



# RWR Pilot Training



## Malibu - Mirage - Meridian

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## The Piper Meridian Pre/Post Annual Pilot Inspection (PAPI)

### Checking Your PA46-500T Meridian Aircraft After Maintenance and at Other Worthwhile Times

By

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A former corporate pilot and primary flight instructor, Dick is a full-time Master Certified Flight Instructor providing insurance approved initial and recurrent pilot training in the Piper PA46 Malibu, Mirage, and Meridian aircraft. He trains 60-80 pilots every year exclusively in these aircraft.

He holds multi-engine ATP and Gold Seal Flight Instructor Certificates with CFII, MEI and CE525S ratings. He has been actively involved in flight training since 1991 and has trained pilots all over the US and in Canada and Western Europe.

Dick is an Aviation Safety Counselor for the FAA Baltimore Flight Standards District Office (FSDO), a National Industry Member of FAAST (FAA Safety Team) and has conducted hundreds of programs for the pilot community. He is an instructor for the M/MOPA Safety and Training Foundation, and The National Association of Flight Instructors has designated him Master CFI. Less than 1% of all flight instructors have earned this designation.

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A "Return to Service" test flight is in some cases required by FAA regulation (91.407) after maintenance is performed; however, there are other times that a thorough check of the aircraft and its records is warranted. What about *before* the annual? It isn't required, but wouldn't it be nice to have a well developed and detailed squawk list going into annual? Your mechanic relies on this list as a starting point. How about prior to purchasing an aircraft? There are a number of very expensive items that may not be found in a pre-buy inspection done by even the best mechanic. A discovery inspection/flight conducted by an experienced PA46 pilot will most likely save you money. Consider doing a discovery inspection/flight before the pre-buy inspection because it is less expensive. You might even find something that warrants rejecting the aircraft for purchase, and at the very least, it can actually help the pre-buy inspection mechanic focus on important issues.

Before we start lets take a look at the aircraft documents. The FAA says that the owner-operator is responsible for airworthiness which makes your involvement in a maintenance logbook review an important step. The review can be done with copies of the logs and a conference call with your favorite PA46 mechanic in about 20 minutes to one hour, depending on the age of the aircraft. If the aircraft is coming out of

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maintenance, pay careful attention to those items that were “fixed”. Even the best mechanics are not infallible.

Caution: 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.

### The PAPI Preflight

The aircraft preflight inspection is a time-honored ritual which, in the case of the discovery inspection, is conducted in an amplified way. It should take about one hour. Do not rush through this process. In addition to my own experience, I use the Piper Event Checklists to help me conduct the inspection in an organized fashion so that I do not miss anything. These checklists are available from your Piper dealer, from my website [www.rwrpilottraining.com](http://www.rwrpilottraining.com), or directly from me via my free “Pilot Reference Library DVD”. Obviously a lot of what is on these lists requires tools, but remember this is a pilot inspection, not an annual inspection. I do not use tools on the expanded walk-around except for a bright flashlight, notebook and pen and, of course, my checklists. You will want to discover and document all of those items and functions which are not reflecting a normal condition. Make sure the aircraft is located in an area that will be comfortable for you and plan on spending some time flat on your back looking into the wheel wells and nose gear bay. Again, the concept of experience enters the picture. If you don't know, bring along someone with the proper experience to help. Some of the common problems and issues which I have found are listed here, but everything needs to be checked for normal condition and function.

### 1 – Aircraft Documents

- Verify the revision level of the POH. A call to any Piper Service Center Parts Department will get you a quick answer to the question. They 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, but will require you to buy a new book if the current one is 4 or more levels out of date. The best way to ensure you are getting the revisions in a timely manner is to contact Piper in writing to notify them that you are the current owner of the aircraft. In many cases the FAA database can take 90 days or more to catch up.
- Verify the presence of a current weight and balance data sheet.
- Observe the general condition of the aircraft as you approach. Verify the struts are level.
- Check for complete and correct placards on the aircraft using your up-to-date POH. You can find a list of required placards in Section 2, “Limitations”

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- Tire pressure must be checked with a gauge so bring one with the correct pressure range along. Bring a small right angle Phillips screw driver as well. You will need it to remove the main wheel fairings which cover the valve stems. Verify that the correct tires are installed as well.

