

# Return to Service Manual for PA46 Aircraft

## JetProp



PROVIDED AS A MEMBER BENEFIT FOR MMOPA

CONTRIBUTORS

Mary Bryant - Malibu  
Ron Cox- Mirage  
John Mariani- JetProp  
Dick Rochfort- Meridian

MECHANICAL REVIEW

Kevin Mead

ORGANIZED AND EDITED

Jeff Schweitzer  
Richard Geist

COPYRIGHT © 2009, 2011  
MALIBU/MIRAGE OWNERS AND PILOTS ASSOCIATION  
P.O. Box 1288 Green Valley, AZ 85622  
Reproduction prohibited without permission.

## Overview

Proper maintenance is essential to safety in aviation. As with all other high-performance aircraft, the PA46 requires close scrutiny and regular maintenance to ensure that all systems are functioning properly. At a minimum, the aircraft undergoes extensive disassembly during the annual inspection. Mid-year events or unpleasant discoveries during routine 100 hour inspections often call for substantial unscheduled maintenance between annuals. No matter the timing or cause, the first flight after extensive maintenance requires an extra dose of care and caution.

The combination of the airplane's incredible complexity and the inherent imperfections of people working on them means that maintenance itself can have the ironic effect of causing systems failures. The more extensive the maintenance, the greater is the chance for a potential problem. The primary means of identifying any issues and correcting them before one or more become catastrophic is to follow carefully an extensive and well-structured checklist.<sup>1</sup>

A good return-to-service post-maintenance checklist covers a comprehensive pre-flight and a structured first check-flight to prove that all systems are functioning properly. Anticipating the unforeseen, the first flight is conducted with certain precautions not routinely incorporated into normal flight operations. An example is staying close to the airport, which of course is not practical for cross-country flying but essential to the safety of an initial check-flight.

## Background and History

In 1991 the first edition of our MMOPA magazine included the first of several installments on preparing the plane for return to service after a major maintenance event. The five part series was written by Andrew Cindric, a former Piper Director of the Aircraft Completion Center in Vero Beach.

His series was converted into booklet form and distributed to all members for easy use with the plane at the point of service. Andrew's introduction is still applicable today:

### *Return-to-Service Test Flight*

*Is it really necessary? Is it a legal requirement? Why should I do it? Who should do it? How long does it take?*

*We will take a look at the answers to these questions and many more in the following discussion. I personally believe a Return-to-Service Test Flight should be performed any time engine or control surface repairs and adjustments were made, an aircraft is coming out of an annual or 100 hour inspection, after major maintenance was performed, etc.*

---

<sup>1</sup> The pilot-in-command is responsible for the safe and proper operation of his/her aircraft and it is the responsibility of the pilot-in-command to operate that aircraft in compliance with that aircraft's Pilot's Operating Handbook and other official manuals and directives.

*Legally, it depends on how the mechanic or inspector interprets the regulations. One shop may indicate a test flight is necessary, another may say don't worry about it. "Why should the answer to this be any different than most other rules regarding aviation?"*

*The reason a test flight should be performed is to prove that everything is operating the way it was intended to operate. If it initially doesn't, then you can find the problem during a test flight where you the pilot and maybe an assistant are the only ones aboard the aircraft. Some of the discrepancies I have come across over the years on the first flight after maintenance, I sure would not have wanted to encounter on a dark, rainy night with the weather near minimums.*

Andrew's narrative style manual is no longer in print but the original articles are viewable on the MMOPA web site.

With the addition of new PA46 models, engines and techniques it seems reasonable to update this valuable manual for all members. The Board of Directors commissioned this update by asking instructors and a mechanic experienced in each model to write a Return to Service manual specific to a model and in a format that can easily be used in the plane. Because of the wide variety of avionics and aftermarket products, only the standard systems usually found in the PA46 will be covered.

This manual is provided as a MMOPA member benefit for the exclusive use by its members. It is copyrighted and may not be copied or reproduced without permission.

## **General Principles**

The time to discover a problem resulting from a significant maintenance event and repairs or modifications is before carrying passengers or in hard instrument conditions.

The Test Flight should be performed after the following events:

- Annual Inspection to prove airplane airworthiness and systems function.
- Extensive airframe repairs or alterations to prove basic airworthiness.
- Extensive engine repairs or alterations (such as engine replacement) to prove proper functioning.
- When airplane has not been flown for an extended period of time.
- Extensive avionics alterations or upgrades to prove proper functioning and interfaces with the autopilot, and to prove other systems have not been affected.

And potentially:

- Prior to annual inspection in order to fine-tune the squawk list.
- Prior to purchase.

Common sense dictates that no matter what airplane is being flown, certain essentials must be addressed prior to the first post-maintenance check-flight.

Review and discuss with the mechanic all the maintenance that was completed, and use that as an initial guide to focus early attention for the first flight.

- Pay attention to any parts that were replaced in addition to normal checklist items.
- Consider taking a good look under the cowling and any access panels before taking the aircraft out of the shop.
- Test as many systems as possible on the ground before lifting off. Test the autopilot, but also get a good feel of the plane by hand-flying a portion of the test flight.
- This is a good time to check infrequently-used or rarely-tested systems like emergency gear extension, stall warning and anti-icing, for example.
- Fly multiple approaches to test avionics in multiple scenarios, and to ensure the integrity of the navigation equipment at the most critical moments of a flight.

Following major maintenance, the aircraft preflight inspection should take about one hour. Do not rush through this process. As has been found whether air-racing or just completing a normal flight, the event is usually “won” on the ground and lost in the air. Invest the necessary time up-front to have a safe and uneventful return to service. Use the Piper Event Checklists to help conduct the inspection in an organized fashion so that nothing is missed. These checklists are available from any Piper dealer. Some items on the checklists require tools, but remember this is a pilot inspection, not an annual inspection: do not use tools on the expanded walk-around except for a bright flashlight, notebook and pen. Document all items and functions that do not reflect a normal condition.

Position the aircraft to an area suitable to a comfortable inspection, with the expectation of lying prone on the ground for some time to look into the wheel wells and nose gear bay. If inexperienced, bring along someone with the proper experience to help. The most common problems and issues are highlighted here, but everything must be checked for normal condition and function. Perform the preflight inspection per POH procedures.

If the airframe and/or engine have undergone extensive repairs or alterations, it would be desirable to perform the preflight with a knowledgeable representative of the shop that performed the work. The same is true for extensive avionics work or upgrades. A knowledgeable representative of the shop that performed the work should go through an avionics cockpit check, explain any installation-unique features and review all the interfaces with the autopilot. Note that due to previously-installed avionics many of these avionics alterations or upgrades have features that are unique to the airplane being tested. These features have to be clearly understood by the test pilot before an effective Test Flight can be conducted.

A responsible and knowledgeable representative of the shop that performed the work must also be ready and willing to ride along on the Test Flight, if so requested by the test pilot. This is a non-negotiable condition and should be made clear to the shop before any work is performed. If the shop refuses to agree to these terms, find another shop.

## **Pilot Qualifications**

The pilot performing the Test Flight has to be well qualified in the operation of the airplane and all of its systems. A low-time pilot, or a pilot just qualified in the airplane, should not be performing the Test Flight (no time-builders allowed) without a competent instructor on board. No passengers allowed. No flight training should be conducted during the Test Flight. At the most, a qualified assistant (such as a mechanic or avionics technician) can be carried. If you do not feel qualified to perform the Test Flight, seek assistance.

A test pilot should be prepared for the unexpected and, equally important, should have confidence in his own abilities to deal with emergencies. The test pilot should also be inquisitive as to what was done to the airplane, and by whom. Trust, but verify. Remember, reasonable paranoia is a good attribute for a test pilot.

## **Equipment on Board**

The equipment to be carried is sometimes determined by the nature of the systems to be checked, for example a propeller strobe to measure accurate RPM. Sometimes no specialized equipment needs to be carried for the Test Flight. However, the following basic equipment, at a minimum, should be carried at all times:

- A note pad and a pen (to write down any discrepancies during the Test Flight).
- A pocket multi-tool such as a Leatherman®, or equivalent, but always remember you are not a mechanic.
- A portable VHF transceiver (with a charged battery).
- A Halon (1211 or 1211-1301 blend) fire extinguisher.

## **Flight Area and Environmental Conditions**

Conduct the Test Flight in good day VFR only, and remain close to the airport, straying no more than 50 NM. Make no exception to this rule. An airport equipped with good emergency services (firefighting and first aid) would be highly desirable. Also, depending on the importance of the items being checked (i.e. basic airworthiness of the airframe and engine), it would be desirable to remain closer (within 10 NM or within easy gliding distance) of the departing airport.

## **Safety**

While obvious, safety must be the number one priority of any Test Flight. The test pilot should never be rushed or under pressure to complete the flight. If any condition arises that puts the safe outcome of the Test Flight in doubt, the flight must be terminated immediately. Be prepared to declare an emergency even if suspecting the conditions require such action.

