
 MIXTURE ADJUST / ENRICH
 FUEL PUMP ON
 LIGHTS (as required) ON

DESTINATION INFO / WX OBTAINED
 ALTIMETER SET
 APPROACH BRIEF COMPLETE

DESCENT / APPROACH, EXPANDED

SEATBELTS / HARNESSSES SECURE

Make sure that seats are locked in place and seatbacks are fully upright and secure. Verify that all occupants have their seatbelts and shoulder harnesses securely fastened.

FUEL SELECTOR (feel for detent) PROPER TANK

Comply with the Switching Fuel Tanks SOP of this chapter. If appropriate, and at sufficient altitude to deal with any fuel related problem, switch the fuel selector to the FULLEST TANK in preparation for terminal operations and landing. However, if the aircraft is already at low altitude and with plenty of fuel remaining in the current tank, leave the fuel selector on the current tank.

AUTOPILOT OFF

Verify that the autopilot is OFF in preparation for approach and landing.

MIXTURE ADJUST / ENRICH

Enrich the mixture during descent to compensate for higher density air at lower altitudes. Ensure the mixture is set to FULL RICH when descending through 3,000 feet for a landing.

FUEL PUMP ON

Turn the fuel pump ON to provide a backup in case of failure of the engine driven fuel pump during the approach and landing.

LIGHTS (as required) ON

The goal is to be as visible as possible. Verify that the BEACON, LANDING, TAXI, RECOGNITION and ANTI- COLLISION/ STROBE lights (if installed) are on in preparation for landing. If operating sunset to sunrise, verify that the NAV lights are on. See lights explanation in Cruise Checklist of this chapter for additional guidance, and for references to appropriate publications.

DESTINATION INFO / WX OBTAIN

Obtain ATIS / ASOS / AWOS, etc. reports at the destination airport and plan the approach accordingly.

ALTIMETER SET / VERIFIED

Set the altimeter to the appropriate altimeter setting, received in the previous step.

APPROACH BRIEF COMPLETE

No later than five (5) miles from the airport of intended landing when arriving from outside of the traffic pattern, conduct the approach brief appropriate to the type of arrival. Include any pertinent information in accordance with the SOP.

Approach Brief (SOP)

Tailor the approach brief to the particular situation. Include any other pertinent information.

IFR Flight (actual or simulated)

APPROACH PROCEDURE.....	CONFIRM CORRECT
COMM / NAV / PCL Frequencies	SET and IDENT
GPS status, RAIM and OBS Coupling	REVIEW and SET
Final approach course	REVIEW AND SET
MSA and TDZ elevation	REVIEW
FAF Altitude and MDA / DA	REVIEW
Time from FAF to MAP (if applicable).....	REVIEW
Missed Approach Point / Procedure	REVIEW

VFR Flight

COMM / NAV / PCL Frequencies	SET and IDENT
Traffic pattern altitude	REVIEW
Direction of traffic (expected or indicated)	REVIEW
Arrival runway and condition	REVIEW
Wind conditions and crosswind on landing	REVIEW
Intended touchdown point	REVIEW
Type of landing and how it will terminate.....	REVIEW

Sample VFR approach brief:

“Tower is 118.1 and ATIS is 126.85 tuned and received; TPA is 1100 MSL; expect right traffic; runway 23, dry and paved; wind is from 260 at 10, so expecting right crosswind on landing; 1000 ft. markers; normal landing to full stop, taxi to the ramp.”

BEFORE LANDING / GEAR DOWN

- ▶ *PATTERN OPERATIONS BRIEF* COMPLETED
 - LANDING GEAR (3 green, no red)**..... **DOWN**
 - MIXTURE..... FULL RICH
 - PROPS FULL FORWARD
 - FUEL PUMP ON
-
- FLAPS (as required) SET
 - GUMP CHECK (SOP)*..... COMPLETE
 - ▶ *SHORT FINAL GEAR DOWN VERIFICATION* COMPLETE

BEFORE LANDING / GEAR DOWN, EXPANDED

- ▶ *PATTERN OPERATIONS BRIEF* COMPLETED
- Conduct this brief during repetitive traffic pattern operations.*

Pattern Operations Brief (SOP)

This brief is to be used during repetitive traffic operations and shall be conducted on the downwind leg, prior to initiating Before Landing checklist.

- Landing runway REVIEW
- Intended touchdown point REVIEW
- Type of landing and how it will terminate REVIEW

Sample Pattern Operations Brief:

“Landing runway 23, thousand foot markers, normal landing, full stop/taxi back.”

LANDING GEAR (3 green, no red)..... **DOWN**

Move the landing gear lever down and verify that the gear is down and locked by observing three green lights and no red “gear unsafe” warning light or “gear in transit” light. Begin landing gear verification callouts, in accordance with Chapter 1, Crew Coordination Procedures of this manual.

