2012 American Snowmobiler/DTR NY Shootout dyno certification, etc.

This year, we had Arctic Cats supplied by D&D Powersports of Loweville, NY since Dale Fredericks was unable to. D&D also supplied the Yamaha “120” and “150” class machines (class designation is determined by AmSnow). Woody’s Performance Center (Yamaha dealer) in Topsham, ME brought us a brand new Nytro with a Yamaha supplied and warranted MPC centrifugal supercharger system installed. This estimated 180hp machine would be run as a demonstration against the F1100 turbo in the “Unlimited” stock class. As has been the case for 23 years now, Smith Marine brought the SkiDoos. And for the second year in a row, Fun Unlimited in Gouverneur NY supplied the Polaris’.

Since my Shootout partner George Taylor died earlier this year, Tom Smith (former owner of Smith Marine) has taken over the organization and supervision of sled selection and setup at each participating dealer. After random crate selection at each dealership, the sleds were set up, studded and loaded into a monstrous sled trailer for delivery by Tom to the dyno for “certification”. Last Monday and Tuesday, the dealers sent technicians to DTR to assist in the dyno testing.

120 class sleds

This is the third Cat 1100 normally aspirated stocker I’ve tested since its debut as the Jaguar Z1 in 2007. In 2007 (scroll down to 4/22/2006 to see that stock evaluation) the preproduction 07 Jag Z1 made 132hp at 8900rpm just below the rev limit. Last year, we thought that the F1100 shootout sled was “stuck” in reverse mode, limiting peak revs to 5800, and making a flat 108hp from 5100-5800rpm. But after testing the 2013 F1100 and seeing a similarly flat 111hp from 6500-8900rpm, I went back and reviewed last years F1100 test data. Sure enough, I found that the dyno was improperly programmed for 1/1 direct drive instead of 1.5/1 used for most sled engines. So if you go back to last year’s test data and multiply each RPM step by 1.5 (and divide each torque reading by 1.5) you will get identical torque and HP as shown here. The only difference is the precise friction HP added by the dyno computer to compensate for the known HP loss from the very efficient toothed belt drive. That friction HP compensator is only activated at 1.5/1, and since the dyno was programmed improperly for 1/1 the HP lost to friction is not added back in. Operator error! This is how I screwed up the first time we tested the DNE/ Gus Bohne 700+ HP turbo—that time it was the opposite goof—the dyno computer was set at 1.5/1 while the monster engine was actually direct drive to the dyno. So when the engine was spinning only 6500 RPM the dyno computer thought it was spinning 9750.

So correcting my dyno drive ratio error on last year’s F1100 we know that it was the same as this year’s. But that 2007 version was much more powerful. It may have been a preproduction sled (acquired early 2006 by JD Powersports for turbo experimentation). But D&D’s Dale Roes reports that the 07 and current engines are the same, but that the intake and exhaust were much better on the early example we had. But for now, a flat 111 HP power curve is what we had for the 2012 NY Shootout.

Compare 2013 and 2007 Cat 1100 4stroke NA engines.

EngSpd RPM	STPPwr CHp 13	STPTrq Clb-ft13	STPPwr CHp 07	STPTrq Clb-ft07
6000	82.8	72.5	85.7	75.1
6100	83.4	71.8	88.3	76.1
6200	83.0	70.3	91.3	77.3
6300	84.9	70.8	94.3	78.6
6400	87.2	71.6	95.1	78.1
6500	89.1	72.0	96.6	78.1
6600	90.9	72.4	98.6	78.1
6700	92.5	72.5	99.7	78.5
6800	93.6	72.3	101.1	78.2
6900	96.1	73.2	102.7	78.2
7000	99.7	74.8	104.5	78.4
7100	101.3	75.0	107.9	79.8
7200	102.4	74.7	109.6	79.9
7300	104.8	75.4	111.7	80.3
7400	107.2	76.1	115.3	81.8
7500	108.1	75.7	116.6	81.6
7600	108.5	75.0	118.9	82.2
7700	109.9	75.0	120.6	82.3
7800	110.7	74.5	121.6	81.9
7900	110.5	73.5	123.5	82.1
8000	110.5	72.5	125.2	82.2
8100	110.7	71.8	126.8	82.2
8200	111.4	71.4	127.9	81.9
8300	111.5	70.5	128.1	81.1
8400	111.1	69.5	130.1	81.3
8500	111.1	68.7	131.5	81.3
8600	111.0	67.8	132.4	80.8
8700			131.4	79.3
8800			132.4	79.1
8900			132.4	79.1

2013 SkiDoo Etec 600

The 2013 Etec 600 (in “breakin mode) is shown with fuel flowmeters fitted and stock airbox (not the dyno airbox with airflow meter). Note that even with a lean wideband A/F ratio reading, BSFC is above .60 at WOT. Expect that to drop some as breakin mode is completed.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BSFA_B lb/hph	FulA_B lbs/hr	LamAF1 Ratio	AirInT degF	ElpsTm Secnds
6100	72.4	62.3	0.629	42.3	14.62	65.0	0.79
6200	73.7	62.4	0.645	44.1	14.57	65.0	1.17
6300	75.0	62.6	0.675	47.1	14.54	65.0	1.53
6400	76.9	63.1	0.684	48.9	14.55	65.0	1.90

