



LIGHT and HEAVY

WORLD FORMULA CLASSES

for

QUARTER MIDGETS of AMERICA

QMA World Formula Class Report

Section 1	Engine Overview	Page 3
	2005 Parts/Price List	Page 4
	World Formula Testing	Page 4
	Briggs Support for the W/F	Page 5
Section 2	2005 Exhibition Year Report	Page 6
	Rules for 2005 Exhibition Class	Page 6
	Engine and Gearbox Suppliers	Page 6
	Maintenance Problems	Page 7
	Cost Summary 1st and 2nd Years	Page 7
	Performance	Page 8
	Light W/F Performance	Page 9
	Torque and Horsepower Chart	Page 10
Section 3	Light and Hvy W/F Classes for QMA	Page 11
	Driver Rules	Page 11
	Driver and Car Weights	Page 11
	Class and Division Structure	Page 12
	Lap Count	Page 12
	Car Construction	Page 12
	Suspension Rules	Page 12
	Restrictor Plate Program	Page 12
	Required / Allowable Modifications	Page 13
Engine Tech Rules	Page 13	
Section 4	Questions and Answers	Page 16
Section 5	Conclusion	Page 18

Engine Overview

Briggs and Stratton History

The Briggs and Stratton Company was founded in 1909 in Wauwatosa, Wisconsin and began building outboard Marine engines through their Evinrude/Johnson brands in the 30's.

Presently Briggs and Stratton distributes to 108 countries through 18,000 lawn and garden centers. In 2004 they built over 11.4 million engines worldwide.

The Briggs & Stratton Motorsports division was founded in 1991 and many motorsport organizations operate Briggs & Stratton motors throughout the world. There are over 450 Motorsports centers located in the United States and Canada making parts availability and delivery quick and easy.

The current racing motors are the Blockzilla, Raptor 3, Animal and World Formula engines.

World Formula

The World Formula engine is currently being raced in over 22 countries and is one of the most popular motors throughout Europe.

In the United States and Canada the engine is raced at:

- The Ron Fellows Championship Series in Canada
- World Karting Association, Gold Cup West Series
- International Karting Federation, National Sprint and Enduro Classes
- 2005 Provisional Acceptance in the National Modified Midget Association

The World Formula engine was developed from years of experience gained through the Briggs & Stratton Animal engine. Specifications and designs required a new racing motor built on this foundation with tight tolerances for consistent parts and tech with a reliable motor that is economical to purchase and maintain. Briggs & Stratton retail centers have a maximum price of \$1000 set to help contain racing costs and the motor utilizes a Rev Limiter that limits engine RPM to 7100. By limiting the RPM, excess wear and heat is reduced and time between overhauls is greatly increased. This helps to contain the maintenance costs and extend engine life.

World Formula Product Features:

- Billet aluminum Rod
- Dual ball bearing Cylinder
- Dura-Bore Cast Iron Cylinder Sleeve
- Slant, 30 degree Overhead valve design
- Displacement 12.48 Cu. Inches 200 cc
- Bore: 2.6875 inches Stroke 2.2 inches
- Compression 9.7 to 1
- Factory timing: 28 degrees BTDC
- Dual Valve Springs on both valves
- Nitrided and dished exhaust valve with hardened tip
- Three-piece Automotive style keepers
- Reinforced crankshaft with Induction hardened crankpin journal
- CNC'd intake port
- Racing designed combustion chamber featuring 25% more "squish" area
- Rotated intake flange with 16 degree slant port
- Rubber isolated carburetor system

- Cam faced, Barrel skirt domed piston with chrome-faced top ring
- Green Air Filter
- Walbro slide Carburetor
- Oversized tappets
- Stellite-faced, slotted cam
- Exhaust system featuring a port liner and bracket system for increased stability

2005 Parts/Price List

Replacement parts for the World Formula motor are widely available at a reasonable price. Below is a sample of the more expensive replacement and commonly used parts for the motor.

▪ Cylinder Assembly	\$136.20
▪ Piston with rings	48.65
▪ Ring set alone	23.35
▪ Billet Rod	83.10
▪ Head Assembly (complete) with valves, springs, keepers	122.14
▪ Valve exhaust 16.95 Valve intake	8.10
▪ Carburetor spacer	12.95
▪ Push Rod	2.40
▪ Crankshaft	60.00
▪ Camshaft	39.55
▪ Carburetor (complete)	125.90
▪ Fuel Pump	22.30
▪ Rev Limiter	95.50
▪ Manifold – Factory Exhaust Pipe	74.50
▪ Green Air filter	21.95
▪ Flywheel	73.40
▪ Housing – Blower	29.75

World Formula Testing

The World Formula engine has over 5,000 hours of MTS (MTS is a company that contracts independent accelerated testing of engines and other components) engine and chassis dyno testing.