### 2 – Fuselage

- 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. You may notice a misalignment of the top half of the MCD where the seam between the door and the fuselage is closed on the forward side and wide on the aft side. This is typical on older aircraft and may result from operating the engine on the ground with the top half of the door open without selecting 0 degrees propeller pitch with beta. If this occurs and the door is dropped to the jamb, paint chipping at the forward seam of the MCD will be the result.

- The cable stays on the Meridian MCD are also fragile and need special attention during operation. Under no circumstances should you allow any untrained person to operate this door except in an emergency. Visually inspect the cable for broken strands and/or loose hardware. Check the cables for even tension fore and aft. It will affect the evenness of the weight applied when the steps are used.

- Inspect the hinge of the lower half of the MCD for evidence of corrosion. It is an area that sees a lot of water, and I have seen small amounts of corrosion on just about every aircraft three or more years old.

- The condition of the aircraft belly skin should be checked for excessive oil. Oil on the belly is a problem for two reasons: 1) Oil is in a place in which it is not designed to be. 2) Oil is not where it is supposed to be. There are several possible reasons for this, so it is important to consider the underlying cause as well as the effects of this issue. In addition to engine and cosmetic issues, I have observed condensate drain decals peeling off or missing altogether, antennas rendered inoperative (particularly the twin blade traffic alert antenna) and yaw damper amplifiers malfunctioning to name a few. Some of these problems can be quite expensive to fix.

### 3 – Empennage

- Check the dielectric paint (the flat black paint that borders the boot) carefully. I often find it 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 the boots develop pinholes, the ejector pump sucks 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.

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- Ice boots improperly maintained leading to reduced functionality and/or failure. If the boots are not kept properly coated, the boots will get a “tooth”. The surface becomes dull and has a propensity to hold ice.
- Missing static wicks and/or vortex generators: The missing wicks are not airworthiness issues on the Meridian but they are important for reasons already mentioned. While missing static wicks are not limited in the POH, six or more missing VGs exceed the limitation in the POH and render the Meridian un-airworthy. In addition to the main wing, be sure to check the ones on the underside of the horizontal stabilizer.
- Loose rivets, commonly referred to as “working” or “smoking” rivets on the aft fuselage bulkheads causing damage to skin and bulkhead flanges. While any loose rivet should be addressed, there are two rivet lines where I have noticed this type of damage: 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. It is possible with heavy passengers and a light fuel load that the aircraft could 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 approved it. Plan on loading the front right seat passenger first to avoid any possibility of a tail strike.
- 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.

### 4 – Right Wing

- Look for aftermarket chafe tape on the top of the flap surface. It 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. Lower the flaps and listen and check for smooth operation. Check the cable and pulley alignment in the recess for abnormal conditions.
- Check the exterior lights (position, strobe, navigation, landing, taxi, pulse and ice).
- Check for leaking or obstructed main fuel tank vent. These are the “one way” NACA vents; one under each outer wing segment. If fuel is leaking from this vent it needs to be addressed. The small cylindrical vent in the cap is a two way vent and it is not unusual for fuel to leak from it if the tank was filled and left in a warmer environment. The older style plastic vent caps have a tendency to get brittle from fuel contamination and break off. These can be drilled out and replaced with one made from machined aluminum.
- The fiberglass radome should be checked carefully for cracks and chips. It is constructed of fiberglass because the transmitter and antenna are inside and the energy needs to be able to penetrate the dome. If the paint on the dome is chipped, flying in the rain will cause water to wick into the exposed fiberglass fabric.

