General Aviation Modifications, Inc.2800 Airport Road, Hangar AAda Municipal Airport• Ada, Oklahoma 74820• (580) 436-4833

GAMI'S LEAN TEST

Instructions for collecting "before" and "after" data, for customers using GAMI's *GAMIjector*® fuel injectors.

These instructions describe the correct way of collecting data so as to provide yourself and **GAMI** with the most useful information possible, depending on which instrumentation you have available to you in your aircraft.

Note: JPI users, please set your EDM instrument to 1° EGT resolution.

Normally Aspirated Engines

Aircraft with Single Probe EGT Only:

- 1. Set up cruise between 5,000 to 7,000ft, approx 65% (or some setting that keeps CHTS<400°F) with RPMs at your normal cruise setting. Please leave your cowl flaps open if you have them.
- 2. Find peak on the EGT.
- 3. Determine if the engine runs smooth to 50°F Lean of Peak.
- 4. Call GAMI with your findings. While we can't fine tune your injectors with these results, we will be able to talk to you about your options.

Aircraft with Multiprobe EGT Bar Display Only:

- Set up cruise between 5,000 to 7,000ft, approx 65% (or some setting that keeps CHTS<400°F) with RPMs at your normal cruise setting. Please leave your cowl flaps open if you have them.
- 2. Find peak on the first cylinder.
- 3. Enrich the mixture to about 1 or 2 gph rich of that peak.
- 4. Record the FF and the number of EGT bars visible. It may be easier to place a sticky note halfway up the monitor face to reduce the number of bars you will need to count. Please note that if you are counting from the bottom you will need to count the "empty bar" also.
- 5. Lean in a small increment (0.2 or 0.3 gph with digital FF, $\frac{1}{4}$ gph estimates with analog).
- 6. Repeat steps 4 and 5 until you are lean of peak on all cylinders (all EGTs start dropping in temperature).
- 7. Send the data to GAMI to see if you need *GAMIjectors*[®] Balanced Fuel Injectors or if your current set of *GAMIjectors*[®] should be adjusted. Fax your results to 580-436-6622 and call us shortly afterwards or email them to <u>comments@gami.com</u>.

Aircraft with Multiprobe Digital EGT Display:

 Set up cruise between 5,000 to 7,000ft, approx 65% (or some setting that keeps CHTS<400°F) with RPMs at your normal cruise setting. Please leave your cowl flaps open if you have them.

- 2. Find peak on the first cylinder.
- 3. Enrich the mixture to about 1 or 2 gph rich of that peak.
- 4. Record the FF and each EGT and CHT.
- 5. Lean in a small increment (0.2 or 0.3 gph with digital FF, $\frac{1}{4}$ gph estimates with analog).
- 6. Repeat steps 4 and 5 until you are lean of peak on all cylinders (all EGTs start dropping in temperature).
- 7. Send the data to GAMI to see if you need *GAMIjectors*[®] Balanced Fuel Injectors or if your current set of *GAMIjectors*[®] should be adjusted. Fax your results to 580-436-6622 and call us shortly afterwards or email them to <u>comments@gami.com</u>.

Turbocharged / Turbonormalized Engines

Aircraft with Single Probe TIT Only:

- 1. Set up cruise between 8,000 to 10,000ft, approx 65% (or some setting that keeps CHTS<400°F) with RPMs at your normal cruise setting. Please leave your cowl flaps open if you have them.
- 2. Find peak on the TIT.
- 3. Determine if the engine runs smooth to 75°F Lean of Peak.
- 4. Call GAMI with your findings. While we can't fine tune your injectors with these results, we will be able to talk to you about your options.

Aircraft with Multiprobe EGT Bar Display Only:

- 1. Set up cruise between 8,000 to 10,000ft, approx 65% (or some setting that keeps CHTS<400°F and TIT<1650°F) with RPMs at your normal cruise setting. Please leave your cowl flaps open if you have them.
- 2. Find peak on the first cylinder.
- 3. Enrich the mixture to about 1 or 2 gph rich of that peak.
- 4. Record the FF and the number of EGT bars visible. It may be easier to place a sticky note halfway up the monitor face to reduce the number of bars you will need to count. Please note that if you are counting from the bottom you will need to count the "empty bar" also.
- 5. Lean in a small increment (0.2 or 0.3 gph with digital FF, $\frac{1}{4}$ gph estimates with analog).
- 6. Repeat steps 4 and 5 until you are lean of peak on all cylinders (all EGTs start dropping in temperature).
- 7. Send the data to GAMI to see if you need *turboGAMIjectors*[®] Balanced Fuel Injectors or if your current set of *turboGAMIjectors*[®] should be adjusted. Fax your results to 580-436-6622 and call us shortly afterwards or email them to <u>comments@gami.com</u>.

