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Flight Test Profiles

- **GAMI Lean Test**
- **In-Flight Lean Mag Check**

NOTE: Before conducting these flight test profiles, please program your digital engine monitor to utilize its fastest available sample rate - but no faster than 1 sample per second . This will provide the highest possible resolution in the data that is dumped from the engine monitor after the test flight. If you have a JPI EDM-series engine monitor, please follow the instructions at the end of this document for setting the sample rate.

GAMI Lean Test

The GAMI lean test is a test of mixture distribution, and is used to help diagnose incorrect fuel nozzles sizing, dirty/clogged fuel nozzles, etc. Its purpose is to measure the difference in fuel flow between where the leanest-running cylinder reaches peak EGT and where the richest-running cylinder reaches peak EGT. That difference (measured in gallons-per-hour) is called the "GAMI spread." In our experience, the GAMI spread must be under 1 GPH for the engine to operate smoothly when lean-of-peak (LOP). For fuel-injected engines, the goal should be to reduce the GAMI spread to 0.5 GPH or less for optimum LOP operation.

Perform the GAMI lean test procedure by setting up the airplane in normal cruise on autopilot. **IMPORTANT: Cruise power setting for this test should be 65% or less to avoid excessive CHTs and stress on the cylinder assemblies.** Then perform the following procedure.

- Start with a rich mixture of at least 100°F ROP.

- Retard the mixture control as slowly and steadily as you possibly can until you reach an LOP mixture that is lean enough to produce significantly rough engine operation. Try to do this slowly enough that it takes no less than 3-4 minutes to move from the rich mixture to the lean one. The slower and smoother you can move the mixture control, the better.

- Reverse the process, very slowly and steadily richening the mixture until you get back to about 100°F ROP. Again, try to do this slowly enough that it takes 3-4 minutes to do the sweep. If your engine monitor does <u>not</u> record fuel flows, then manual record the <u>exact</u> fuel flow value as each individual cylinder reaches peak EGT.

- Repeat this rich-to-lean-to-rich mixture sweep procedure several times. (This allows us to obtain an average of several sweeps, which provides more accurate information than one sweep alone.)

For twins, repeat this procedure on the other engine. Do each engine separately, do not try to do both simultaneously.

NOTE: If your engine monitor <u>does not</u> record fuel flow, you can manually calculate your GAMI spread by recording the <u>exact</u> fuel flow value as each individual cylinder reaches peak EGT. The fuel flow should be recorded to the nearest 0.1 GPH or 1 PPH from a digital fuel flow instrument if possible. The GAMI spread is the difference between the highest and lowest of these fuel flow values. (If your engine monitor <u>does</u> record fuel flow, then such manual recording is unnecessary.)

In-Flight Lean Mag Check

The in-flight lean mag check is a test of ignition system performance, and is used to help diagnose problems with magnetos, ignition harnesses, spark plugs, ignition timing, etc.

Perform the in-flight lean mag check procedure by setting up the airplane in normal cruise on autopilot. Then perform the following procedure.

- Lean to an aggressively lean cruise mixture. The leaner, the better for this test. The test will be much more discriminating and meaningful if you lean to a lean-of-peak-EGT (LOP) mixture setting. Preferably lean as far LOP as you can without experiencing significant engine roughness.

- For a key or rotary style magneto switch (as found in most singles), select BOTH-LEFT-BOTH-RIGHT-BOTH, leaving the mag switch in each of these positions for <u>at least 10 engine monitor sample times</u>. (If your sample interval is 6 seconds, that will be a full minute; if your sample interval is 1 second, then 10 seconds should suffice.)

- For individual magneto toggle switches (as found in most twins), turn off the LEFT ENGINE/LEFT MAGNETO switch for <u>at least 10 engine monitor sample times</u>, then turn it back on and wait for <u>at least 10 engine monitor sample times</u>. (If your sample interval is 6 seconds, that will be a full minute; if your sample interval is 1 second, then 10 seconds should suffice.) Repeat this procedure with each of the other three magneto switches in sequence. (LE/LM, LE/RM, RE/LM, RE/RM.)

NOTE: It is normal for engines to run a bit rougher on one magneto than they do on two, but they should not run change-of-underwear rough. Please report on the level of perceived roughness during phase of the test.

NOTE: For turbocharged engines, TIT may rise to above red-line during single-magneto operation. This is normal and will not do any harm if the exceedences do not exceed a few minutes' duration.

After The Test Flight

When you have completed the test flight, please dump your engine monitor data and upload the data to Savvy's engine monitor data analysis server. If you don't know how to dump your engine monitor data, please refer to the document "How to download engine monitor data" at **http://savvyanalysis.com/how-to-download** that provides detailed procedures for dumping the data and uploading it to Savvy's server.

NOTE: If you are a SavvyMx managed maintenance client or a SavvyQA maintenance consulting client, please upload your data by clicking on the "Upload Engine Data" button in the header of a Savvy ticket. If you are a SavvyAnalysis or SavvyAnalysis Pro client, please upload your data by logging into the SavvyAnalysis.com website and clicking on "UPLOAD NEW."

IMPORTANT: Please do not send engine monitor data files or spreadsheets or manually-recorded data to our analysts. We cannot analyze your engine monitor data unless and until you upload the data to our server as described above.

Appendix

Instructions for setting JPI EDM-series monitor sample rate

(If you do not have a JPI EDM-series digital engine monitor, skip this section.)

- Hold the STEP and LF buttons simultaneously for five seconds to put the EDM into programming mode.

- Tap STEP repeatedly until the display shows "DUMP? NO"

- Hold the STEP and LF buttons simultaneously for five seconds to access long-term memory.

- You should see "TIME n" denoting the current sampling rate of the instrument. "TIME 6" means that the instrument is set to its default 6-second sampling rate.

- Tap or hold LF until the display reads "TIME 2" indicating that the sampling rate is 2 seconds (which is the highest rate supported by the EDM).

- Tap STEP to sequence through the rest of long-term memory. While doing this, you may want to check and possibly set the time clock (month, day, year, hour and minute) to accurate UTC time, and make sure that your N-number is entered correctly. Tap or hold LF to make changes to any of these values.

- When you reach "END Y" tap STEP to end the programming procedure.

To set the sample rate back to the default 6-second rate after the test flight, repeat this procedure.

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