

Training PA46 Pilots: A Scalable 5 Step Practical Model Which Can Improve Flight Safety

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In spite of insurance mandated training, the accident rate for the PA46 Matrix, Malibu, Mirage and Meridian remains higher than that of other comparable aircraft in the general aviation fleet¹. The FAA, NTSB and the AOPA Air Safety Foundation agree that the PA46 is a good and capable aircraft, and that these accidents suggest a deficiency in pilot training². In this white paper, you will learn about a model for training PA46 pilots which I believe can improve the safety record of the PA46 aircraft.

The PA46 Matrix, Malibu, Mirage and Meridian enjoy a rich history. Since its introduction in 1983 the PA46 aircraft has enjoyed a world-wide reputation as the pinnacle of personal aviation. There were, however, a number of fatal accidents beginning late in 1989 which drew special attention from the FAA. The aircraft design was completely exonerated by an exhaustive review by the NTSB, Piper Aircraft, and The FAA. The following words summarize the findings of the NTSB in the 1994 special investigation of the Piper PA46: *“As revealed by the investigation of the accidents, we believe that the area of most concern in operating the PA-46 and other similar airplanes is the adequacy of initial and recurrent training received by the pilots.”*³

The NTSB and FAA recommendations were embraced by the manufacturer and the insurance industry; however, implementation was largely left to the training community. Since the Matrix, Malibu, Mirage and Meridian are perceived to be like larger, professionally flown aircraft, and since the professional pilot community enjoys a far lower accident rate, the pilot training programs for the PA46 were originally structured as they are for professional pilots.

Unfortunately, the accident rate remains unchanged.⁴ Personal flying represents less than 50% of all general aviation flying, yet the personal flying segment of General Aviation is

¹ AOPA Air Safety Foundation (1994) “Safety Review, Piper Malibu/Mirage” p 1-4

² AOPA Air Safety Foundation (1994) “Safety Review, Piper Malibu/Mirage” p 1-11, 3-33, 3-34

³ NTSB Piper PA-46 Special Investigation and FAA Certification Review. Retrieved January 11, 2009 from http://www.nts.gov/Recs/letters/1992/A92_84_89.pdf

⁴ 1997 Nall Report. Retrieved January 11, 2009 from <http://www.aopa.org/asf/publications/97nall.pdf>

responsible for over 80% of the fatal accidents.⁵ These accidents are largely (over 80%) pilot error, not system failure.⁶ After a review of these data, I suggest that the pilot error most commonly associated with fatal accidents tend to be errors of omission; that is succumbing to “noble distractions”. Not doing the wrong thing, but doing a less important thing at the wrong time.

The insurance industry has been very effective in mandating training for the PA46 beyond the minimum FAA standard; however, the single-pilot PA46 operator remains a moving target in this regard. Pilot training is additionally challenged by fast paced changes in avionics in new and used aircraft. These new levels of avionics performance can dramatically increase pilot situational awareness when paired with proper aircraft specific-training.

The classroom lecture/aircraft simulator model which is used to train professional flight crews, in many cases, continues to be used to train PA46 single-pilot operators. The latest accident data clearly indicates that this model is ineffective.⁷ According to the single-pilot PA46 operators themselves, there are many reasons for this. Here are the most frequent observations:

- Single-pilot PA46 operators frequently arrive for training unevaluated and underprepared.
- We call them simulators; however, there are no FAA approved simulators available for the PA46, only flight training devices (FTDs) which, most often, do not adequately represent the PA46 single-pilot’s aircraft.⁸
- The FTDs are sometimes not functioning properly, too sensitive, or not available as promised.
- Single-pilot PA46 operators frequently lack the requisite experience to transfer FTD drills into effective pilot skills without significant iteration.

⁵ 2006 Nall Report. Retrieved January 11, 2009 from <http://www.aopa.org/asf/publications/06nall.pdf>

⁶ Ibid.

⁷ 2006 Nall Report. Retrieved January 11, 2009 from <http://www.aopa.org/asf/publications/06nall.pdf>

⁸ FAA List of Qualified Simulators. Retrieved January 11, 2009 from http://www.faa.gov/safety/programs_initiatives/aircraft_aviation/nsp/train_devices/media/All_FSTD.pdf

- Many PA46 flight instructors lack adequate time in type and tend to teach with primary training doctrine.
- In some cases, the training is done incorrectly and/or incompletely.
- There is little or no verification or follow-up.

