

SNOWTEST PRODUCT REVIEWS

Ultimate Flow Optimizers (UFOs)

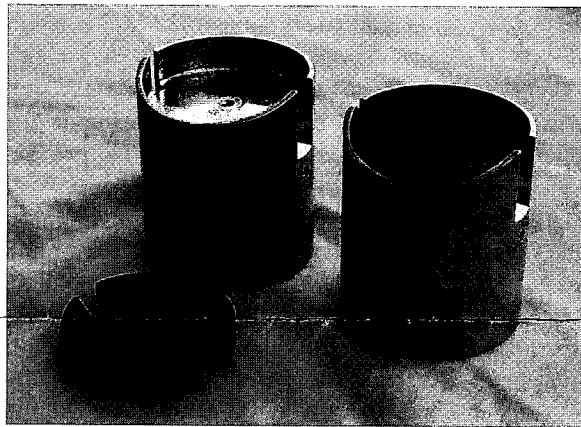
We took a little heat last season for running an article on a product that had never been tested on the snow. Yet the airflow and manometer test results on the UFOs were so convincing that we felt this product had great potential. Quite a bit of discussion and some disagreement resulted. Even so, *the UFO was probably the most significant new product release of the year!*

SnowTech ran UFOs on three different sleds last season, and several SnowTech test riders also installed them on their engines. Did they work as promoted, did they deliver throttle response similar to flatslide carbs? We can say that yes, they did work (quite well in fact), BUT, they did require

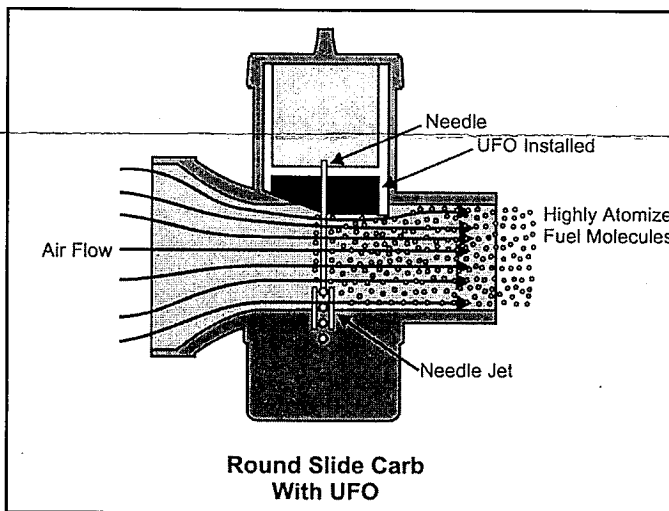
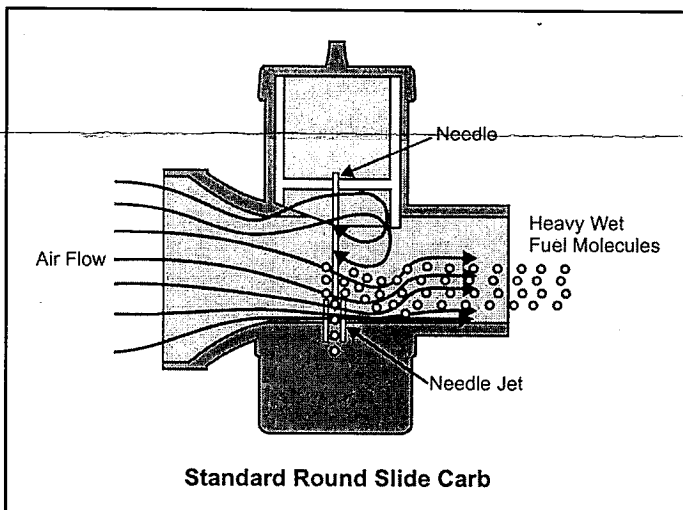
extensive re-calibration of the carbs. The UFOs, as shown by the airflow and fuel pulling data, change how the carbs flow air & fuel (and the calibration of the carbs) to the point that you had better know what you're doing when it comes to carb tuning, or better yet let someone else do the experimenting and then apply their proven carb specs to your machine. The tuners learned that once you figured out how to get the carbs UFO calibrated, *the end result was simply awesome.*