## **Checklist Structure**

Each model of the PA46 has a unique configuration based on engine type and year of production. Reflecting that diversity, there are several versions of this manual. Each devoted to one model:

the Meridian, JetProp, Mirage/Matrix or Malibu. The Matrix is combined with the Mirage, with the expectation that Matrix pilots will simply ignore any checklist items relating to pressurization. Each member will receive the section applicable to his/her model. The return-to-service checklist for each variation of the PA46 is unique, even if much of the checklist is common to all.

## **Liability Limitation**

This checklist is not provided from, endorsed by, affiliated with, nor supported by the New Piper Aircraft, Inc., Lycoming Engines, Continental, Pratt and Whitney, JetProp or any other parts or equipment vendor in any way. All copyrights remain the property of their respective owners. The procedures contained within are necessarily based upon generic flight operations and intended to supplement compliance with all operating manuals for the aircraft and systems described therein. These procedures are not always accurate in all situations. MMOPA (including but not limited to the authors contributing to the checklist or editors of the checklists) assumes no liability for any incorrect information. The purpose of the checklist is not to claim ownership of any content herein, rather, to show flight operations and performance of the PA46 based on available public information.

Material in the checklist may include technical inaccuracies or typographical errors. Changes may be periodically incorporated into this material. MMOPA may make improvements and/or changes to the content described in these materials at any time without notice.

THE CHECKLIST MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL MMOPA, (including but not limited to the authors contributing to the checklist or editors of the checklists,) BE LIABLE FOR ANY DAMAGES WHATSOEVER, INCLUDING SPECIAL, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES OR DAMAGES FOR LOSS OF PROFITS, REVENUE, USE, OR DATA WHETHER BROUGHT IN CONTRACT OR TORT, ARISING OUT OF OR CONNECTED WITH ANY OF THE CHECKLIST OR THE USE, RELIANCE UPON OR PERFORMANCE OF ANY MATERIAL CONTAINED IN THE CHECKLISTS.

THERE IS NO WARRANTY, REPRESENTATION, OR CONDITION OF ANY KIND; AND ANY WARRANTY, EXPRESS OR IMPLIED, IS EXCLUDED AND DISCLAIMED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE.

THE PILOT IN COMMAND IS RESPONSIBLE FOR THE SAFE AND PROPER OPERATION OF HIS/HER AIRCRAFT AND IT IS THE RESPONSIBILITY OF THE PILOT IN COMMAND TO OPERATE THAT AIRCRAFT IN COMPLIANCE WITH THAT AIRCRAFT'S PILOT'S OPERATING HANDBOOK AND OTHER OFFICIAL MANUALS AND DIRECTIVES.

# ANNOTATED CHECKLIST



# Preflight

## *Aircraft and Maintenance Documents*

- Review with the shop all the maintenance requested on the squawk list.

Query mechanic as to status and results of each item, including: incoming squawks and new items mechanic may have found; intermittent items or UTD (unable to determine); results of his engine ground check for operation and leaks; results of oil analysis and type of oil used to replenish the engine; and remember to get the keys to the aircraft.

- Aircraft Inspector (IA) signs off in the maintenance logs.

Maintenance logs must be reviewed for completion of work. Several insurance companies have denied claims because the aircraft was not properly returned to service with appropriate entries entered into the maintenance log books and properly authenticated by an IA.

- Verify that all Airworthiness Directives (AD) are complied with.

- Verify the revision level of the POH.

Call any Piper Service Center Parts Department. The representative will need the “VB” number in the lower right corner of the page, and the serial number of the aircraft. Piper will provide up to 3 revision levels free of charge. If the book is 4 or more revisions out of date, a new book will need to be purchased. To ensure the timeliest response, contact Piper in writing and inform Piper the request comes from the aircraft owner. Note that the FAA database on ownership transfers can lag 90 days or more.

- Verify that the current weight and balance data sheet is in the aircraft.

- Verify that airworthiness certificate (with correct information) is in the aircraft.

On board the aircraft must be both Piper and JetProp pilot operating handbooks (POH). They contain three required documents required by the FAA: a) Weight and balance data, b) aircraft limitations, and c) performance data. Also the aircraft registration and airworthiness certificate must be prominently displayed on board, normally on the aft bulkhead.

- Check for complete and correct placards on the aircraft using the up-to-date POH.

A list of required placards is found in Section 2 of the Piper POH and Section 2 of the JetProp POH, “Limitations.”

- Check weather and file flight plan for a local flight, if the early preflight to this point has not precluded continuing with the flight.

Checkouts should be done in VFR conditions or conditions providing adequate weather should unanticipated equipment failures be experienced. Minimal personnel should be on board. However, a knowledgeable second person can be helpful during later portions of the checkout when the pilot's attention needs to be focused on flying the aircraft.

### *Initial Observations*

- Observe the general condition of the aircraft as you approach. Verify the struts are level.

Approach the aircraft with all senses keenly operating. Sight, smell, touch, feel, and hearing must be used on the pre-flight. A polished, clean, and level aircraft is a good start to a preflight inspection. Make sure nothing is hanging, dripping, or inappropriately attached, unattached or missing.

- Check fuel visually and note level. Secure the caps.
- Verify that the correct tires are installed. Main tires 600x6, 8 ply. Nose tire 15-600-5, 6 ply.
- Check tire pressure with a pressure gauge.

Use a gauge with the correct pressure range. Bring a small right-angle Phillips screw driver to remove the main wheel fairings that cover the valve stems. Main tire pressure is 55 lbs; nose tire pressure is 47 lbs.

- Verify the airplane has been washed after the maintenance was complete.

## *Initial Cockpit and Interior Check*

Note: do **not** test the windshield heat and stall warning heat on the ground, as it can cause overheat damage to these components.

- Gear selector down.
- Fuel shutoff valve open (lever up in the top detent, and latched).
- Check windows for cracks and security.
- Check that all switches are in proper position and that all breakers are in.
- Check Ground Clearance Switch.

With Battery Master OFF and no power on the airplane, turn the Ground Clearance ON: one Com radio should come on. Perform a radio check with an appropriate ground facility. Turn Ground Clearance switch OFF after the radio check.

- Push in static drain.

Do not cover the drain when pushing in the valve. If the drain is not absolutely secure, the aircraft will experience instrumentation anomalies.

- Check elevator is free and correct.

Check for free and correct movement with full travel of control wheel. The elevator should deflect trailing-edge up when the control wheel is moved aft, and trailing-edge down when the control wheel is moved forward.

Pull control wheel full aft to the stop and verify that it moves full forward under the force of the spring when released.

- Check elevator trim.

Move elevator trim wheel manually through its full travel (nose-up and nose-down) and verify indicator accuracy and no binding. The trim tab should deflect trailing-edge up when the trim wheel is moved nose-down, and trailing-edge down when the trim wheel is moved nose-up. Have someone confirm outside.

- Check ailerons are free and correct.

Check for free and correct movement with full travel of control wheel. Left turn: left aileron up; right turn: right aileron up. Check ailerons neutral with control wheel level. Check that both control wheels line up with each other. Check that

fixed trim tab on right aileron is reasonably faired-in with top surface of aileron (an excessively bent tab likely indicates an out-of-rig condition).

- Check fuel condition lever.

Check for freedom of movement and positive engagement of detent and operation of friction lock, and then move to CUTOFF position.

- Check power lever.

Check for freedom of movement and operation of friction lock, and then move to idle position.

Do **not** move the power lever into BETA/Reverse with the engine NOT running, as it can damage the BETA linkage/ring.

- Verify that all electrical switches and radio master are off.

### ***Main Cabin Door (MCD) and Fuselage***

- Check main cabin door pressure seal.

The main cabin door (MCD) should be checked for pressure seal abrasions and punctures, particularly at the door locking pin wells. Sometimes the pin damage even extends to the fuselage skin in front of the pin wells. While this is indeed ugly, paint damage does not affect performance.

- Inspect the fuselage below and aft of the MCD for skin and paint damage from baggage transfer.

The top half of the MCD may be misaligned at the seam between the door and fuselage, tight on the forward side and wide on the aft. This is typical on older aircraft.

- Visually inspect the cable for broken strands and/or loose hardware. Check the cables for even tension fore and aft. Note that this does not apply to JetProp conversions of older Malibus, which have chains.

Proper and equal tension will ensure that even weight is applied when the steps are used. The cable stays on the Mirage airframe JetProp MCD are fragile and need special attention during operation. Under no circumstances should any untrained person be allowed to operate this door except in an emergency.

- Inspect the hinge of the lower half of the MCD for evidence of corrosion.

This hinge area is exposed to a lot of water. Almost any airplane three years older or more will experience some corrosion here.

