



HRL 2023 ANNEXES

TABLE OF CONTENT

ANNEX A	2
Grand Prix Technical Rules.....	2
ANNEX B	9
Hydro 350 Technical Rules	9
ANNEX C	17
2.5 Litres & Formula 2500 Technical Rules	17
ANNEX D	24
Air System	24
ANNEX E.....	25
Capsule Training Procedures.....	25
ANNEX F.....	27
Safety Inspection	27
ANNEX G	28
Boat on Restriction – Specifications	28
ANNEX H	29
Lane Assignement	29
ANNEX I.....	30
Safety Commission Chart.....	30
ANNEX J.....	31
Technical Measurement.....	31



ANNEX A

Grand Prix Hydroplane Technical Rules

A. Class letter designation shall be “GP”

B. **1- New construction:**

Minimum length shall be 24' 0" excluding projections not integral parts of hull structure.

Box rule: Maximum length shall be 26' 0" including projections not integral parts of hull structure.

Maximum width shall be 12'6". Maximum tunnel width 76".

2- Hulls:

To be eligible to race with HRL GP Series you must submit the Hull and Motor Specs to Hydroplane Racing League – HRL by email administration@hrlhydroplane.com

3- Color schemes:

Dark colors are not acceptable unless offset by highly visible colors.

Example: Navy blue decks with bright yellow cowlings.

For safety reasons it is important to submit your color scheme to HRL for approval. Hydroplane Racing League – HRL by email administration@hrlhydroplane.com

4- Numbers:

The numbers are to be a minimum 15" high by 2" wide and on both sides of boat in a highly visible area.

C. Propulsion will be by one underwater propeller. Outdrives are not allowed. Said propeller shall have no more than three blades.

No forged propellers shall be allowed. HRL reserves the right to purchase your propeller for \$ 3,000 CAD for inspection purposes.

D. All current inspection procedures outlined here and in the APBA Inboard racing rules apply. Only HRL inspectors are authorized to inspect all HRL hydroplanes participating in a sanctioned HRL event.

E. Two-way radio communications are **mandatory.**



F. All Hydroplanes built after January 1st, 2020, must meet the new cockpit reinforcement standards approved by HRL **see Annex I.** (Safety commission chart).

Racing teams who participate in the HRL series with hulls built before January 1st, 2020 that do not meet the new HRL cockpit reinforcement standards, must sign a release and waiver of liability form.

For safety, canopy must be painted orange inside.

G. All boats must have an on-board 9 pound minimum manual or automated Fire boy (or approved equal) fire extinguisher securely mounted outside the cockpit area. A minimum of two spray nozzles will be installed in the engine compartment. The activation of the fire system will be either automatic and /or manual with an accessible handle. The handle will be marked with a **red triangle and the word FIRE.**

H., Please note that this rule is slightly different from the APBA rule.

New constructions:

All rudders must be made of 17-4 with a minimum heat treatment of 38 Rockwell and a maximum of 48 RC (Rockwell C scale) or equivalent strength. For 4130 and 4140 steels, quench, and temper to a hardness of 325 HB (Brinell hardness) the use of material of equivalent strength is also permitted. It is the responsibility of the builder to obtain certification from the supplier.

The pin must be made of 17-4 H900 or higher (the H number). The rudder brackets and quadrants must be made of either 6061 T6 aluminum or 7075 aluminum (7075 is stronger) materials of equal strength may be used. It is the responsibility of the builder to obtain certification from the supplier.

Skid fins:

Measuring from waterline (bottom of primary of sponson) any skid fin made of 7075 or 7475 T651 must have a minimum thickness of .750". + -.0025" to allow for straightening, if a skid fin is made of 17-4 stainless steel or 4340/4140 the skid fin must be heat treated to a minimum of 36 Rockwell c optimal strength of 17-4 stainless steel / 4140 steel / 4340 steel would be hardened to 43 Rockwell c.

The minimum thickness at the waterline (bottom of primary sponson) would be .6250". If using 4140 or 4340 the steel must be zinc plated to avoid rusting. Only continuous leading edges on a skid fin is permitted. Jagged edges are not allowed.

I. Gear boxes are allowed but multiple speed gear boxes are not permitted.

J. Minimum hull weight: after a race, 3250 lbs. with the driver and the equipment completely drained of water. During the weighing process no one can touch the boat.



