

09 Arctic Cat Z1 turbo w/ D&D HiJacker boost/ fuel controller

Nelson Cadieux and Scott Brownlee of Carlson Sports (Arctic Cat) in North Bay, Ontario (www.carltonsports.com) made their fourth tuning trip to DTR in as many years. This time they brought a trailer full of Cat sleds to dyno tune for themselves and for their customers. Among them was a new stock Z1 turbo that Nelson and Scott had fitted with a D&D HiJacker controller. We had previously tested a preproduction Z1 with D&D's Glenn Hall tuning fuel and boost independently—turning up the power that day took many hours of very gradually electronically tweaking boost and fuel flow separately while watching carefully on the dyno to achieve big power. The production Z1 ECU is said to increase boost some as altitude increases, ostensibly to maintain sea level HP regardless of where you ride. But as the boost pressure rises, fuel flow drops because the fuel flow required for proper A/F ratio is based upon the absolute pressure (barometric pressure plus gauge boost pressure) that determines the actual air CFM going through the engine. We can fool the ECU into thinking we're at 10,000 ft, and the boost pressure will rise to compensate. But since the ECU thinks the absolute pressure is lower, fuel flow is reduced. But if real baro is sea level (14.7 psi) instead of 10,000 ft (@ 10 psi) the ECU delivers less fuel than needed. This required D&D and Boondocker to collaborate on a complex Z1 boost/ fuel controller (called the HiJacker) that would raise boost pressure *and* fuel flow in some non-proportional way that would create optimal A/F ratio as boost levels were very gradually increased. It was not easy.

This push-button D&D HiJacker HP selector was made possible and practical by Cat's very excellent deto protection. This senses the engine vibrations created by deto and drops boost immediately to lower-than-stock levels before engine damage occurs. Dale Roes told me that putting low octane gas into the sled, and dialing in gonzo boost gives you a squirt of violent acceleration followed by instant boost/ hp reduction and laziness as soon as deto is sensed, keeping the engine safe from those who buy intentionally (or are defrauded with) low octane fuel.

So this would be our first opportunity to see the production D&D HiJacker controller on a production Z1 with the stock whisper-quiet muffler. With a cold tankfull of 91 octane Canadian 91 octane ethanol fuel (it's wise to dyno test with fuel temp closely matching air temp) and stock muffler, we began our test session to see what the HP limits of the Canadian 91 octane fuel would be. We opted to just tweak the boost by selecting the desired HiJacker HP setting. The following dyno data includes LAMAF1 readings by our Innovate wideband O2 sensor. The wideband reads a bit differently than our mechanical meters that I trust, but I included the LAMAF1 readings for those who measure A/F by wideband on their sleds (everyone should do that!).

Also note that the HiJacker increases boost pressure mostly above 7000 RPM, not below.

Here is our baseline bone stock as expected:

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
5300	124.6	125.8	0.40	50.0	13.03	11.5	18	142
5400	124.4	127.9	0.41	51.6	12.82	11.6	19	144

5500	123.7	129.6	0.41	52.3	12.81	11.7	18.2	146
5600	125.0	133.3	0.41	53.5	12.86	11.8	18.2	150
5700	126.3	137.0	0.42	57.0	12.48	11.7	18.3	155
5800	126.9	140.1	0.42	58.5	12.58	11.6	18.6	161
5900	127.4	143.1	0.41	58.4	12.88	11.4	18.3	164
6000	127.7	145.9	0.42	60.2	12.60	11.3	18.8	166
6100	126.9	147.3	0.44	64.3	12.07	11.2	19.1	170
6200	125.9	148.6	0.44	65.2	12.23	11.2	18.6	174
6300	125.1	150.0	0.45	67.1	12.08	11.1	18.7	177
6400	124.2	151.3	0.45	67.8	12.16	11.1	18.6	180
6500	123.1	152.4	0.46	69.7	12.06	11.0	18.8	184
6600	122.4	153.8	0.47	71.8	11.82	10.9	19.4	185
6700	121.4	154.9	0.48	73.7	11.78	10.8	18.2	190
6800	121.3	157.0	0.48	74.1	11.81	10.7	18.6	191
6900	121.0	158.9	0.48	74.9	11.87	10.7	18.4	194
7000	120.0	159.9	0.46	73.4	12.14	10.8	18.4	195
7100	118.8	160.7	0.46	72.8	12.38	10.8	18.8	197
7200	119.2	163.4	0.48	77.7	11.98	10.8	20.5	203
7300	120.9	168.0	0.50	82.5	11.69	10.8	21.9	211
7400	124.9	175.9	0.51	88.4	11.43	10.8	23.0	221
7500	126.2	180.3	0.50	89.2	11.55	10.8	23.4	225
7600	125.4	181.5	0.51	92.3	11.33	10.6	23.3	228
7700	124.1	182.0	0.52	93.7	11.23	10.5	23.9	230
7800	122.2	181.5	0.53	95.5	11.07	10.5	24.1	231
7900	118.9	178.8	0.54	94.7	11.16	10.4	23.6	231
8000	116.8	178.0	0.54	94.7	11.14	10.4	22.2	230
8100	112.2	173.1	0.55	93.9	11.10	10.3	21.4	228