Sample testing:

Billet Rod

MTS testing – passing two million cycles at 33% greater firing pressure than the World Formula (1300 psi)

- Best aftermarket rod design 1.2 million cycles (ARC)
- Qualified with over 3,000 hours of recorded dyno testing
- The 'little' things
 - Bolt threading
 - Oil hole location
 - Billet grain requirements (longitudinal)

Briggs support for the World Formula

Briggs & Stratton Motorsports Division is committed to the long term support and growth of the World Formula engine within QMA and other racing organizations. World Formula support for 2006:

- \$25,000 in tooling to update and improve the carb spacer
- \$150,000 in new tool die for the cylinder
- Improved cylinder design with more ribbing around the case, better support material in the bearing pockets, around the jug and down to the fins
- New digital PVL ignition system with integral Rev Limiter
- In 2006 Briggs will hand build all racing engines. A QMA specification will be developed that will eliminate all parts not required or allowed by the new class rules. This QMA spec. will lower the base price of the motor to the membership.

2005 Exhibition Year Report

Overview and Objective

At the 2004 National Meeting the Honda 160 Mod was introduced as an Exhibition class for the 2004 racing season. This class was not adopted at that meeting but direction was given to the National Tech Director to research and deliver a high performance, production motor to the membership.

Research was done and several motors were considered. The ideal motor must satisfy the following requirements:

- Single cylinder, air-cooled motor with horsepower and torque output greater than a Honda 160 requiring driver throttle control.
- A motor mass-produced that is economical to purchase and operate.
- A reliable motor requiring only nominal handler maintenance.
- A motor with tight, manufacturing specifications for easier inspections and clear tech determinations.
- A motor with a proven history and sure future with the backing of a strong company.

The World Formula Motor fit these criteria and was adopted during the 2005 National Meeting to be raced as a Heavy Exhibition class during the 2005 season.

Rules established for the 2005 Exhibition Class

- Minimum driver age 11 years old with one year racing experience in an unrestricted class.
- Weight: 100 lbs. minimum driver 325 lbs. minimum total
- Starter must be removed and flywheel opening must be covered with metal cover
- Black top cover and plate can be removed, flywheel openings must be covered
- Rev limiter must stay attached to engine and unaltered.
- Original exhaust header must be used, but may be cut no closer than 6" from flange at engine. Any pipe may be attached to header pipe and 1 min to 4 max. Briggs style mufflers must be used.
- Any unaltered automotive spark plug
- Pull starter optional
- May cut Flywheel cup
- Breather hose and carburetor bowl overflow must drain to a catch can
- Fuel pump optional
- Engine is to remain stock except for these items, other alterations will be considered illegal unless specifically approved by the QMA National Tech Director.

Engine and Gear box Suppliers

<u>Supplier</u>	<u>Cost</u>	<u>Location</u>	<u>Gear Box Type</u>	<u>Availability</u>
Hansen Racing Products	\$1700 race ready	California	Deco type	1-2 weeks
Buckwalter Racing	\$1595 race ready	Pennsylvania	Honda type	1-2 weeks
Ambassador Racing	\$1595 race ready	Florida	Deco type	1-2 weeks

Maintenance Problems

During 2004 and 2005 there were no major failures with the stock World Formula motor. There were two known failures of highly modified World Formula motors being raced in the half class. These motors had many modifications including different cams, different carburetors using alcohol and were operated without a Rev Limiter.

Listed below are all known problems that occurred during the year in the World Formula Exhibition class.

- Several handlers in QMA and Karting organizations have experienced problems with the Carb spacer. This is a rubber and metal spacer between the intake manifold and carburetor. The weight of the carb and air filter combined with the vertical G forces causes the rubber to either split or the metal stiffener within the spacer to detach from the rubber spacer. This causes an air gap and loss of performance. Handlers have been installing zip ties from the top of the carb to the impulse fitting on the intake manifold in an effort to keep the full weight off the spacer. This has been successful and extends the life of the carb spacer. External inspection will show a failed spacer. Replacement time is approx. 2-5 minutes. Cost \$15. Briggs has recognized this problem and will have a newly designed carb spacer available October of 2005.
- Broken stud on the top of the head that holds the exhaust pipe to the head. One known failure. Cost \$10
- Coil Failure. One known case. Cost \$ 10.
- Stock Crankshaft seal between the engine and gear-box is too soft and was replaced with a stronger seal. Stock seal allows the negative pressure in the engine to draw oil from the gearbox into the engine. Cost \$5, now included with each new motor coming from the engine builders.
- Exhaust pipe weld failures. Not an engine problem but a concern for handlers. Stock welds around the base of the pipe needs to be strengthened. Cost \$0 to \$10
- Vibration of the motor leading to loss or loosening of nuts and bolts on the exterior of the engine. Check all nuts and bolts prior to each day of racing. Cost \$0

Cost Summary typical first year

Engine Purchase including shipping	\$1750
Exhaust pipe	\$ 150
2 Carb Spacers	\$ 30
Oil Changes	\$ 30
Total	\$1960

Cost Summary typical second year for motors run on a weekly basis

Freshening by Engine builder	\$ 400
Oil changes	\$ 30
Total	\$430

Scheduled Maintenance, overhauls, freshening

- Oil change after every other race day. Synthetic oil recommended after break-in period.
- Overhauls: No known overhauls were done during exhibition year.
- Freshened: One motor that was raced as a half class in 2004 was refreshed. Price \$400
- Carb float height adjustment. Check after shipping and if running rough or excess fuel is observed in fuel catch can. Procedure available at ww.briggsracing.com
- Timing adjustment: Check after shipping and if engine is difficult in starting.

