

## Introduction

If your instrument training was as haphazard and unstructured as that of most general aviation pilots, then this book may cause a profound change in the way you fly instruments. What I am going to advocate is that you develop a set of personal SOP's, Standard Operating Practices. This involves four key elements:

First, you need to find standardized power settings, pitch attitudes, and configurations (gear and flap positions) for every phase of flight, and then use these habitually in your flying. How large a power increase is needed to arrest your descent at the minimum descent altitude (MDA)? What is your target pitch attitude on a missed approach or ILS? Learning the answers to these and a handful of related questions will give you a *preconceived idea* of how you are going to manage the power, attitude, and configuration at any point in a flight. There will be no more "hunt and peck," no more making it up as you go along. Pilots who fly this way are often said to fly "by the numbers." Once you see the simplicity and precision this brings to your instrument flying, you will wonder how you ever managed before.

Second, reorganize your checklists and flows. Decide which lists you are going to read and which you are going to do from memory. Decide when during the trip you are going to accomplish each list, and then get regimented in your use of these lists.

Third, develop a set of "callouts" for critical moments in the flight. A simple spoken phrase, like "four thousand for five thousand," can do a world of good, even if you are the only person who hears it. Speaking and hearing a critical phrase, as opposed to simply thinking it, can somehow bring you more firmly into the moment. When you have heard yourself make a callout, it is as if you've put an extra Postit© on your mental bulletin board.

Finally, start briefing yourself (and anyone else who is sitting up front) prior to all departures and arrivals. Briefings are a chance for the pilot to visualize and rehearse the likely sequence of upcoming events, somewhat like an athlete visualizing a sequence of complex actions prior to performing them. When you fly with a crew, the briefing helps ensure that everybody in the cockpit is on the same page, so to speak. "...we'll climb straight out to two thousand, then a climbing turn to six thousand direct FOT..." If you fly as a single pilot, there is no need to coordinate what you are doing with anyone else in the cockpit, but the brief has a way of getting you to look ahead and prepare for critical upcoming issues.

When you combine these four elements, you will have developed your personal SOP's. This is how well-trained aviators operate. But it is not, unfortunately, the way most general aviation pilots have been taught to fly.

One of the innovations of this book is the constant coaching on the creation and use of personal SOP's. As I mentioned, if you take this to heart, it is likely to change the way you fly. But this book is about a great deal more than the development of SOP's. The book is primarily a wholesale review and analysis of IFR operations with special emphasis on the integration of GPS into modern IFR. This is long overdue. Tens of thousands of general aviation IFR pilots are now using GPS. Most of these pilots took their last groundschool or IFR written exam years before the advent of GPS and have never really studied the system. Instructors see the effects of this lack of training all the time. Many pilots have only a perfunctory knowledge of how the GPS systems works, and how it sometimes fails to work. Many pilots comprehend only a small fraction of the capabilities of their specific GPS units. Even more commonly seen are failures to understand the new regulations that govern GPS use and the newly formatted charts that have evolved with the GPS approaches. There are a great many subtleties here, and it is time for serious instrument pilots to roll up their sleeves and get to work bringing themselves up to date. I am confident this book can help.