- Check the condition of the aircraft belly for excessive oil (if airplane has not been washed).

Oil on the belly is a problem for two reasons. Oil is in a place in which it is not designed to be, and less oil is not where it should be. In addition to engine and cosmetic issues, excessive belly oil can peel off condensate drain decals render antennas inoperative (particularly the twin blade traffic alert antenna). Belly oil can result from multiple causes and each will have to be considered until the source is found.

- Check all surfaces for loose rivets.

Commonly referred to as “working” or “smoking” rivets. While any loose rivet should be addressed, two rivet lines in particular require special attention: the diagonal line on both sides running from the belly to the tail cone, and the aft most line running from left to right at the tail cone. Both are safety of flight issues and should be corrected immediately.

- Check for damage to the tail tie-down ring.

With heavy passengers and a light fuel load the aircraft can pivot on the main tires and strike the ground with the tail tie-down ring. If the ring is damaged, *do not fly the aircraft* until a qualified mechanic has repaired the damage and signed off the airplane. Load the front right seat passenger first to avoid any possibility of a tail strike.

### ***Elevator and Trim Tab***

- Check elevator function and integrity.

Lift the elevator smoothly from the center rivet line. Listen and feel for signs of binding. A misaligned pitch trim capstan retainer can cause a faint, but noticeable scraping sound when the elevator is exercised, and could cause some damage to the capstan at the very least. Check drain hole at the bottom of elevator fairing. Check the trim tab dual actuating rods to ensure both rods are connected.

### ***Right Wing***

- Check carefully the dielectric paint (the flat black paint that borders the boot).

This area is often abraded from ice and rain. If this paint is damaged or missing, the ability of the static charge to find its way to the wicks is reduced, leading to

potential ice boot damage from pinholes. If boots develop pinholes, the vacuum pump and the ejector pump suck in rain water that corrodes the sequence valves which, in turn, causes the boots to fail. It would also be wise to request a continuity check of the static wicks before leaving the shop. (As part of a return to service check, this may well be impractical and requires equipment that a lot of shops do not have. All the wicks would have to be removed to check continuity even if the shop did have the equipment).

- Check boot integrity.

Ice boots improperly maintained lead to reduced functionality and/or failure. If the boots are not kept properly coated, the surface becomes dull and has a propensity to hold ice.

- Check for missing static wicks.
- Verify that the two stall strips on each wing, located mid-wing and near the wing root, are present and secured.
- Lower the flaps and listen and check for smooth operation. Check the condition of each inboard flap bellcrank. Check the aileron cable and pulley alignment behind the rear spar for abnormal conditions.

Look for aftermarket chafe tape on the top of the flap surface. This tape will protect the small corners of the aft wing surface and prevent paint abrasion on the top of the flap in these areas. This is a small item, but important in the long run.

- Check all exterior lights (strobe, navigation, landing, taxi, pulse and ice).
- Check for a leaking or obstructed main fuel tank vent.

These are the NACA vents, one under each outer wing segment. If fuel is leaking from this vent the problem needs to be addressed. On occasion, fuel may leak from the NACA vent when the outboard fillers are full.

It is not uncommon for the original style inboard filler caps to leak. If the new style caps are installed and subsequently leak, the vent holes should be filled with epoxy.

- Check the fiberglass radome (if installed) for cracks and chips.

If the paint on the radome is chipped, flying in the rain will cause water to wick into the exposed fiberglass fabric. This contamination will cause gross errors in the display. In this case, the radome will probably need to be replaced. Avoid storing anything other than clean rags in the small storage area in the aft portion of some radomes. An aftermarket clear cover for the front of the radome will help prevent chips in the paint. This should be considered a must-have item.

- Check the right main strut/wheel/tire/brake assembly.

This assembly should be checked thoroughly for cleanliness and the absence of any evidence of hydraulic leaks or fuel leaks in the well. The shiny surfaces of the strut and actuator are sealing surfaces. They should be conspicuously clean to avoid abrading the seals. Use MIL-H-5606 hydraulic fluid to clean these surfaces.

- Check the strut and doors for hardware and hinge security and alignment.
- Check the brake pad thickness.

Brake pad minimum thickness is 0.10” or about the thickness of two stacked pennies. The inner and outer pads should be evenly worn, and the disc should be free of ridges. If not, the caliper may not be floating properly, which can lead to brake overheating and reduced takeoff performance.

- Remove the Pitot cover (if installed) and verify the condition of the Pitot tube.
- Look for any loose screws on the access panels at the forward edge of the inboard wing section.

### ***Engine Cowling and Nose Section***

- Ensure that all of the cowling fasteners are present and flush with the cowling.

Tapping on the seams can reveal a loose fastener if one or more is suspect.

- Verify that the intake plug, exhaust covers and propeller cuffs are removed and properly stowed.
- Inspect the propeller blades for nicks and grease leaks.
- Place your foot on the top of the nose wheel tire and try to push the tire rearward. There should be no play in the strut.

If the strut makes a “thunk-thunk” sound, have it addressed before flying.

- Verify that the physical turn stops on the nose wheel trunnion are not damaged.

If the flange is cracked or bent, or if the stop is wiped off, the trunnion is damaged and should be repaired or replaced before flight.

- Look carefully at the nose wheel and stem valve.

The brass valve stem should be on the right hand side. The valve should not be bent over near or against the wheel. If so, the stem is damaged and could fail, causing a flat tire. This sort of damage is most commonly caused by a tow bar coming loose during towing. Bending the stem back can fatigue the metal to the breaking point, so have the tube replaced.

- Look at the wheel on the right side. Verify that the castellated nut that holds the wheel in place has a clevis pin in place, and that the flat head and retaining hardware are in place.

The nut is torqued with only enough force to center the wheel bearing. If the pin comes out, the nut can come off.

- Look up into the nose wheel bay. Give special attention to the sequencing valve, hydraulic hoses of the landing gear/doors actuation system and the nose gear actuator.

All of these places can have minor leaks that evidence themselves with small amounts of dry hydraulic fluid near the source of the leak. If the leak is bad enough, fluid on the left hand side of the tire may be flung outward toward the tread by the centrifugal force of the landing rollout. Note that the tire lies in the wheel well with the left side up.

- Check for any gap between the nose gear steering arm and the nylon rollers at the top of the nose gear strut. The gap should not exceed the thickness of a business card. Adjust if gap is excessive.
- Check the level of engine oil with the dipstick.

Only fill with one third quart at a time to prevent overfilling and “oily belly syndrome.” Storage bottles are available for unused oil remaining in the can.

### *Left Wing*

- Repeat inspection as with Right Wing.
- Close the bottom half of the main cabin door during fueling operations. Always supervise fueling.
- Test the stall warning vane and heater for proper operation.

For 310P airframe:

Vane function: have someone inside the aircraft turn on the Battery Master Switch. Lift the stall warning tab up and listen for the audible warning inside the cabin



Lift detector heating: When testing detector heat on the ground, be aware that on the low setting (gear in weight-on-wheels position) the vane may not always feel warm to the touch. To test for high heat, turn the stall warning heat on and have one person actuate the squat switch while the other feels the stall vane. If it gets very hot, the system is working correctly. If the stall vane gets hot before the squat switch is actuated, the squat switch is defective.

For 350P airframe:

Vane heating: When the Mirage comes from the factory its stall vane heater is wired through the left main gear door switch (up limit switch). However, after compliance with Piper AD 2008-26-11, which requires installation of the stall warning heat control modification kit, the high stall heat will instead be activated by actuation of the squat switch to the flight position. If AD 2008-26-11 has been accomplished, test stall heat on the ground using the following procedure. With the stall heat switch in the cabin “on”, have someone actuate the squat switch, located on the left main gear torque links. Have a second person feel the mounting base of the stall transducer. It should get hot almost immediately, after which the squat switch should be released. Do not touch the stall transducer tab.

- Confirm proper function of the door ajar light on the annunciator panel.

While the battery master switch is on and the MCD is open, observe the presence of the door ajar light on the annunciator panel. Close and latch the lower half of the MCD and verify that the door ajar light remains on. Close and latch the upper half, and confirm the light extinguishes. An open forward baggage door should also illuminate the door ajar light on the annunciator panel.

### ***Baggage Storage Areas***

- Check the brake system hydraulic fluid level in the forward baggage compartment. Add fluid (MIL-H-5606) if necessary.
- Latch and lock door of forward baggage compartment.
- Look carefully at the sight gauge behind the aft baggage partition for proper hydraulic fluid level. Some 310P aircraft may not have sight windows in the rear panel. In this case, the entire panel will have to be removed to check fluid level. Add fluid (MIL-H-5606) if necessary.

Do not overfill this reservoir or serious damage can result.

### ***Passenger Seating Area***

- Check each passenger seat gas-spring recliner for correct operation.