Single-pilot PA46 operators are fundamentally different from professional flight crews because:

- Single-pilot PA46 operators fly less frequently and have less overall experience.
- Single-pilot PA46 operators fly to a greater variety of destinations.
- PA46 operators typically operate in the single pilot environment with far less operational capacity (bandwidth) than a professional flight crew.
- Single-pilot PA46 operators are motivated differently because flying is a part-time avocation.
- Single-pilot operators learn differently because they come from a diverse background of age, education, training and experience.⁹
- Single-pilot operators have significantly more pilot error related accidents because they do not benefit from a formal safety management system.¹⁰

I believe it is time to acknowledge the unique circumstances associated with training PA46 single pilot operators and apply the training techniques most likely to improve knowledge and skills in this pilot community. Concurrently, we can and should encourage a higher level of professionalism and improved aeronautical decision making through the implementation of standard operating procedures. We can begin by studying other training programs which have been successful with the single-pilot complex aircraft “all weather”

⁹How people learn: Brain, Mind, Experience, and School By John Bransford, Ann L. Brown, Commission on Behavioral and Social Sciences and Education, Rodney R. Cocking, National Research Council (U. S.) Committee on Developments in the Science of Learning (COR), National Research Council (U. S.) Committee on Learning Research and Educational Practice Retrieved January 11, 2009 <http://books.google.com/books?id=B2h3iaDkUo8C&printsec=frontcover#PPA5,M1>

¹⁰ 2006 Nall Report. Retrieved January 11, 2009 <http://www.aopa.org/asf/publications/06nall.pdf>

operations model. One such model is Cape Air. In 2009 Cape Air flew 65,000 accident free single-pilot hours in complex aircraft on “all weather”, short haul routes¹¹. They accomplished this by careful and consistent use of advanced training techniques such as pre-training assessment, use of CPT (cockpit procedures training), training in the aircraft one-on-one with an experienced instructor, using checklists, flows, memory items and strict adherence to well vetted standard operating procedures¹².

If we were to make use of this very successful model, PA46 single pilot operator training should be provided twice per year at a minimum and should be focused on three key areas:

1 – **Knowledge** – PA46 flight instructors know that the PA46 pilot community has significant gaps in operational knowledge which may lay dormant and uncorrected, potentially leading to an aviation accident. Professional pilots train twice per year to ATP standards and so should PA46 operators.¹³

2 – **Skills** – Skills are perishable and need to be constantly and precisely iterated on a regular basis. PA46 pilots should train to ATP standards, twice per year in their own aircraft with an experienced PA46 specific flight instructor using well vetted checklists, flows and memory items.¹⁴

3 – **Procedure** – PA46 pilots often lack the discipline to fly procedurally to ATP standards. PA46 pilots should have, and use well vetted Standard Operating Procedures (SOPs). They should receive effective scenario-based training emphasizing SOP, checklists, flows and memory items.¹⁵

“Practice does not make perfect. Only perfect practice makes perfect.”¹⁶

¹¹ Cape Air flew 65,000 accident free single pilot IFR hours in 2009 by focusing their training on knowledge, skills, and SOPs and by training one-on-one in the aircraft with experienced pilot instructors. Downloaded from http://www.rwrpilottraining.com/PA46_SOPs_RWRPT-09120716.pdf on 22 Nov 2010.

¹² Cape Air uses home study, ground school, CPT, and in-aircraft flight training to prepare its pilots: Downloaded from http://www.avweb.com/avwebflash/exclusivevids/ExclusiveVideo_IFRMagazine_CapeAir_PilotTraining_201704-1.html 22 Nov 2010.

¹³ *ibid*

¹⁴ Cape Air flew 65,000 accident free single pilot IFR hours in 2009 by focusing their training on knowledge, skills, and SOPs and by training one-on-one in the aircraft with experienced pilot instructors. Downloaded from http://www.rwrpilottraining.com/PA46_SOPs_RWRPT-09120716.pdf on 22 Nov 2010.

¹⁵ PA46 Standard Operating Procedures derived from the NBAA pro forma Standard Operating procedures and downloaded from http://www.rwrpilottraining.com/PA46_SOPs_RWRPT-09120716.pdf on 22 Nov 2010.