Here are some basic guidelines that we learned for tuning a sled with UFOs installed:

Pilot Jet Size: Up to 1/4 throttle, the UFOs were now pulling up fuel between the



needle and the nozzle, requiring less fuel from the pilot circuit, so the idle screw had to be cranked in to get enough air into the engine for it to idle. Reduce pilot size in half (this will usually be within 1 size of final setting). For example, if the sled has a #60 pilot, go down to #30. The final pilot size will usually be within 5, from #25 to #35. The idle screw will have to be turned in to get the engine to idle, and the air screw will have to be re-adjusted (usually out). Arriving at the proper balance between the pilot jet size and air screw setting will



What are UFO's? They are "carb slide stuffers", simple plastic "patent pending" pieces from Thunder Products (320-597-2700) that fit up into the bottom of the carb slides. The theory was that the exposed forward wall of the carb slide was creating turbulence, forcing the fuel to the bottom of the carb bore. By filling this slide cavity, the airflow is increased and the fuel is pulled farther up the needle. Throttle response is greatly improved, and midrange power is very impressive.

From 1/4 throttle to 7/8 throttle, the UFOs were causing the carb to flow more air (as shown by the flow bench results) which required an increase in fuel delivery. Most of this extra fuel was supplied by the carb's ability to pull more fuel up out of the float bowl. Never did we experience an engine that needed the jetting leaned in the midrange. In reality, many set-ups needed more fuel in the midrange.

Needle Jet & Jet Needle: Leave the needle jet alone. You'll likely have to raise the needle (lower the clip) at least one position, maybe two. Exception: on '96 & '97 MX Z 670 engines, increase from AA-2 needle jets to AA-3 needle jets (what the '98 MX Z 670s have). Other sleds with known lean spots in the midrange will likely need more fuel.

Slide Cutaway: Open up the cutaway by one size. Example, if the sled has stock 2.5 cutaway, you will want to install a 3.0 UFO, but you have to modify the slide so that the 3.0 is effective. If you don't increase the cutaway, you'll end up at an even lower pilot jet size to get the sled to idle but will not get the proper fuel economy. Some guys tried to drop a 3.0 UFO into a 2.5 slide not realizing that they have to grind away the extra metal on the slide. We weren't too keen on "burning this bridge" either, but if you want it to work right without sucking your fuel tank dry in record time you need to do it.

Main Jet: If the main jet circuit has been tweaked to the edge prior to installing UFOs, you'll have to increase the main jet, usually only one size. The rule of thumb here is that if the pilot jet is reduced 4-5 sizes, increase the main jet one size. **Remember, by reducing the pilot jet so far, you are reducing the amount of fuel delivery at full throttle!**

One of the biggest mistakes tuners made was in thinking that since the UFOs pulled on the fuel harder that they would need to reduce the needle jet and/or main jet circuits. Quite the contrary, many sleds required an INCREASE in the midrange and main jetting circuits due to the increased airflow in the midrange and the reduction in pilot size that was needed to get the engine to idle. This was a major oversight that caught all of us by surprise. No one really thought the pilot jet supplied much fuel (about 10% of total fuel delivery) at wide open throttle. We'll say it again; by reducing the pilot jet size so far the fuel delivery was reduced through the midrange and at wide open throttle. If you were running stock mains, you'd likely not have a problem, but if your mains were smack where they should be, installing the UFOs and dropping the pilots led to a lean condition at wide open - so beware.

Usually tuners would use the following path of getting the UFOs to work. First off they would install the same size cutaway UFO as what

their slides were, not wanting to cut into their slides. The sled wouldn't idle, so they would next reduce the pilot jet size (repeatedly) until they could get the sled to idle and run at 1/4 throttle positions. Once they actually got the engine to run (sometimes pretty good), they would start to experience the desired wicked midrange power, but the fuel consumption was off the scale. We experienced this on our ZL 500 and Formula Z 670 fitted with UFOs.