K. Engine: If it is not written here inform yourself

1- Total cubic inches shall be 468.

2- Block: Any manufacturer cast iron Block only, short deck 9.800" or Tall deck 10.200". Maximum bore of 4.310 inch. Tolerance + or – 0.005. Crankshaft stroke must be 4.00". Tolerance + or – 0.005 cylinder and lifter bore may be sleeved to meet stock spec. if damaged.

3- Head:

a) DART Part # 19574030 CNC-PRO1-355cc may be purchased from HRL. The part number must be highly visible and heads must me unaltered in any ways.

Repairs to the head are permitted but they must be certified by Dart and have the new spec sheet from DART. The spec sheet must be presented to an HRL-GP representative in person at registration of the following race.

b) No alterations permitted except for the addition of Jesel shaft mount rocker systems or similar systems. Only milling the intake rocker studs is permitted for fitting the Jesel system and will be done by Dart, you must notify HRL when ordering heads if you want to use this system. If heads are stamped with the official HRL stamp, the letters <MRV 2007> is the official stamp of the GP class.

c) No angle milling. Combustion chamber = 119cc + or – 2cc.

d) Ports must remain stock as per manufacturer - Dart.

e) Valve Springs: Any type and any manufacturer may be used. **No titanium or exotic material.**

f) Valves: Any manufacturer may be used, **no titanium or exotic material.**

This specific spec. must be respected. Our reference is Manley, part number 11843-8 (exh.), 11854- 8 (int).

Type	Head Diameter	Steam Diameter	Installed Height	O/A Length	Tip Length	Under head Angel/Radius	Margin	Seat Width	Top of Head	Wgt/ Grams
exh	1.880	.3415	stock	5.422	.250	10°x 3/8"	.075	.085	6° dish	122
int	2.300	.3415	.250 longer	5.494	.250	12°x 3/8"	.050	.100	7° dish	149



4- Limit cam lift at the valve stem to .680". Method to be used to verify cam lift: to verify first adjust the rocker so that there is 0 lash then rotate cam until you get max lift.

5- Crankshaft: not to exceed 4 in stroke. Tolerance + or – 0.005

6- Connecting rods: steel rod, any type or manufacture. Length 6.135 for a 9.800 deck block and 6.535 for a 10.200 deck block. **No aluminum or titanium or exotic material and no handmade rods.**

7- Lifters: any manufacture, no hydraulic lifters, no mushroom lifters. Alterations to the lifters are not allowed. Bronze lifters bushings are permitted, keyed lifters and/or bushings are prohibited. Lifters not to exceed standard GM diameter of .842".

8- Rockers: roller rockers may be used, must not exceed 0.680 lift.

9- **Piston:** Any type or manufacturer. No more than 20cc piston dome. The block may be decked (.010" maximum) (a minimum of 9.790" for a short deck and 10.190" for a tall deck) top of the piston (flat surface) at TDC must have a minimum distance of .060" with gasket. Any piston ring may be used, thickness will be: first and second ring 1/16 oil ring 3/16. Thickness of the rings must be uniform in each case.

Method of inspection: Rotate motor to TDC (Top Dead Center) place plastic fluid retainer over piston and seal. With the use of a calibrated burette introduce a liquid into chamber and record the amount of liquid used. The measuring process is accomplished by filling the combustion chamber with fluid from a graduated burette. A flat Plexiglas plate is placed over a combustion chamber and fluid is released into the chamber through a hole in the Plexiglas plate. A thin layer of grease seals the plate against leaks to either the cylinder head or cylinder block. When the combustion chamber is filled with no air bubbles showing, read the burette and write down the number.

The easiest way to measure piston dome or dish volume is to cc the piston in the cylinder. Seal the rings with grease, accurately place the piston 0.100 inch down in the cylinder and then measure the cc volume by filling up the cylinder. Next, compute the volume of a standard cylinder (bore x bore x height x 0.7854). For example, a 4.00-inch bore, and a 0.100-inch height would be: $4 \times 4 \times 0.100 \times 0.7854 = 1.256 \text{ ci} \times 16.387 = 20.59 \text{ cc}$. If you are measuring a piston with a dome, the measured volume will be less than the computed volume with the difference being the effective dome volume.