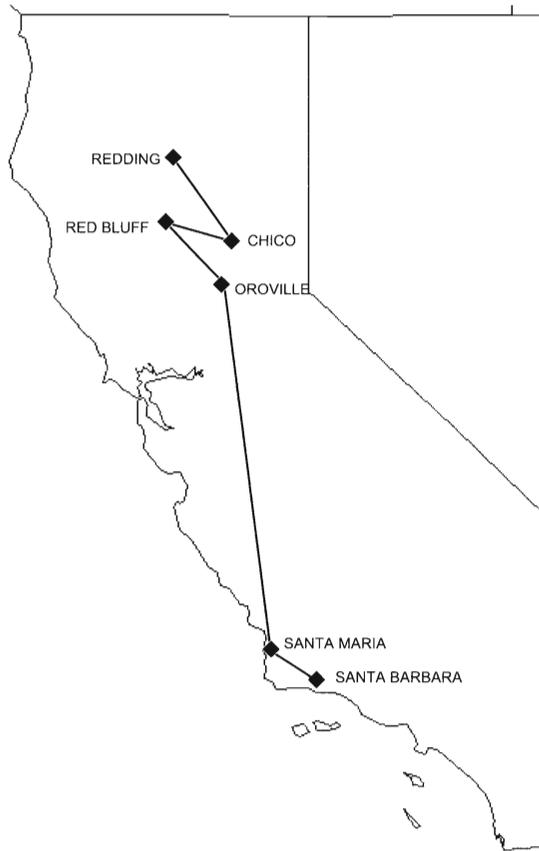
The "plot vehicle" that I use as I weave all this together is an imaginary training flight. I am going to bring you along on my ultimate all-day instrument lesson. We will work at developing the SOP's and at bringing you up to speed on a number of other critical IFR issues, including GPS.

Here's my idea of how the perfect IFR training day would go: You and your instructor decide that you are going to fly your Baron from Abbeville to Zion and shoot a variety of approaches along the way. Before you leave, you take the Baron on a practice flight and learn its "numbers." In an hour of test flying you learn what the pitch attitude should be as you descend on the ILS. You learn how much power to add as you level off at the MDA. You take notes on these and a dozen other useful flying characteristics of your airplane, then you land for a debrief and a break. Your instructor says that using these rehearsed power settings and pitch attitudes will greatly simplify your flying, and you resolve to give it a try.

After the break, you go out to the airplane with the pilot's operating handbook and a blank tablet. You read through the checklists, cutting and pasting at will, adding checklist items for new equipment, deleting items that don't matter any more. You reorganize the items on the lists so they flow logically across your panel. You decide which lists should be read and which memorized. You discuss when during the flight each list will be accomplished. Your instructor breaks out his laptop, types up the lists, and laminates them for you.

Then you go inside and take out the charts, both visual and instrument.

You review the instrument departure and approach procedures for the airports along the way and create a flightplan. In the process of going over the charts, a lot of questions come up. When do you use the textual departure procedure that is printed like a footnote on the airport chart in the Jeppesen book or in section C of the NACO U. S. Terminal Procedures book? What is the meaning of the note at the top of the approach plate saying “RNP-0.3 required”? Your instructor finds all of the relevant sections in the AIM, the FAR’s, the Advisory Circulars, the Jeppesen chart bulletins, the Controller’s Handbook, and even the FAA’s approach design criteria manual called the “TERPS” (Terminal Instrument Procedures). A blackboard is wheeled in. Diagrams are drawn. Issues are reviewed in detail and applied as needed to the upcoming flight.



**Figure 1.** Our trip.

Many hours later you find yourself in the runup area. Checklists have been reorganized. SOP’s have been debated and determined. Approach briefings and callouts have been rehearsed. The airspace has been cleared of all other aircraft within 100 nm. You are finally ready to depart.

After takeoff ATC gives you an instruction that you don’t fully understand. You turn to your instructor and declare a time out. Everything stops. A blackboard appears. The AIM flips open to the relevant section. When everything makes sense, you carry on. And so it goes through a half dozen departures and approaches.

Have you ever had a dual session like that? Me either, but it is what we all need.

We are going to fly from Santa Barbara to Redding, California, and along the way we are going to do a half dozen approaches. (The big picture is shown in Figure 1.) Prior to the trip, we will establish our checklists, flows, and callouts, and we will do a brief test flight to set up our numbers. Our object will

be to weave all of these into a coherent, structured technique for coping with the extraordinary demands of single pilot IFR. During the trip, various issues will arise naturally, and when some issue seems to be worth exploring, we will declare a time out and dig into it. We might, for example, do a DME arc at the start of an approach. Is there some science to picking the proper lead distance for the turn onto the arc? Time out, let's look into it. We will do a GPS approach. There is a lot that is new regarding GPS. Time out. What's the meaning of the Terminal Arrival Area, TAA? Or maybe we are using a chart that lists an "LNAV/VNAV DA(H)." What's that? Time out. Or we get a clearance GPS-direct to our destination from an uncontrolled departure airport. What sort of routing should you follow right after takeoff? It's a complex subject, and it is not very well understood in the general aviation pilot community. Time out, let's look into it. We will look hard at the charts. And we'll pore over the most critical IFR regs.