- Operate all of the arm rests to ensure that they operate correctly and do not sag.
- Check the reading lights and the courtesy lights for proper operation.
- Check the emergency exit for security and proper placarding.
- Check all headset jacks for proper operation.
- Open the oxygen drawer under the right middle seat, and verify that the masks are correctly stowed and ready for operation.

The carpet and carpet cover or rug should not interfere with the drawer operation.

- Verify that each fresh air vent works correctly, and verify a flow of air through the vents with the vent/defog blower in operation and the main cabin door closed.
- Check the folding table for tightness and smooth operation.

Tables can be broken from flailing in rough air.

- Operate the window shades (if installed).

Many operators use these shades for sun protection on the ramp. This causes the pleats to take a “set” and the shades will then not fold properly when they are raised abruptly. Instead, use sun shields to preserve the shades.

### ***Pilot and Copilot Storage Areas***

- Verify that the cabinet drawers slide and latch correctly.
- Check the oxygen tank gauge to verify that the tank is full.
- Turn on the O<sub>2</sub> and verify oxygen flow through the mask’s flow indicator.
- Check the fire extinguisher.

The extinguisher should have a placard or sticker certifying the weight. A pull pin should be in the charge handle.

- Verify again that both POHs are on board.
- Close and latch the main cabin door.

Ensure that the door halves do not bind and that all of the indicator windows operate properly. Ensure that the safety latch is engaged (should not be able to rotate the upper door handle).

### *Pilot and Copilot Seats*

- Check all functions just as with the passenger seats.
- Check seats for positive engagement of seat latch, and for installed stops at each seat track.
- Check the height adjustment, the fore/aft slide adjustment and lumbar support function (if installed).
- Verify proper seat belt function.

Make sure that the seat belts on all seats are installed correctly and not bound by the seat track or seat position.

Check lap belts and shoulder harnesses for fraying. Check shoulder harnesses for proper operation of inertia reels (should lock when tugged).

# FIRST TEST FLIGHT

## STARTING ENGINE

**NOTE:** if major engine work has been performed, it would be very beneficial to start, run the engine, and stop without the upper cowling. During the run and after the shutdown, check for any fluid (fuel, oil, and hydraulic fluid) leaks. If no leaks are noted after the shutdown, re-install the upper cowling and restart engine. In addition, prior to the engine start, it would be beneficial to have an outside observer with a fire extinguisher, positioned in front of the airplane within sight of the test pilot.

**WARNING:** when running the engine without the upper cowling, do not touch any of the ignition components (especially the ignition exciter) for at least 5-6 minutes after shutting down the engine.

Items **HIGHLIGHTED** are **MUST-NOT-FORGET** items:

Item	Check
Battery Master Switch	ON.
Landing Gear Lights	Check for 3 greens (check operation of DAY/NIGHT dimmer switch).
Fuel Quantity	Check gauges to agree with visual indication. Check Header Tank full.
Shadin Fuel Totalizer	Set for current fuel quantity.
Flaps	Check indicator at flaps up, 10, 20 and 36 degrees. Reset flaps to UP position.
Annunciator Panel	Check illumination of all lights (each light has 2 bulbs) with press-to-test button. Note any inoperative light.
Ice Deflector	Verify OFF.
BATT Select	Check Battery #1 and #2; >23 Volts.
Fuel Transfer Pumps, L & R	Check Manual operation & reset to <b>AUTO</b> .
Emergency Transfer Pump	ON until <b>HT HP</b> light illuminates, then <b>OFF</b> .
Fuel Selector	On proper tank (LEFT TANK if full).
Manual Override	Guarded & light out.
Ignition	AUTO, then ON, check spark & <b>LEAVE ON</b> .
Fuel Boost Pumps #1 and #2	Check each pump, 15 PSI min., then leave <b>ON</b> (odd day #1, even day #2).
BATT Select	<b>BOTH</b> (if so equipped). Otherwise hold <b>DUAL BATT</b> switch.
Propeller Area	Verify clear.
Starter	ON (>14 Volts during start).
Fuel Condition Lever	Full forward @ 15% N <sub>G</sub> & stable.
Oil Pressure	Check.
ITT	Monitor (see table for maximum values)
Starter	<b>OFF</b> @ 52% N <sub>G</sub> .
Ignition	<b>OFF</b> .
Alternator	Check red LOW BUS VOLT light is on (with voltage <25 Volts), and then Alternator <b>ON</b> .
Engine Instruments	Check.
Ice Deflector	<b>ON</b> .
BATT Select	#1 & #2 (charge each battery >30sec), & set on BOTH (if so equipped).
Generator	ON & verify (green light on); Alternator OFF & verify (green light

	off).
<b>Radio Master</b>	ON.
<b>Radios</b>	Set COM & NAV frequencies/settings as required.
<b>Navigation and Anti-Collision Lights</b>	Turn on as required.
<b>Cockpit Lights</b>	Check operation of all cockpit lights (dome, post & instrument lights).
<b>Auxiliary Electric Heat and Air Conditioning</b>	Check operation (with OAT <20 degrees C). Verify AUX HEAT does <u>not</u> operate with VENT/DEFOG fan OFF. Check operation of Air Conditioning (HI & LO fan).
<b>Vacuum</b>	Check 4.8 in-Hg minimum.
<b>Autopilot</b>	Test (refer to POH for test procedure of specific autopilot installed in airplane).
<b>Elevator Trim</b>	Check manual electric operation for full travel in both directions; check each half of split-switch; check trim disconnect; check priority of Pilot's trim over Copilot's trim (if installed); pull pitch trim C/B and verify electric trim is disabled; reset pitch trim C/B and set trim for Takeoff.
<b>Rudder Trim</b>	Verify neutral and make sure Yaw Damper is OFF before taxiing.
<b>Brakes &amp; Nose Wheel Steering</b>	Test brakes before taxiing. Check brakes & nose wheel steering during taxiing.
<b>Power Lever</b>	Check BETA and reverse during taxiing.

## **BEFORE TAKEOFF**

Items **HIGHLIGHTED** are **MUST-NOT-FORGET** items:

<b>Item</b>	<b>Check</b>
<b>Fuel Condition Lever</b>	Verify full forward.
<b>Propeller Control</b>	Verify full forward.
<b>Propeller Overspeed Governor</b>	Check @ 2000+ RPM.
<b>Propeller Feathering Function</b>	Cycle @ 1500 RPM.
<b>Manual Override (@ idle power)</b>	Increase/Decrease, then guarded & light out.
<b>Header Tank</b>	Verify full.
<b>Flaps</b>	Takeoff (0 or 10 degrees).
<b>Oil Temperature and Pressure</b>	Check.
<b>Fuel Flow / N<sub>P</sub> / N<sub>G</sub> / ITT / Torque</b>	Check.
<b>Generator</b>	Verify <b>ON</b> (green light on).
<b>Boost Pump</b>	Verify <b>ON</b> #1 or #2.
<b>Oil Door</b>	Verify OPEN.
<b>Fuel Tank Selector</b>	Verify on proper tank (LEFT TANK if full).
<b>Fuel Transfer Switch</b>	Verify on <b>AUTO</b> .
<b>Flight Instruments</b>	ASI (zero reading) / ADI (erect) / ALT (indicates within 40 feet of field elevation when set to current altimeter setting) / TC (check when turning & no red flag) / HSI & DG (check for proper indication on known heading; reset DG as required) / VSI (zero reading).
<b>Magnetic Compass</b>	Check for proper indication on known heading. Check agreement with HSI within 10 degrees (with air conditioning and re-circulating blowers OFF).
<b>Vacuum</b>	Verify 4.8 in-Hg minimum.

<b>Pressurization</b>	Isobaric Controller set at 1000 ft. (on outer scale) above departure field elevation. Dump Switch NORM; Knob IN. Set rate control at 9 o'clock position.
<b>Pitot Heat &amp; Ice Protection</b>	Check function and verify ammeter reading ( <b>NOTE</b> : do not test the windshield heat and stall warning heat on the ground, as it can cause overheat damage to these components).
<b>Radios</b>	Verify COM & NAV frequencies/settings as required.
<b>Autopilot</b>	Verify <b>OFF</b> .
<b>Yaw Damper</b>	Verify <b>OFF</b> .
<b>Ignition</b>	<b>ON</b> .
<b>Pitot Heat</b>	<b>ON</b> .
<b>Transponder</b>	<b>ON</b> .
<b>Active Runway</b>	Check both sides of active runway before entering runway.
<b>HSI / DG / Magnetic Compass</b>	Check alignment with runway heading.

## TAKEOFF

Item	Check
<b>Fuel Flow / N<sub>P</sub> / N<sub>G</sub> / ITT / Torque</b>	Check when takeoff power is applied & during initial climb.
<b>Oil Temperature and Pressure</b>	Check when takeoff power is applied & during initial climb.
<b>Flight Controls</b>	Check for proper response during initial climb.
<b>Landing Gear &amp; Flaps</b>	Retract landing gear when positive VSI is established, and then retract flaps.
<b>Initial Climb</b>	Maintain V <sub>y</sub> (110 KIAS). Remain close (within 2 NM) to airport.