6500	78.3	63.3	0.742	54.0	14.55	65.0	2.40
6600	78.7	62.6	0.761	55.7	14.45	65.0	2.57
6700	78.5	61.5	0.790	57.6	14.20	65.0	2.86
6800	82.3	63.6	0.777	59.4	14.06	65.0	3.27
6900	85.6	65.1	0.770	61.2	14.03	65.0	3.58
7000	88.2	66.2	0.763	62.5	14.02	65.1	3.90
7100	91.0	67.3	0.747	63.2	14.03	65.1	4.26
7200	94.1	68.6	0.734	64.2	14.08	65.1	4.64
7300	97.1	69.9	0.722	65.2	14.17	65.1	4.99
7400	99.6	70.7	0.710	65.7	14.24	65.1	5.27
7500	102.4	71.7	0.688	65.5	14.26	65.1	5.60
7600	106.1	73.3	0.672	66.2	14.15	65.1	5.97
7700	109.3	74.6	0.662	67.2	14.05	65.1	6.27
7800	112.4	75.7	0.636	66.4	13.94	65.1	6.61
7900	115.1	76.5	0.616	66.0	13.92	65.1	6.98
8000	116.5	76.5	0.616	66.7	14.08	65.1	7.39
8100	116.5	75.6	0.603	65.3	14.24	65.1	7.75
8200	114.8	73.5	0.606	64.6	14.35	65.1	8.14

2013 Yamaha Nytro

Here's the most powerful of the 120 class sleds. This was the third test where the engine made best torque and HP, with oil temperature up to normal. Also for those who continue, wrongly, to think that they should get initial clutch shift at torque peak then slide up to HP peak please look closely at this dyno test! Do we really want the Nytro clutches to shift at 103.9 HP? Probably not. 129HP & 83.7LB/FT will outaccelerate 103.9HP & 89.5LB/FT every time.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	AirInT degF	ElpsTm Secnds	DenAlt Feet	Baro_P InHga	STPCor Factor
6100	103.9	89.5	51.9	0.78	919	28.9	1.039
6200	104.2	88.2	51.9	1.16	918	28.9	1.039
6300	106.0	88.4	51.9	1.53	918	28.9	1.038
6400	108.2	88.8	51.9	1.95	918	28.9	1.038
6500	110.4	89.2	51.9	2.27	919	28.9	1.039
6600	112.4	89.4	51.9	2.61	919	28.9	1.039
6700	114.0	89.4	51.9	2.93	919	28.9	1.039
6800	115.9	89.4	51.9	3.28	921	28.9	1.039
6900	117.6	89.3	51.9	3.67	922	28.9	1.039
7000	119.0	89.3	51.9	4.01	922	28.9	1.039
7100	120.0	88.8	51.9	4.31	921	28.9	1.039
7200	120.7	88.0	51.9	4.61	922	28.9	1.039
7300	121.8	87.7	51.9	4.99	923	28.9	1.039
7400	123.3	87.5	51.9	5.33	924	28.9	1.039
7500	124.5	87.2	51.9	5.65	924	28.9	1.039
7600	125.6	86.8	51.9	5.98	924	28.9	1.039
7700	126.8	86.5	51.9	6.31	925	28.9	1.039
7800	127.7	86.0	52.0	6.69	927	28.9	1.039

7900	128.6	85.5	52.0	7.04	927	28.9	1.039
8000	129.0	84.7	52.0	7.38	927	28.9	1.039
8100	129.0	83.7	52.0	7.74	927	28.9	1.039
8200	128.9	82.5	52.0	8.13	927	28.9	1.039
8300	128.5	81.3	52.0	8.48	927	28.9	1.039
8400	127.7	79.8	52.0	8.80	927	28.9	1.039
8500	126.1	77.9	52.0	9.18	928	28.9	1.039
8600	125.0	76.4	52.0	9.54	929	28.9	1.039
8700	121.1	73.1	52.0	10.21	929	28.9	1.039

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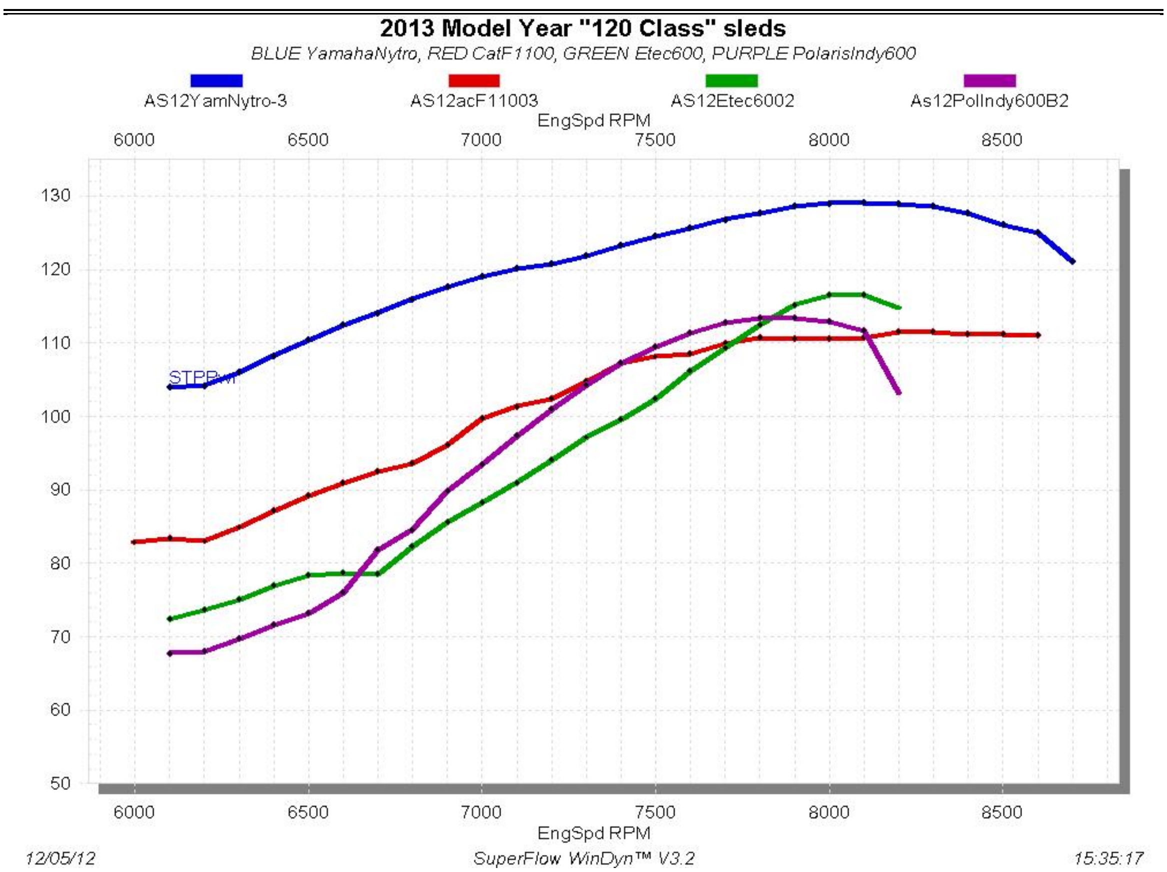
2013 Polaris Indy 600

