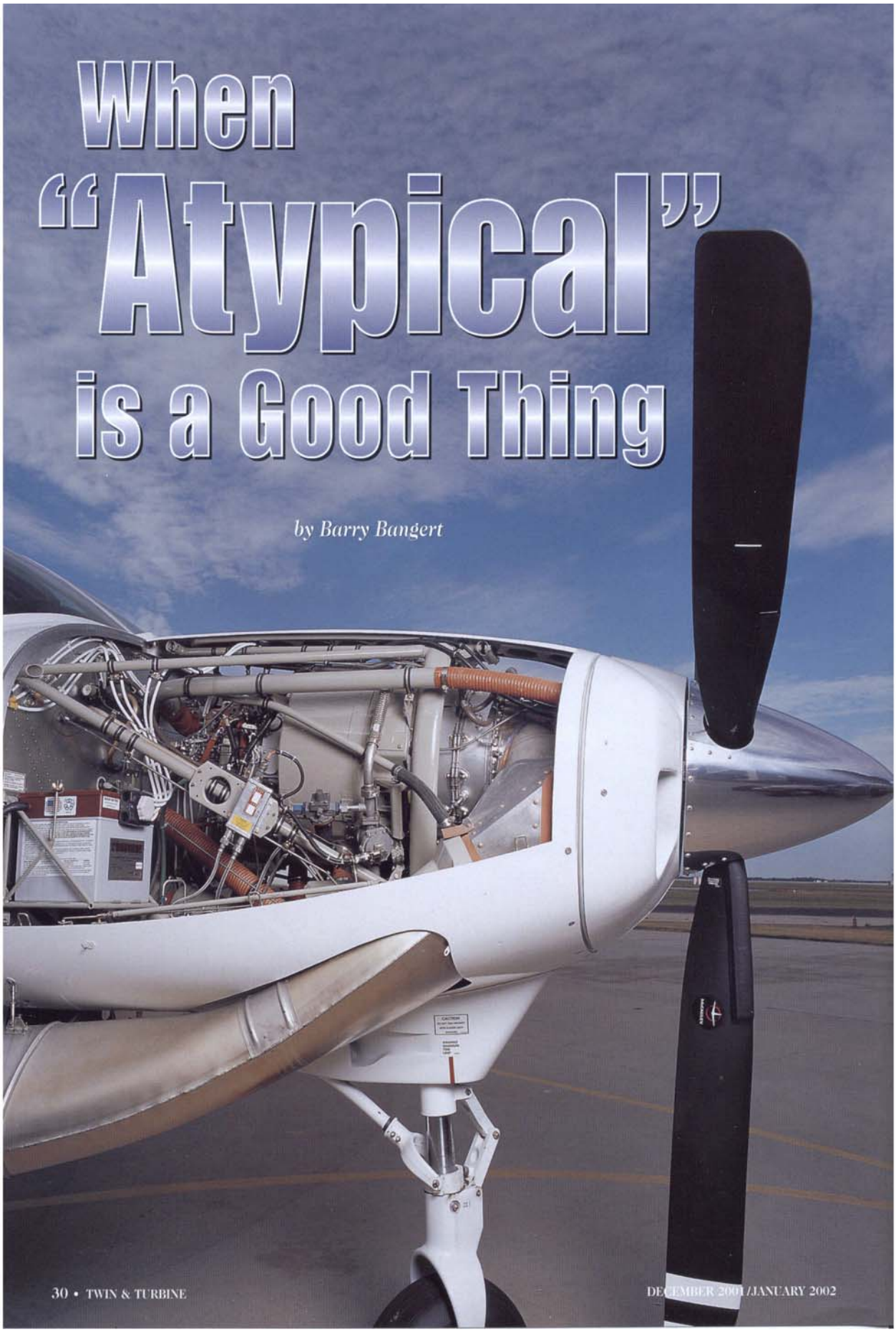
When "Atypical" is a Good Thing

by Barry Bangert



About ten years ago, some Pratt & Whitney PT6A-powered aircraft were selling for less than the cost of two engine overhauls. This was not good)r either airplane owners, or for engine overhaul hops. I remember one shop that claimed 79 engines were on customer hold while the owner tried to figure out what to do. Sometimes the owner would decide to ell the plane for salvage.

I thought about this for a time and came to some conclusions. It occurred to me that if an aircraft was crapped, no one would ever work on it again. No one would sell fuel for it again, no one would buy avionics)r it, no one would paint it, no one would repair the engines, and no pilot would be needed.

My conclusion was that if the owner could keep the engines on-wing longer, the airplane would follow long. I had some experience in the early 1970's with commuter airlines flying Beech 99's and 1\vin Otters with overhaul periods of 7,500 to 8,000 hours. It was I1teresting to me that the commuter airlines did not perform any special maintenance between overhauls; I1stead performance trend monitoring, compressor rashes, and fuel nozzle testing and cleaning were accomplished regularly.

As a result, I realized that the FAA could grant TBO extensions for the PT6A engines ... if I had some kind ,f a plan. I tracked down a respected friend and asked [he knew of anyone who could assist me. My friend recommended Ralph lIawkins, an engineer with a lot ,f PT6A experience.