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This contamination will cause gross errors in the display. In this case, the radome will probably need to be replaced. Avoid storing anything of mass in the small storage area in the aft portion of the radome. The only thing I would consider putting in there are clean rags, because whatever is in there will jump around during flight which could cause cracking of the paint on the pod. The factory delivers new aircraft with the red plugs and cuffs neatly folded and placed carefully in the radar pod storage area. I have never seen anyone who is able to get them out or put them back in there without a lot of pushing and pulling. I have seen long cracks in the paint on the radar pod, and I wonder if this isn't one of the reasons. There is an aftermarket clear cover for the front of the radome which will help prevent chips in the paint. I consider it a must have item. Enhanced Flight Group has them.

- The right main strut/wheel/tire/brake 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. I recommend you use non-petroleum based cleaner on these about every 30 days.
- Check the strut and doors for hardware and hinge security and alignment.
- Check the brake pad thickness. The inner pad and the outer pad should be evenly worn and the disc should be free of ridges. If not, it is possible that the caliper is not floating properly which can lead to overheating of the brakes and reduced takeoff performance.
- Remove the pitot cover if the aircraft is so equipped and verify its condition.
- Look for loose screws on the access panels at the forward edge of the inboard wing section.

### 5 – Engine Cowling/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 plugs, exhaust covers and propeller cuffs are removed and properly stowed. Consider a gym bag to hold these items so that your interior does not become contaminated with turbine exhaust residue.
- 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.

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- Look at the nose wheel carefully. The brass valve stem should be on the right hand side and it should not be bent over near or against the wheel. If it is, the stem is damaged and it 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 just have the tube replaced.
- Look at the wheel on the right side and verify that the castellated nut which 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 fall off very easily.
- Look up into the nose wheel bay and give special attention to the sequencing valve and associated gear system hydraulic hoses and the lower portion of the nose wheel actuator. All of these places can have minor leaks which evidence themselves with small amounts of dry hydraulic fluid near the source of the leak. If the leak is bad enough you may see fluid on the left hand side of the tire 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. It is during this storage during flight that fluid gets on the wheel.
- Check the level of the engine oil at the site gauge on the left side of the engine. It should be visible in the glass column but no higher than the first rivet up in the green. I highly recommend that you add only one third quart at a time to prevent overfilling and “oily belly syndrome”. You can find a source for storage bottles on my website [www.rwrpilottraining.com](http://www.rwrpilottraining.com) on the “Products of Interest” page.

### 6 – Left Wing

- Be sure to close the bottom half of the main cabin door during fueling operations. You should always supervise fueling, but if the left tank is over-filled, fuel will run toward the aft inner segment of the wing and find its way to the flap track. From here, a light breeze can cause it to drip on the cabin entry steps. When the door is closed, the jet fuel smell will permeate the cabin until the steps are disassembled and thoroughly cleaned.
- Test the stall warning vane and heater for proper operation. You will need someone inside the aircraft to turn on the Battery Master Switch and press the stall warning test button while you observe the vane. It should move full deflection when the test button is pushed.
- Remember that the stall vane heater is wired through the left main gear door switch. When this switch is open, voltage is interrupted to the stall warning heater plate. To test the heater circuit, apply power to the battery bus and turn on the stall warning heat in the cockpit. Hold the left main gear door switch closed with the strongest finger on your left hand while feeling the stall warning heater plate with the most sensitive finger on your right hand. It will heat up quickly so, be ready. When you feel the heat, let go of the gear door switch. The stall warning device is expensive and easily damaged by heat. It is an airworthiness item as well, so be judicious with its use.

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- 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 is still on.
- Check all of the exterior lights.

