Total Recall

Photo courtesy of Avidyne.

How Flight Data Monitoring Can Help Improve Your Skills

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What separates the very good from the truly great is recall.

This concept might initially strike you as an odd idea. You might think; isn't talent a factor in distinguishing the good from the great? Talent certainly plays a role, but greatness demands more. It demands a sort of "extra capacity" that can only be described as recall.

Nowhere is this concept clearer than in Formula One (F1) racing. An average driver might be able to tell you what his or her car was doing and how it felt overall on a particular circuit. A good driver might be able to tell you how it reacted in particular corners on that circuit. But the great F1 drivers can tell you about virtually any point on that circuit: what gear they were in, what the speed was on corner entry, what the water temperature was, what the differential setting was, and much more. In a world where hundredths or even thousandths of a second can mean the difference between first and tenth, the devil is truly in the details. Vivid and detailed recall thus allows the racing team and driver to better set up the car for a circuit.

FDM data allows both you and the computer to monitor information in real time and review it more carefully after the fact.

So what does this mean for pilots?

One of the benefits of so-called glass cockpit avionics is that a tremendous amount of the information we generate — and need for our "total recall" flight management efforts — can be digitally captured and recorded. While we aren't generally transmitting this information from the aircraft "on the fly" like F1 drivers do on a race course, Flight Data Monitoring (FDM) systems do make it infinitely easier to collect.

In the days of nothing-but-analog instruments, information was passed from a sensor such as a tachometer or a pitot tube, to a gauge. In most cases, these gauges provide the instantaneous state of whatever it is measuring. The "instantaneous" nature of the data isn't as important as the trend, so that's why it's important to continuously monitor systems. That's also where digital records are handy: the digital record allows both you and the computer to monitor information in real time and review it more carefully after the fact.

The FDM dataset can include anything from a simple smartphone-generated flight track to a complete avionics record that provides everything from engine parameters to control surface deflections. Airlines have long used this kind of information in a program called Flight Operations Quality Assurance (FOQA). In essence, air carriers use the data collected in the Digital Flight Data Recorder (DFDR) or Quick Access Recorder (QAR) to review fleet-wide trends and develop system-wide mitigations for issues they've identified as possible incident/accident precursors, or practices that detract from operational efficiency.

GA aircraft don't use DFDR or QAR recorders, but many modern avionics systems can offer some-

thing pretty close for our purposes. This capability can be really useful both for piloting and for monitoring the health and well-being of your aircraft. Here's how.

To understand how "flight telemetry" can be useful in improving pilot skills, it's helpful to see how such information is used elsewhere — for example, in F1 racing. Through simulation, F1 teams come up with a "perfect" lap for any given circuit. Next, they compare the telemetry data to the simulation to see where and how they might be able to improve.

Pilots can adapt this technique by using online programs, apps, and tools that allow you to overlay your personal flight data on a sectional, instrument, or approach chart. This technique provides a clear picture of how precisely you flew the planned track, or how well you tracked the localizer and/or glideslope on an instrument approach. It also lets you see how well you did during the en route phased with such "mundane" (but important!) tasks as holding altitude or heading, following noise abatement procedures, proficiency work (e.g., stall recovery practice), or flying a proper traffic pattern. By comparing your actual performance with the ideal values depicted on the chart or flight plan, you can pinpoint specific areas for improvement in your practice sessions, both with and without an instructor.

Speaking of instructors, this kind of flight data information can be an excellent tool for instructors. The CFI can use FDM readouts to make debriefs more interactive and more accurate, as well as to identify areas for additional explanation, practice, or emphasis. And, finally, for those who benefit from a bit of friendly competition, FDM data can provide an indisputable basis for "best pattern" (or "best" whatever) bragging rights.

As noted, FDM can also provide extremely helpful data on the health and well-being of your aircraft. As with human health, early detection is key to avoiding big health problems down the road. When it comes to communicating about illness or potential illness, though, non-FDM-equipped aircraft are even less communicative than the typical household pet. Sure, they can give warning signs to the watchful pilot, but too often the troubleshooting process involves expensive guesswork. With FDM, though, you get tons of useful information. You can see what every parameter is doing, and see how it compares with other parameters throughout the flight. You can analyze the meaning of the various readings and trends, and plot key parameters in a time series over multiple flights or years. This kind of information can save you a lot of money, and it can give your AMT a head start on identifying and fixing the real issue. Less trial-and-error translates pretty quickly to lower shop bills.

Photo courtesy of Garmin

Glass cockpit displays like this make data collection and analysis far easier.

Our own in-house amateur-built aircraft expert, Aviation Safety Inspector Mark Giron, raves about the benefits of FDM for his own aircraft. "On my RV-6, I take data from my avionics and upload it into a free service on the web," Giron explains. "The service puts it into usable graphs that let me sort and plot the data in various ways. That lets me see how selected metrics react to each other."

By using FDM data to compare actual performance with ideal values depicted on the chart, you can pinpoint specific areas for improvement in your practice sessions.

Giron also has a ready example of how FDM helped with troubleshooting. "At one point, my engine was getting uneven cooling. I used the data to test some revised inlet designs that solved the problem. I wouldn't have known about the issue, much less have been able to fix it, without FDM."

Here's the bottom line: Information is a powerful tool. As one F1 team boss once said, "It is impossible to *not* learn something about your car by running it with telemetry." The same goes for aviation: FDM "telemetry" can help you identify ways to be a better pilot, and show you ways to improve the mechanical condition of your airplane. Use it!

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