STRIKE

PRODUCTS

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SUBJECT: Aftermarket CNC cylinder for Yamaha J engine

Australian Karting Association,
NKC & Executive,

Dear Madame/Sirs,

Since the NKC meeting in late December 2011 and the Suggestions memo (2 January, 2012), we had direction from Craig Denton to send a prototype cylinder each to J & A (Melbourne) and Flatout (Perth) for testing. At this time Flatout were not available to do any testing due to other work commitments so the other cylinder was sent to Gyrotune (Tasmania).

In addition to testing by both the above, the cylinders were also dyno tested by both A1 Engines in Melbourne and also Roy Tester in Perth. All the testing results can be seen at the back of this document (see NOTE 1.)

In al,l but one case, the cylinders showed a performance slightly better than any reference cylinders of a known very high level of performance. Obviously this situation needs to be understood and, if necessary, would need to be addressed by some form of detuning, a listing of some options to do this can be seen at the back of this document (see NOTE 2.).

Given this and the fact that time is ticking by, STRIKE seeks some form of written guarantee from the AKA along the following lines:

“That, should STRIKE go ahead with the production tooling of the cylinder as proposed, that the AKA will allow the cylinder to be accepted as an aftermarket item for the National class (& derivatives) pending dynamometer performance testing of a small quantity production cylinders to show that its overall performance is no greater than any known (& legal) J cylinder with the performance being detuned by a method chosen by the AKA”.

We are seeking such a commitment from the AKA so we can plan the future of STRIKE PRODUCTS. The investment in the tooling and equipment to manufacture such a cylinder is not trivial and we could only undertake this if there was the certainty that it was accepted given, of course, the appropriate power level demonstration. It is to be noted that there is no market for the J engine (and therefore cylinder) other than in Australia.

In summary, we propose the following basic programme for the cylinder:

1. Given the AKA written guarantee (as above), STRIKE goes ahead with the tooling for the production cylinder.
2. STRIKE produces a small quantity of cylinders to allow development and demonstration of the appropriate level of power.
3. STRIKE then produces a small quantity (say 3 off) of these cylinders for final validation by some appropriately selected AKA engine builders with dynamometers.
4. STRIKE then presents the cylinder with the necessary paperwork (including the validation test results) and fee to the AKA for aftermarket acceptance.
5. STRIKE commences manufacture and sale of the cylinder.

We would suggest that the cylinder if all goes well, say with an introduction of mid 2012, would not be permitted to be used for any State or National competition until 2013.

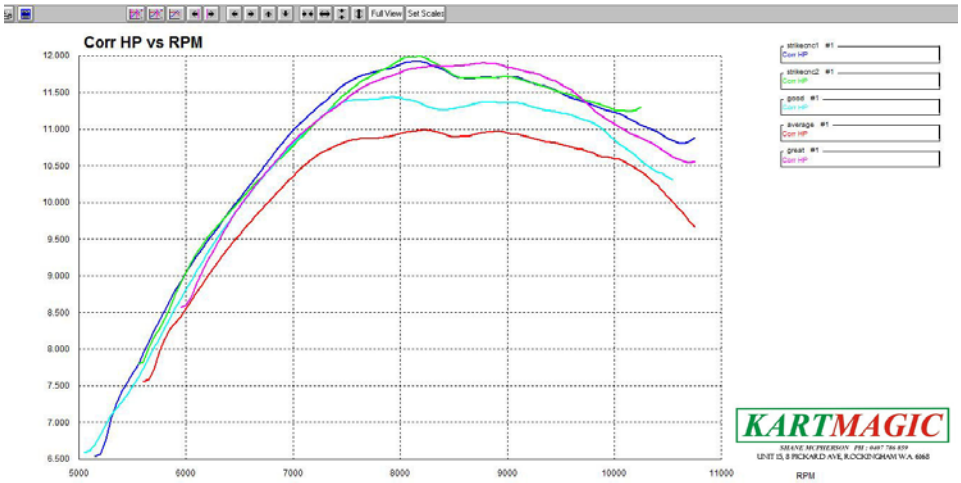
As a final note, we and many others make the point that the AKA has nothing to lose with the introduction of this cylinder, but many karters have a lot to gain.

Yours Faithfully

Ken Seeber

NOTE 1. TESTING

a) Kartmagic. Shane McPherson originally tested the two cylinders and produced the following graph:



There are 5 power curves shown in the graph:

Red: A very average engine, ie below average

Turquoise: An average engine

Purple: A very good engine

Green & Blue: STRIKE CNC cylinders on different engines.

From this it can be seen that the STRIKE barrels are extremely close in their performance and its characteristics and compare very well with the “very good” engine.