The retro name is excellent, but the engine HP was not! We're used to seeing the late model "short stroke" 600s make 120+ HP but today we could only muster just over 111 HP. So when the Indy 600 came up well short of expectations we were concerned that something was wrong with the sled. Dyno certification is to ensure that our Shootout sleds are proper and trypical—not too high, but not too low. Compression test with my Harbor Freight gauge tested showed 110 psi on both cylinders. A/F ratio appeared fine, as did fuel flow and pressure. This was late in the day—it had begun to rain very hard just as we began testing the two Polaris' late last Tuesday, and humidity had climbed quite suddenly. High humidity saps some HP—but not 9 HP. The dyno correction will compensate for humidity, but will only be fairly accurate if A/F ratio remains constant. The ECU will compensate for air temp and barometric pressure but it has no way of measuring water in the air (water molecules can take up lots of space otherwise occupied by O2 molecules), so as humidity increases, A/F ratio enrichens, and HP is reduced.

And it was late in the day, but after communicating with our contacts at Polaris we failed to get a response from them to confirm whether or not this power was proper. So this sled was loaded back in Tom Smith's trailer with the rest of the dyno certified stock sleds and taken back to Tom's storage building in Old Forge. But Fun Unlimited owner Bill Lutz volunteered to come on Wednesday with another stock Indy 600 and if this one made the expected 120 HP we would have made arrangement to use it instead of the first one. So Bill and made a second 440 mile round trip to DTR, only to see it make 113.5 HP in dry cold air (thanks to a cold front that came in overnight that, unfortunately, pushed the warm rain up to Woodgate NY to melt the foot of snow on the Shootout track!). So what we had was what we had. Subsequent investigation by Bill and his crew revealed new part numbers for the Indy 600 cylinder head (said to be 2.5cc higher volume), cylinders, exhaust pipe, muffler, and airbox top. More to come on this, in our quest to get 120+ HP back. But for now, this is the dyno test result in cold dry air. Also it should be noted that on this test the Polaris Digital Wrench computer indicated that peak exhaust temp was 1000F and coolant temp was 110F—both ideal numbers for achieving max power.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BSFA_B lb/hph	FulA_B lbs/hr	AirInT degF	Air_1c CFM	ElpsTm Secnds
6100	67.7	58.3	0.600	38.0	39.4	127.3	0.80
6200	68.0	57.6	0.615	39.1	39.4	130.4	1.18
6300	69.7	58.1	0.574	37.6	39.3	133.8	1.57

6400	71.6	58.7	0.597	40.1	39.3	136.7	1.91
6500	73.1	59.1	0.639	43.7	39.4	141.2	2.19
6600	76.0	60.5	0.699	49.6	39.4	149.3	2.54
6700	81.8	64.1	0.688	52.8	39.4	155.6	2.97
6800	84.5	65.3	0.712	57.3	39.4	160.1	3.18
6900	89.7	68.3	0.698	59.6	39.4	166.5	3.65
7000	93.4	70.1	0.703	62.5	39.4	170.1	3.90
7100	97.4	72.0	0.694	64.3	39.4	175	4.29
7200	101.0	73.6	0.704	67.4	39.4	178.5	4.59
7300	104.2	75.0	0.666	65.5	39.4	182.8	4.98
7400	107.2	76.1	0.656	66.0	39.4	185.8	5.30
7500	109.4	76.6	0.639	65.3	39.4	188.5	5.62
7600	111.3	76.9	0.625	64.3	39.4	190.2	5.98
7700	112.7	76.9	0.615	63.6	39.5	191.0	6.35
7800	113.4	76.3	0.595	61.2	39.5	191.4	6.67
7900	113.4	75.4	0.586	59.6	39.5	191.4	7.02
8000	112.8	74.1	0.570	57.9	39.5	191.0	7.38
8100	111.6	72.4	0.545	54.8	39.5	190.4	7.77
8200	103.1	66.0	0.612	53.6	39.6	187.0	8.58