The next thing the tuner would decide was that they had to open up the cutaway to get the fuel economy back down, and this is where trouble could set in. Once the cutaway was opened up, the pilot size would have to come back up. Failure to put larger pilots back in could result in a burndown (we had it happen). A larger cutaway means more airflow, and with the pilot jet already down to the bone increasing the cutaway without increasing the pilot size led to trouble. If the tuner was lucky enough to increase the pilot jet before opening up the cutaway, they would be pretty close to having it dialed. The temptation to drop the needle or drop the main had to be resisted, and we feel that anyone who tried this kind of tuning without temp gauges was foolish at best, flirting with engine burndowns.

We did experience less sensitivity to temp and elevation changes on our UFO equipped engines. The theory is that with more complete fuel atomization the exact jetting is less critical, and we have to agree that the UFO sleds were able to run better as the temps warmed up. An April snowfall with temps climbing up to 40 degrees brought out a final test run, and the UFO equipped 670 Rotax ran far better than the non-UFO equipped 670 with similar main jetting (280/310 mains).

Once the UFO equipped carbs are adjusted properly you will definitely "feel" the difference in the midrange and throttle response, and will have improved fuel economy - compared to a stock carb that is properly jetted. Every sled that we installed UFOs into would over rev, indicating that the engine was making more power, which required a clutching change to keep the rpms right, so be ready to do this, too. We had to install heavier flyweights in every primary clutch to keep the shift RPM down where it belonged.

Now that tuners have had a full (yet short) season tuning carbs with UFOs, a safe calibration for just about every stock sled has been figured out. The UFOs are not for the casual tuner. Either have exact carb specs for your sled or be ready to perform some time consuming testing with EGT gauges to get the sled dialed in. Tuning ability is a pre-requisite to get them to work, but you will appreciate the difference once properly dialed in. We did, as did many experienced tuners.

UFOs on the Dyno: FACT OR FICTION?

We wanted to find out, on the dyno, what kind of effect the UFOs had on the power levels of an engine. We knew they made our sleds pull incredibly hard through the midrange, but was it simply because of lower fuel consumption numbers? Could we get the same results just by leaning out the stock carb jetting? The only way to find out was to make before & after dyno runs with similar Brake Specific Fuel Consumption (BSFC) numbers, then we could be sure. Our test mule was a stock '95 ZRT 800.

RUN # 1
Full throttle w/o UFOs
MJ 350, NJ Q0, JN #3, PJ35
BSFC under full load: 0.66

RPM	CBT	CBHP	BMEP
6000	56.78	64.87	87.15
6500	64.58	79.92	99.11
6750	72.37	93.02	111.07
7000	79.05	105.36	121.33
7250	84.62	116.81	129.87
7500	89.07	127.20	136.71
7750	94.64	139.66	145.25
8000	96.87	147.55	148.67
8250	95.75	150.41	146.96
8500	92.41	149.57	141.83
8750	87.96	146.55	135.00
9000	83.51	143.10	128.16

Dyno run #1: Our first dyno run was with the stock engine, stock pipes and carb jetting as follows: Main Jet (MJ) 350, Needle Jet (NJ) Q0, Jet Needle (JN) position #3, Pilot Jet (PJ) 35. Dyno run was at wide open throttle. Peak power of 150.41 HP occurred at 8250 RPM, with peak torque of 96.87 foot pounds at 8000 rpm. The EGT's were slow to respond when running under partial load, and temps were uneven under full load. Cylinder #1 - 1187 F, #2 - 1155 F, #3 1145. Brake Specific Fuel Consumption (BSFC) under full load was .66 demonstrating a safe jetting combination.