Ralph is definitely not your typical engineer. He is n engine Designated Engineering Representative with 5 years of experience and quite a perfectionist. We talked about my idea and Ralph asked me to send him letter that outlined my plan. It took me awhile to put something down on paper and a few weeks to receive call from Ralph. He thought we may be on to something and promised a more detailed and complete document than my offering.

My letter to Ralph was two pages. Ralph's draft was '7 pages. I was impressed Ralph had generated detailed I1structions, including engine monitoring techniques, Preventative maintenance instructions, engine modules, engine inspections, and engine repair instructions. This was really cool! Ralph's document was to become the Maintenance On Reliable Engines (MORE) I1structions for continuing airworthiness.

With all the details now in writing, I called the FAA Headquarters in Washington D. C. to discuss the possibility of the agency approving our instructions for continued airworthiness. The FAA asked for a copy with a cover letter stating our intentions and desires.

Our customers are atypical,' most of them embraced our instructions because of the detailed information they gathered from their engines, permitting them to take a pro-active approach to maintaining a valuable asset, the PT6A engine.

A few weeks went by before I received a nice letter from FAA Headquarters stating they had decided to send our instructions for continuing airworthiness to the Engine and Propeller Directorate in the New ~~England Region with the explanation that a supplemental type certificate would be the required method for obtaining FAA approval.

FAA Directorate sent a letter explaining they had our package and were going over it. The next communication requested an STC application form; we complied. The STC process is pretty simple: the FAA looks at your proposal, asks some questions, listens to your answers, asks additional questions, and reviews your answers. This can go on for quite awhile. In our case it took eighteen months.

One afternoon my fax machine printed a letter from FAA and a copy of an STC that approved our instructions for continuing airworthiness. Ralph and I were happy, to say the least. Now we had to form a business to sell the STC to aircraft owners. We created Maintenance on Reliable Engines and called our new company MORE Company, Inc. We thought it was a swell name. Next we applied for a method patent from the U.S. patent office. While I was busy setting up the business, Ralph was worked on additional STC's for other PT6A models. We ended up with eight STC's covering the PT6A-6/C20 through the PT6A-45 engines.

Our customers are atypical; most of them embraced our instructions because of the detailed information they gathered from their engines, permitting them to take a pro-active approach to maintaining a valuable asset, the PT6A engine. They also liked the TBO extension from 3,500 hours to 8,000 hours.

The regimen contained in the MORE instructions for continuing airworthiness is atypical, as well. The method is an aggressive inspection system designed to find problems in an early stage, and to correct them promptly. Our monitoring methods are formulated to provide maintenance personnel with the information that indicates something in the engine is not normal.

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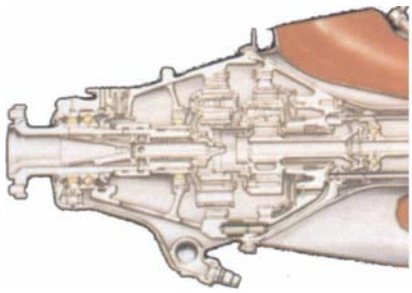
There are four main elements in the MORE STC's that provide redundancy and that allow on condition maintenance. We start with engine performance data. The engine's performance is continually compared to itself; anomalies can signal an engine problem. This information is supported with a continual series of visual inspections that confirm the mechanical condition of the engine. The engine oil and oil filter are continually analyzed for foreign materials in the engine's oil system. This monitors virtually every part of the engine that is in contact with oil. Vibration analysis backs up the oil analysis by measuring the engine's vibration on a continuous comparative basis. Each part that spins is identified and compared to a previous vibration analysis report to check for any differences that might indicate a problem.



• Our system looks for engine parameters that are not normal for the engine.

• Our system looks for mechanical conditions that are not normal for the engine.

• Our system looks for wear material in the oil that is not normal for the engine.

• Our system looks for vibration that is not normal for the engine.

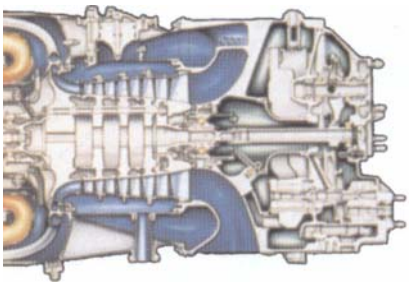
How do we know what is normal for the particular PT6A engine? All engines must undergo an initial entry procedure that identifies what is normal, and if the engine is not within acceptable limits, corrections must be accomplished to make it normal. This entry procedure establishes the baselines necessary for future comparisons as the engine continues in service. Pretty cool!

Is there a downside? Strict compliance with all our instructions is necessary. If you don't follow our instructions exactly, our method will not work.

MORE Company is proud of its FAA-approved STC's. We know that it is an option to safely extend the TBO of the PT6A engine while only costing about five to 10 percent of an engine overhaul.

Many of the maintenance personnel performing the work on engines utilizing the MORE STC must become "atypical." In addition to the mechanical skills they already possess, they must develop detective skills to properly interpret the data collected.