150 class sleds

2013 Arctic Cat ProCross F800

Here's the best dyno test of the Cat 800. These engines also make the best power with 1000F pipe center section temp and we were able to create that with this dyno test. The ECU is programmed to retard ignition timing at lower exhaust temperature (which reduces HP) to get the pipe temperature to optimal more quickly.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BSFCAB lb/hph	FulAB lbs/hr	AirInT degF
6500	109.1	88.1	0.594	56.0	48.2
6600	109.6	87.2	0.603	57.7	48.2
6700	109.7	86.0	0.591	58.8	48.2
6800	110.6	85.4	0.586	59.9	48.2
6900	113.7	86.5	0.578	60.5	48.3
7000	119.1	89.3	0.568	60.4	48.3
7100	121.8	90.1	0.562	60.3	48.3
7200	124.2	90.6	0.557	59.8	48.3
7300	127.7	91.9	0.578	62.6	48.3
7400	133.7	94.9	0.597	67.0	48.3
7500	137.6	96.3	0.596	69.8	48.3
7600	141.1	97.5	0.610	72.6	48.4
7700	144.4	98.5	0.634	75.7	48.4
7800	146.7	98.8	0.662	79.7	48.4
7900	149.8	99.6	0.683	85.5	48.4
8000	155.6	102.2	0.678	89.6	48.4
8100	157.9	102.4	0.671	92.1	48.4
8200	156.4	100.2	0.665	94.7	48.4
8300	152.0	96.2	0.650	94.5	48.4
8400	143.7	89.8	0.640	95.1	48.4

2013 Yamaha Apex

When we tested the first 2011 Apex with EXUP—a preproduction model with lots of demo miles on it—we saw over 163 HP. Of course, that test article ( ) had the customary cautionary note suggesting the preproduction might not = production. That appears to be the case. Since then, we've done more than a few production EXUP Apex, all measuring about 150 HP at peak. The 2013 is no exception. Less power than the 800 Cat and

SkiDoo, but the graphic comparison shows a broad HP plateau that assures good performance if revs are anywhere in a 1000+ RPM band of HP at peak revs.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	AirInT degF	Vap_P InHg	ElpsTm Secnds	DenAlt Feet	Baro_P InHga	STPCor Factor
6600	95.1	75.7	54.1	0.33	0.85	1146	28.85	1.043
6700	95.4	74.7	54.1	0.33	1.19	1146	28.85	1.043
6800	96.3	74.3	54.1	0.33	1.56	1146	28.85	1.043
6900	98.2	74.8	54.1	0.33	2.02	1146	28.85	1.043
7000	100.3	75.2	54.1	0.33	2.37	1146	28.85	1.043
7100	102.3	75.6	54.1	0.33	2.69	1147	28.85	1.043
7200	104.7	76.3	54.2	0.33	3.01	1148	28.85	1.043
7300	107.8	77.6	54.2	0.33	3.39	1148	28.85	1.043
7400	110.5	78.4	54.2	0.33	3.71	1148	28.85	1.043
7500	113.1	79.2	54.2	0.33	4.04	1149	28.85	1.043
7600	115.7	80.0	54.2	0.33	4.38	1149	28.85	1.043
7700	118.4	80.7	54.2	0.33	4.69	1149	28.85	1.043
7800	120.7	81.3	54.2	0.33	5.04	1150	28.85	1.043
7900	123.2	81.9	54.2	0.33	5.43	1152	28.85	1.043
8000	125.3	82.3	54.2	0.33	5.75	1153	28.85	1.043
8100	127.4	82.6	54.2	0.33	6.12	1153	28.85	1.043
8200	129.5	82.9	54.2	0.33	6.39	1153	28.85	1.043
8300	131.3	83.1	54.2	0.33	6.72	1153	28.85	1.043
8400	133.3	83.4	54.2	0.33	7.08	1153	28.85	1.043
8500	135.1	83.5	54.2	0.33	7.38	1154	28.85	1.043
8600	136.5	83.4	54.2	0.33	7.67	1155	28.85	1.043
8700	137.8	83.2	54.3	0.33	8.06	1156	28.85	1.043
8800	139.2	83.1	54.3	0.33	8.41	1157	28.85	1.044
8900	140.4	82.9	54.3	0.33	8.79	1158	28.85	1.044
9000	141.1	82.3	54.3	0.33	9.11	1160	28.85	1.044
9100	141.9	81.9	54.3	0.34	9.32	1160	28.85	1.044
9200	142.1	81.1	54.3	0.34	9.64	1163	28.85	1.044
9300	143.3	80.9	54.4	0.34	9.98	1165	28.85	1.044
9400	144.6	80.8	54.4	0.34	10.30	1168	28.85	1.044
9500	145.9	80.6	54.4	0.34	10.54	1171	28.85	1.044
9600	146.7	80.2	54.5	0.34	10.95	1176	28.85	1.044
9700	147.9	80.1	54.5	0.34	11.22	1179	28.85	1.044
9800	148.2	79.4	54.5	0.34	11.60	1179	28.85	1.044
9900	148.1	78.6	54.5	0.34	11.97	1181	28.85	1.044
10000	148.1	77.8	54.6	0.34	12.29	1182	28.85	1.044
10100	147.4	76.6	54.6	0.34	12.63	1184	28.85	1.044
10200	147.2	75.8	54.6	0.34	12.95	1187	28.85	1.044
10300	147.5	75.2	54.7	0.34	13.27	1191	28.85	1.044
10400	147.6	74.5	54.7	0.34	13.62	1192	28.85	1.044
10500	147.9	74.0	54.7	0.34	13.96	1192	28.85	1.044
10600	148.3	73.5	54.7	0.34	14.29	1195	28.85	1.044
10700	148.5	72.9	54.8	0.34	14.61	1198	28.85	1.044
10800	148.0	72.0	54.8	0.34	14.94	1200	28.85	1.044
10900	147.4	71.0	54.9	0.35	15.29	1205	28.85	1.045
11000	147.2	70.3	54.9	0.35	15.62	1209	28.85	1.045

2013 Polaris ProR 800

This engine, too, is the same as in previous years. As we saw when testing the Indy 600, warm humid air would cost us some HP.