## AFTER TAKEOFF (>1000 FEET AGL)

Item	Check
<b>Ignition</b>	AUTO.
<b>Ice Deflector</b>	Verify power 150 ft-lbs below red line & then Ice Deflector OFF.
<b>Climb to Safe Altitude</b>	Climb above 8000 feet AGL if basic airworthiness of the airframe and/or engine is being checked.

## LEVEL OFF (>8000 FEET AGL)

Item	Check
<b>Fuel Flow / N<sub>P</sub> / N<sub>G</sub> / ITT / Torque</b>	Verify within normal range. Discontinue flight & return to airport if not.
<b>Oil Temperature and Pressure</b>	Verify within normal range. Discontinue flight & return to airport if not.
<b>Fuel System</b>	Switch tanks and verify that the automatic transfer system keeps filling the fuselage header tank. Set fuel switch to Manual and check operation of manual transfer system (pump lights should come on and keep filling the fuselage header tank). Reset the fuel switch to Auto.
<b>Airplane Rigging</b>	While cruising at approximately 160 KIAS with elevator and rudder trimmed for level flight, and with approximately the same fuel level in both wings, verify that the airplane can maintain flight with wings level and no excessive tendency to bank left or right.

<b>Landing Gear</b>	<p>Cycle landing gear (DOWN and UP) with selector. Ensure hydraulic pump cycles normally and the red gear warning light extinguishes with gear fully up or down.</p> <p>Perform emergency gear extension (free fall) per POH procedures.</p>
<b>Alternate Static</b>	<p>In level flight at approximately 160 KIAS with static source on primary (toggle down), note the altimeter reading. Switch to the alternate static source (toggle up) &amp; record new altimeter reading. It should be within 50 feet of previous reading.</p>
<b>Cabin Heater &amp; Defroster</b>	<p>Turn on JP SUP CABIN HEAT (rear blower) and check operation of normal heat (push-pull knob). Check operation of defrost knob (with VENT/DEFOG FAN on, check flow on both sides of windshield center-post).</p> <p>Check operation of Auxiliary Electric Heat. Verify AUX HEAT does not operate with VENT/DEFOG fan OFF.</p>
<b>Recirculating Blowers and Air Conditioning</b>	<p>Check operation of Recirculating Blowers in LO and HI positions.</p> <p>Check operation of Air Conditioning (HI &amp; LO blower settings).</p> <p>Check heading of Magnetic Compass with Air Conditioning and/or Blowers.</p>
<b>Pressurization Inflow Control &amp; Dump Switch (below 10,000 ft. MSL)</b>	<p>Pull the cabin pressure control knob on copilot side and verify that cabin begins to depressurize. With cabin pressure differential (<math>\Delta P</math>) at 2 psid or less, push the cabin Dump Switch to DUMP (the cabin should depressurize rapidly).</p> <p>After this test, reset (push &amp; secure) the cabin pressure control knob on copilot side and set the Dump Switch to NORM. The cabin should re-pressurize.</p>
<b>Cabin Altitude Warning Light</b>	<p>With the airplane maintaining 12,000 feet and the cabin pressurized, pull the cabin pressure control knob on copilot side: the cabin should start climbing (i.e. de-pressurizing). Note at what cabin altitude the red CABIN ALTITUDE light illuminates. It should be 10,000 ft. +/- 500 (per the cabin altimeter).</p> <p>After this test, reset (push &amp; secure) the cabin pressure control knob on copilot side. The cabin should re-pressurize.</p>
<b>Pressurization Isobaric Control and Rate Control (below 14,000 ft. MSL)</b>	<p>Below a Pressure Altitude of 14,000 ft., with the cabin Isobaric Pressure Controller set at 1000 ft. (outer scale), the cabin altitude should be 1000 ft. +/- 500.</p> <p>Below a Pressure Altitude of 14,000 ft., reset the cabin Isobaric Pressure Controller from 1000 ft. to 8000 ft. (on outer scale). Turn the rate control fully counter-clockwise: the rate of climb of the cabin should be 200 fpm +/- 100.</p> <p>Turn the rate control fully clockwise: the rate of climb of the cabin should be 2000 fpm +/- 500.</p> <p>Reset the cabin Isobaric Pressure Controller to 1000 ft. (outer scale), and reset the rate control at 9 o'clock position.</p>
<b>Maximum Cabin Pressure Differential (<math>\Delta P</math>)</b>	<p>Climb to a Pressure Altitude of 14,000 ft., with the cabin Isobaric Pressure Controller set at 1000 ft. (outer scale). The cabin pressure differential (<math>\Delta P</math>) should reach the maximum (5.5 psid) at 14,000 ft. Pressure Altitude.</p>
<b>Flaps Operation</b>	<p>Trim the airplane for 110 KIAS in level flight (below full-flaps extension speed of 117 KIAS) and set rudder trim for zero yaw.</p> <p>While maintaining 110 KIAS, cycle flaps through each position (10, 20, 36 degrees and then UP) while visually verifying the flaps position and agreement with the flap handle position.</p> <p>With landing gear retracted, verify that the gear warning horn sounds &amp; the gear warning light illuminates when the flaps position is 20 degrees or greater.</p>

<b>Flaps Rigging</b>	While maintaining 100 KIAS in level flight with flaps fully deflected (36 degrees), release ailerons and time any roll to a 20-degree angle of bank. It should not exceed 10 seconds.
<b>Stalls</b>	Perform a power-off, wings-level full stall (beyond the aerodynamic buffet) with flaps up and with flaps full down. When approaching the full stall, the rate of airspeed reduction should be 1 knot/second or less. The airplane must be controllable before, during, and in the recovery phase of the stall.
<b>Copilot's Airspeed Indicator</b>	The Copilot's Airspeed Indicator, if installed, should read within 5 knots of the Pilot's Airspeed Indicator.
<b>Attitude Indicator(s)</b>	Check proper functioning of pilot's, copilot's (if installed) and stand-by (if installed) Attitude Indicators (ADI's). Perform a 45-degree bank turn (for a full 360 degrees) in level flight and check agreement of all ADI's. Perform a 15-degree pitch climb and descent (for at least 500 feet) and check agreement of all ADI's.
<b>HSI / DG</b>	Check proper functioning of pilot's HSI, and copilot's DG (if installed). Perform 30-degree bank turns and check agreement of HSI/DG with each other and with magnetic compass at the end of the turn. The DG should not precess more than 4 degrees in 10 minutes.
<b>Turn Coordinator(s)</b>	While maintaining level flight, perform and time a left & right standard-rate turn for 180 degrees. The 180-degree standard-rate turn should take 1 minute (+/- 7 seconds).
<b>Vertical Speed Indicator(s)</b>	While maintaining level flight, the VSI(s) should indicate zero. Per the VSI indication, time a 500 ft./min. climb and descent for 1 minute. After 1 minute, the indicated altitude change should be 500 ft. +/- 100.
<b>Anti Ice &amp; De-Ice system</b>	Check proper functioning of propeller heat, inlet heat, stall warning heat, and windshield heat (both HI and LOW if so equipped). Check proper inflation and sequence (empennage-lower wing-upper wing) of pneumatic boots. Check complete deflation of boots after inflation cycle.
<b>Landing Gear @ V<sub>MO</sub></b>	With the landing gear retracted, accelerate to V <sub>MO</sub> (172 KIAS). The red gear warning light should not illuminate. Check for any unusual vibrations and buffeting. Slow down to 169 KIAS and extend the landing gear at 169 KIAS. In smooth air, accelerate to V <sub>MO</sub> (172 KIAS). Check for any unusual vibrations and buffeting. After this test, slow down to 130 KIAS and retract the landing gear.
<b>Autopilot</b>	Check all modes (refer to POH/Pilot's Guide for procedures of specific autopilot installed in airplane).
<b>Avionics</b>	Check all modes, (refer to POH/Pilot's Guide for procedures of specific avionics equipment installed in airplane). Execute a coupled ILS and GPS WAAS (if so equipped) approach to verify proper interface/coupling with the installed autopilot. For each Com radios, check the squelch & volume control. For each Com radio, perform a radio check in flight with the appropriate ATC facility. Check the proper functioning of the Audio Selector Panel. For transponders, ask ATC for a discrete code to check the Mode C/S accuracy.
<b>Standby Alternator</b>	With the total electrical load below 60A, turn OFF the Generator (green light off), and then turn ON the Standby Alternator (green light