Aircraft with Multiprobe Digital EGT Display:

- 1. Set up cruise between 8,000 to 10,000ft, approx 65% (or some setting that keeps CHTS<400°F and TIT<1650°F) with RPMs at your normal cruise setting. Please leave your cowl flaps open if you have them.
- 2. Find peak on the first cylinder.
- 3. Enrich the mixture to about 1 or 2 gph rich of that peak.
- 4. Record the FF and each EGT and CHT.
- 5. Lean in a small increment (0.2 or 0.3 gph with digital FF, $\frac{1}{4}$ gph estimates with analog).

- 6. Repeat steps 4 and 5 until you are lean of peak on all cylinders (all EGTs start dropping in temperature).
- 7. Send the data to GAMI to see if you need *turboGAMIjectors*[®] Balanced Fuel Injectors or if your current set of *turboGAMIjectors*[®] should be adjusted. Fax your results to 580-436-6622 and call us shortly afterwards or email them to <u>comments@gami.com</u>.

RESULTS:

It is sometimes helpful to repeat the test, to make sure the results are generally "repeatable". Before repeating the test, make sure that you have gone back to the rich side of peak EGT and that all of the cylinders are under 400° F.

If you wish, you can plot the data on standard graph paper. Or you can enter it into a standard PC spreadsheet program and graph the data there.

There is a sample of what the data will look like included with this material. Note the fuel flow of the first cylinder to reach peak and fuel flow of the last cylinder to reach peak. This difference in fuel flow, is what GAMI refers to as the "spread, is the most important piece of information to be gained from these tests. When leaning this engine from a rich condition, leaner cylinders peak first and richer peak last.

While there is some variation from one engine type to another, typically, engines such as big bore TCM engines without *GAMI<u>jector</u>®* fuel injectors will have a fuel flow spread from 1.3 to 1.75 GPH, with some engines being well over 2.0 GPH.

Typically, after *GAMI<u>jector</u>*®, fuel injectors have been installed - - and sometimes tweaked after a further test, that same engine will have a "spread" of under 0.7 GPH. We have seen some engines with truly spectacular results, going from over 2.0 GPH to under 0.5 GPH in their spread.

Lycoming engines and so called "tuned induction" TCM engines may have an initial spread of somewhere between 0.7 and 1.3 GPH, although we have seen some truly extraordinary examples of these engines in which the spread was much larger. Experience has shown that it is worthwhile to adjust the fuel injector fuel flows for these engines until we get them below 0.5 GPH in spread from the richest to the leanest cylinders.

Last, in any event, please send us a copy of the data, and we will include it in your file so that we might talk to you later about any problem that might arise.

SAMPI	E TES	T D AT <i>i</i>	д		Genera	l 🗸 viati	on M od	lific ation		PHONE:	1-888-35	9-4264		
STOCK TCM INJECTORS						FLIGHT	TEBT DAT.	A FORM			FAX	1-580-43	6-6622	
DATE AIRCRAFTTYPE		ENGNE	MODEL MP RPM PRESSUREALT.		REALT.	OAT ENGINE A				ZER				
		-	ю-	550	Z3	Z300	7 500 ,081		+ 14" C		E.I.			
Fuel Flow	СНТ1	EOT 1	снтг	вэтг	снтэ	ЕОТЭ	снт₊	60 T 4	CHT5	B0T5	сите	ЕОТЕ	π	RS.
15 D	343	1414	392	1355	351	1360	347	1347	318	1323	358	1292		152
14.8	345	1423	39.2	1365	352	1371	350	1364	319	1332	359	1301		152
14.5	342	1432	391	1376	351	1383	348	1375	3 18	1343	359	1311		152
14.2	338	1442	387	1393	350	1403	346	1398	317	1367	358	1331		152
13.9	336	1438	384	1397	352	1414	349	1410	320	1378	361	1353		153
13.5	329	1418	37.7	1387	351	1428	346	1422	322	1394	363	1363		152
13.2	320	1395	365	1366	348	1429	344	1427	323	1407	365	1375		150
12.9	313	1374	357	1345	342	1415	337	1414	321	1421	362	1391		152
12.5	301	1354	341	1320	331	1398	327	1387	3 18	1432	359	1400		150
12.1	292	1341	330	1299	325	1367	318	1368	3 15	1425	356	1387		146
11.9	280	1330	318	1281	313	1349	307	13.45	308	1406	347	1370		145
	GAMUE	<u>CTORFL</u>	JELINJE	CTORS										
DA	TE	A IRC RA	FTTYPE	ENGNEMODEL		мр	R.PM	PRESSURE ALT.		OAT		ENGINE ANALYZER		
				0-550		Z3	Z300	7500 M 8 L		+ 15" C		E.I.		
Fuel Flow	CHT1	EOT1	CHTZ	BOTZ	СНТЭ	EOT3	C HT +	B3 T 4	CHT5	BOTS	СНТБ	ЕОТЕ	π	AS.
14.5	322	1355	362	1323	335	1364	333	1358	303	1362	345	1326		155
14.3	323	1380	362	1348	333	1395	330	1389	303	1389	346	1351		155
140	324	1393	363	1362	334	1409	332	1403	304	1402	347	1363		154
13.3	325	1414	363	1380	335	1425	332	1419	305	1422	349	1383		153
12.8	325	1441	359	1389	329	1419	328	1425	301	1428	349	1397		153
12.5	321	1434	357	1383	325	1409	325	1418	299	1425	345	1396		152
12.1	311	1411	349	1368	316	1388	316	1408	292	1412	339	1387		152
11.8	301	1390	345	1345	307	1368	308	1378	284	1391	328	1368		151