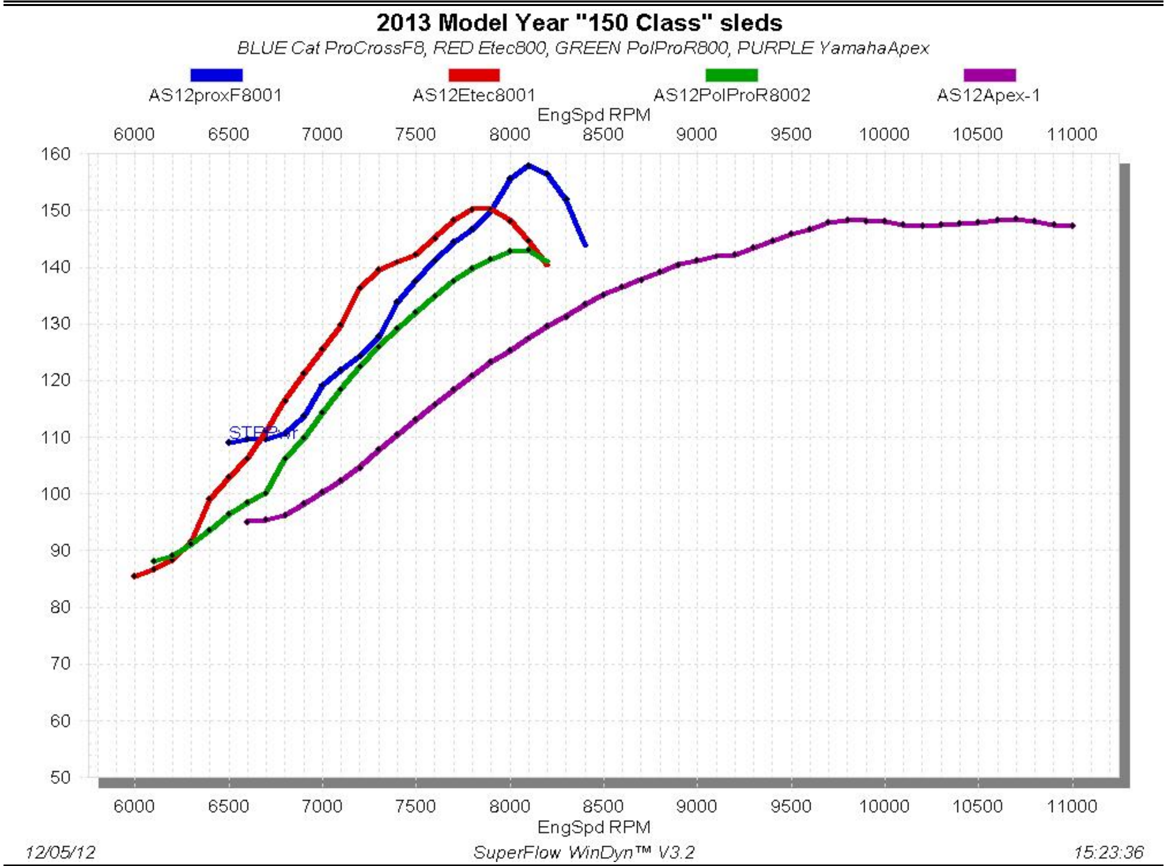
EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BSFA_B lb/hph	FulA_B lbs/hr	AirInT degF	AFRA_B Ratio	ElpsTm Secnds
6100	88.2	75.9	0.586	48.0	64.6	13.33	0.78
6200	89.1	75.4	0.600	49.6	64.6	13.17	1.2
6300	91.1	76.0	0.589	49.8	64.6	13.32	1.52
6400	93.7	76.9	0.562	48.8	64.7	13.81	1.89
6500	96.4	77.9	0.563	50.4	64.7	13.63	2.28
6600	98.4	78.3	0.590	53.8	64.7	13.00	2.57
6700	100.2	78.5	0.627	58.2	64.7	12.36	2.79
6800	106.2	82.0	0.680	67.0	64.8	11.22	3.28
6900	109.9	83.7	0.680	69.3	64.8	11.10	3.54
7000	114.3	85.7	0.675	71.6	64.9	11.04	3.91
7100	118.5	87.6	0.651	71.6	64.9	11.28	4.25
7200	122.4	89.3	0.642	72.9	64.9	11.30	4.59
7300	126.0	90.6	0.650	76.0	65.0	11.05	4.93
7400	129.2	91.7	0.645	77.3	65.0	11.07	5.27
7500	132.1	92.5	0.633	77.5	65.1	11.19	5.59
7600	134.9	93.2	0.613	76.7	65.1	11.44	5.92
7700	137.5	93.8	0.605	77.2	65.2	11.49	6.29
7800	139.8	94.1	0.587	76.0	65.2	11.91	6.62
7900	141.4	94.0	0.551	72.1	65.3	12.35	7.02
8000	142.7	93.7	0.528	69.8	65.3	12.76	7.32
8100	143.0	92.7	0.513	68.0	65.4	13.10	7.66
8200	140.9	90.3	0.520	67.8	65.5	13.12	8.08

2013 SkiDoo Etec 800

This will surely pick up more HP after "breakin" is complete. We're planning to do a full workup on Billy Howard's 2013—jockeying timing about to see if we can get back to 2010.5 HP levels. But for the shootout, here is what we had this year.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BSFA_B lb/hph	FulA_B lbs/hr	LamAF1 Ratio
6000	85.5	74.8	0.806	64.1	14.04
6100	86.6	74.6	0.811	65.3	14.00
6200	88.4	74.9	0.792	65.1	14.02
6300	91.5	76.3	0.781	66.4	14.07
6400	99.1	81.3	0.735	67.8	14.19
6500	102.9	83.2	0.726	69.6	14.20
6600	106.3	84.6	0.708	70.0	14.20
6700	111.0	87.0	0.698	72.1	14.22