¹⁶ Vince Lombardi. Retrieved January 11, 2009 <http://www.brainyquote.com/quotes/quotes/v/vincelomba138158.html>

Psychologists, sports trainers, coaches and the military all agree; effective skills improvement training requires specificity and iteration.¹⁷ Single-pilot PA46 operators will benefit from decentralized, performance based training which emphasizes the specificity of their particular environment and aircraft. The training should be structured to meet the requirements of a FITS (FAA Industry Training Standards) approved and insurance industry verified custom training plan which is paced to maximize learning for the individual PA46 single-pilot operator.¹⁸

The ADDIE 5 step model was developed by the US Military in 1975. Since then, ADDIE has become the primary process used by instructional systems designers and training developers. I recommend that the PA46 training community structure training around these five phases which represent a dynamic, flexible guideline for building effective training and performance support tools.¹⁹

- *Analyze* the performance environment in order to understand it, and then describe the goals needed in order to correct any performance deficiencies (identify training requirements).
- *Design* a process to achieve your goals, that is, correct the performance deficiencies.
- *Develop* your initial discoveries and process them into a product that will assist the learners to become performers (in training, this product is often called an action plan or training plan).
- *Implement* by delivering the elements of the action plan to the learners.
- *Evaluate* the performers, action plan, and audit-trail throughout the four phases and in the working environment to ensure it is achieving the desired results.

When applied to the PA46 training environment, this model will:

- Properly evaluate each owner-pilot prior to the start of training; a pre-training assessment tool.
- Provide the methodology for a custom training plan for each pilot; a focused training course outline.

¹⁷ Philip M. Myers, Brent Watson, Molly Watson. "Effective training programs using instructional systems design and e-learning". Retrieved January 11, 2009 from

<http://www3.interscience.wiley.com/journal/117863239/abstract?CRETRY=1&SRETRY=0>

¹⁸ Clark, Donald, Retrieved January 11, 2009 from <http://www.nwlink.com/~donclark/hrd/sat.html>

¹⁹ The ADDIE Model of instructional systems design (ISD) theory. Retrieved January 11, 2009 from http://en.wikipedia.org/wiki/ADDIE_Model

- Allow for skill building iteration of proper procedures through timely and effective application of the proper learning tools; drawing on Standard Operating Procedures, eLearning content, video demonstration and review, scenario based training, cockpit procedures training, and standardization flights.
- Provide for an accurate, consensus-based evaluation and a custom follow-up plan which will ensure continued improvement through the use of validated post-training assessment tools.

Effective PA46 training can then be conducted in these five phases by qualified instructors with significant make/model experience and careful supervision from a Senior Certified Flight Instructor (Senior CFI).

Phase I – Pilot Assessment – A Senior Certified Flight Instructor uses a validated diagnostic tool (a pilot assessment survey completed by the owner-pilot) to evaluate the owner-pilot's background, experience and training needs. The Senior CFI scores the survey using a validated proprietary formula. A reliable and realistic estimate of training requirements is produced. Concurrence from the owner-pilot leads to Phase II.

Phase II – Training Plan Design – The Senior CFI designs a custom training plan for the owner-pilot, and with the owner-pilot's concurrence, forwards it to the designated insurance broker for inclusion in the insurance RFQ. This will give the underwriter an opportunity to provide more competitive quotes and clear up any doubts about what training will be provided.

Phase III - Development - The training plan design will be used to populate the training course outline on a realistic time line with consideration for the individual pilot's needs. At a minimum it will include:

- Aircraft systems presentations
- Expanded walk-around and aircraft familiarization
- Cockpit procedures training (CPT) (aircraft-based)
- Pitch/Power/Configuration (PPC) familiarization drills (VFR and IFR)
- Remedial instrument training (aircraft or FTD based as needed)
- Scenario Based Training (SBT), including abnormal and emergency operations (aircraft-based)
- Line Oriented Flight Training (LOFT) (aircraft-based)
- Initial Operating Experience (IOE) (aircraft-based as needed)

- Supervised solo (aircraft-based as needed)

In order to provide the specificity required for efficient learning, the primary methodology is aircraft-based training, however, FTD sessions may also be used as appropriate.