Maintenance Conclusion

The motor performed as expected and without ongoing problems except for the problem with the carburetor spacer. Briggs and Stratton have corrected the problem and new parts will be available the fall of 2005. The combination of a stock motor using the Rev Limiter has shown to be very effective in keeping failures and rebuilds to a minimum. The failure/overhaul rate in the karting organizations is the same as experienced during the 2005 Exhibition season. The engine is easy to work on for most handlers with little need for specialized tools or experience. Parts are readily available at reasonable prices. Based on these conclusions and future projections the World Formula motor has satisfied all maintenance objectives that were established.

Performance

The performance and lap times of the Heavy World Formula class were monitored using electronic scoring throughout the 2005 season at the New Smyrna QMRA track during Points races. The track is a 1/20th of a mile slightly banked asphalt track. New Smyrna QMRA raced all Honda classes and the World Formula class throughout the year. The B class times were recorded during the January 1st race prior to World Formula introduction.

Below are the best and average lap times during the A main races. Classes that were compared are Hvy World Formula, Light B, Hvy 160 and Light 160.

Heavy World Formula Performance Comparison

Date of 2005	WF Best	WF Avg	Lt B Best	Lt B Avg	Lt B Diff in avg	H160 Best	H160 Avg	H160 Diff in avg	L160 Best	L160 Avg	L160 Diff in avg
Jan 1-2			5.750	5.882							
Mar 11	5.925	5.955	na	na		6.227	6.288	+.333	6.119	6.197	+.242
Apr 22	5.886	5.913	na	na		6.194	6.268	+.355	6.044	6.148	+.235
May 13	5.907	5.945	na	na		6.035	6.195	+.250	5.978	6.075	+.130
May 20	5.782	5.852	na	na		6.098	6.202	+.350	6.012	6.084	+.232
Jun 10	5.844	5.895	na	na		6.219	6.323	+.428	6.052	6.141	+.246
Aug 19	5.955	6.029	na	na		6.331	6.394	+.365	6.042	6.123	+094
Summary Average	5.883	5.931	5.750	5.882	-.049	6.184	6.278	+0347	6.041	6.128	+0197

Light World Formula Performance

The Light World Formula Class did not operate as an exhibition class during the 2005 season and as such direct comparison numbers are not available. Handlers comments from QMA surveys have made it clear that one reason drivers are leaving QMA to move into other forms of racing is the speed disparity between light and heavy classes. The lighter and for the most part younger drivers that race in the light divisions are able to achieve speeds greater than their heavier and older counterparts in the heavy classes. The objective for the Light World Formula class is to provide approximately the same lap times as the Heavy Class by use of a restrictor plate.

Tests were completed over several days at the New Smyrna Quarter Midget track using the same car and motor and a light and heavy class drivers. The car was optimized for the respective class to achieve the best possible times. Different restrictor plates were used to adjust the lap times of the light class to those of the heavy class. The 3 hole, .312" (each hole) restrictor plate allowed the light class car to operate at approximately the same lap times as the heavy class car. During the tests the engine performance was only changed due to the restrictor plate and continued to run smoothly and without backfire or other problems.

Performance conclusion

It is clear that the performance of the World Formula engine has satisfied all objectives and requirements set forth for the 2005 Exhibition Season. The engine provides acceleration for both the engine and the car to a point that requires driver input and throttle control. This throttle control is important both for car performance and lap times but also tire management for longer races. This requires drivers that have only raced performance limited cars to learn throttle control and apply this knowledge every lap. This is an important lesson for drivers planning to move into higher performance quarter midgets and beyond quarter midgets.

The lap times of the Heavy World Formula class were approximately .35 seconds faster than the Honda Heavy 160 classes and .20 seconds faster than the Honda Light 160 classes over the race season. The Light B class ran lap times slightly faster than the Heavy World Formula class. This is consistent with the expectations of this class.

The comments from drivers and handlers involved in the exhibition year reported praise for the motor in all areas. The drivers enjoyed driving a car with increased performance and speed. The handlers liked the simple design, maintenance free reliability within an economic package of purchase and operation.