6800	116.4	89.9	0.687	74.4	14.21
6900	121.3	92.3	0.674	76.0	14.16
7000	125.5	94.2	0.654	76.3	14.09
7100	129.8	96.0	0.627	75.8	14.04
7200	136.3	99.4	0.602	76.3	14.12
7300	139.5	100.4	0.567	73.7	14.14
7400	140.8	99.9	0.555	72.7	14.31
7500	142.2	99.6	0.557	73.6	14.58
7600	145.1	100.2	0.564	76.1	14.59
7700	148.2	101.1	0.571	78.7	14.40
7800	150.2	101.1	0.565	79.0	14.21
7900	150.2	99.8	0.566	79.0	14.14
8000	148.1	97.3	0.577	79.5	14.16
8100	144.6	93.7	0.596	80.1	14.17
8200	140.3	89.9	0.604	78.6	14.07



UNLIMITED CLASS SLEDS

2013 Arctic Cat F1100 turbo

Dyno testing the stock F1100 turbo is a little tricky since the ECU adjusts so many parameters (boost rise, peak boost, fuel flow, timing) based upon so many other things (coolant temp, exhaust temp, knock, etc). So getting an optimal power curve requires paying attention to too much data for one person. Today, Glenn Hall and Dale Roes were great help in watching engine conditions on their Arctic Cat diagnostic software. Beginning each test at a particular coolant temp was critical, as was watching for any clicks of deto in the midrange that could cause timing to be pulled/ boost to drop. Midrange deto on the dyno is not unusual because of the time spent there, as the dyno allows revs to rise slowly in order to get accurate measurements. But in the field, revs climb quickly to 7500 and beyond so power-robbing midrange knock is seldom an issue.

Here's a nice example of a proper dyno test on the stock F1100 turbo with everything just right. Note that torque rises to peak at 7500 due to the boost controller preventing boost from rising too high at low revs preventing deto there.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	LamAF1 Ratio	ElpsTm Secnds	DenAlt Feet	Baro_P InHga	AirInT degF
6000	129.6	113.5	12.87	0.16	1326	28.83	56.4
6100	127.3	109.6	12.90	0.69	1327	28.83	56.4
6200	129.6	109.8	12.84	1.02	1327	28.83	56.4
6300	132.4	110.4	12.77	1.28	1328	28.83	56.4
6400	133.8	109.8	12.69	1.58	1328	28.83	56.4
6500	135.3	109.3	12.62	1.83	1328	28.83	56.4
6600	138.1	109.9	12.58	2.06	1328	28.83	56.4
6700	141.1	110.6	12.59	2.44	1326	28.83	56.4
6800	142.5	110.1	12.61	2.63	1326	28.83	56.4
6900	144.1	109.7	12.62	2.84	1328	28.83	56.4
7000	148.7	111.6	12.59	3.06	1329	28.83	56.5
7100	154.7	114.4	12.52	3.26	1328	28.83	56.4
7200	158.9	115.9	12.46	3.40	1327	28.83	56.4
7300	162.6	117.0	12.42	3.52	1328	28.83	56.4
7400	171.4	121.6	12.37	3.80	1327	28.83	56.4
7500	177.2	124.1	12.35	4.10	1328	28.83	56.4
7600	178.1	123.1	12.26	4.54	1327	28.83	56.4
7700	176.8	120.6	12.19	4.79	1326	28.83	56.4
7800	175.0	117.9	12.11	5.02	1325	28.83	56.4
7900	174.4	115.9	12.03	5.21	1327	28.83	56.4
8000	171.4	112.5	11.87	5.49	1328	28.83	56.5
8100	167.1	108.4	11.76	5.74	1331	28.83	56.5

Then since D&D was planning to demonstrate their $289 ECU reflash at the NY Shootout, Glenn Hall installed a reflashed ECU and while monitoring engine conditions. We developed this dyno test data with no other components touched—stock muffler, same 91 octane gas.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	LamAF1 Ratio	ElpsTm Secnds	DenAlt Feet	Baro_P InHga	AirInT degF
6600	150.7	119.9	12.58	0.40	1975	28.83	65.9
6700	159.3	124.9	12.43	0.79	1970	28.83	65.8
6800	167.8	129.6	12.13	1.21	1967	28.83	65.8
6900	172.6	131.4	12.11	1.43	1964	28.83	65.8
7000	176.8	132.6	12.12	1.59	1962	28.83	65.7
7100	181.2	134.0	12.14	1.73	1961	28.83	65.7
7200	193.9	141.5	12.24	2.08	1956	28.83	65.6
7300	201.8	145.2	12.38	2.37	1952	28.83	65.6
7400	206.7	146.7	12.52	2.67	1951	28.83	65.6
7500	206.1	144.3	12.58	3.01	1949	28.83	65.5
7600	206.2	142.5	12.53	3.35	1945	28.83	65.5
7700	206.1	140.6	12.40	3.66	1940	28.83	65.4
7800	204.5	137.7	12.26	3.89	1938	28.83	65.4
7900	202.3	134.5	12.13	4.13	1934	28.83	65.4
8000	201.6	132.4	12.04	4.32	1932	28.83	65.3
8100	201.1	130.4	11.95	4.53	1929	28.83	65.3
8200	201.0	128.7	11.90	4.72	1927	28.83	65.3
8300	200.8	127.1	11.87	4.92	1925	28.83	65.2
8400	201.1	125.7	11.85	5.14	1923	28.83	65.2
8500	199.6	123.3	11.80	5.35	1923	28.83	65.2
8600	199.3	121.7	11.75	5.65	1919	28.83	65.1

2013 Yamaha Nytro w/ factory authorized MPC supercharger system

The AmSnow guys thought it would be interesting to run this combo in the Unlimited Stock class, since there's been nothing to compare to the big Cat turbo sleds. Keith "Woody" Wood came once again from his shop Woody's Performance Center in Topsham, ME with this new Nytro that was fitted with the MPC supercharger system. Last year, I believe Yamaha sold those non-intercooled low boost SC systems to dealers with 1/1 toothed belt drive from crank to supercharger (28 tooth crankshaft pulley, 28 tooth on the SC). But this year, since Yamaha is providing engine warranty for customers opting for the $4399 option (plus six hours labor) they've dropped the boost by a few pounds by supplying a 26 tooth crank sprocket instead of the previous year's 28 tooth crank sprocket.