Hand on gear lever (SOP)

During initial gear deployment prior to a landing, PF hand will remain on the gear lever while the gear is in transit, and until gear down, 3 green, no red visual verification and verbal callouts are complete.

MIXTURE..... **FULL RICH**

Set/Verify the mixture is in FULL RICH (full forward) position, to ensure smooth engine operation during landing and in case of a go-around.

PROPELLER..... FULL FORWARD

Set the propeller to FULL FORWARD, MAXIMUM RPM, or as required.

FUEL PUMPON

Verify the fuel pump is ON to provide a backup in case of failure of the engine driven fuel pump during the approach and landing.

FLAPS..... (as required) SET

Set flaps for landing, in increments, and as required by the conditions. Refer to the POH / AFM and Chapter 5, Maneuvers of this manual.

GUMP CHECK (SOP)..... COMPLETE

Complete the GUMP check SOP when 1000' AGL or lower, for each landing. The check must be complete no later than after completing the turn base to final, or equivalent, and in no case later than 300' AGL.

GUMP Pre-landing check (SOP)

Complete this check before each landing
1000' AGL or lower but no later than 300' AGL

GAS PROPER TANK, FUEL PUMP ON
UNDERCARRIAGE 3 GREEN, NO RED
MIXTURE FULL RICH
PROP FULL FORWARD

► **SHORT FINAL GEAR DOWN VERIFICATION COMPLETE**

As described in the Standard Callouts section of Chapter 2, the crew will verify with each other that the gear is down and locked on short final, no later than 200 AGL.

GO-AROUND (SOP)

POWER (MIXTURE / PROP / THROTTLE) **FULL FORWARD**
FLAPS (if full) **RETRACT 40° to 25°**
POSITIVE RATE OF CLIMB **GEAR UP**
 ► **IF OBSTACLES (and until clear)**
 CLIMB with FLAPS 25° AT Vx (85 MPH until gear is UP, then 96 MPH)
FLAPS (when clear of obstacles)..... **RETRACT 25° to 10°**
FLAPS (above 90 MPH) **RETRACT 10° to 0°**
AIRSPEED (once clear of obstacles)..... **Vy (100 MPH)**
 ► **CLIMB CHECKLIST**..... **EXECUTE**

GO-AROUND (SOP), EXPANDED

NOTE

This section deals with the GO-AROUND as a Standard Operating Procedure, as outlined in the Chapter 1, Crew Coordination Procedures of the FSM

For more details and discussion of the Go-Around as a Maneuver and how it relates to Traffic Pattern operations, see Chapter 5, Maneuvers of the FSM

POWER (MIXTURE / PROP / THROTTLE)..... **FULL FORWARD**
 Immediately, right to left, apply MIXTURE, PROPELLER and THROTTLE all the way forward for maximum power..

FLAPS (if full) **RETRACT 40° to 25°**
 If the flaps are fully down at 40°, retract them immediately to 25°

POSITIVE RATE OF CLIMB **GEAR UP**
 When positive rate of climb is indicated on the altimeter and the VSI, as well as using visual references, and the possibility of touching down on the remaining runway no longer exists, retract the landing gear.

► **IF OBSTACLES (and until clear)**.....
 CLIMB with FLAPS 25° AT Vx (85 MPH until gear is UP, then 96 MPH)
 If obstacles exist and maximum angle of climb is desired, continue climbing at Vx with flaps at 25° until obstacles are cleared. While gear is down, climb at Vx (gear down) = 85 MPH. Once gear has retracted, climb at Vx (gear up) = 96 MPH.

FLAPS (when clear of obstacles) **RETRACT 25° to 10°**
 When clear of obstacles, pitch for Vy, and retract flaps from 25° to 10° while accelerating to Vy.

FLAPS (above 90 MPH) **10° to 0° (up)**
 When above 90 MPH, retract flaps from 10° to 0° (full up) and maintain Vy (100 MPH).

AIRSPEED (once clear of obstacles)..... **Vy (100 MPH)**

Continue climbing at Vy, or as appropriate, once the flaps have been retracted and obstacles cleared.

- ▶ **CLIMB CHECKLIST** **EXECUTE**
 Perform the Climb Checklist flow and complete the checklist as soon as practical.

AFTER LANDING

TRIM..... TAKEOFF
 FLAPS UP / CONFIRMED
 MIXTURE (as required) LEANED FOR TAXI
 FUEL PUMP OFF
 LIGHTS / PITOT HEAT..... (as required) OFF
 TRANSPONDER (as required) STANDBY

AFTER LANDING, EXPANDED

TRIM **TAKEOFF**
 Set the trim controls to TAKEOFF position.

FLAPS **UP/ CONFIRMED**
 Retract the flaps and confirm outside visually that the flaps are fully UP.

MIXTURE.....**(as required) LEANED FOR TAXI**
 If appropriate, lean the mixture for taxi to prevent fouling of spark plugs from excessively rich mixture during low RPM ground operations in accordance with Mixture Ground Leaning SOP of this chapter.