Torque and Horsepower Chart

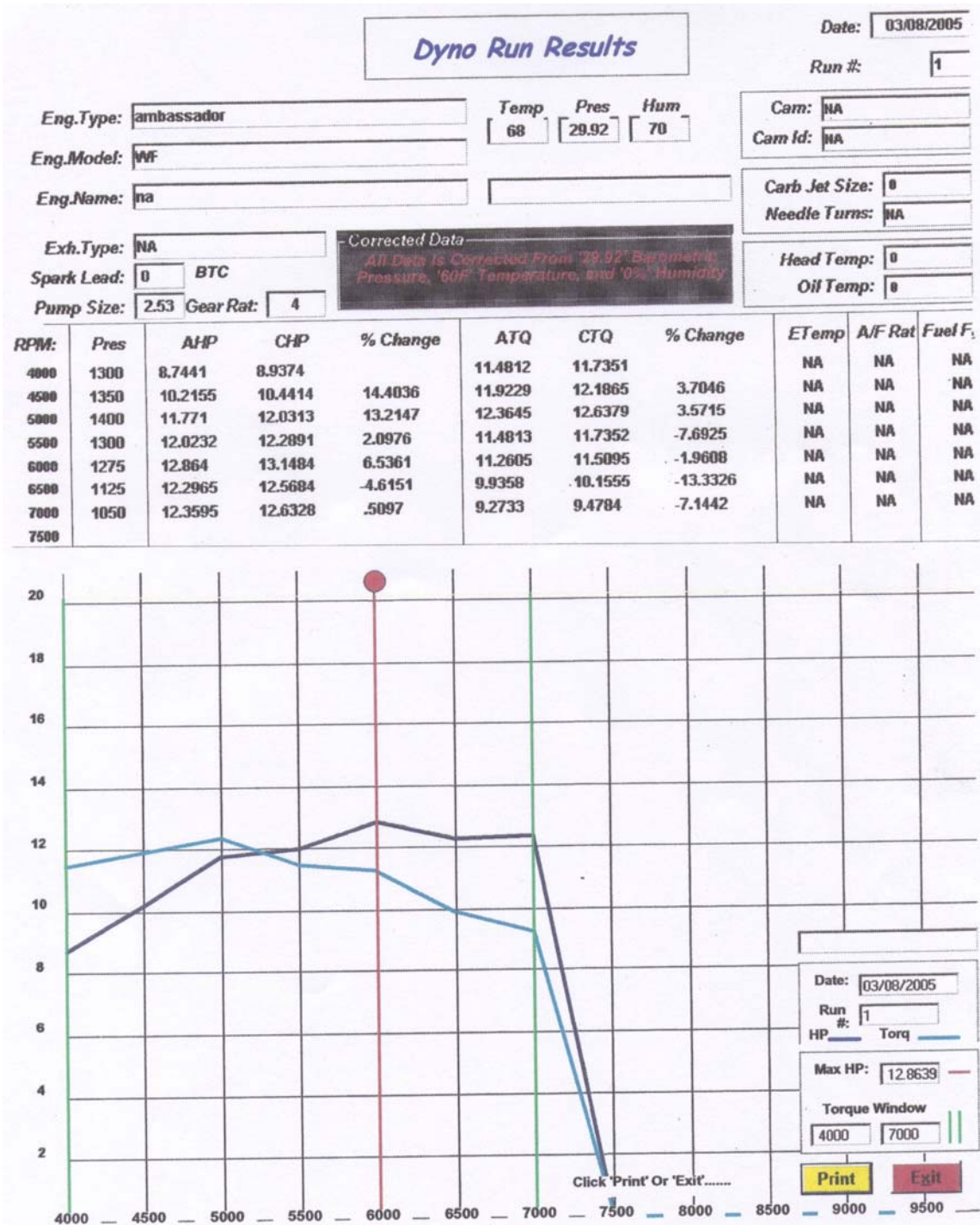


Chart provided by: Ambassador Racing
 Balm, FL
 813-634-1076

Light and Heavy World Formula Classes for QMA

(Draft)

This section establishes the preliminary rules, tech manual and operating parameters of the Briggs World Formula classes for QMA. The details of these rules are subject to change as more information is obtained and class rules are established.

World Formula Class Rules

Driver

Ages and Experience

Rule: Pg. 22 Article 5 Section 1. Rule 1H Add W/F classes to this rule. Minimum age of 9 to race W/F.

In order to run AA, B, W/F, or 160 driver must run one 12 month period upon graduation from the novice class, in a lower class or combination of lower classes (not including novice year) or obtain the unanimous approval of the Novice Committee before competing in these classes. To run AA or W/F driver must be at least 9 years old.

Reason: The W/F class will be one of the higher performance classes in QMA and as such the class is limited to drivers with at least one year of unrestricted experience and at least 9 years old. The class is designed to keep drivers in QMA longer and provide a class for a high performance class of cars to operate at an economical price. Novice Committee exceptions should be used only in rare cases for drivers that are truly ready for this class but due to unusual circumstances or seasonal timing would not satisfy the requirements.