Next we set the HiJacker to 200—close enough to 200:

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
5300	123.1	124.2	0.39	48.4	13.41	11.8	18.6	142
5400	121.9	125.3	0.39	48.1	13.51	11.8	17.8	142
5500	122.2	127.9	0.38	48.3	13.84	11.8	17.2	146
5600	123.3	131.5	0.39	50.7	13.57	12.0	18.3	150
5700	124.7	135.3	0.41	54.9	12.98	12.0	18.0	156
5800	124.7	137.7	0.40	55.1	13.22	11.9	18.7	159
5900	125.6	141.1	0.42	58.4	12.78	11.8	18.7	163
6000	125.6	143.5	0.43	60.6	12.65	11.7	17.8	167
6100	124.9	145.1	0.43	61.0	12.78	11.5	17.7	170
6200	124.5	147.0	0.44	63.9	12.47	11.4	18.8	174
6300	123.8	148.5	0.43	63.6	12.73	11.3	18.6	177
6400	123.0	149.8	0.45	66.2	12.47	11.2	18.4	180
6500	121.4	150.3	0.46	68.8	12.10	11.1	18.8	182
6600	121.3	152.5	0.46	69.1	12.34	11.0	18.3	186
6700	120.8	154.0	0.48	73.2	11.79	11.0	18.4	188
6800	121.8	157.7	0.48	74.4	11.92	10.9	18.7	194
6900	121.0	159.0	0.48	75.0	11.96	10.9	19.2	196
7000	123.1	164.0	0.46	75.0	12.31	11.0	19.6	202
7100	127.4	172.3	0.47	79.7	12.26	11.1	21.5	213

7200	129.4	177.3	0.48	83.7	12.07	11.1	22.3	221
7300	135.6	188.5	0.51	94.2	11.34	11.0	24.2	233
7400	140.7	198.2	0.51	99.4	11.32	10.6	28.5	246
7500	139.0	198.4	0.50	98.9	11.45	10.6	28.2	247
7600	136.3	197.3	0.51	99.9	11.45	10.5	27.9	250
7700	134.7	197.4	0.51	99.6	11.48	10.5	28.0	250
7800	133.3	198.0	0.52	101.7	11.43	10.4	27.1	254
7900	130.1	195.7	0.53	102.0	11.37	10.3	26.7	253
8000	126.6	192.8	0.53	100.7	11.49	10.3	26.8	253
8100	120.8	186.4	0.54	100.4	11.26	10.2	26.0	247
8200	117.8	184.0	0.56	101.4	11.09	10.2	25.2	246

Here is the stock Z1 with the HiJacker set at 210. Boost is higher by just 3 in hg (1.5 psi).
Still pretty good HP/ HJ setting with stock muffler!