### 7 – Baggage Storage Area

- Check the area for general condition. Look carefully at the sight gauge in the aft baggage bulkhead for proper hydraulic fluid level. Do not overfill this reservoir or serious damage can result.
- Check all of the seat backs for integrity and cracks beneath the carpeted backs. This type of damage is quite common, especially in cold weather. It results from kneeling on the forward folded seat while loading bags or putting too much weight high on the seatback when entering or exiting the cockpit.
- Check the clear plastic document pouch for the presence of the correct airworthiness certificate and registration. Remove old and outdated documents.
- Verify that the spring loaded seat back release latches are operating normally and not damaged or binding.

### 8 – Passenger Seating Area

- At this point, the aircraft should be plugged in to a 28V GPU.
- Check each passenger seat 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 as you would on a preflight for security and proper placarding.
- Check the headset jacks for proper operation.
- Open the oxygen drawer under the starboard 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 lower plenum with the vent/defog blower in operation.
- Check the folding table for tightness and smooth operation. Some are broken from flailing in rough air.

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- Operate the window shades. Many operators use these shades for sun protection on the ramp. This causes the pleats to take a “set” and the shades will then crumble when they are raised abruptly. I highly recommend the Kennon shields to preserve the shades.

### 9 - Pilot and Copilot Storage Areas

- Verify that the drawers slide and latch correctly and that the oxygen bottle service drawer latch and the post lamp on top of the cabinet near the gauge are in tact and working correctly. I often find these items broken from mismanagement.

- Check the oxygen tank gauge to verify that the tank is full. Turn on the O<sub>2</sub> and operate the mask. Yes, take it out of the compartment and test it. Make sure all of the features are working, including the rotary “emergency” O<sub>2</sub> free-flow switch on the bottom. Ensure that the mask seal is not deformed and is sealing correctly. Most pilots never take it out and the mask actually gets damaged from being stored incorrectly for an indefinite period of time. Look carefully at the seals on the mask and the dowel and latches on the door. These are sometimes broken from hurried or improper attempts to replace the mask. Note the level of O<sub>2</sub> and check it again post flight to verify that the connectors are not leaking. They often do leak. If you have not been shown how to replace the mask, leave it for the maintenance crew or other qualified person. You can easily break something trying to ad lib on replacing the mask.

- Check the fire extinguisher. It should have a placard or sticker certifying the weight and it should have a pin in the charge handle.

- Make sure the POH is on board. We checked it earlier during the documents review.

- Now, close and latch the door ensuring that the door halves do not bind and that all of the indicator windows operate properly.

### 10 – Pilot and Copilot Seats

- Check each function on these seats just as the passenger seats. Additionally, check the height adjustment, the fore/aft slide adjustment and lumbar support function.

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

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### The PAPI Flight

#### 1 – Engine Start

- Prior to engine start, check the security and function of each and every switch, left to right around the cockpit. Turn the night lights up and verify that ALL lights and dimmer knobs are working, particularly the standby instrument internal lights. If subdued light is needed, put the aircraft in a hanger.
- Press the fire detect test and verify the annunciator light.
- Test the stall warning annunciator.
- Press the annunciator panel test button and observe all of the pretty lights.
- I would normally use a 28V GPU for the start whenever one is available; however, for the test flight, we want to verify the condition of the battery, so let's do a battery start. During engine start, note and record engine start parameters paying careful attention to oil pressure, ITT, bus voltage, amperage, NG and the rates of recovery of these items as well. Results will vary but these items should be within usual limits.
- Conduct the post-start checklist per the POH, and note any discrepancies.
- Verify all subscriptions and data bases are up to date and that all avionics boot correctly.
- Copy and set the clearance into the panel in the usual way noting any discrepancies. You will need an IFR clearance for the portion of the checks done above 17,500 feet; however, VMC will be necessary for some of the low altitude checks. You can plan to take off VFR and pickup your IFR at a filed time, altitude and fix (known as a VFR/IFR flight plan) or, if circumstances make this idea imprudent, you can ask for VFR on top and a block altitude.
- Note Hobbs time, local time and fuel on board.