10- Oil pan: any oil pan may be used.

11- Dry sump: any dry sump may be used.

12- Push rod: any push rod may be used. **No titanium, exotic material or handmade rods may be used.**



13-Valve spring: retainer may be titanium or steel, **no exotic material.**

14-Timing chain: gear and belt drive may be used.

15- Headers are not allowed. Only traditional Zoomie configuration with one bend only must be used.

16- Intake manifold: any manufacturer cast aluminum may be used. No handmade fabricated manifold. Two-piece manifolds which consist of a cast base and an adaptor plate may be used if the adaptor plate is less than one inch thick. The adaptor plate may be constructed of cast or extruded aluminum. **No magnesium or exotic material. No handmade fabricated manifolds.**

17- No titanium engine components with the following exceptions: valve spring retainers.

18- Maximum compression ratio 9, 5:1 static.

19- Supercharger must be an 8-71 standard roots type design with 60-degree helix rotor only.

a) Case and rotor must be a maximum 16.00" in length inside diameter.

b) Cast or billet rotors are allowed, 5.860" maximum rotor diameter.

c) Supercharger to be driven at no more than 20% (120%) of crankshaft speed.

d) No magnesium cases or rotors.

e) **Nothing** is permitted between the base of the supercharger and the intake manifold.
Example: spacer plate, intercooler or after cooler, chiller, etc.

f) Any supercharger inlet opening and /or outlet opening 'shape or dimension' is allowed without exposing the ends of the rotors.

20- **Mandatory for the 2024 season**, the injection hat shall be the following:
Enderle Bird Catcher E-1004: Max Butterfly size 4.375 inches minimum shaft diameter .440.
Must remain Stock. No modifications both internally and externally.

21- No overhead camshafts.

22- Maximum of 2 valves per cylinder.

23- Fuel and air must be metered by a mechanical fuel injection system or electronic fuel injection system.

All fuel must be injected by a minimum of (8) eight hat nozzles using a cast aluminium injector available from a major manufacturer. Port injection is permitted but not mandatory, unless using EFI.



24- Fuel will be methanol only, unless using EFI.

25- The use of a magneto is permitted, and it must be placed in its original position behind the supercharger on the intake manifold. No offsets are permitted. The use of two (2) MSD boxes is permitted.

Any electronic ignition system may be used **if a magneto can be installed in its original position behind the supercharger. Magneto used for inspection will be MSD 12/20”.**

26- EFI engine rule

26.1. Electronic fuel injection is allowed in the GP class.

- a) Electronic fuel injection shall be controlled by one (1) onboard ECU. Holley HP ECU, or related system is allowed.
- b) EFI closed loop functionality is allowed.
- c) No outside telemetry or modifications from shore are allowed during a race. Only onboard functionality is allowed.
- d) Rev limiter should be set through ignition system and set to the desired amount not to exceed 8000 rpm.

26.2 Air intake

- a) Air is allowed to enter engine through butterfly hat injector only, injector such as Enderle Birdcatcher or BAU is allowed.
- b) No throttle body air intake styles allowed.

26.3 Injectors

- a) Up to eight (8) electronic injectors in Port and up to (8) eight mechanical hat nozzle injectors are permitted.
- b) Hat or port injection is allowed.
- c) Must be mounted externally on intake manifold runners or hat.
- d) Injector tips may not be modified, and diffuser plates may not be added.

26.4 Fuel and fuel delivery system electronic fuel pumps are allowed.

- a) Electronic fuel pumps must have an external power shut off outside of hull for safety reasons.

26.5 Intake manifold

- a) The use of intercooler intake manifolds will be allowed for those that run fuel other than methanol. Ex. E85-E98 ethanol, or gasoline can use an intercooler. Must declare with HRL what fuel you are running.
- b) The use of methanol as fuel will not be allowed to use an intercooler.



L. On board Data Acquisition is Mandatory. Racepack or equivalent for recording the following:

- a) Exhaust gas temperatures for all 8 cylinders, manifold pressure, fuel pressure, oil pressure, water temperature etc.
- b) member of each team must be capable of downloading and recording information from RP (or equivalent) for each heat.

If it is not written here, you are not allowed to do it.