Driver and Car Weights

Pg. 23 Article 5 Section 2 Table 5-1 Add Light and Heavy World Formula Classes

Table 5-1 QMA Required Ages and Weights by Class/Division

Class	Division	Driver age	Driver Wt(min)	Comb Wt (min)	Car Wt (min)
W/F	Light	9-16	N/A	275 lbs.	160 lbs.
W/F	Heavy	9-16	100 lbs.	340 lbs.	160 lbs.

Reason: The weight bracket for the W/F classes have been increased 15 pounds for both light and heavy classes. This is mainly due to the increased weight of the W/F motor with a gearbox but also has been adjusted to better reflect actual car, engine and driver weights for the light and heavy classes. This weight structure better reflects a light driver at 99 pounds that is too light to race in heavy but not penalized for racing in the light class due to his/her weight. The heavy class is increased to allow drivers to competitively participate within this class longer and hopefully retain this driver longer in QMA.

Examples:

Light W/F Class

Medium car, race ready without motor	125
Engine, gearbox, gears and chain	45
Driver equipment	5
99 pound driver, street cloths	99
Total	274

Heavy W/F Class

Large car race ready w/o motor	135
Engine, gearbox, gears, chain	45
Driver Equipment	5
155 pound driver, street cloths	155
Total	340

Class and Division Structure

Number of Cars per Race

1. Pg. 22 Article 5 Section 2 Rule 1.F Add W/F to this rule.
Senior Honda, 160 Honda, Senior Stock and all Mod, W/F, B, AA and ½ classes will have a maximum of 10 cars per race. With eleven cars permitted at local events, but never twelve. If over 11 cars signed in, must be a B main.

Lap Count

2. Pg. 23 Article 5 Section 2 Table 5-2 Add W/F classes to table.

Table 5-2 Lap Counts by Class/Division, QMA running order.

Class	Division	Main	Semi	Consi
Honda 160	Heavy	40	35	30
W/F	Light	40	35	30
W/F	Heavy	40	35	30
B	Light	40	35	30

Car Construction

Engine

- Pg. 15 Article 4 Section 2. Rule 10 E (7) Briggs World Formula 124435-8101-01

Fuel

- Pg. 17 Article 4 Section 2. Rule 15 A Add W/F
Honda 120, Super Stock, Honda 160, Mod, W/F and B: Gasoline automotive type only; no white or aviation gas or additives.

Fuel Pumps

- Pg. 17 Article 4 Section 2 Rule 18 B Add W/F
Modified, W/F, B, AA and Half Midgets:
Vacuum type fuel pump, which will automatically deactivate if engine stops, (vacuum operated only), Maximum allowable pressure: 3 psi

Article 6.A Deco/Continental Suspension Rules

- Pg. 25 Add World Formula to Article 6.A title
Article 6.A Deco/Continental/World Formula Suspension Rules

- Pg. 25 Article 6.A Rule 1.G Add W/F to engine types
For the purpose of this rule only, if a handler has multiple cars competing in the class (Stock, Mod, W/F, B, AA) at one race event and more than one engine is found to be illegal at that event; It will be considered to be one offense.

Racing

- Pg. 27 Article 7 Sec. 4 Rule 2 Delete the word Briggs.
The Novice Class shall be divided into the Junior and Senior Divisions only, which may be combined if necessary to make a class and will use a stock engine only. Deco or Honda.
Reason: The word Briggs was left over from the former Briggs motor that was removed in 2004.
This is to clear up an oversight that was left in the rulebook and to avoid confusion.

Restrictor Plate Program

- Pg. 47 Article 10 Sec. 1 Rule 1.E New Rule to include Light W/F
Light World Formula
- Pg. 47 Article 10 Sec. 1 Rule 7 Add W/F
Failure to use proper restrictor plate in any designated classes or any alterations of restrictor plate is cause for immediate DQ and applicable suspension with Deco, W/F or Honda Suspension Program.

Pg. 48 Article 10 Sec. 4 New Section

Sec. 4 Light World Formula

1. Light W/F division will utilize a 3 hole, .312" each hole at all times.
2. Restrictor plate size is 3 holes at .312" each hole
3. Restrictor plate must be installed between the carburetor and manifold.
4. Airflow / Fuel air mixture from carburetor must pass through the 3 factory restrictor plate holes with no addition means.

Pg. 48 Article 10 QMA Restrictor Plate Dimensions Table

Add Light W/F to table

Division	Color	Restrictor
Light World Formula	Green	3 hole .312" each hole

Required Modifications

1. Gearbox - Any gearbox is approved. Crankshaft may be altered only on external output shaft by adding a gear to drive the gearbox. All other modifications to crankshaft are illegal.
2. Electric starter must be removed and flywheel openings must be covered with fabricated metal cover.
3. Rev limiter must be installed, unaltered and operable: Rev limiter is subject to tech after each race. Motor will be accelerated up to a point where the Rev limiter begins to function and checked with rpm gauge. All Rev limiters must function within 100 rpm (7200 rpm) when checked with the same instrument. Rev limiter normal limit is 7100 +/- 50 rpm.
4. Attach any pipe (Max. 1.120" OD) exhaust pipe to the exhaust manifold (Recommend exhaust flange separate from exhaust pipe). Minimum one to maximum 4 Briggs style mufflers per rulebook.
5. Oil breather and fuel overflow must collect in catch cans.
6. Light World Formula must have an unaltered restrictor plate: 3 hole .312" each hole restrictor plate properly installed per Tech manual.
7. Impulse fitting on intake manifold to be closed if fuel pump is not used.
8. Pull starter removal required.

