ON DEALING WITH SYSTEMS

BY

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I am soon to conduct a workshop on flying multiengine airplanes. The folks who come to hear my words of wisdom are probably going to be there to hear a lot of stuff about emergency procedures. When all engines are running, multiengine airplanes fly pretty much like single-engine machines.

But I'm afraid that my poor audience is going to have to sit through a few introductory minutes of chatter about the privileges and limitations of the rating, along with a few examples illustrating the diversity of systems found in various types of multiengine aircraft.

My point is going to be that the multiengine rating is a *class* rating, not a *type* rating. In some ways the practical test resembles an examination of the applicant's knowledge of the specific type in which he is being tested. When I used to conduct these tests, I'd try to stress the importance of learning the complexities of the wide variety of types the rating allows one to operate.

The folks attending my session will mostly be flying the Piper Seminole, a twin-engine version of the Cherokee Arrow that many of them might already have flown. The Seminole

is superbly engineered for simplicity and ease of operation. The fuel system is a good example. Each engine is normally fed by one fuel tank that resides in the engine nacelle behind that engine. The right tank feeds the right engine and the left tank feeds the left one. All you have to do is put both fuel selectors to the "on" position, and you're in business. The only other two options available are the "off" and the "crossfeed" positions. When an engine's selector is set to "crossfeed," it simply pulls fuel out of the tank on the opposite side. If you have to shut down one of your engines, you turn its fuel selector to the "off position. That's it. That's the sum and substance of what you have to know about a Seminole's fuel system. Oh yeah. You're not to select "crossfeed" on both engines at the same time. I don't know why, and I don't care. I don't know why anyone would want to do that.

A Seneca has the same setup, except that there is a small mouse trap awaiting the hapless Seneca pilot who does not do his homework. It seems that some models of the Seneca have pumps that draw fuel at a constant rate. Each engine uses whatever it needs, and returns the unused portion to the tank on its own side. Under normal circumstances, this poses no problem, since fuel is coming out of the same tank to which the unused portion is being returned.

The problem comes if you want to crossfeed. Setting the fuel selector for either engine to that position draws fuel from the opposite side, but after it is through using what it needs, it

returns the unused portion to the tank on its own side, not to the tank from which the fuel is being drawn. So if you start crossfeeding the left engine, for example, and the left tanks are full, the vapor return, as it is called, is shunted into a full tank, and the excess fuel is blown overboard, out the breather. In other words, you lose the fuel the engine didn't burn.

A Cessna 310 has the same problem with vapor return if aux tanks are selected before enough room has been created in the main tanks to accommodate the extra fuel. As I recall, the main tanks, on the wingtips, hold 60 gallons and the aux tanks, in the wings, just outboard of the engine nacelles, contain 15 gallons each. The book says to burn at least an hour's worth of fuel out of a main tank before selecting the aux tank.

To add to the merriment, the auxiliary fuel pumps are located in the tip tanks. If the engine-driven fuel pump goes out, the aux pump can keep fuel flowing to the engine on its own side, but it cannot deliver fuel from the aux tank or from either gas tank on the opposite side. In other words, if you're counting on any gas contained in any tank except for the main tank on the same side as the engine you're operating with that gas, you're going to get a rude surprise when you run that tank dry.

In a Twin Comanche, when you select "crossfeed" on either side, the opposite fuel selector becomes the one that controls which tank feeds the crossfeeding engine. In a Seneca, if you lost your left engine and decided to lighten up that side by crossfeeding the right engine from the left tanks, you'd normally

set the right engine's selector to "crossfeed," and the dead left engine's selector to "off." If you did that in a Twin Comanche, the "good" engine would quit, and you'd find yourself flying a twin-engine glider. I don't think they have a class rating for that.

In some of the older models, there are tanks in the fuselage, and it's important to drain fuel out of the rear ones first, so as not to move the center of gravity too far aft. You would be well advised, as well, to do two weight-and-balance calculations prior to flight, one with your beginning fuel and another one with the fuel you intend to have on landing. I got my original multiengine rating in a Beech D-18S that had a fuel tank in the nose that always had to be full, in order to get the center of gravity within limits. That gas could technically be used to satisfy the requirement for reserve fuel, but we never planned a flight that would use that fuel, for fear of having a tail-heavy condition at the end of the flight.

You don't learn those kinds of things flying a Seminole.

The electrical systems of airplanes are also many and varied. On the Twin Comanche, there were generators on both engines, but you were only supposed to use one of them. If that one went out, there was a shielded toggle switch on the panel that would switch you over to the generator on the other side, which was essentially a standby unit. In the Cessna 337 there was a little magic button hidden underneath the side panel that would activate the field on an alternator, using a trickle charge

from a dry cell battery located in one of the tail booms, should you find yourself with a discharged main battery. You might get the engines going with a jump start, but you'd never get the alternators to put out, if you didn't know about that little button.

In the Seneca, both alternators jointly and severally served the electrical needs of the airplane. If one of them went out, an annunciator light would come on, and the entire load would automatically be picked up by the operating unit. There were two little load meters lurking somewhere around the panel where they were not very noticeable. When you lost an alternator, one of these meters would register zero and the other one would go up a little bit. But there was only one annunciator to indicate that all was not right in electron land.

I had some friends who were almost brought to grief by this system, one foggy night. Coming out of Memphis, they lost an alternator and the annunciator light came on. They thought they had a perfectly good 60 amp alternator on the other side, so they kept on truckin'. Imagine their surprise when the lights started to go dim, the transponder quit putting out, and the controllers told them that their radios were getting very weak.

With the last few microcoulombs of charge in the battery, they declared an emergency and told ATC they were heading south-east, where the weather briefer had promised clearer conditions. Soon they were on vacuum instruments, with one guy flying and the other one holding a flashlight on the panel so that he could see what he was doing. It was fortunate for these

two pilots that they had a flashlight with good batteries, and that there was an extra pair of hands available to hold the light.

And did I mention that there are almost as many procedures for emergency gear extension as there are types of retractable-gear aircraft? You'd better break out the book and make sure you understand how to do that, before you go charging off into the wild blue yonder with your new multiengine class rating in something other than a Seminole. Interested parties may wish to review my essay entitled *A Bird in the Hand*, which is an account of a couple of pilots with one engine and two alternators inop, along with a dead battery, trying to figure out how much trouble they were going to be in when it came time to extend the gear.

Most people who attain a multiengine class rating never use it very much. It's expensive to operate a multiengine airplane, and very few are for rent. Also, there is no requirement in the regulations for recurrent training in light twins. A rated pilot who has not been at the controls of a twin for the last ten years can pass a biennial flight review in a glider (if he is so rated), go out and shoot three touch-and-goes in a twin, and then carry passengers anywhere he pleases in any multiengine airplane that doesn't require a type rating.

This is one area in which the insurance industry is probably providing more safety to the flying public than are the FARs, by requiring more stringent recency of experience from pilots covered by their policies. Don't get me started.

So. It's a very good idea, before committing aviation in a new twin type, to get some type-specific training from an instructor familiar with the type, with special emphasis on systems and on emergency operation of those systems. This is definitely one of those times when a *little* learning is a dangerous thing.