Dyno run #2: Exact same carb specs as run # 1 (MJ 350, NJ Q0, JN #3, PJ 35), this dyno run was made at 1/2 throttle. Peak HP of 105.00 @ 7500 rpm, peak torque of 73.53 @ 7500 rpm. EGTs were again slow to climb and uneven. BSFC @ .67

RUN # 2
Half Throttle w/o UFOs
MJ 350, NJ Q0, JN #3, PJ 35
BSFC under full load: 0.67

RPM	CBT	CBHP	BMEP
6000	54.62	62.40	83.83
6500	59.87	74.10	91.89
6750	66.18	85.05	101.56
7000	70.38	93.80	108.01
7250	72.48	100.05	111.23
7500	73.53	105.00	112.85
7750	70.38	103.85	108.01
8000	66.18	100.80	101.56
8250	58.82	92.40	90.28

Dyno run # 3: UFOs were installed. All jetting the same except for the clip was moved to #2 from #3 (MJ 350, NJ Q0, JN #2, PJ 35). Wide open throttle run. HP peak of 152.16 @8250, torque peak of 97.98 @ 8000 rpm, showing little change (+1.5 hp) in power levels at wide open throttle. The engine had great response, but was very rich at idle and up to 1/4 throttle. EGT temps came up to maximum temp quicker and were now very close to each other, cylinder # 1 - 1190, #2 - 1185, cylinder #3 - 1205. BSFC @ .62

We then jetted the mains up from 350s to 370s (MJ 370, NJ Q0, JN #2, PJ 35), re-ran and to our surprise only lost 1/2 HP at 8250 rpm. BSFC only increased to .68. The exhaust gas temps dropped slightly to #1 - 1175, #2 - 1170, #3 - 1160. The engine

RUN # 3
Full throttle w/ UFOs
MJ 350, NJ Q0, JN #2, PJ 35
BSFC under full load: 0.62

RPM	CBT	CBHP	BSFC
6000	60.12	68.69	92.28
6500	67.92	84.06	104.24
6750	74.60	95.88	114.49
7000	81.28	108.33	124.74
7250	87.96	121.42	135.00
7500	91.30	130.38	140.12
7750	96.87	142.94	148.67
8000	97.98	149.25	150.38
8250	96.87	152.16	148.67
8500	93.53	151.37	143.54
8750	89.07	148.40	136.71
9000	84.62	145.01	129.87

really seemed to run well despite the main jet increase of two sizes. This seemed to demonstrate how the exact fuel amount is less critical with the UFOs installed. So many field reports were of awesome performance but terrible fuel consumption (like 70 miles for a whole tank!). Usually, when an engine is jetted so rich it doesn't run well, but this didn't appear to be the case with the UFOs installed.

Dyno run # 4: UFOs installed. Main jets back to 350. Now we dropped the pilot jet from #35 down to #20 (MJ 350, NJ Q0, JN #2, PJ 20). Peak power increased to 153.91 HP @ 8250, peak torque of 97.98 @ 8000 rpm, but the engine was running leaner with a BSFC of .57 and the temps went up to #1 - 1230, # 2 - 1225, # 3 - 1235. This demonstrated the fact that reducing the pilot jets 3 sizes affected the fuel flow at wide open throttle, reducing the BSFC

RUN # 4
Full Throttle w/ UFOs
MJ 350, NJ Q0, JN #2, PJ 20
BSFC under full load: 0.57

RPM	CBT	CBHP	BMEP
6000	60.12	68.69	92.28
6500	67.92	84.06	104.24
6750	75.71	97.31	116.20
7000	83.51	111.30	128.16
7250	89.07	122.96	122.96
7500	92.41	131.97	141.83
7750	96.87	142.94	148.67
8000	97.98	149.25	150.38
8250	97.98	153.91	150.38
8500	94.64	153.17	145.25
8750	89.07	148.40	136.71
9000	84.62	145.01	129.87

from .68 to .57. We increased the main jets up from 350s to 360s and re-ran, which raised the BSFC up to .62 and lowered the EGT temps by 15 degrees.