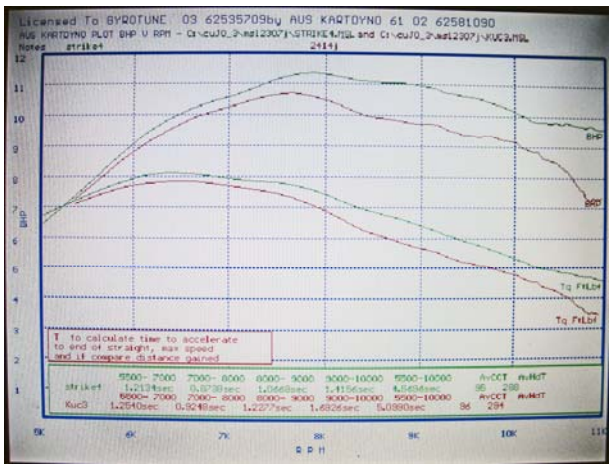
NOTE: All tests were conducted on the same day, same dyno and on the same fuel. Whilst the power scale is shown, it must be pointed out that the power levels are shown would not necessarily be the same on another dynamometer, they are comparative levels only.

b) Roy Tester. Roy Tester, a part time engine builder in Perth, dyno tested the cylinder and that it was confirmed that its performance was greater than his best known cylinder.

c) A1 Engines. Brett Arnett dyno tested the cylinder and confirmed that its performance was greater than his best known cylinder. His opinion was that it could be simply detuned by increasing the CCs.

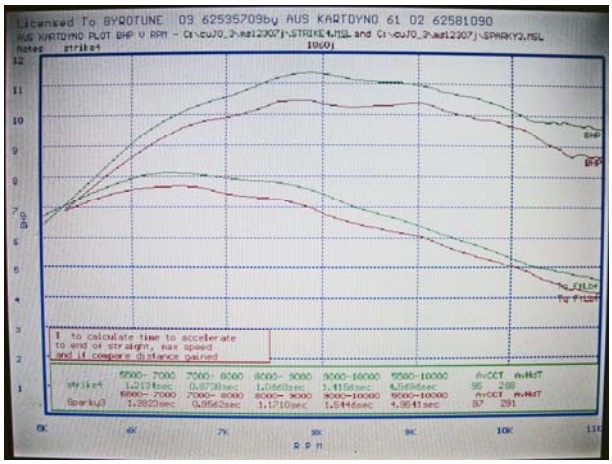
d) J & A. Anthony Bartolo dyno tested the cylinder and confirmed that its performance was slightly greater than his best known cylinder. His opinion was that it should be detuned by lowering the transfers. Anthony, as with Flatout, was very busy with engine preparation work for the recent Victorian Open so only had little time for this test.

e) Gyrotune. John Whitfield both dyno and track tested the cylinder and confirmed its performance level in both situations.



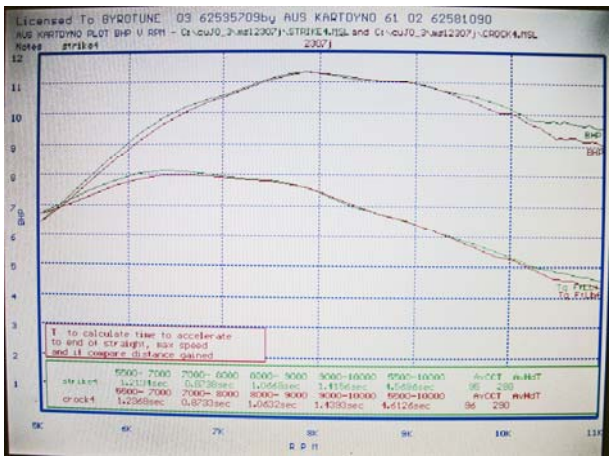
The cylinder was compared to 3 cylinders, the first one shown on the left shows the STRIKE cylinder (green line) compared to a “very average” Yamaha J cylinder (red line). The difference is very obvious.

The 5500 to 10000 rpm acceleration time was 4.57 seconds for the STRIKE cylinder and 5.1 seconds for the “very average” cylinder.



This second graph shows the same STRIKE cylinder in comparison with a “good average” J cylinder

The 5500 to 10000 rpm acceleration time was 4.57 seconds for the STRIKE cylinder and 4.95 seconds for the “good average” cylinder.



This third graph shows the same STRIKE cylinder in comparison with an “exceptionally good” J cylinder that has been used to garner five Tasmanian state titles.

The 5500 to 10000 rpm acceleration time was 4.57 seconds for the STRIKE cylinder and 4.61 seconds for the “exceptionally good” cylinder. The STRIKE cylinder was very close in performance, but was still better than this cylinder.