FUEL PUMP **OFF**
 Turn the electric auxiliary fuel pump OFF.

LIGHTS / PITOT HEAT **(as required) OFF**
 Turn the PITOT HEAT OFF, or as required. Turn the LANDING LIGHT OFF, except when necessary to use it as a TAXI light. BEACON light shall remain on at all times. Appropriate ANTI-COLLISION / RECOGNITION / STROBE lights (if installed) should be used as appropriate for safety and to comply with the regulations regarding lights during ground operations.

DAYTIME: Leave BEACON and ANTI-COLLISION / STROBE LIGHTS ON for anti-collision purposes on the ground, as required by FAR 91.209(b). One permitted exception is strobe lights should be turned off on the ground when they adversely affect ground personnel or other pilots.

NIGHTTIME: Turn the ANTI-COLLISION / STROBE LIGHTS OFF (except when on a runway). Leave the NAV LIGHTS ON if any portion of the flight can potentially occur during the period between sunset and sunrise, as required by FAR 91.209(a). Use the combined LANDING and TAXI light as necessary during ground operations, except avoid shining your light at other aircraft.

TRANSPONDER(as required) STANDBY

Set the transponder to STBY (STANDBY) mode to discontinue transmitting the squawk code (Mode A) and altitude (Mode C) information.

NOTE

At some large airports, the transponder Mode C reply is used to monitor aircraft on the surface of the airport. At those airports, the transponder should be left in ALT mode during all ground operations unless otherwise requested by ATC. Consult the A/FD for the particular airport you are planning to use to see if such operations are in effect.

SHUTDOWN

- AVIONICS SWITCH..... OFF
- THROTTLE.....IDLE
- MAGNETO GROUNDINGCHECKED
- MIXTURE..... IDLE CUT- OFF
- PANEL ELECTRICAL SWITCHES (except BEACON/ANTI-COLLISION) OFF
- MASTER SWITCH..... OFF
- IGNITION SWITCH and KEY..... OFF and OUT
- CONTROL LOCK..... INSTALLED
- PARKING BRAKE..... AS REQUIRED

AIRCRAFT SECURE (SOP) COMPLETE

SHUTDOWN, EXPANDED

AVIONICS SWITCH..... OFF

Turn the avionics switch to OFF to prevent potential damage to the avionics from electrical current surge during shutdown.

THROTTLE.....IDLE

Set the throttle to IDLE (full out).

MAGNETO GROUNDINGCHECKED

Turn the IGNITION KEY to OFF, but only MOMENTARILY, and immediately return it to BOTH. The engine should quit running momentarily, and start running again when the magnetos are restored. If the engine continues running in the OFF position, a problem exists with magneto grounding and it must be reported to Dispatch / Maintenance immediately.

MIXTURE..... IDLE CUT- OFF

With the engine running, set the mixture to IDLE CUT-OFF (full back) position in order to starve the engine of fuel and shut it down.

PANEL ELECTRICAL SWITCHES (except BEACON / ANTI-COLLISION) OFF

Turn OFF all electrical switches (except BEACON / ANTI-COLLISION, as appropriate to the aircraft), in accordance with “live aircraft” concept (described earlier in this chapter).

MASTER SWITCH..... OFF

Turn OFF both sides of the red master switch.

IGNITION SWITCH and KEY OFF and OUT

Turn OFF the ignition / magnetos switch with the key. Gently check if the key can be easily removed in either left or right magneto position. That would indicate a worn out lock/key and must be reported to Dispatch/Maintenance. Continue to the OFF position and remove the key. Never allow the key to remain in the ignition lock unless the engine is running.

CONTROL LOCKINSTALLED

Secure the flight controls by looping the seatbelt over the control yoke, drawing the control yoke back to the most aft position, and latching the seatbelt so the control yoke remains secured in this position.

PARKING BRAKE AS REQUIRED

If the aircraft is to be tied down or wheel chocks are to be used, leave the parking brake OFF. Consider setting the parking brake ON if tie down locations or wheel chocks are unavailable.

AIRCRAFT SECURE (SOP)..... COMPLETED

Secure the aircraft in accordance with the SOP.

Aircraft Secure (SOP)

Tie downs (3)	ATTACHED
Pitot mast cover	INSTALLED
Cowl plugs.....	INSTALLED
Oil cooler air inlet anti-bird plug (if required)	INSTALLED
Tail cone anti-bird plug (if required)	INSTALLED
Extension cord(as appropriate)	PLUGGED IN
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Hobbs time (if Hobbs meter installed)	RECORDED
Tachometer time	RECORDED
Squawks	RECORDED
Cabin and Baggage Areas	CLEAN
Personal items	REMOVED
Window(s)	SECURED
Cabin and baggage doors	SECURED
Aircraft.....	LOCKED

This Space is Intentionally Left Blank