ANNEX B

Hydro 350 Technical Rules

1 - ENGINE BLOCK

- A. Stock production style GM V8 engine V-8 only.
- B. Must be cast iron block with standard external measurements only.
- C. Maximum 358 cubic inches.
- D. No removing of identification numbers. No grinding or lightening.
- E. A maximum of 3 sleeves in cylinders and 7 sleeves in lifter holes. (No index lifter holes).
- F. 153 teeth SFI type flywheel.
- G. Starter - any starter that functions like the stock starter may be used. No inertia starters.
- H. The only aftermarket engine block permitted is Dart SHP P/N: 31161111.
- I. As of 2025 there will be Grandfather clause for blocks:
 - I. Block using pistons other than Weisco must be registered by March 17th 2023 with bore dimension to HRL by email administration@hrlhydroplane.com
 - II. Block will be then stamped by HRL.

2 – CRANKS

- A. Minimum 50lb. (including balancing) steel magnetic cranks only.
- B. Stock stroke for block. 3.480". (+ or - 0.010").
- C. Unaltered except for normal cleanup and balancing.
- D. Cranks should not be contoured or sculptured.
- E. Stock main journal and rod journal sizes only. 2.450" main / 2.100" rod. (Undercut maximum 0.030").
- F. No knife edge allowed.

3 - CONNECTING RODS

- A. Any large journal magnetic steel type connecting rods only.
- B. No titanium or aluminum rods.
- C. 5.700" maximum length. (+ or - 0.010").
- D. Minimum weight of rods 600 grams (cap and bolt included).
- E. **MUST** use full floating pins.



4 – PISTONS

A. Any piston or manufacturer may be use. Piston must be in stock configuration. Piston skirt must be a full round. No FSR

As of the 2025 Season: Wiseco Pistons will be mandatory for all participants except those who registered their engine block before March 17, 2023, according to article I. of Annex B

Weisco part number K431A2 (4.020, K431A3 (4.030) and K431A4 (4.040) which include pin part S424. Must use supplied pin. No alteration is permitted.

B. No portion of the piston may protrude above the top of the block and that without any head gaskets.

C. No gas porting of piston ring lands and no top of piston coating of any kind.

D. The weight of each piston should not be less than 590 grams including the wrist pin and “C” clips and rings.

E. Piston Rings - Must be of the type supplied by General Motors. The 1st and 2nd rings (compression) must be 1-piece design, 3rd ring (oil) must be 3-piece design, consisting of 2 rails and 1 expander. Moly file fit allowed. Minimum thickness of rings 1/16” for top and second, 3/16” for oil control ring.

F. Ring lands must remain in standard location. Minimum distance between top of piston and top of first ring (compression) .180” exception Wiseco Piston.

G. No gapless rings allowed.

H. Maximum size over standard piston allowed (0.040”).

5 - CAMSHAFT & VALVETRAIN

Comp Cams # 12-675-4 Can be purchased from any distributor.

All Cam numbers must be visible – no grinding permitted.

A copy of the cam card you received when purchasing a cam must be sent to the HRL by email administration@hrlhydroplane.com



- A. Stock diameter magnetic steel solid flat tappets lifters. Maximum size 0.842" **no hydraulic lifters.**
- B. Stock size push rods only. Size 5/16" all the way. **(No titanium or exotic material).**
- C. No mushroom or roller tappets. No rev kits.
- D. Double roller or standard timing chain only. No gear drive or belt drive.
- E. Roller rocker arms allowed. NO shaft rocker arm systems. 1.50 ratio only.
- F. Stud girdles allowed.
- G. Valve Springs - Any valve spring may be used, maximum size: 1.250" (+ or – 0.010") diameter.
- H. Spring retainer: steel only, no exotic material.
- I. No cam roller bearing allowed.
- J. Standard diameter cam bearing only.
- K. Any alteration of the original form is prohibited.