We have reports that some are so skilled at this activity that abnormal behavior of parts as



small as rough bearings in the fuel control can be detected using the vibration analyzer. Ralph Hawkins works with the owners and mechanics to assist with troubleshooting, data interpretation and maintenance requirements. This interaction helps the owners and maintenance personnel hone their analytical skills.

Here's what an aircraft owner who incorporates a MORE STC into his or her engines can expect:

The owner contacts MORE Company and purchases the right to use one of our STC's. An STC will be prepared for the particular "engine, each page will have the engine serial number on it, and the STC will have a revision number with a permission to use statement as required by law. MORE Company will forward all of this to the owner along with an oil analysis kit by overnight delivery.

The owner may notice that the gross weight of his wallet is reduced by a small amount as well. Upon receipt, the owner opens the box and finds the oil sample kit and a book. The book is opened and the owner begins to read. There are a lot of pages, but the whole book is read. This is good because there is going be a test on this book. The owner has the maintenance provider read the book also. This is good because there will be a test for them, too.

Now the airplane with its engine goes to a maintenance provider for the entry inspection. The maintenance provider must comply with all the procedures in the STC Part 3 initial entry inspection. Any defects discovered during this inspection that must be corrected are fixed. All of the necessary forms, records, charts, logbook entries, and an FAA Form 337 (Major repair and Alteration) must be completed. The Form 337 is sent to the local FAA office. A further decrease in the gross weight of the owner's wallet is noted.

Everything is good! Now it's time to use the aircraft, the owner is happy.

A few days go by, and the owner is contacted by the local FAA inspector who would like to schedule a meeting. It seems that the inspector noticed the Form 337 and has something called a Flight Standards Information Bulletin to discuss. A meeting is scheduled with the FAA inspector, the maintenance provider, and the owner. At the meeting the FAA inspector has some papers with him. The

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maintenance provider has the STC and airplane records, the owner has knowledge because the book was read and this is the test. The conversation goes something like this:

FAA Inspector: Sir: do you know that FAR 91.403 (a) says that the owner or operator of an aircraft is primarily responsible for maintaining that aircraft in an airworthy condition?

Owner: Of course I know that. It's in my STC manual under engine owner's management procedures. I read the book.

FAA Inspector: Good, now please tell me who is responsible for overall engine management. Per FAR 91.403 (a), (b), (c)?

Owner: I am primarily responsible as the owner but I have a pilot and my maintenance provider to assist me.

FAA Inspector: Swell, please tell me who is responsible for scheduling when maintenance is to be performed per FAR 91.401, 91.405, 91.407, 91.409, and 91.415?

Owner: No problem, I read the book. I am, but the STC allows me to choose inspection intervals of 100 hours, 150 hours, or 200 hours. I have selected the 200hour intervals because it coincides with my aircraft inspection interval. The STC has a scheduled inspection status sheet that we use to tell us when the next inspection is due. MORE Company provided us with a simple computer program that we use to print our status sheet. The STC has checklists and work packages for each inspection that we use for record keeping. We keep all the oil analysis reports, vibration analysis reports, and engine performance reports in the back of our book for reference. During the entry inspection we noticed that the engine's compressor was dirty, so we reduced the compressor wash interval to 50 hours and keep track of this using the unscheduled maintenance section of the inspection status sheet. I had my pilot review the MORE STC daily check, and he keeps track of the engine


PHOTO BY PAUL BOWEN

cycles by following the instructions in the STC.

FAA Inspector: Great. Now, can you tell me how you recognize an adverse trend in your engine?

Owner: I can do that. One of the benefits of using the STC is redundancy, a good example is that if an engine oil sample shows an unusual amount of metal in the oil, the STC requires a vibration analysis that can show any change in vibration caused by wear. If my pilot sees something he doesn't like on the engine gauges, we can compare previous engine performance with current reports to see if performance has deteriorated over time; then if necessary we can look in the engine with a borescope to find any defects. That's how it works.

FAA Inspector: That fills me with undiluted pleasure. But what will you do if you decide to sell your aircraft?

Owner: Easy. The STC includes forms for transfer of ownership of the plane, I give the new owner the records and he can continue to follow the MORE instructions for continuing airworthiness.

FAA Inspector: You are using the MORE instructions for continuing airworthiness program to maintain your engines and the aircraft manufacturers maintenance instructions for the aircraft. Is that correct?

Owner: That is precisely what I am doing.

FAA Inspector: It looks like you have your ducks in a row on this STC. But remember, from time to time I might drop by to look over your records and see how it's going, so keep up the good work.

Owner: Thanks. We will keep up our maintenance.

MORE Company is currently working on revisions to each of our STCs. These revisions are designed to make the STC's even more user-friendly for both the owners and the FAA.

It is important for owners to know that an option exists to the manufacturer's recommended engine overhaul periods. We think the owners should take a look at our STC option. Being "atypical" is sometimes okay! ~

Barry Bangert is *the founder and president of MORE Company.*
You can reach the company at (775) 782-3346.