Here's the 2013 Nytro with the 2013 MPI supercharger system. Note that the centrifugal supercharger increases airflow/ boost pressure as the square of engine RPM so boost and HP peaks at the rev limiter.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BoostP psig	LamAF1 Ratio	AirInT degF	ElpsTm Secnds
6600	120.9	96.2	2.9	12.11	37.3	0.71
6700	122.1	95.7	2.9	12.13	37.3	1.18

6800	123.7	95.6	3.0	12.19	37.3	1.55
6900	126.0	95.9	3.1	12.27	37.3	1.92
7000	128.5	96.4	3.1	12.33	37.3	2.25
7100	130.8	96.7	3.2	12.40	37.4	2.61
7200	133.2	97.1	3.4	12.45	37.4	2.92
7300	135.6	97.5	3.5	12.50	37.4	3.29
7400	138.0	98.0	3.5	12.54	37.4	3.62
7500	140.4	98.3	3.7	12.55	37.4	3.94
7600	142.5	98.5	3.8	12.52	37.4	4.26
7700	144.7	98.7	3.9	12.47	37.4	4.60
7800	147.3	99.2	4.0	12.41	37.4	4.99
7900	149.4	99.3	4.1	12.36	37.4	5.31
8000	151.0	99.1	4.4	12.30	37.5	5.62
8100	152.9	99.1	4.5	12.24	37.5	5.93
8200	154.9	99.2	4.5	12.24	37.5	6.31
8300	156.9	99.3	4.7	12.23	37.5	6.62
8400	158.4	99.0	4.9	12.24	37.5	6.95
8500	160.3	99.0	5.0	12.26	37.5	7.29
8600	162.1	99.0	5.1	12.30	37.5	7.62
8700	163.5	98.7	5.2	12.35	37.5	7.97
8800	165.6	98.9	5.5	12.40	37.6	8.34
8900	167.3	98.7	5.6	12.46	37.6	8.63
9000	168.6	98.4	5.6	12.51	37.6	8.97
9100	170.8	98.6	5.7	12.58	37.6	9.32
9200	172.1	98.3	5.9	12.65	37.6	9.68

As we did with the D&D boosted-up F1100 turbo, we increased the boost and supercharger speed by installing the 2012 spec 1/1 drive from crank to SC. As we can see this is where the “180 HP” number came from—once again occurring just before the rev limiter.

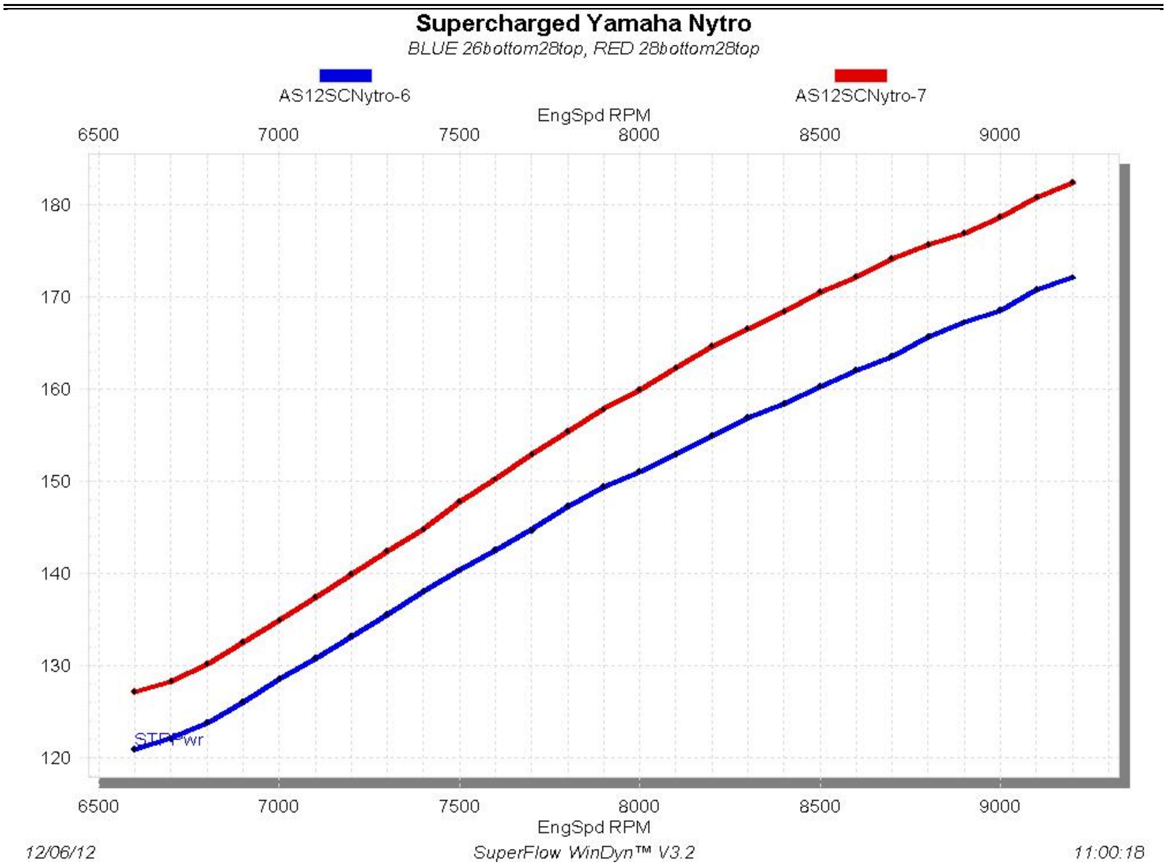
EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BoostP psig	LamAF1 Ratio	AirInT degF	ElpsTm Secnds
6600	127.2	101.2	3.5	12.65	46.5	0.75
6700	128.3	100.6	3.6	12.67	46.5	1.19
6800	130.2	100.5	3.8	12.65	46.5	1.55
6900	132.5	100.9	3.9	12.65	46.5	1.92
7000	134.9	101.2	4.0	12.66	46.4	2.25
7100	137.4	101.6	4.1	12.70	46.3	2.63
7200	139.9	102.0	4.2	12.76	46.3	2.95
7300	142.4	102.5	4.3	12.78	46.3	3.26
7400	144.8	102.7	4.5	12.82	46.3	3.62
7500	147.8	103.5	4.6	12.85	46.2	3.95
7600	150.2	103.8	4.8	12.82	46.1	4.26
7700	152.9	104.3	4.9	12.79	46.1	4.63
7800	155.4	104.7	5.0	12.75	46.1	4.94
7900	157.8	104.9	5.2	12.66	46.2	5.28
8000	159.9	105.0	5.4	12.62	46.1	5.61