Phase IV – Integrated Ground and Flight Training – Performance based, modular blocks of training are presented in a specific sequence in accordance with the pre-approved custom training plan. The correct information is provided in a logical, evenly paced manner by a qualified instructor with emphasis on correct and consistent standard procedure. Benchmarks are noted, and the owner-pilot is aware of his or her progress through the use of briefings and debriefings around each block of instruction.

Phase V – Evaluation, Remediation, Certification and Follow-up – Each pilot receives a summary evaluation of his or her performance with respect to FAA standards mandated in the approved training plan. A final diagnostic tool is used to verify that the owner operator has a realistic self-image with respect to pilot skills and has set the appropriate personal limits. Remedial training, if needed, is agreed upon and completed prior to certification. A follow-up plan is derived which may involve supervised solo and/or additional blocks of instruction over a prescribed period of time. This is often done to accommodate low survey score, weather (or lack thereof) during the training cycle, or as follow-up to supervised solo. An interval of two to five months is agreed upon and set for re-contact in order to plan and schedule the next training session.

In order to accomplish this, the PA46 training community should recruit, prepare and provide training cadre with the following qualifications & performance capabilities, as needed to meet the demand for training:

PA46 Certified Flight Instructor (CFI):

Note: This level of certification is authorized to provide Phase IV and V of PA46 recurrent training only under the supervision of a Senior CFI.

- CFI-I SEL rated and current
- 2000 PIC total time
- 1000 PIC hours airplane, single engine land
- 500 hours flight instruction given
- 200 PIC hours in the pressurized flight environment or have completed the USAF physiology training
- 250 hours PIC PA46 make and model

- 25 hours PIC in PA46 aircraft in the last 12 months or have completed a PA46 Instructor Development Course (IDC) within the last 6 months
- Use an FAA Industry Training Standards (FITS) approved training syllabus via license with direct supervision from a Senior CFI
- Use validated diagnostics for pre and post training analysis and verification via license with direct supervision from a Senior CFI
- Complete an industry provided PA46 Instructor Development Course each 12 months from the syllabus and diagnostic tool licensor.
- Complete PA46 initial or recurrent training with a PA46 Senior CFI each 12 month period (PA46 piston and PA46 turbine programs may be given in alternate years).
- Maintain a minimum of \$1M flight instructor liability insurance applicable to PA46

PA46 Senior Certified Flight Instructor (Senior CFI):

- ATP; CFI-I SEL rated and current or Commercial SEL and hold at least 1 type rating
- 3000 PIC total time
- 2000 PIC hours airplane single engine land
- 1000 PIC hours in the pressurized flight environment; or 500 PIC hours in the pressurized flight environment and have completed USAF physiology training.
- 1000 hours flight instruction given
- 1000 hours PIC PA46 make and model
- 150 hours PIC in PA46 aircraft in the last 12 months or PA46 Instructor Development Course (IDC) within the last 12 months
- Maintain and use an FAA Industry Training Standards (FITS) approved training syllabus via original certification or license
- Maintain and use validated diagnostics for pre and post training analysis and verification via original certification or license
- Complete an industry provided PA46 Instructor Development Course each 24 months from the syllabus and diagnostic tool licensor or remain Master Certified Flight Instructor current through a nationally recognized organization
- Complete PA46 initial or recurrent training with a PA46 CFI or Senior CFI each 12 month period (PA46 piston and PA46 turbine programs may be given in alternate years)
- Maintain a minimum of \$1M flight instructor liability insurance applicable to PA46

PA46 Course Director:

- ATP, CFI-I SEL rated and current or Commercial SEL and hold at least 1 type rating
- 5000 PIC total time
- 3000 hours flight instruction given
- 2000 PIC hours Airplane Single engine land
- 2000 PIC hours in the pressurized flight environment and have completed USAF physiology training or its equivalent
- 2000 hours PIC PA46 Make and Model
- Have served as a PA46 Senior CFI for a minimum of three years
- Provide Course Development and Instructor Development Training Programs to qualified industry members under license
- Provide approved syllabi and diagnostic tools to Senior CFIs under license

You can help improve the safety of the PA46 aircraft. Call 410-435-3333 or send an email to mail@rwrpilottraining.com to find out how.

Additional information is available at www.rwrpilottraining.com

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