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
5400	127.3	130.8	0.38	49.6	13.48	11.9	18.9	146
5500	126.4	132.4	0.38	49.3	13.72	11.9	19.6	148
5600	125.8	134.2	0.39	51.5	13.37	12.0	19.2	150
5700	126.1	136.8	0.39	52.3	13.62	12.0	18.7	156
5800	126.1	139.2	0.40	54.5	13.45	11.9	18.5	160
5900	127.1	142.7	0.41	57.2	13.09	11.8	18.9	163
6000	126.6	144.6	0.42	60.3	12.53	11.6	17.9	165
6100	125.4	145.7	0.42	60.5	12.84	11.5	17.8	170
6200	125.7	148.4	0.44	63.8	12.38	11.3	18.8	173
6300	124.2	149.0	0.44	64.8	12.38	11.2	18.8	175
6400	123.4	150.3	0.45	66.3	12.38	11.1	18.8	179
6500	122.8	152.0	0.43	64.8	12.92	11.0	18.3	183
6600	122.2	153.6	0.45	68.4	12.46	10.9	17.8	186
6700	122.1	155.8	0.47	72.9	11.91	10.9	18.0	190
6800	122.9	159.2	0.47	73.4	12.09	10.8	18.9	194
6900	124.5	163.5	0.47	75.5	12.07	10.8	19.8	199
7000	126.1	168.0	0.46	76.0	12.31	10.9	20.8	204
7100	129.9	175.5	0.47	81.6	11.98	11.0	22.2	214
7200	133.3	182.8	0.48	87.1	11.82	11.0	25.1	225
7300	140.8	195.7	0.49	95.3	11.58	11.0	29.2	241
7400	147.1	207.3	0.51	104.1	11.09	10.6	30.6	252
7500	145.2	207.3	0.51	104.6	11.10	10.4	31.1	254
7600	142.9	206.7	0.51	103.9	11.20	10.4	30.4	254
7700	141.1	206.9	0.52	105.8	11.06	10.4	30.3	256
7800	139.1	206.6	0.53	108.0	10.86	10.3	29.1	256
7900	136.1	204.7	0.54	108.8	10.90	10.2	30.1	259
8000	132.3	201.5	0.54	106.6	11.02	10.2	29.4	257
8100	127.0	195.9	0.56	107.7	10.75	10.1	28.3	253
8200	123.0	192.0	0.56	105.7	10.89	10.0	27.3	251

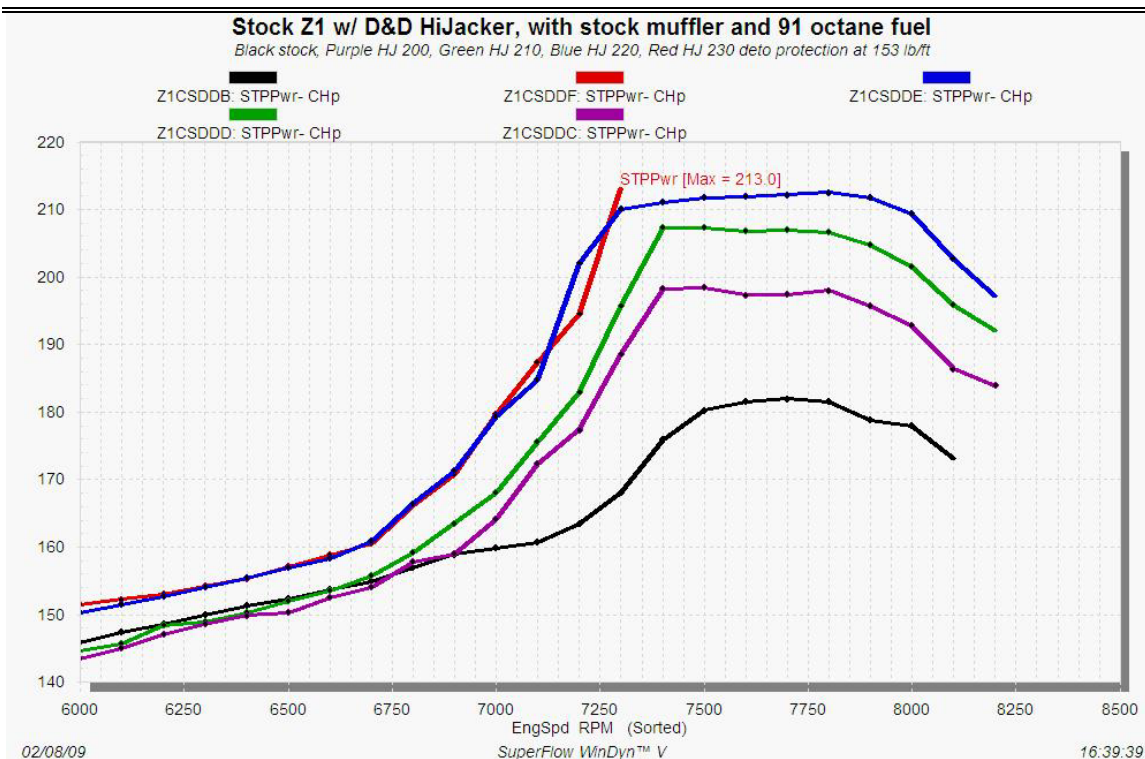
Here's the 220 HP HJ setting. Now the stock muffler is beginning to be a restrictor, choking things a bit. But we have zero signs of deto with 91 octane. Incredible quiet pump gas HP. Boost has tweaked up just a bit more, about one PSI.