Subsequent track testing showed the STRIKE cylinder to be roughly 0.2 to 0.3 seconds quicker (compared to the “exceptional” cylinder) on the Hobart track which has a lap time of around 42 seconds. All track testing was done using an Alfano logger. Gyro’s thought’s were that the cylinder be detuned with increased CCs and squish control (see below in NOTE 2.)

A couple of things can be determined from this thorough testing:

- There is a considerable difference between Yamaha J cylinders, eg, at 10500 rpm, the “exceptional” cylinder was 9.25 hp and the “very average” was 8.0 hp.
- That there is some difference between the initial testing showing a slightly lower performance to the subsequent multiple testing where it was shown to be better. Perhaps Kartmagic has the cylinder of all cylinders.
- The good thing about the combined dyno and track testing confirmed that the dyno predicted the increased track performance, to the point that the controlled dyno testing method is the ideal way to make a comparison of two cylinder types, in this case the STRIKE vs a Yamaha cylinder, all other controlling parameters being the same (eg, exhaust, carburetor, ignition, head, squish, intake and exhaust timings and complete crankcase/crankshaft assembly as well as atmospheric conditions).

STRIKE must acknowledge its appreciation for the time and effort that the above and their enthusiastic helpers have put into the testing of the cylinders and their ongoing support for the concept.

As a general comment, the good performance of the STRIKE cylinder, despite the conservative port timings used (for the exhaust/transfer split) is simply due to the improved flow characteristic of the transfer ports and passages and the accurate symmetry from side to side. This is fortunate in terms of possibly having to reduce power, rather than attempting to find power.

NOTE 2. OPTIONS TO DETUNE CYLINDER.

There are a number of options available to reduce the effective performance of the cylinder, should this be necessary with the production versions:

Option 1. To maintain the current prototype port sizes and timings (all within the AKA rules) and simply increase the CCs of the head.

Pro's: a). If the production cylinder proves to be too fast, it is a simple matter to alter the CC value (eg go from 11 cc to say 12 cc) and possibly vice versa. This makes for simple parity adjustment.
b). It does "dumb" down the rest of the engine to make it less sensitive to other performance controlling criteria. This exact approach was used in detuning the Comer SW80 in the changeover from the S80.
c). There is some argument that the engine life might be increased due to lower combustion pressures.
d). Would likely maintain the very close power curve relationship to the Yamaha cylinder.

Con's: a). Does require the engine inspector to be aware of the cylinder being used

Option 2. As above, but with the added feature of controlling the squish clearance at the same time. This could mean a 11 cc head could be used as the CC would be increased by raising the head with increased gasket thickness, eg 12 cc with a 1.2 mm squish compared to the typical 11 cc with 0.7 mm squish (based on a 0.5 gasket giving a 1.0 cc increase in volume).

Pro's: a). This would not necessitate any modifications to the head, the squish being measured with solder as per Rotax Max
b). Same as in 1. above
c). Simplifies the installation of the cylinder, with only gasket changes to vary the engine CCs. .

Con's: a). Does require the engine inspector to be aware of the cylinder being used plus the extra task of inspecting for squish clearance

Option 3. Gradually (with subsequent iterations) lower the transfer port height. This would be done on production cylinders typically lowering the transfer port height (both in the liner and also the cylinder casting) in say 0.2 mm increments until the appropriate power level can be achieved.

Pro's: a). Cylinder could be interchangeably used with no need for alternative rules of recognition of what cylinder type is used

Con's: a). Should the power level be shown (in time) to be lower, it would be difficult to increase other than say reduce CCs.
b). Further alteration of the transfer port height might alter the shape of the power curve.

Option 4. To introduce a restrictor plate (in National classes)

Option 5. To add weight to the kart.

From STRIKE's perspective, the Options 1 & 2 would be the first choice, but do recognize that there is extra inspection complication and rules required. The second choice would be the Option 3. We consider Options 4 & 5 to be inappropriate. Ultimately we would accept the AKA's choice.

It might be worthwhile to remind ourselves of the alterations of engine performances or even inclusions of engines into classes that the AKA has overseen in recent years:

- SW80 to replace the S80. The engine was detuned with CCs change and given the green light based on dyno testing
- The detuning of the KT100J in the Midget class going from a Ø13.5 restrictor to one of Ø13.0 plus the addition of an extra 5 kg
- The formation of the different engine restrictor sizes for the 125 Restricted class based on track testing only
- The acceptance of the X30 engine into the "one engine" Leopard class based on track testing only
- The acceptance of various iterations of Rotax Max cylinders with no known parity testing, some with reported performance increase over the earlier versions

The above is not intended as a criticism of the AKA, but a comparison with the thoroughness of our proposed detuning and evaluation programme.