In a sense, this book is a write-up of a general aviation LOFT flight—but a special LOFT, where we are permitted extended "time outs" for blackboard discussions. The airlines and some fractional jet operators have successfully used LOFT training for years. LOFT stands for Line Oriented Flight Training. It is one of the last steps before the crew member is released for revenue operations. A LOFT flight, whether it is in an airplane or a simulator, is paced like a real trip. You and the instructor-pilot get the weather, go over the route, do a preflight, get a clearance, set up the radios, run the checklists, do the briefings, fly the departure, spend time at altitude en route, get the ATIS, review the approach, fly the procedure, and land. Unlike a great many instrument dual sessions, the LOFT flight is not a rapid-fire series of approaches and missed approaches, it is more like a normal trip. It is a chance to see how SOP's are put into practice.

But why should I write a book? Why not just do all this in a real airplane one student at a time? In a sense, this book is a result of the frustrations involved in trying to do that properly. Every little issue that comes up in flight seems to require a twenty minute discussion, and the little issues pop up every thirty seconds. Everyone knows that airplanes make awful classrooms. There is far too much going on in the airplane. How many times have you gone through a scene like the following? Instructor: "As I was saying, you've got to be thinking of the wind..." ATC: "Baron 78PS, you've got eastbound traffic at 3000 feet, 2 o'clock and two miles. When you get him in sight I can give you lower." Student: "You see him?" Instructor: "No, tell him we're looking and we'd like the published miss." Student: "Approach, no joy on the traffic and could we get the published miss after this approach?" ATC: "Standby." Instructor, trying to spot the traffic while drawing a holding pattern on his clipboard as the airplane bounces around: "Look, the reason you didn't get established inbound on the last

hold is because the wind was from here and..." ATC: "Baron 78PS, I've got a revision to your routing..." And so on. It's amazing that we learn anything from sessions like that.

You might think that simulator training would solve this problem, and in principle it could. No doubt there are planets out there where well-rested, bright-eyed pilots report every morning to the sim academy, where they attend relaxed and fruitful sim sessions and brilliant lectures. Where they can interrupt a sim flight with a question that prompts the instructor to bring in a blackboard and spend the rest of the morning explaining little gems that bring enlightenment to all involved. But here on Earth that's not the way it really works. What you find instead is that six weeks of classroom and simulator training are crammed into a three week class. This is forced by economics. You don't want to pay twice the current thousand-dollar-per-day price, do you? Neither does your employer. You go into total information overload from the moment you pin on your name tag. The list of things to memorize seems endless—limitations, emergency checklists, systems, annunciator panel indications, profiles, avionics, and on and on. The simulators are scarce and expensive. Time in the sim is carefully parceled out. You are one of the lucky ones if your sim session isn't midnight to 4 AM. And there are a lot of boxes under your name that need to be checked off before Friday. You're falling behind. You don't dare ask for a time-out to clarify some issue. The seat in the sim was warm and a little damp when you sat down. The next two pilots are already standing by the gantry. Besides, you are too exhausted from spending the last ninety minutes being put through six lifetimes of aviation horrors. You just want to go back to the hotel for a bad meal, some high-octane cramming, and a few fitful hours of sleep.

It should go without saying that simulators are invaluable in that they can give you synthetic experience with a range of problems that no sane pilot would ever intentionally duplicate in a real airplane. Uncommanded thrust reverser deployment at rotation comes to mind, but that is not the point. The point is that for economic reasons the pace of real world simulator training is very high, maybe high enough to be counterproductive. The standard joke is that you show up on Monday morning and the staff inserts a firehose in each ear. At 8 AM they open both valves and from that moment on you hang on for dear life. During the breaks, you run into people from other classes and you can guess how long they've been there by the degree of vacancy and suppressed panic in their stares.