*During the inspection process the maximum valve lifts are as follows:
(Lobe separation Comp Cam 110° HRL 112°)*

Exhaust Lobe			Intake Lobe		
Camshaft:	Comp Cam	HRL	Camshaft:	Comp Cam	HRL
Lift	Degrees		Lift	Degrees	
0,050	0	0	0,050	0	0
0,100	6	5,5	0,100	5	5
0,150	11	10,5	0,150	10	10
0,200	16	15,5	0,200	15	15
0,250	20,5	20	0,250	20	19,5
0,300	25,5	25	0,300	24,5	24,5
0,350	31	30,5	0,350	30	30,5
0,400	37	37	0,400	36,5	37,5
0,450	46,5	47	0,450	46,5	49,5
0,488*	60,5	n/a	0,477*	56,5	n/a
0,471**	n/a	59,5	0,471**	n/a	57,5
0,450	73,5	72	0,450	69	66
0,400	82	81	0,400	78	77,5
0,350	88,5	87,5	0,350	85	84
0,300	94	93	0,300	90	89,5
0,250	98,5	98	0,250	95	94,5
0,200	103,5	103	0,200	99,5	99
0,150	108,5	108	0,150	104,5	104
0,100	113,5	113	0,100	109,5	109
0,050	119,5	119	0,050	116	114,5

*Measured max lift and degree of Comp Cam.

**Measured max lift and degree of HRL Cam.

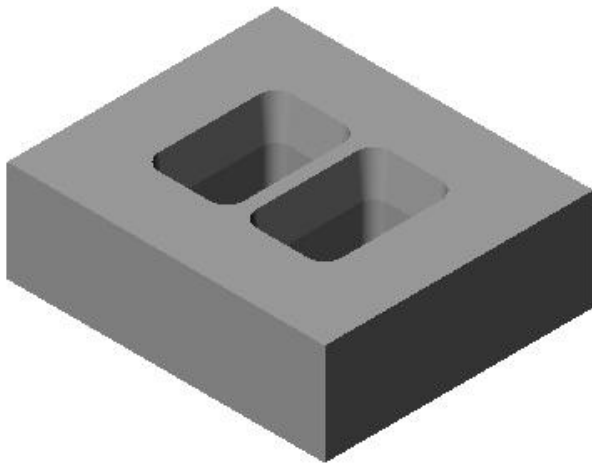


6 – HEAD

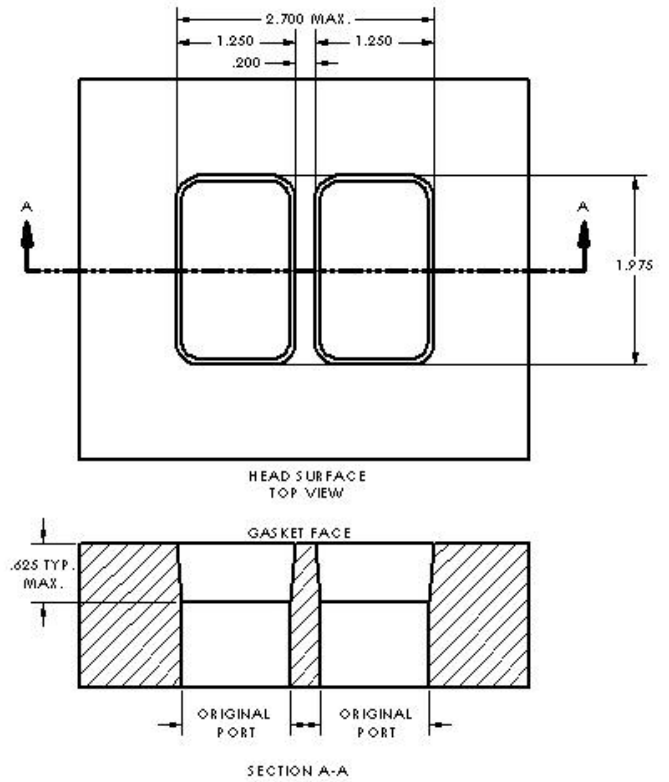
Option 1

Dart Part #:10021070 Dart Iron Eagle S/S 165.