	<p>on).</p> <p>Verify successful power transfer to the Standby Alternator (check Ammeter for proper indication). Check for any Alternator-induced noise in headset.</p> <p>After this test, turn Generator ON (green light on) and verify Standby Alternator offline (green light off).</p> <p>Verify successful power transfer back to the Generator (check Ammeter for proper indication). Turn Standby Alternator switch OFF.</p>
--	--

## APPROACH & LANDING

Items **HIGHLIGHTED** are **MUST-NOT-FORGET** items:

Item	Check
<b>Radios</b>	Set COM & NAV frequencies/settings as required.
<b>Safety Belt &amp; Shoulder Harness</b>	Tight & secure.
<b>Header Tank</b>	Verify full.
<b>Fuel Selector</b>	Fullest tank.
<b>Ice Deflector</b>	ON.
<b>Ignition</b>	ON.
<b>Pressurization</b>	Isobaric Controller set at 1000 ft. (on outer scale) above landing field elevation. Dump Switch NORM; Knob IN. Set rate control at 9 o'clock position.
<b>Autopilot &amp; Yaw Damper</b>	Verify both OFF.
<b>Navigation and Anti-Collision Lights</b>	Verify ON as required.
<b>Landing Gear</b>	<b>DOWN &amp; LOCKED</b> on downwind leg abeam of landing runway number.
<b>Brakes</b>	Test for pedal pressure. Choose longest runway if pedal pressure is low or uneven. Pump affected pedal to build up pressure. Be prepared to use full reverse on landing with low brake pedal pressure.
<b>Flaps</b>	Full down on final or as required.
<b>Elevator Trim</b>	As required.
<b>Rudder Trim</b>	Verify neutral.
<b>Propeller Control</b>	Verify full forward.

**After Landing & Off the active runway:**

<b>Ignition</b>	OFF.
<b>Pitot Heat</b>	OFF.
<b>Transponder</b>	STANDBY.
<b>Flaps</b>	Identify flap lever & retract.

## ENGINE SHUTDOWN

Item	Check
<b>Radio Master</b>	OFF.
<b>Electrical Equipment</b>	OFF.

<b>Generator/Alternator</b>	OFF.
<b>Power Lever</b>	Idle.
<b>Propeller</b>	Feather.
<b>Fuel Condition Lever</b>	Cutoff ( $N_P < 400$ RPM).
<b>Fuel Boost Pump</b>	OFF ( $N_G < 10\%$ ).
<b>Ice Deflector</b>	OFF (for next start).
<b>Battery Master</b>	OFF.
<b>Battery Select</b>	Select #1.
<b>After-Shutdown Checks</b>	Check the fluid level of the hydraulic pump inside the cabin. Once outside of the cabin, walk around the airplane and check for any leaks (fuel, oil, hydraulic fluid). After using the air conditioner, it is normal for water to drain from the evaporators drain (short pipe) below the aft fuselage.

### **DISCREPANCY REVIEW**

<b>Item</b>	<b>Check</b>
<b>Airframe, Systems, Engine and Avionics Discrepancies</b>	Write all the found discrepancies in a clear, understandable language. Discuss all the discrepancies with the responsible shop and agree on a resolution for each one. Ground the airplane if any safety-of-flight issues are found and not resolved.

# ACTION CHECKLIST

### ***Aircraft and Maintenance Documents***

- Review with the shop all the maintenance requested on the squawk list.
- Aircraft Inspector (IA) signs off in the maintenance logs.
- Verify that all Airworthiness Directives (AD) are complied with.
- Verify the revision level of the POH.
- Verify that the current weight and balance data sheet is in the aircraft.
- Verify that airworthiness certificate (with correct information) is in the aircraft.
- Check for complete and correct placards on the aircraft using the up-to-date POH.
- Check weather and file flight plan for a local flight, if the early preflight to this point has not precluded continuing with the flight.

### ***Initial Observations***

- Observe the general condition of the aircraft as you approach. Verify the struts are level.
- Check fuel visually and note level. Secure the caps.
- Verify that the correct tires are installed. Main tires 600x6, 8 ply. Nose tire 15-600-5, 6 ply.
- Check tire pressure with a pressure gauge.
- Verify the airplane has been washed after the maintenance was complete.

### ***Initial Cockpit and Interior Check***

Note: do **not** test the windshield heat and stall warning heat on the ground, as it can cause overheat damage to these components.

- Gear selector down.

- Fuel shutoff valve open (lever up in the top detent, and latched).
- Check windows for cracks and security.
- Check that all switches are in proper position and that all breakers are in.
- Check Ground Clearance Switch.
- Push in static drain.
- Check elevator is free and correct.
- Check elevator trim.
- Check ailerons are free and correct.
- Check fuel condition lever.
- Check power lever.
- Verify that all electrical switches and radio master are off.

### ***Main Cabin Door (MCD) and Fuselage***

- Check main cabin door pressure seal.
- Inspect the fuselage below and aft of the MCD for skin and paint damage from baggage transfer.
- Visually inspect the cable for broken strands and/or loose hardware. Check the cables for even tension fore and aft. Note that this does not apply to JetProp conversions of older Malibus, which have chains.
- Inspect the hinge of the lower half of the MCD for evidence of corrosion.
- Check the condition of the aircraft belly for excessive oil (if airplane has not been washed).
- Check all surfaces for loose rivets.

- Check for damage to the tail tie-down ring.

### ***Elevator and Trim Tab***

- Check elevator function and integrity.

### ***Right Wing***

- Check carefully the dielectric paint (the flat black paint that borders the boot).
- Check boot integrity.
- Check for missing static wicks.
- Verify that the two stall strips on each wing, located mid-wing and near the wing root, are present and secured.
- Lower the flaps and listen and check for smooth operation. Check the condition of each inboard flap bellcrank. Check the aileron cable and pulley alignment behind the rear spar for abnormal conditions.
- Check all exterior lights (strobe, navigation, landing, taxi, pulse and ice).
- Check for a leaking or obstructed main fuel tank vent.
- Check the fiberglass radome (if installed) for cracks and chips.
- Check the right main strut/wheel/tire/brake assembly.
- Check the strut and doors for hardware and hinge security and alignment.
- Check the brake pad thickness.
- Remove the Pitot cover (if installed) and verify the condition of the Pitot tube.
- Look for any loose screws on the access panels at the forward edge of the inboard wing section.

### ***Engine Cowling and Nose Section***

- Ensure that all of the cowling fasteners are present and flush with the cowling.
- Verify that the intake plug, exhaust covers and propeller cuffs are removed and properly stowed.
- Inspect the propeller blades for nicks and grease leaks.
- Place your foot on the top of the nose wheel tire and try to push the tire rearward. There should be no play in the strut.
- Verify that the physical turn stops on the nose wheel trunnion are not damaged.
- Look carefully at the nose wheel and stem valve.
- Look at the wheel on the right side. Verify that the castellated nut that holds the wheel in place has a clevis pin in place, and that the flat head and retaining hardware are in place.
- Look up into the nose wheel bay. Give special attention to the sequencing valve, hydraulic hoses of the landing gear/doors actuation system and the nose gear actuator.
- Check for any gap between the nose gear steering arm and the nylon rollers at the top of the nose gear strut. The gap should not exceed the thickness of a business card. Adjust if gap is excessive.
- Check the level of engine oil with the dipstick.

### ***Left Wing***

- Repeat inspection as with Right Wing.
- Close the bottom half of the main cabin door during fueling operations. Always supervise fueling.
- Test the stall warning vane and heater for proper operation.

### ***Baggage Storage Areas***

- Check the brake system hydraulic fluid level in the forward baggage compartment. Add fluid (MIL-H-5606) if necessary.
- Latch and lock door of forward baggage compartment.
- Look carefully at the sight gauge behind the aft baggage partition for proper hydraulic fluid level. Some 310P aircraft may not have sight windows in the rear panel. In this case, the entire panel will have to be removed to check fluid level. Add fluid (MIL-H-5606) if necessary.

### ***Passenger Seating Area***

- Check each passenger seat gas-spring recliner for correct operation.
- Operate all of the arm rests to ensure that they operate correctly and do not sag.
- Check the reading lights and the courtesy lights for proper operation.
- Check the emergency exit for security and proper placarding.
- Check all headset jacks for proper operation.
- Open the oxygen drawer under the right middle seat, and verify that the masks are correctly stowed and ready for operation.
- Verify that each fresh air vent works correctly, and verify a flow of air through the vents with the vent/defog blower in operation and the main cabin door closed.
- Check the folding table for tightness and smooth operation.
- Operate the window shades (if installed).

### ***Pilot and Copilot Storage Areas***

- Verify that the cabinet drawers slide and latch correctly.
- Check the oxygen tank gauge to verify that the tank is full.



- Turn on the O2 and verify oxygen flow through the mask's flow indicator.
- Check the fire extinguisher.
- Verify again that both POHs are on board.
- Close and latch the main cabin door.