There's got to be a better way. Maybe it's instrument dual in remote regions, far from other airplanes and busy ATC. Maybe it's doubly expensive, slowed-down sim training. Maybe it's CD's or DVD's or videotapes. Personally, I like books, or books in conjunction with simulators and airplanes.

A book, old tech as it is, can be an eminently patient and reliable instructor. Unlike a CD or an airplane, it won't crash. Unlike a videotape, you

can easily jump from one topic to another. Unlike a human instructor, it is happy to say the same thing over and over, and it doesn't take offense if you put it aside in the middle of a sentence and take a nap. And you don't need to make an appointment before you pick it up again. You can read it slowly, you can skip what isn't interesting, you can follow the references to other books for more detail. It's three days of re-usable dual in a one pound package.

The trip we are going to take is "real" in that I've done all the bits and pieces of it dozens of times over the years, but thanks to the folks at ELITE Simulation Solutions I have been able to illustrate the trip with numerous screen shots of the panel from their marvelous Baron computer simulator. In that sense, the trip is synthetic, a flight of fantasy. But that is how it has to be. How else could we freeze an approach at the outer marker and spend twenty minutes discussing often-neglected items in the minimums table?

When you've finished this book, I hope you will be well on your way to "the next level" with your instrument flying. For those of you new to flying "by the numbers," I can guarantee that if you translate the relentless repetition of numbers flying found in these pages to your flying, you will find yourself at the next level of instrument competence. For others, the checklist discipline and callout techniques will be new and, hopefully, helpful. Most instrument pilots can benefit from being brought up to date on GPS issues, which run consistently through the book. And everyone can benefit from periodic update of the regs and charts, which you will find here.

I've subtitled this book "A Structured Approach," and try as I might, I can't come up with a better phrase to encapsulate my overriding theme. When you weave the checklists, flows, callouts, briefings and numbers together, you will have developed your own personal SOP's. For many of you, this will constitute an A to Z revamping of your method for managing an IFR flight. Your flying will be much less haphazard, and much more regimented, structured, and above all, safe. This is how professional pilots operate. Is it any wonder that their safety record is far superior to that of the more casual pilot?

---

Many people have contributed to this project. First, I must thank the wonderful folks at ELITE, especially Fred Zanegood. I have spent many productive hours giving instrument instruction on the ELITE computer simulator, and I can't help feeling that it comes very close to being the ultimate instrument training aid. The panel used in the book is a photo-realistic duplicate of the post-1984 Beech 58 Baron, and the power settings, pitch attitudes, and performance are a close match to the real airplane. The ELITE sim has most of the advantages of the large, Level D simulators, but it is so economical you never think twice about freezing the action to analyze some aspect of the current situation. The

FAA has now approved the ELITE, and a few other PCATD's (Personal Computer-based Aviation Training Devices), for up to 10 hours of dual instruction toward the instrument rating, and hopefully we will some day see approval for maintaining instrument competency. (Reference the FAA's Advisory Circular 61-126 for the details.)

Thanks also to Jeppesen Sanderson for their kind permission to reproduce some of their charts. Special thanks to Georgia Wolf at Jeppesen for handling the file transfer. James Grant at the FAA's National Aeronautical Charting Office was also very helpful. Garmin was kind enough to allow reproduction of screen shots of their wonderful 430/530. Thanks to Bill Stone, Avionics Product Manager at Garmin. Thanks to Tim Travis at Raytheon for providing the beautiful cover photo.

Numerous flight instructor friends have been good enough to offer comments on early drafts. Thanks to Judy Cadmus, Randy Bailey, Henry Roberson, Walter Atkinson, John Deakin, and Ron Zasadzinski. Finally, thanks to Maria Reyes for help in the copy editing and to Kathy Brown and Lori Briegel for their work on production.