- A. Part number must be highly visible on the head.
- B. Heads must remain **UNALTERED** in any way. Except for flat milling of deck. (No angle milling). Outer edge of valve guide for smaller valve seal and bronze liner allowed except for the following rule K.
- C. Valves - any manufacturer may be used, no titanium or exotic material. Those specific spec. must be followed:
 - Exhaust Diameter: 1.500“, Minimum stem: 0.340”.
 - Intake, Diameter: 1.940“, Minimum stem: 0.340”.
 - Maximum back cut ¼ inch measured from the outside diameter of the valve.
 - Must keep the original standard 45-degree seat angle. Swirl polish allowed.
- D. Stem must remain same size all the way.
- E. **9:30: 1** maximum compression ratio as measured on the ‘Whistler’.
- F. The number of CC in the head runner should not exceed: intake: 175cc exhaust: 70cc (+2cc).
- G. Combustion chamber, intake and exhaust ports must be in the original ‘as cast’ configuration. Except for the following rule K.
- H. Minimum cc in the combustion chamber of 64 cc.
- I. Screw in studs (maximum size 0.4375”) and guide plates allowed.
- J. Any evidence of sanding, polishing, relieving, grinding, porting, chemical treating ceramic work, abrasive blasting, and alteration of the original form or the addition of material to the ports or combustion chambers are prohibited. Except for the following rule K.
- K. Port matching of the intake face of the cylinder head and intake manifold may be altered to the following dimensions.



Suggested intake gasket for template: FEL-PRO MS 90322.
Both the intake and head grinding shall be measured to a maximum depth of 0.025" from the gasket face.





- L. Valves must be in stock location and at stock angle.
M. For the measurement of the volume (cc) of cylinder opening in the cylinder head gasket, HRL will only consider the value specified by the manufacturer.
N. When using Dart Aluminium head option you may only use your choice of the following Head Gaskets approved by HRL:

Cometic Gaskets – Part #'s available:

- C5247-027 - C5247-036 - C5247-040 for bore size 4.125
- C5248-027 - C5248-036 - C5248-040 for bore size 4.165
- C5249-027 - C5249-036 - C5249-040 for bore size 4.200

O. All teams must provide the manufacturer and the part number of the cylinder head gasket used, as well as all technical details to Hydroplane Racing League - HRL by email administration@hrlhydroplane.com

As of the 2025 Season:

Option 2

Dart Part #: 127111 64 cc chamber - Dart SHP Aluminium or Dart Part #: 127211 72 cc chamber - Dart SHP Aluminium -

- A. Part must be highly visible on the head.
B. **Heads must remain UNALTERED in any way.** Except for flat milling of deck. (No angle milling). Outer edge of valve guide for smaller valve seal and bronze liner allowed except for the following rule K.
C. Valves - any manufacturer may be used, no titanium or exotic material. Those specific spec. must be followed:
Exhaust Diameter: 1.600", Minimum stem: 0.340".
Intake, Diameter: 2.020", Minimum stem: 0.340".
Maximum back cut ¼ inch measured from the outside diameter of the valve.
Must keep the original standard 45-degree seat angle. Swirl polish allowed.
D. Stem must remain same size all the way.
E. 9:30: 1 maximum compression ratio as measured on the 'Whistler'.
F. The number of CC in the head runner should not exceed: intake: 180cc exhaust: 70cc (+2cc).
G. Combustion chamber, intake and exhaust ports must be in the original 'as cast' configuration. Except for the following rule K.
H. Minimum cc in the combustion chamber of 64 cc.
I. Screw in studs (maximum size 0.4375") and guide plates allowed.
J. Any evidence of sanding, polishing, relieving, grinding, porting, chemical treating ceramic work, abrasive blasting, and alteration of the original form or the addition of material to the ports or combustion chambers are prohibited. Except for the following rule K.
K. Port matching of the intake face of the cylinder head and intake manifold may be altered to the following dimensions.



DIAGRAM TO FOLLOW....

N. When using the Dart Aluminium head option, you may only use your choice of the following Head Gaskets approved by HRL:

Cometic Gaskets – Part #'s available:

- C5247-027 - C5247-036 - C5247-040 for bore size 4.125
- C5248-027 - C5248-036 - C5248-040 for bore size 4.165
- C5249-027 - C5249-036 - C5249-040 for bore size 4.200

O. All teams must provide the manufacturer and the part number of the cylinder head gasket used, as well as all technical details to Hydroplane Racing League - HRL by email administration@hrlhydroplane.com.

7 - INTAKE MANIFOLD

A. Only aluminum intake allowed: Edelbrock 7101 dual plane only.

B. Cooling bleed lines allowed.

C. Any evidence of sanding, polishing, relieving, grinding, porting, chemical treating abrasive blasting, ceramic work, addition of material or any alteration and modification of the original form is prohibited. Except for the Head rule K.