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
5900	131.5	147.7	0.43	63.3	12.35	11.7	20.5	171
6000	131.5	150.2	0.42	62.5	12.69	11.4	19.3	173
6100	130.4	151.4	0.42	62.6	12.77	11.3	19.9	175
6200	129.3	152.6	0.44	65.6	12.38	11.2	20.2	177
6300	128.4	154.0	0.44	66.8	12.36	11.1	19.9	180
6400	127.6	155.4	0.46	69.8	12.02	10.9	20.1	183
6500	126.8	157.0	0.45	70.2	12.10	10.8	20.0	185
6600	125.9	158.3	0.46	71.1	12.14	10.8	21.1	188
6700	126.1	160.9	0.47	75.0	11.84	10.7	19.7	194
6800	128.5	166.4	0.47	77.1	11.91	10.7	20.9	200
6900	130.4	171.3	0.47	79.1	11.97	10.8	21.7	207
7000	134.5	179.3	0.47	83.9	11.82	10.9	23.4	217
7100	136.6	184.7	0.47	86.3	11.86	10.9	24.7	224
7200	147.4	202.0	0.50	99.5	11.34	10.9	29.6	246
7300	151.1	210.1	0.51	106.6	11.17	10.5	34.7	260
7400	149.8	211.1	0.51	105.7	11.37	10.4	33.7	262
7500	148.3	211.8	0.51	107.3	11.35	10.4	33.2	266
7600	146.4	211.9	0.53	109.8	11.12	10.3	33.4	267
7700	144.7	212.2	0.53	111.0	11.10	10.3	33.6	269
7800	143.1	212.5	0.53	111.3	11.16	10.2	33.6	271
7900	140.7	211.7	0.54	112.9	10.98	10.1	32.5	271
8000	137.5	209.4	0.54	111.1	11.03	10.1	31.9	268
8100	131.4	202.6	0.56	111.1	10.88	10.1	30.6	264
8200	126.3	197.2	0.55	107.1	11.03	10.0	29.1	258

Now we're up and incredible 30 HP over stock on 91 octane with no signs of deto that would limit our fun. But here's our dyno run with HJ set at 230. This time the engine knocked as soon as revs climbed to where boost created 153 lb/ft of torque and that's when the 91 octane fuel detonated. But instead of being allowed to continue and to destroy the engine, the deto was sensed and the boost was dropped and fuel flow increased to drop HP to nothing after 7300 RPM. When I saw the real time HP graph drop I aborted the test. If we had real 93 octane we may have made this run knock-free. But on 91 octane here is what was recorded before knock spoiled the run:

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6000	132.6	151.4	0.43	63.6	12.50	11.3	19.4	174
6100	131.1	152.3	0.41	62.0	12.89	11.3	19.3	175
6200	129.6	153.0	0.44	65.9	12.37	11.2	20.1	178
6300	128.6	154.2	0.44	66.9	12.46	11.1	20.3	182
6400	127.5	155.3	0.45	69.6	12.13	10.9	20.5	184

6500	126.9	157.1	0.45	70.3	12.18	10.9	20.6	187
6600	126.4	158.8	0.46	72.2	12.08	10.9	21.2	190
6700	125.8	160.5	0.45	71.9	12.33	10.8	21.4	194
6800	128.3	166.1	0.47	76.7	11.99	10.8	21.6	201
6900	129.9	170.7	0.47	78.6	12.00	10.8	22.4	206
7000	134.8	179.7	0.47	84.0	11.85	10.8	24.5	217
7100	138.6	187.3	0.47	86.4	11.99	10.9	26.6	226
7200	141.9	194.5	0.47	90.8	11.92	11.0	27.3	236
7300	153.3	213.0	0.52	110.1	11.03	10.5	36.2	265



Was the quiet stock muffler restricting airflow and causing active radicals to be trapped in the combustion chamber? Nelson and Scott had less restrictive hand-built glasspack muffler that would increase airflow CFM *and* boost pressure stock and with various HJ HP settings. Here's the Z1 with HJ settings back to stock, and we would work our way back up from here with the higher flowing but much louder muffler:

EngSpd	STPTRq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6000	127.3	145.4	0.40	57.1	13.85	18.3	17.5	173
6100	125.9	146.3	0.41	59.1	13.42	16.3	19.2	173
6200	125.5	148.2	0.44	64.7	12.47	15.2	18.8	176
6300	124.5	149.3	0.44	64.4	12.72	14.5	18.9	179

6400	123.6	150.6	0.44	66.1	12.71	13.6	18.6	183
6500	122.8	152.0	0.45	67.0	12.65	13.1	19.1	185
6600	123.1	154.7	0.45	68.7	12.59	12.3	19.4	189
6700	123.6	157.7	0.46	71.4	12.37	11.7	19.7	193
6800	124.5	161.2	0.44	70.8	12.79	11.4	19.7	198
6900	124.1	163.1	0.46	74.3	12.42	11.5	19.8	201
7000	125.5	167.2	0.46	75.8	12.50	11.5	20.4	207
7100	127.6	172.5	0.47	80.6	12.12	11.4	21.2	213
7200	127.1	174.3	0.48	82.1	12.02	11.4	21.4	215
7300	126.9	176.4	0.48	84.2	11.96	11.3	21.5	220
7400	128.8	181.5	0.47	84.3	12.42	11.2	22.7	229
7500	129.4	184.7	0.48	88.6	12.06	11.1	23.8	233
7600	128.9	186.5	0.48	89.3	12.03	11.0	23.9	235
7700	127.5	186.9	0.49	91.4	12.00	10.9	23.5	239
7800	125.8	186.8	0.50	92.8	11.87	10.7	24.7	241
7900	122.3	184.0	0.51	92.2	11.98	10.7	25.2	241
8000	116.3	177.2	0.52	91.3	12.05	10.5	23.2	240
8100	112.0	172.8	0.53	90.2	12.13	10.4	22.1	239

Now that we saw the higher flowing loud muffler increase stock airflow 10 CFM, we were anxious to see what the Hijacker would do with our 91 octane gas. Would the added airflow blow away those deto-producing active radicals? We went right to the 220 HP setting and once again we rattled the engine at just over 153 lb/ft of torque (peak torque is where cylinder filling and effective compression ratio is greatest) and the deto protection kicked in. Now being more confident that the deto protection would really protect, I stayed into the throttle and let the dyno run proceed even with the real-time graph showing HP in the basement. Note that the boost dropped quickly as the deto protection did it's job. Once again, if we had better pump gas we could have made 220 HP!

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6000	131.9	150.7	0.42	62.5	12.79	11.5	20.3	175
6100	132.0	153.3	0.43	64.6	12.50	11.6	20.8	176
6200	131.0	154.6	0.43	66.1	12.40	12.0	20.4	179
6300	131.0	157.1	0.44	68.7	12.32	12.3	20.9	185
6400	130.2	158.6	0.43	67.5	12.65	12.3	20.9	186
6500	130.0	160.9	0.44	69.5	12.54	12.2	20.5	190
6600	131.0	164.6	0.45	73.7	12.11	11.8	21.0	195
6700	132.3	168.7	0.45	75.5	12.16	11.6	22.8	201
6800	134.1	173.7	0.46	79.4	11.96	11.6	22.8	207
6900	137.8	181.0	0.46	82.3	11.96	11.6	23.6	215
7000	147.2	196.2	0.47	90.4	11.83	11.6	27.5	234
7100	153.7	210.5	0.48	99.4	11.65	11.4	31.5	253
7200	152.7	209.3	0.49	101.2	11.71	10.9	32.9	259
7300	152.6	212.1	0.50	104.2	11.65	10.8	32.1	265
7400	151.3	213.1	0.51	106.8	11.45	10.8	33.4	267
7500	133.2	190.1	0.56	105.0	10.61	10.5	28.7	243
7600	122.1	176.7	0.57	99.0	10.68	10.3	25.1	231

7700	115.9	169.9	0.56	93.3	10.89	10.3	23.0	222
7800	110.7	164.4	0.55	90.0	11.06	10.3	19.7	217
7850	108.5	161.9	0.54	86.6	11.55	10.3	19.0	218
7900	108.3	162.9	0.54	87.2	11.48	10.3	18.8	219

Since we were at the end of the line with 91 octane, Nelson and Scott drained the pump gas out of the tank, and refilled it with cold new VP C12 race gas. Here's the same setup, same 220 HP HJ setting. As always with high performance engines, octane is your friend.