### ***Pilot and Copilot Seats***

- Check all functions just as with the passenger seats.
- Check seats for positive engagement of seat latch, and for installed stops at each seat track.
- Check the height adjustment, the fore/aft slide adjustment and lumbar support function (if installed).
- Verify proper seat belt function.

# FIRST TEST FLIGHT

## STARTING ENGINE

**NOTE:** if major engine work has been performed, it would be very beneficial to start, run the engine, and stop without the upper cowling. During the run and after the shutdown, check for any fluid (fuel, oil, and hydraulic fluid) leaks. If no leaks are noted after the shutdown, re-install the upper cowling and restart engine. In addition, prior to the engine start, it would be beneficial to have an outside observer with a fire extinguisher, positioned in front of the airplane within sight of the test pilot.

**WARNING:** when running the engine without the upper cowling, do not touch any of the ignition components (especially the ignition exciter) for at least 5-6 minutes after shutting down the engine.

Items **HIGHLIGHTED** are **MUST-NOT-FORGET** items:

- Battery master switch:** On
- Landing gear lights:** Check for 3 greens (check operation of DAY/NIGHT dimmer switch).
- Fuel quantity:** Check gauges to agree with visual indication. Check Header Tank full.
- Shadin fuel totalizer:** Set for current fuel quantity.
- Flaps:** Check indicator at flaps up, 10, 20 and 36 degrees. Reset flaps to UP position.
- Annunciator panel:** Check illumination of all lights (each light has 2 bulbs) with press-to-test button. Note any inoperative light.
- Ice deflector:** verify OFF.
- BATT selector:** check battery #1 and #2; greater than 23 volts.
- Fuel transfer pumps, L&R:** Check Manual operation & reset to **AUTO**.
- Emergency transfer pump:** ON until HT HP light illuminates, then **OFF**.
- Fuel selector:** On proper tank (LEFT TANK if full).

- Manual override:** Guarded & light out.
- Ignition:** AUTO, then ON, check spark & **LEAVE ON.**
- Fuel boost pumps #1 and #2:** Check each pump, 15 PSI min., then leave **ON** (odd day #1, even day #2).
- BATT select:** **BOTH** (if so equipped). Otherwise hold **DUAL BATT** switch.
- Propeller area:** Verify clear.
- Starter:** ON (>14 Volts during start).
- Fuel condition lever:** Full forward @ 15% NG & stable.
- Oil pressure:** Check.
- ITT:** Monitor (see table for maximum values).
- Starter:** **OFF** @ 52% NG.
- Ignition:** **OFF.**
- Alternator:** Check red LOW BUS VOLT light is on (with voltage <25 Volts), and then Alternator **ON.**
- Engine instruments:** Check.
- Ice Deflector:** **ON.**
- BATT selector:** #1 & #2 (charge each battery >30sec), & set on BOTH (if so equipped).
- Generator:** ON & verify (green light on); Alternator OFF & verify (green light off).
- Radio master:** ON.
- Radios:** Set COM & NAV frequencies/settings as required.

- Exterior Lights:** navigation and anti-collision lights ON as required.
- Cockpit lights:** Check operation of all cockpit lights (dome, post & instrument lights).
- Auxiliary electric heat and air conditioning:** Check operation (with OAT <20 degrees C). Verify AUX HEAT does not operate with VENT/DEFOG fan OFF. Check operation of Air Conditioning (HI & LO fan).
- Vacuum:** Check 4.8 in-Hg minimum.
- Autopilot:** Test (refer to POH for test procedure of specific autopilot installed in airplane).
- Elevator trim:** Check manual electric operation for full travel in both directions; check each half of split-switch; check trim disconnect; check priority of Pilot's trim over Copilot's trim (if installed); pull pitch trim C/B and verify electric trim is disabled; reset pitch trim C/B and set trim for Takeoff.
- Rudder trim:** Verify neutral and make sure Yaw Damper is OFF before taxiing.
- Brakes and nose wheel steering:** Test brakes before taxiing. Check brakes & nose wheel steering during taxiing.
- Power lever:** Check BETA and reverse during taxiing.

### **BEFORE TAKEOFF**

- Fuel condition lever:** Verify full forward.
- Propeller control:** Verify full forward.
- Propeller overspeed governor:** Check @ 2000+ RPM.
- Propeller feathering function:** Cycle @ 1500 RPM.
- Manual override (at idle power):** Increase/Decrease, then guarded & light out.
- Header tank:** Verify full.

- Flaps:** Takeoff (0 or 10 degrees).
- Oil temperature and pressure:** Check
- Fuel Flow / NP / NG / ITT / Torque:** Check
- Generator:** Verify **ON** (green light on).
- Boost pump:** Verify **ON** #1 or #2.
- Oil door:** Verify OPEN.
- Fuel tank selector:** Verify on proper tank (LEFT TANK if full).
- Fuel transfer switch:** Verify on **AUTO**.
- Flight instruments:** ASI (zero reading) / ADI (erect) / ALT (indicates within 40 feet of field elevation when set to current altimeter setting) / TC (check when turning & no red flag) / HSI & DG (check for proper indication on known heading; reset DG as required) / VSI (zero reading).
- Magnetic compass:** Check for proper indication on known heading. Check agreement with HSI within 10 degrees (with air conditioning and re-circulating blowers OFF).
- Vacuum:** Verify 4.8 in-Hg minimum.
- Pressurization:** Isobaric Controller set at 1000 ft. (on outer scale) above departure field elevation. Dump Switch NORM; Knob IN. Set rate control at 9 o'clock position.
- Pitot heat and ice protection:** Check function and verify ammeter reading (NOTE: do not test the windshield heat and stall warning heat on the ground, as it can cause overheat damage to these components).
- Radio:** Verify COM & NAV frequencies/settings as required.
- Autopilot:** Verify **OFF**.
- Yaw damper:** Verify **OFF**.

- Ignition: ON.**
- Pitot heat: ON.**
- Transponder: ON.**
- Active runway:** Check both sides of active runway before entering runway.
- HSI/DG/magnetic compass:** Check alignment with runway heading.

## TAKEOFF

- Fuel Flow / NP / NG / ITT / Torque:** Check when takeoff power is applied & during initial climb.
- Oil temperature and pressure:** Check when takeoff power is applied & during initial climb.
- Flight controls:** Check for proper response during initial climb.
- Landing gear and flaps:** Retract landing gear when positive VSI is established, and then retract flaps.
- Initial climb:** Maintain Vy (110 KIAS). Remain close (within 2 NM) to airport.

## AFTER TAKEOFF (>1000 FEET AGL)

- Ignition:** AUTO.
- Ice deflector:** Verify power 150 ft-lbs below red line & then Ice Deflector OFF.
- Climb to safe altitude:** Climb above 8000 feet AGL if basic airworthiness of the airframe and/or engine is being checked.

## **LEVEL OFF (>8000 FEET AGL)**

- Fuel Flow / NP / NG / ITT / Torque:** Verify within normal range. Discontinue flight & return to airport if not.
- Oil temperature and pressure:** Verify within normal range. Discontinue flight & return to airport if not.
- Fuel system:** Switch tanks and verify that the automatic transfer system keeps filling the fuselage header tank. Set fuel switch to Manual and check operation of manual transfer system (pump lights should come on and keep filling the fuselage header tank). Reset the fuel switch to Auto.
- Airplane rigging:** While cruising at approximately 160 KIAS with elevator and rudder trimmed for level flight, and with approximately the same fuel level in both wings, verify that the airplane can maintain flight with wings level and no excessive tendency to bank left or right.
- Landing gear:** Cycle landing gear (DOWN and UP) with selector. Ensure hydraulic pump cycles normally and the red gear warning light extinguishes with gear fully up or down. Perform emergency gear extension (free fall) per POH procedures.
- Alternate static:** In level flight at approximately 160 KIAS with static source on primary (toggle down), note the altimeter reading. Switch to the alternate static source (toggle up) & record new altimeter reading. It should be within 50 feet of previous reading.
- Cabin heat and defroster:** Turn on JP SUP CABIN HEAT (rear blower) and check operation of normal heat (push-pull knob). Check operation of defrost knob (with VENT/DEFOG FAN on, check flow on both sides of windshield center-post). Check operation of Auxiliary Electric Heat. Verify AUX HEAT does not operate with VENT/DEFOG fan OFF.
- Recirculating blowers and air conditioner:** Check operation of Recirculating Blowers in LO and HI positions. Check operation of Air Conditioning (HI & LO blower settings). Check heading of Magnetic Compass with Air Conditioning and/or Blowers.

- **Pressurization inflow control and dump switch (below 10,000 feet):** Pull the cabin pressure control knob on copilot side and verify that cabin begins to depressurize. With cabin pressure differential ( $\square P$ ) at 2 psid or less, push the cabin Dump Switch to DUMP (the cabin should depressurize rapidly). After this test, reset (push and secure) the cabin pressure control knob on copilot side and set the Dump Switch to NORM. The cabin should re-pressurize.
  