#### 2 - Taxi

- During taxi, verify the braking action on all four pedals.
- Check for play in the rudder steering mechanism. There should be none. Check the copilot side as well.
- Conduct a beta lockout test.
- Check the flight control systems for free and correct operation. Include the autopilot in this check. The procedure for the autopilot check is in the POH.

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- Note the free and correct movement of all of the instruments including the compass. Verify the presence and correctness of the compass card.
- Check the ELT. Plan to run it for a few cycles while monitoring 121.5, but only during the first 5 minutes after the hour.
- Press and hold each Pitot-Static System Condensate Drain for a second or two, and observe that there are no “nervous” pitot static instruments.
- Conduct an over-speed governor check at the run-up area.

### 3 – Take-Off /Climb

- Use normal callouts for the take-off roll and initial climb. Note engine instrumentation on take-off and during climb and record them once the autopilot is engaged. Note the length of the take-off roll. The PA46-500T Meridian should be at 2/3 of the rotate speed in 900 feet or less on a standard sea level day. If not, check for dragging brakes, uncommanded roll-back on the power lever or instrument error.
- Observe gear cycle time of 7 seconds and normal operation. Throughout the flight, verify that the gear pump light does not cycle excessively. Use the autopilot for all operations except take-off and landing and stall series to ensure that it is working in all flight regimes.
- Verify correct operation of the Cabin Pressurization System (At or below 7,000 feet MSL):
  - Conduct a Cabin Dump (use a cabin pressure of about 2.5 PSI)
  - Restore the cabin to normal pressure
  - If it is not already done, set the cabin at least 3,000 ft below current altitude and allow the cabin pressure to stabilize. (Set the rate controller fully clockwise to expedite this.)
  - Turn the ECS Knob to High and note normal operation.
  - Turn the ECS Knob to Emergency and note normal operation.
  - Return the ECS Knob to Normal.
  - Verify the cabin pressure system is operating as commanded.

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### 4 – Low Altitude

- Set up for VMC cruise flight between seven and ten thousand feet AGL if possible, and verify all pilot and copilot instrumentation are in agreement and within limits.
- Activate the alternate static system and verify correct operation.
- Operate and verify correct operation of all threat ID equipment on board: RADAR, Lightning Detection/Sferics, Terrain Awareness, Ground Proximity Warning, TAS, TIS, etc.
- Check the Fuel Pumps, Igniters and Ice Protection items for correct operation. Look for proper annunciation and electrical load. Observe aircraft limits, but be sure to check the auto functions as well.
- Press the Stall Warning Test Button, and verify the presence of the horn and that the autopilot disconnects. Set the torque to 200 lbs, and verify the presence of the ignition light on the annunciator panel and the gear warning horn. Press the gear warning horn silence button. Return the torque to 350 lbs, and verify that the horn silencer has reset and that the Ignition Light goes out.
- Verify the correct operation of the autopilot CWS.
- Verify the correct operation of the Go Around (TOGA) button (Magic 1500 autopilots only).
- Test the Emergency Gear Extension system.
- Perform imminent stalls to verify that the stall horn works correctly in the dirty configuration and in the clean configuration.

### 5 – High Altitude

- Climb to FL 280 if possible, and verify the “cabin above 10k” light.
- Verify that the cabin pressure system is producing 5.5 PSI when commanded by the altitude controller
- Set engine power for max cruise in accordance with the POH, and verify engine parameters and performance.

### 6 – Arrival

- Check the complete operation of the autopilot coupled ILS approach.

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### 7 – Post Flight

- Check the exterior of the aircraft for evidence of leaks. Pay careful attention to:
  - engine oil level sight gauge
  - left hand side of the nose wheel tire
  - actuators and struts
  - nose wheel bay
  - belly and the tail tie-down ring.

We are finished! Remember, some of the common problems and issues which I have found are listed here, but everything needs to be checked for normal condition and function.

If you have any questions or comments, please feel free to contact me:

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