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6000	125.8	143.7	0.44	62.4	12.52	15.8	20.4	171
6100	124.8	145.0	0.43	61.9	12.60	15.8	20.1	170
6200	125.1	147.7	0.45	65.2	12.27	14.6	19.3	175
6300	124.1	148.8	0.46	67.4	12.03	13.9	19.4	177
6400	124.2	151.3	0.45	68.1	12.04	13.2	19.4	179
6500	124.6	154.2	0.47	71.7	11.70	12.6	20.1	183
6600	124.0	155.8	0.46	71.6	12.01	12.1	20.3	188
6700	124.6	159.0	0.47	73.3	11.97	11.9	20.7	192
6800	128.6	166.5	0.46	76.1	11.99	11.7	21.5	199
6900	130.9	172.0	0.46	77.7	12.04	12.1	22.7	204
7000	135.9	181.1	0.47	83.5	11.80	12.4	24.2	215
7100	142.8	193.0	0.47	90.5	11.68	12.6	27.9	231
7200	149.3	204.7	0.48	97.9	11.47	12.6	29.7	245
7300	153.6	213.4	0.49	104.6	11.25	11.7	33.4	257
7400	152.8	215.2	0.50	106.3	11.24	11.6	33.4	261
7500	151.2	216.0	0.49	105.1	11.40	11.5	33.3	262
7600	150.4	217.6	0.50	107.2	11.23	11.4	32.9	263
7700	148.7	218.0	0.50	108.2	11.18	11.2	33.9	264
7800	146.9	218.1	0.51	109.1	11.17	11.1	32.4	266
7900	144.9	217.9	0.51	109.8	11.16	11.0	31.2	268
8000	140.3	213.7	0.51	108.2	11.25	10.9	31.0	266
8100	136.0	209.8	0.52	108.1	11.13	10.9	31.1	263
8200	131.6	205.5	0.52	106.8	11.13	10.8	29.5	260

Now we had decent gasoline, so we began cranking up the HiJacker. Here's what we made with the HJ set at 240 with Carlson's hand built straight through glasspack:

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6100	126.8	147.2	0.43	63.2	12.47	18.2	19.6	172
6200	126.0	148.7	0.43	63.3	12.65	17.6	19.8	175
6300	124.9	149.8	0.44	65.0	12.56	16.7	19.7	178
6400	124.4	151.6	0.44	66.6	12.49	15.9	19.7	182
6500	125.1	154.8	0.46	70.2	12.08	14.9	19.7	185

6600	125.2	157.3	0.47	72.7	11.79	14.2	20.4	187
6700	126.6	161.5	0.47	75.4	11.80	13.2	21.4	194
6800	128.3	166.1	0.48	79.0	11.63	12.7	21.7	201
6900	132.2	173.7	0.47	80.9	11.80	12.4	22.7	209
7000	134.5	179.2	0.47	83.2	11.82	12.3	23.8	215
7100	139.3	188.3	0.46	86.8	11.89	12.2	26.1	225
7200	151.3	207.4	0.46	94.0	12.07	12.1	29.3	248
7300	166.7	231.8	0.50	114.4	11.12	10.8	38.5	278
7400	164.7	232.1	0.51	116.3	11.01	10.6	38.8	280
7500	162.5	232.0	0.51	117.7	10.92	10.6	38.1	281
7600	160.6	232.3	0.52	119.0	10.88	10.4	38.1	283
7700	158.1	231.8	0.52	120.2	10.90	10.3	37.2	286
7800	155.8	231.4	0.53	120.5	10.91	10.3	38.8	287
7900	153.6	231.0	0.54	123.8	10.58	10.2	37.9	286
8000	149.8	228.1	0.54	121.7	10.80	10.2	37.6	287
8100	146.1	225.3	0.53	119.2	10.95	10.2	35.8	285
8200	141.6	221.1	0.54	117.6	10.97	10.1	35.0	282

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With the reduced restriction of the loud glasspack now it appears as though the tiny, quick boosting turbo is on the edge of its compressor map. Airflow is only increasing a bit to 292 CFM , and HP is now up to 237 and with the extra octane, torque is knock-free at 167 lb/ft:

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6000	125.9	143.8	0.43	60.5	12.80	14.7	19.4	169
6100	124.4	144.5	0.43	61.9	12.57	14.4	20.4	170
6200	123.9	146.2	0.44	64.1	12.33	14.1	19.6	173
6300	122.4	146.9	0.45	64.8	12.50	13.4	19.3	177
6400	122.3	149.0	0.46	67.3	12.16	12.9	19.6	179
6500	122.8	152.0	0.46	68.6	12.18	12.5	19.7	182
6600	124.3	156.2	0.46	70.3	12.18	12.2	20.6	187
6700	125.5	160.1	0.46	72.8	12.17	12.0	20.3	194
6800	127.3	164.8	0.46	75.0	12.22	11.8	21.6	200
6900	131.4	172.6	0.45	77.6	12.31	11.7	23.0	209
7000	133.8	178.3	0.46	80.9	12.13	11.7	24.0	214
7100	137.0	185.2	0.46	84.1	12.05	11.7	25.0	221
7200	142.0	194.7	0.47	89.8	11.85	11.6	27.1	232
7300	148.5	206.4	0.46	93.1	12.03	11.6	29.6	245
7400	167.1	235.4	0.51	119.8	11.03	10.3	40.7	289
7500	165.3	236.1	0.52	120.7	10.87	10.2	40.8	287
7600	163.1	236.0	0.52	121.4	10.86	10.2	40.6	288
7700	160.8	235.8	0.52	121.8	10.87	10.2	40.8	289
7800	159.2	236.5	0.52	122.3	10.92	10.2	38.9	292
7900	156.7	235.7	0.52	121.4	10.97	10.2	37.7	291
8000	154.0	234.6	0.52	120.6	10.98	10.2	39.2	289
8100	150.7	232.4	0.52	118.7	11.18	10.3	38.0	290
8200	146.9	229.3	0.52	117.6	11.24	10.3	37.6	289

Finally, we bumped the HiJacker to the 280 setting, and it was apparent that this turbo has its tongue hanging out! We made best HP at 7400 RPM, then the maxed out turbo caused boost to decline, and HP to tail off at higher revs. This is most apparent in the following graph, where HP peaks at 7400 RPM, then tails off quickly as revs climb (as the engine speed climbs, friction eats up HP as the square of RPM, and those higher RPM require more airflow that the tiny turbo can't seem to deliver here). With the Carlson supplied straight through muffler, this is all we could get out of the engine:

EngSpd	STPTrq	STPPwr	BSFA-B	FulA-B	A/FA-B	LAMAF1	BOOST	Air 2
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	Ratio	IN HG	scfm
6200	123.9	146.3	0.43	61.8	12.64	16.5	19.7	171
6300	122.7	147.2	0.43	62.8	12.68	15.3	20.0	174
6400	122.8	149.6	0.45	66.0	12.35	14.2	20.1	178
6500	122.3	151.4	0.45	67.3	12.26	13.7	20.0	180
6600	124.1	155.9	0.46	70.4	12.04	12.9	20.0	185
6700	126.1	160.9	0.46	73.1	11.90	12.3	20.5	190
6800	127.0	164.4	0.45	73.3	12.15	12.0	21.0	194
6900	130.1	171.0	0.46	77.3	11.94	11.8	22.5	202
7000	132.2	176.2	0.46	79.2	12.03	11.7	23.6	208
7100	137.1	185.4	0.46	84.0	12.04	11.6	25.5	221
7200	142.2	194.9	0.47	90.2	11.75	11.6	27.4	232
7300	147.9	205.6	0.47	94.9	11.71	11.6	29.8	243
7400	170.5	240.2	0.48	114.5	11.44	10.8	41.4	286
7500	167.0	238.5	0.48	113.5	11.50	10.7	41.0	285
7600	164.6	238.2	0.49	115.3	11.45	10.7	40.8	288
7700	161.2	236.4	0.50	117.6	11.39	10.6	41.3	293
7800	159.5	236.9	0.51	119.8	10.99	10.5	40.5	288
7900	156.6	235.5	0.51	118.4	11.11	10.5	39.4	287
8000	153.9	234.5	0.51	117.1	11.32	10.5	39.2	290
8100	150.9	232.7	0.50	114.3	11.63	10.5	38.5	290
8200	145.3	226.9	0.51	114.1	11.46	10.5	36.9	286

Stock Z1 turbo w/ stock and glasspack (GP) muffler, C12 leaded race gas

Black stock, Gold GP muffler, Purple C12 GP HJ 220, Green C12 GP HJ 240, Blue C12 GP HJ 260, Red C12 GP HJ 280