Allowable Modifications

1. Crankshaft seal between engine and gearbox may be replaced with a stronger seal to prevent gearbox oil transfer to engine.
2. Flywheel cup may be cut.
3. Fuel Pump: B & S part 557033. Must be pulsed from intake manifold only.
4. Black plastic top cover and plate on top of engine may be removed. Flywheel openings must be covered with fabricated metal.
5. Rocker Cover Part number 555528 may be modified for installation of oil breather line fitting.

Engine Tech Rules

1. Stock, unmodified Briggs & Stratton World Formula Model 124435-8101-01 except as provided in this section. All parts must be Briggs and Stratton production parts unless otherwise stated in this section.
2. Direct Drive, Clutches are not allowed
3. Spark plug: Any commercially available, 10 mm thread, unaltered, spark plug allowed. Indexing washers is not allowed.
4. Carburetor: Stock Walbro PZ carb only. No alterations allowed.
Carb bowl overflow must be attached to catch can

Slide must remain unaltered. Stock needle marked CDB is required.
 Unaltered Idle Jets marked 36,38 or 40 are allowed
 Unaltered Main Jets marked 90,93,96,98,100 are allowed

Venturi Measurement:

Vertical .9902" max.

Horizontal .7382" max.

5. Camshaft: First camshaft check will be taken at the valve spring retainers. With the lash set at zero, the movement of the valve spring retainer may not exceed .3085".
 Camshaft must be as supplied with compression relief.
1. Tech camshaft at pushrods. Push gently down on dial indicator stem to ensure that there is no lash when pushrods are going down.

Exhaust Lobe	Lift	Intake Lobe
75-71 BBDC	.020	34-30 BTDC
57-53 BBDC	.050	18-14 BTDC
39-35 BBDC	.100	2BTDC-2ATDC
25-21 BBDC	.150	13-17 ATDC
9-5 BBDC	.200	29-33 ATDC
12-16 ABDC	.250	49-53 ATDC
25-29 ABDC	.275	63-67 ATDC
.3085 MAX	.3085	
70-66 BTDC	.275	31-28 BBDC
57-53 BTDC	.250	18-14 BBDC
37-33 BTDC	.200	2-6 ABDC
21-17 BTDC	.150	18-22 ABDC
6-2 BTDC	.100	33-37 ABDC
11-15 ATDC	.050	49-53 ABDC
29-33 ATDC	.020	66-70 ABDC

7. Deck: No machining of deck surface is permitted.
8. Bore: Maximum bore 2.695". Oversized pistons not allowed
9. Stroke: Maximum stroke is 2.204". Push piston down to take up rod play.
10. Head gasket: Stock B&S head gasket only. .049" minimum thickness between head bolt holes. Measurements are to be made with micrometer from inside of gasket.
11. Head: Head may not be altered in any way from factory specifications.
12. Ports
 - Intake port
 - Maximum diagonal measurement is 1.101".
 - Maximum vertical measurement is 1.044".
 - Exhaust port:
 - Maximum I.D. of shoulder in bottom of exhaust port is .854"
13. Valve seats - one 45° angle only
14. Intake valve seat diameter is .966" - .972".
15. Exhaust valve seat diameter is .844" - .850".
16. Valves
 - Intake valve head diameter is 1.055" - 1.065".
 - Exhaust valve head diameter is .935" - .945".
 - Valve stem diameter is .232" - .238".
 - Valve face must have one 45° sealing surface only.
17. Valve springs
 - Dual valve springs as supplied by factory are required.
 - Inner spring wire diameter is .066" - .068".
 - Outer spring wire diameter is .112" - .114".
18. Valve Guides: Replacement of valve guides with B&S factory part 555645, is allowed.
19. Ignition: Unaltered B&S stock coil #557040 is mandatory. Attachment bolts or bolt holes may not be altered. Factory timing required.