- **Cabin altitude warning light:** With the airplane maintaining 12,000 feet and the cabin pressurized, pull the cabin pressure control knob on copilot side: the cabin should start climbing (i.e. de-pressurizing). Note at what cabin altitude the red CABIN ALTITUDE light illuminates. It should be 10,000 ft. +/- 500 (per the cabin altimeter). After this test, reset (push and secure) the cabin pressure control knob on copilot side. The cabin should re-pressurize.
  
- **Pressurization isobar control and rate control (below 14,000 feet):** Below a Pressure Altitude of 14,000 ft., with the cabin Isobaric Pressure Controller set at 1000 ft. (outer scale), the cabin altitude should be 1000 ft. +/- 500. Below a Pressure Altitude of 14,000 ft., reset the cabin Isobaric Pressure Controller from 1000 ft. to 8000 ft. (on outer scale). Turn the rate control fully counter-clockwise: the rate of climb of the cabin should be 200 fpm +/- 100. Turn the rate control fully clockwise: the rate of climb of the cabin should be 2000 fpm +/- 500. Reset the cabin Isobaric Pressure Controller to 1000 ft. (outer scale), and reset the rate control at 9 o'clock position.
  
- **Maximum pressure differential ( $\square P$ ):** Climb to a Pressure Altitude of 14,000 ft., with the cabin Isobaric Pressure Controller set at 1000 ft. (outer scale). The cabin pressure differential ( $\square P$ ) should reach the maximum (5.5 psid) at 14,000 ft. Pressure Altitude.
  
- **Flaps operation:** Trim the airplane for 110 KIAS in level flight (below full-flaps extension speed of 117 KIAS) and set rudder trim for zero yaw. While maintaining 110 KIAS, cycle flaps through each position (10, 20, 36 degrees and then UP) while visually verifying the flaps position and agreement with the flap handle position. With landing gear retracted, verify that the gear warning horn sounds & the gear warning light illuminates when the flaps position is 20 degrees or greater.
  
- **Flaps rigging:** While maintaining 100 KIAS in level flight with flaps fully deflected (36 degrees), release ailerons and time any roll to a 20-degree angle of bank. It should not exceed 10 seconds.
  
- **Stalls:** Perform a power-off, wings-level full stall (beyond the aerodynamic buffet) with flaps up and with flaps full down. When approaching the full stall, the rate of airspeed reduction should be 1 knot/second or less. The airplane must be controllable before, during, and in the recovery phase of the stall.



- Copilot's airspeed indicator:** If installed, should read within 5 knots of the Pilot's Airspeed Indicator.
- Attitude indicator(s):** Check proper functioning of pilot's, copilot's (if installed) and stand-by (if installed) Attitude Indicators (ADI's). Perform a 45-degree bank turn (for a full 360 degrees) in level flight and check agreement of all ADI's. Perform a 15-degree pitch climb and descent (for at least 500 feet) and check agreement of all ADI's.
- HSI/DG:** Check proper functioning of pilot's HSI, and copilot's DG (if installed). Perform 30-degree bank turns and check agreement of HSI/DG with each other and with magnetic compass at the end of the turn. The DG should not precess more than 4 degrees in 10 minutes.
- Turn coordinator(s):** While maintaining level flight, perform and time a left & right standard-rate turn for 180 degrees. The 180-degree standard-rate turn should take 1 minute (+/- 7 seconds).
- Vertical speed indicator(s):** While maintaining level flight, the VSI(s) should indicate zero. Per the VSI indication, time a 500 ft./min. climb and descent for 1 minute. After 1 minute, the indicated altitude change should be 500 ft. +/- 100.
- Anti-ice and de-ice system:** Check proper functioning of propeller heat, inlet heat, stall warning heat, and windshield heat (both HI and LOW if so equipped). Check proper inflation and sequence (empennage-lower wing-upper wing) of pneumatic boots. Check complete deflation of boots after inflation cycle.
- Landing gear at VMO:** With the landing gear retracted, accelerate to VMO (172 KIAS). The red gear warning light should not illuminate. Check for any unusual vibrations and buffeting. Slow down to 169 KIAS and extend the landing gear at 169 KIAS. In smooth air, accelerate to VMO (172 KIAS). Check for any unusual vibrations and buffeting. After this test, slow down to 130 KIAS and retract the landing gear.
- Autopilot:** Check all modes (refer to POH/Pilot's Guide for procedures of specific autopilot installed in airplane).
- Avionics:** Check all modes, (refer to POH/Pilot's Guide for procedures of specific avionics equipment installed in airplane). Execute a coupled ILS and GPS WAAS (if so equipped) approach to verify proper interface/coupling with the installed autopilot. For each Com radios, check the squelch & volume control. For each Com radio, perform a radio check in flight with the appropriate ATC facility. Check the

proper functioning of the Audio Selector Panel. For transponders, ask ATC for a discrete code to check the Mode C/S accuracy.

- Standby alternator:** With the total electrical load below 60A, turn OFF the Generator (green light off), and then turn ON the Standby Alternator (green light on). Verify successful power transfer to the Standby Alternator (check Ammeter for proper indication). Check for any Alternator-induced noise in headset. After this test, turn Generator ON (green light on) and verify Standby Alternator offline (green light off). Verify successful power transfer back to the Generator (check Ammeter for proper indication). Turn Standby Alternator switch OFF.

## **APPROACH & LANDING**

- Radios:** Set COM & NAV frequencies/settings as required.
- Safety belts and shoulder harness:** Tight & secure.
- Header tank:** Verify full.
- Fuel selector:** Fullest tank.
- Ice deflector:** ON
- Ignition:** ON
- Pressurization:** Isobaric Controller set at 1000 ft. (on outer scale) above landing field elevation. Dump Switch NORM; Knob IN. Set rate control at 9 o'clock position.
- Autopilot and yaw damper:** Verify both OFF.
- Navigation and anti-collision lights:** Verify ON as required.
- Landing gear:** **DOWN & LOCKED** on downwind leg abeam of landing runway number.
- Brakes: Test for pedal pressure.** Choose longest runway if pedal pressure is low or uneven. Pump affected pedal to build up pressure. Be prepared to use full reverse on landing with low brake pedal pressure.
- Flaps:** Full down on final or as required.

- Elevator trim:** As required.
- Rudder trim:** Verify neutral.
- Propeller control:** Verify full forward.

### **AFTER LANDING AND OFF THE ACTIVE RUNWAY**

- Ignition: OFF.**
- Pitot heat: OFF.**
- Transponder: STANDBY.**
- Flaps: Identify flap lever and retract**

### **ENGINE SHUTDOWN**

- Radio master: OFF.**
- Electrical equipment: OFF.**
- Generator/Alternator: OFF.**
- Power lever: Idle.**
- Propeller: Feather.**
- Fuel condition lever: Cutoff (NP<400 RPM).**
- Fuel boost pump: OFF (NG<10%).**
- Ice deflector: OFF (for next start).**
- Battery master: OFF.**

- Battery select:** Select #1.
  
- After-shutdown checks:** Check the fluid level of the hydraulic pump inside the cabin. Once outside of the cabin, walk around the airplane and check for any leaks (fuel, oil, hydraulic fluid). After using the air conditioner, it is normal for water to drain from the evaporators drain (short pipe) below the aft fuselage.

### **DISCREPANCY REVIEW**

- Airframe, systems, engine and avionics discrepancies:** Write all the found discrepancies in a clear, understandable language. Discuss all the discrepancies with the responsible shop and agree on a resolution for each one. Ground the airplane if any safety-of-flight issues are found and not resolved.

The following Limitations must be observed during all normal operations:

### ENGINE LIMITATIONS

	Torque			ITT °C		
	-21	-34	-35	-21	-34	-35
<b>Start</b>	1337	1337	1337	850 (1090)	850 (1090)	850 (1090)
<b>Takeoff</b>	1337	1337	1337	695	790	805
<b>Climb</b>	1337	1337	1337	680	740	740
<b>Cruise</b>	1337	1337	1337	680	740	740
<b>Reverse</b>	550	550	550	695	790	790
<b>Idle</b>				660	685	685

### AIRSPEED LIMITATIONS

<b>V<sub>MO</sub></b>	172
<b>V<sub>A</sub></b>	137 @ 4300 lbs.
<b>V<sub>LO</sub></b>	169 (Down) 130 (UP)
<b>V<sub>LE</sub></b>	172
<b>V<sub>FE</sub></b>	169 (10°) / 134 (20°) / 117 (30°)
<b>V<sub>X</sub></b>	90
<b>V<sub>Y</sub></b>	110
<b>V<sub>BEST GLIDE</sub></b>	90
<b>V<sub>EMERG. LAND. GEAR EXT.</sub></b>	90