Dyno run # 5: This is where it got interesting. Jetting was the same as run # 4 (MJ 350, NJ Q0, JN #2, PJ 20). While the UFOs didn't show much of a difference at wide open throttle (we didn't really expect them to) they should really wake up the numbers at half throttle. This run was again at half throttle with UFOs installed. Peak power of 117.66 @ 7500 rpm, peak torque of 82.39 also @ 7500 rpm (compare to 105 HP and 73.53 ft lbs of torque w/o UFOs at the same RPM). BSFC was .65 (compared to .67 w/o UFOs @ 1/2 throttle), temps at #1 - 1210, #2 - 1200, # 3 - 1195. **There was over 12 HP more at half throttle, and nearly 9 more foot pounds of torque!** The engine had excellent throttle response, and the EGTs were quick to respond

RUN #5
Half throttle w/UFOs
MJ 350, NJ Q0, JN #2, PJ 20
BSFC under full load: 0.65

RPM	CBT	CBHP	BMEP
4000	44.54	33.92	68.35
5000	54.56	51.94	83.73
6000	61.24	69.96	93.98
6500	65.69	81.30	100.82
6750	73.49	94.45	112.78
7000	77.94	103.88	119.62
7250	81.28	121.20	124.74
7500	82.39	117.66	126.45
7750	79.05	116.65	121.33
8000	74.60	113.63	114.49
8200	69.03	108.44	105.95

and stabilize.

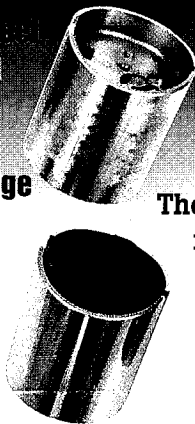
We tried a 1/4 throttle run, but the temps climbed quickly up towards 1300 degrees. So we raised the needle (clip position #3) and stabilized the 1/4 throttle temps to 1265. Raising the needle again to clip position # 4 brought the temps down to 1200 degrees at 1/4 throttle.

Conclusions: We felt the testing on this engine was fairly conclusive, showing horsepower and torque gains using UFOs at mid throttle positions and little power gains once the throttle is brought to wide open. We were also able to demonstrate what we had been finding in the field on what to change in the overall jetting with UFOs installed. To stabi-

UFO'S

Ultimate Flow Optimizers Are Here!

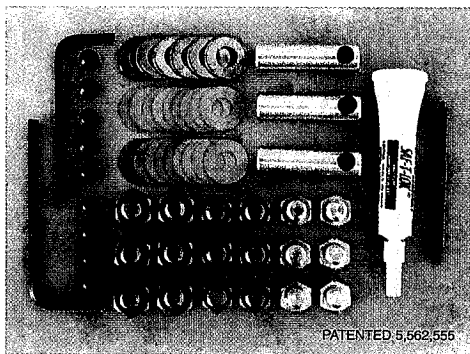
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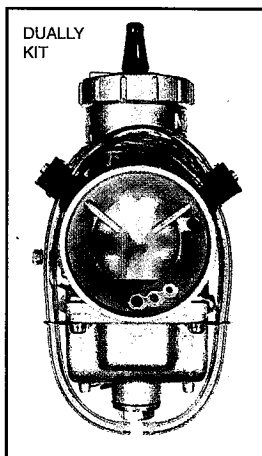
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lize the idle you have to drop the pilot jet size. When you drop the pilot jet by 4-5 sizes you should increase the main jet one size. You do not want to lean the midrange at all, in most cases you will have to raise the needle to keep the mid throttle temps in line. Throttle response is something that is difficult to show on a dyno, but horsepower and torque increases are for real at mid throttle positions with UFOs installed and similar BSFC numbers for apples to apples comparisons.

The ability of the engine to run pretty much the same with extra fuel seemed to verify the field reports that a sled with UFOs could be jetted for 6000 feet, and run seemingly well up to 10,000 feet with out significant loss of engine response or performance as demonstrated by the ability to increase the main jets by 2 sizes and only loose 1/2 HP and 40 degrees on the EGTs. Yes, the fuel consumption would go up but the ability to run well with so much fuel was a surprise. We suspect this is caused by more complete atomization of the fuel. How else could we make more power while using the same amount of raw fuel?

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