20. Spark plug connector must be stock factory type.
21. Rubber plug boot is allowed.
22. There must be resistance from plug wire to ground. Resistance must be between 3000 ohms, minimum, to 6000 ohms, maximum. Coil resistance may be rechecked after a minimum of 10 minutes if correct reading is not attained upon first check.
23. Coil air gap is non-tech.
24. Flywheel: Only stock flywheel is permitted. Starter ring gear must be in place. No machining, glass beading, sandblasting, painting or coating of flywheel is allowed.
25. Chipped fins due to poor casting are legal. Completely broken off fins are not allowed.
26. Stock, unaltered flywheel key is required.
27. One or two stock crankcase gaskets are required.
28. Valve Lifters: Must be stock.
29. Lifter head diameter must be .969" - .972".
30. Connecting Rod: Stock B&S part #557005 rod only. Rod may not be altered. Rod may be clearanced providing that it is in stock configuration and finish, with no dimpling or media blasting. Rod ends must be concentric with crank journal and wrist pin with no chamfer or breaking of edges.
31. Rod length, measured from bottom of wrist pin hole to top of crank journal hole, is 2.419" minimum to 2.429" maximum.
32. Oil hole opening is .185" no-go. Crank end of oil hole is chamfered.
33. Wrist pin:
Maximum I.D. is .414".
O.D. is .624"-626".
Minimum length is 1.901".
34. Piston rings: Three rings mandatory. Stock Briggs rings only part number 555514. Oversized rings not allowed. Top compression ring must have chamfer or O toward top of piston. Second scraper ring must be installed with inside chamfer down and O toward top of piston. Oil ring must be installed as from factory. Rings must be in one piece when removed from block.
Minimum width of top two rings is .095".
Thickness of top two rings is .059" - .064".
Minimum width of oil ring is .065". Ring groove must be present. Expander must be installed.
Thickness of oil ring is .098" - .102".
35. Piston: Stock "kidney bean" piston required. Part number 557001 Oversized piston not allowed
Minimum from top of piston to top of wrist pin on circlip side is .658".
Minimum piston length is 1.768".
36. Crankshaft: Stock B&S crankshaft with stock timing gear installed in stock location only. Offset crankshafts not permitted. Stock bearings required.
Gear may be added to the output end of crankshaft to drive the gearbox. This is the only modification allowed to crankshaft.
Shim(s) if used, must be installed as from factory.
Crankshaft journal diameter is 1.094" - 1.100".
37. Block: Must be stock with no alterations, except blocks may be repaired from broken rod damage, providing that repair does not constitute a functional modification of original block. Repair must be approved prior and inspected after complete by National Tech Director. No welding is permitted from the cooling fins upward.

Motor Sealing Points

To be determined by National Tech Director

Questions and Answers

How will the W/F classes affect driver retention in QMA?

The Members of QMA have been asking for a high performance, economical motor that will allow drivers the chance to race on a weekly basis within QMA. By adopting this motor the driver would experience speeds very close to the limit of the car and track giving them the ability to race a car that requires good throttle control. The handlers will enjoy the new class since it offers a completely different type of racing than they may have experienced. This combined with an economical cost and good market for resale will encourage fast growth within QMA and widespread appeal. The positive aspects of the new class will provide a challenge for many families and hopefully retain these families longer within QMA.

Is there a market for the W/F motor besides QMA?

Yes, The motor is widely used around the world in various karting organizations and is raced in the United States and Canada within the World Karting Association and International Karting Federation.

Why are the total weights for the light and heavy classes increased 15 pounds?

Since the minimum driver weight to race in the heavy class is 100 pounds, we worked backwards to establish a minimum total weight. Take an average medium (78") car race ready without a motor, 125 pounds. Add 45 pounds for a W/F motor with a gearbox, gears and chain, add 5 pounds for driver equipment and shoes and a 99 pound driver. This equals 274 pounds. Anything less than this number and the driver that is prohibited from racing in the heavy division is penalized by racing in the light division.

Similar numbers were used to arrive at a heavy weight. The car weight was increased by 10 pounds for a larger car and allowance was given so a 155 pound driver could race in the heavy class without a penalty.

During the 2005 exhibition season we had drivers of all sizes between 100 pounds and 170 pounds. The lap times of the drivers running 20 to 30 pounds over did not seem to suffer in reduced lap times because of the increased weight. The acceleration off the corner was slightly reduced but the car would grip better throughout the corner and the heavier drivers could drive deeper into the corner. Much of this difference is due to the fact that drivers were required to exercise throttle control going into the corners for performance and tire management. The lift points were slightly different for the drivers operating over the minimum weight. At some tracks under certain conditions, the heavier drivers actually had an advantage.

One set of numbers will not satisfy all drivers and car combination but by increasing the class weights based on known weights of typical cars and the motor a more realistic set of weights can be utilized. This will help in keeping the playing field level, give the drivers a realistic expectation of competitiveness and retain families within QMA for a longer time.

Why is it required to add a gearbox to the engine?

The World Formula motor is not delivered from Briggs & Stratton with a gearbox. The main purpose of direct drive for a quarter midget is safety. Even experienced racers will sometimes spin and hit the wall. Cars that are direct drive will quickly stall and stop on the track or infield. A car with a clutch has the potential to keep on moving even though the driver may be injured and need help. Another safety concern is from cars that are stationary with the engine running at idle in the hot chute, staging or pit area. If a driver accidentally hits the gas it has the potential of running over a handlers leg or foot with the front bumper or hitting a handler in the pit area. By

operating with a gearbox and direct drive the level of safety continues to remain at it's highest possible level.