SAMPI	ETES	ΤΟΑΤΛ	4		General Aviation Modifications, Inc.						PHONE: 1-888-359-4264				
STOCK TCM INJECTORS					FLIGHT TEBT DATA FORM						FAX	1-580-43	6-6622		
DATE AIRCRAFTTYPE		ENGNE	OMEMODEL /		R. PM	PRESSURE ALT.		0.	OAT ENGINE ANAL			ZER			
		ю-	10-550		Z300	300 7500W8L		+ 1+" C		E.I.					
Fuel Flow	CHT1	EOT 1	снтг	BOTZ	снтэ	ЕОТЗ	снт е	B0 T 4	CHTS	BOTS	снте	ЕОТЕ	π	RS .	
15 D	343	1414	39.2	1355	351	1360	347	1347	318	1323	358	1292		152	
14.8	345	1423	39.2	1365	352	1371	350	1364	319	1332	359	1301		152	
14.5	342	1432	391	1376	351	1383	348	1375	318	1343	359	1311		152	
14.2	338	1442	387	1393	350	1403	346	1398	317	1367	358	1331		152	
13,9	336	1438	384	1397	352	1414	349	1410	320	1378	361	1353		153	
13.5	329	1418	37.7	1387	351	1428	346	1422	322	1394	363	1363		152	
13.2	320	1395	365	1366	348	1429	344	1427	323	1407	365	1375		150	
12.9	313	1374	357	1345	342	1415	337	1414	321	1421	362	1391		152	
12.5	301	1354	341	1320	331	1398	327	1387	318	1432	359	1400		150	
12.1	292	1341	330	1299	325	1367	318	1368	315	1425	356	1387		146	
11.9	280	1330	318	1281	313	1349	307	1345	308	1406	347	1370		145	
GAMUECTOR FUEL INJE			CTORS												
DA	TE	A IRC RA	FTTYPE	ENGNEMODEL		М Р	R. P.M	PRESSURE ALT.		OAT		ENGINE ANALYZER			
				10-550		Z 3*	Z300	7500 M 8 L		+ 15° C		E.I.			
Fuel Flow	CHT1	EOT 1	CHTZ	BOTZ	снтэ	ЕОТЗ	СНТ 4	B3 T 4	CHT5	80T.5	СНТБ	ЕОТЕ	π	AS.	
14.5	322	1355	362	1323	335	1364	333	1358	303	1362	345	1326		155	
14.3	323	1380	36.2	1348	333	1395	330	1389	303	1389	346	1351		155	
14D	324	1393	363	1362	334	1409	332	1403	304	1402	347	1363		154	
13.3	325	1414	363	1380	335	1425	332	1419	305	1422	349	1383		153	
12.8	325	1441	359	1389	329	1419	328	1425	301	1428	349	1397		153	
12.5	321	1434	357	1383	325	1409	325	1418	299	1425	345	1396		152	
12.1	311	1411	349	1368	316	1388	316	1408	292	1412	339	1387		152	
11.8	301	1390	345	1345	307	1368	308	1378	284	1391	328	1368		151	

2800 Airport Road - Hangar A Ada, Oklahoma 74820 phone: 580.436.4833 fax: 580.436.6622 toll-free: 1-888-FLY-GAMI <u>comments@gami.com</u>

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FLIGHT TEST DATA FORM

1-888-359-4264

		F/										-AX 1-580-436-6622				
DATE		ENGINE START		TEST START TIME		MP	MP RPM		PRESS. ALT			GEM/JPI MODEL				
Fuel Flow	EGT 1	CHT 1	EGT 2	CHT 2	EGT 3	CHT 3	EGT 4	CHT 4	EGT 5	CHT 5	EGT 6	CHT 6	TIT	IAS		