8100	162.3	105.2	5.5	12.61	46.1	5.94
8200	164.7	105.5	5.7	12.58	46.1	6.29
8300	166.5	105.4	5.8	12.56	46.1	6.62
8400	168.4	105.3	5.9	12.59	46.1	6.96
8500	170.5	105.4	6.1	12.59	46.1	7.30
8600	172.2	105.1	6.2	12.61	46.1	7.66
8700	174.2	105.2	6.3	12.66	46.1	7.96
8800	175.7	104.9	6.5	12.66	46.0	8.30
8900	176.9	104.4	6.7	12.66	46.0	8.60
9000	178.7	104.3	6.8	12.54	45.9	8.96
9100	180.8	104.4	7.0	12.49	46.0	9.29
9200	182.5	104.2	7.1	12.52	45.9	9.67

Finally, Woody installed overdrive sprockets that would take boost up to 10 psi at peak— well beyond the capability of the stock injectors to deliver adequate fuel— the stock fuel pump is adequate but injector size is inadequate (see earlier boosted Nytro tests on this site). With the overdrive pulleys, power climbed in a linear fashion until just above midrange where A/F ratio began to lean out and drop HP. So going beyond 1/1 SC drive in winter sea level air is inviting problems! With this boost level and adequate fuel flow (from proper injector sizing, fuel volume and pressure and good tuning), it can easily be in the 200HP range, but surely unadvisable on pump gas for even short periods of time at this level of boost.

EngSpd RPM	STPPwr CHp	STPTrq Clb-ft	BoostP psig	LamAF1 Ratio	AirInT degF	ElpsTm Secnds
6600	132.9	105.8	5.9	10.78	48.6	0.76
6700	134.6	105.5	6.2	10.80	48.6	1.19
6800	137.3	106.0	6.3	10.78	48.6	1.57
6900	139.7	106.3	6.5	10.74	48.6	1.93
7000	142.5	106.9	6.6	10.82	48.5	2.26
7100	145.5	107.6	6.7	10.93	48.5	2.61
7200	148.8	108.5	6.8	11.11	48.5	2.96
7300	151.8	109.2	6.9	11.30	48.5	3.27
7400	155.5	110.4	7.2	11.50	48.4	3.63
7500	159.0	111.3	7.3	11.67	48.4	3.93
7600	163.0	112.6	7.5	11.84	48.4	4.32
7700	166.3	113.4	7.6	11.91	48.4	4.61
7800	169.1	113.8	7.7	11.99	48.3	4.93
7900	172.2	114.5	7.8	12.17	48.3	5.29
8000	175.0	114.9	8.0	12.29	48.2	5.62
8100	177.5	115.1	8.1	12.41	48.2	5.96
8200	179.9	115.2	8.2	12.56	48.2	6.32
8300	182.0	115.1	8.4	12.65	48.2	6.63
8400	183.7	114.9	8.6	12.73	48.2	6.96
8500	185.4	114.6	8.7	12.83	48.1	7.28
8600	187.2	114.3	8.9	12.96	48.1	7.62
8700	188.8	114.0	9.1	13.09	48.1	7.98
8800	190.3	113.6	9.2	13.19	48.0	8.29

8900	191.5	113.0	9.4	13.34	48.0	8.66
9000	192.4	112.3	9.6	13.45	47.8	8.99
9100	192.8	111.3	9.8	13.60	47.8	9.34
9200	192.8	110.1	9.9	13.75	47.8	9.68
9300	192.2	108.5	10.0	13.83	47.7	10.06



Here's a graph comparing stock boost F1100 turbo with stock tune and with the $289 D&D reflash along with the Yamaha Nytro SC with 28/28 tooth pulleys and overdrive pulleys. Note that the overdriven Nytro supercharger, even with the fuel tuner maxed out, caused A/F ratio to lean out at high revs causing HP to tail off. More fuel is necessary to overdrive the SC.