Where will the drivers for the W/F class come from?

Based on the 2005 Exhibition season findings, discussions with drivers and handlers and observing the trends in registrations:

1. Drivers want to race in the fastest classes offered to them.
2. Drivers and handlers would rather race in a full field of cars as opposed to racing with two or three other cars.
3. Most handlers on a week to week basis will only race a maximum of two cars per driver.
4. The bulk of the drivers that raced a W/F motor during 2005 did so by swapping out a Honda 120 motor for the W/F motor.

Based on these findings we expect that only a few handlers will purchase a new chassis to race in the W/F class. Instead most handlers will swap out a lower performance motor (Honda 120 or Stocker) and continue to race in the fastest classes that offer full fields for the race events they attend. Each club, region and family will have different circumstances.

How will adding 2 new classes affect the amount of time required to race the Grand National Events and other large races?

Handlers during the 2005 exhibition year reported that few chassis were purchased to race in the W/F class. Handlers and drivers decided to move from a lower powered class and race in the fastest classes offered. As such the total number of cars at the Grand National events should stay approximately the same. The difference would be a slightly lower car count in the Honda 120 classes and an increase in the W/F classes as that class increases in size. This change would not have a large impact since the Senior Honda currently has over 120 at some of the Grands races and a reduction of 20-30 cars would still make Senior Honda one of the largest classes. The same situation is expected for the Heavy W/F class. By redistributing cars but keeping the total car count the same, the total number of races will remain the same and the time to accomplish the event should remain relatively unchanged.

Will other classes in QMA be eliminated by introduction of the W/F class?

No, The W/F RCP has no provision to eliminate any class in QMA. The new W/F classes will give the members an additional choice and hopefully promote the retention of drivers within QMA. Presently we have many tracks within QMA that only race Honda classes on a weekly basis. The introduction of the W/F classes will add a higher performance class that can be raced economically by more families. By adding the W/F classes to QMA, many people believe that as drivers master Sr. Honda/Sr. Stock/Hvy Honda and the Honda 160 classes they will switch to the World Formula. This natural transition should be encouraged and as they gain experience many drivers will want to again transition to the B and AA classes. Each driver and handler would best be able to make this decision based on their club/region participation.

What is the availability of the W/F motor and parts?

The motor is readily available from Briggs & Stratton and their Motorsports division outlets. The W/F motor is also available from several different engine builders that make the required modifications to the motor and install a gearbox. When the motor arrives to the handler from the engine builder it is race ready. Delivery time may vary but normally 10 to 14 days. Parts are available through Briggs Motorsports part suppliers throughout the country. Delivery is usually less than 7 days.

What kind of support can QMA expect from Briggs & Stratton?

Briggs & Stratton is an international company with a smaller division that concentrates on Motorsports. Years of racing motor production and an increased focus on establishing a bigger presence throughout the racing community makes it clear that Briggs is fully committed to the future of this engine and Motorsports. The maximum price for the W/F motor has been set at \$1000 at the retail level and is expected to stay that way throughout 2006. Starting in the fall of 2005, Briggs will begin hand building ALL of their race motors. This could be very beneficial to QMA and it's members to further reduce the price of the motor. By hand building the W/F motor, QMA can establish the specs to which the motor will be built. By eliminating the electric starter, pull start, clutch, plastic top and other parts associated with the QMA spec, the base price of the motor less a gearbox should be less than the current \$1000.

Why is the W/F motor important to QMA and its members?

The W/F classes will fill a void currently existing within QMA. By establishing two new high performance, economical classes it will keep families involved in QMA for a longer period of time growing the clubs and growing QMA. The two benefits of speed and economy must go together. It is the increased performance that will challenge the drivers and handlers. The economics of a motor that can be purchased and operated by more people at a reasonable price will let more people participate and create a full field of entries. This high level of participation will encourage others to join the W/F classes. The successful implementation and growth of the World Formula classes may very well decide the future, growth and retention of families within QMA.

Conclusion

The World Formula motor has met or exceeded all performance and economic requirements that were established. It performed flawlessly during the 2005 Exhibition year while being raced throughout the country at different tracks with many different drivers and handlers. All of the reports have been positive and any service difficulties were small and immediately addressed by Briggs and Stratton.

One of the best measures of the class success was by watching the kids that raced this class. They all had huge smiles and a great time racing this motor. The handlers enjoyed learning how to setup a car with this much power and extra performance and all of them are anticipating a large increase in car counts next year hoping that the classes are adopted permanently.

A race ready engine is very economical to purchase when comparing price to horsepower. The present price of a race ready motor is approximately \$1700 for 13 horsepower or about \$130 a horse. The yearly operating costs are comparable to those of a Honda motor.

The World Formula is the future of QMA and will provide excitement for the families that race the new classes and added growth for QMA.