8 - CARBURETOR/SPACER

A. One Holley 4412 carburetor allowed or Holley HP #80583-1 Venturi size: 1.375", Throttle bore: 1.687".

B. The carburetor must pass top and bottom dimension tool specs.

C. Choke plate may be removed but no removal of choke housing. Fine tuning of jets, power valves, float bowl, metering block, accelerator pump and nozzles is permitted.

D. Standard boosters only and must be tightly mounted. No annular boosters. Epoxying or safety wiring of boosters recommended.

E. No vacuum leaks. No turtles or other induction performance enhancing devices. No other systems allowed.

F. Two (2) return springs mandatory. An over-center throttle stop is recommended.

G. Carburetor adapter Bicknell #376 (Max. 1.00") No modification allowed to adapter.

H. Maximum size thickness straight bore spacer of 1.00".

I. Maximum of 3 gaskets for 0.225" of total thickness.

J. No billet metering block.

9 - IGNITION

A. Any factory stock HEI type ignition only.

B. No crank triggers.

C. No external super coils.

D. No aftermarket multiple spark discharge control boxes.

E. Firing order must remain stock GM: 1.8.4.3.6.5.7.



10 - OIL SYSTEM

- A. Aftermarket oil pans and breather allowed.
- B. Wet sump Oil pump must remain in stock location.
- C. Dry sumps allowed. Maximum three stages only.
- D. Oil coolers allowed.
- E. "Aeroquip" type oil lines only.

11 - FUEL & OIL LINES

- A. Fuel is restricted to gasoline.
- B. Any pump fuel allowed.
- C. Specific gravity must fall within the range: .715 to .765 at 60 degrees F.
- D. Maximum oxygen content is 4% by weight.
- E. Ethanol content must be less than 25% by volume.
- F. No alcohol or additives allowed.
- G. Fuel lines must mount in a position to reduce damage, usually on front side of pump.
- H. No fuel lines shall pass through the driver's compartment.
- I. No plastic fuel filters.
- J. No plastic pressure lines - No pressurized fuel tanks.
- K. Any type of fuel pump allowed. (Electric pump must be connected to oil pressure switch).

12 - MISC.

The following items may be of any manufacture: gaskets, spark plugs, wires, bearings, filters, fuel lines, hoses, fittings, valve covers, breathers, nuts, bolts, washers, fittings, and exhaust system unless specified in these rules.

If it is not written here, you are not allowed to do it.



ANNEX C

2.5 Litres & Formula 2500 Technical Rules

- A.** The word “stock” as used in these rules is understood to mean the part in question will be used as it was supplied to the public by the original motor manufacturer.
- B.** The term “stock replacement” is understood to mean the part is sold to the public as a direct replacement for a stock part, without modification. Its marketed purpose must be for use in rebuilding an engine to stock specifications; not to increase power. The intent of stock replacement parts being included in these rules is to keep cost down and allow the use of readily parts. No titanium parts are permitted.
- C.** Approved engine is Ford 2.3 Litres and Honda K20
- D.** When using Ford 2.3 Litres option parts must be used as supplied by Ford. Alterations not permitted except as specified herein.
- E.** If other parts from other manufacturers are to be allowed, they will only be those listed in these specifications.
- F.** NOT PERMITTED for Ford 2.3 Litres engine: gear boxes or devices that alter the speed or direction of power from the motor to propeller.
- G.** All parts outside of engine may be removed to permit installation into boat, except for the carburetor and distributor.
- H.** Engine may be clearance. Rotating and reciprocating parts may be balanced. Points, piston rings, spark plugs, bearings, timing belts, resistors, filters, plug, wires, fuel lines, condensers may be any stock or replacement parts of any manufacturer sold over the counter to and for the general automobile trade. Gapless or other racing type non-stock configuration rings are not permitted.
- I.** Grinding, polishing, or blasting any internal part that result in smoothing, recontouring or enlarging is prohibited. Configuration changes in any way on the Ford 2.3 Litres engine are prohibited.
- J.** Oil pan, oil pump and oil pickup may be modified as necessary but must remain a wet sump. Remote filter, oil cooler, and oil accumulator are permitted. One oil accumulator with two-quart maximum volume is permitted, connected by a single oil line. Baffle in oil pan is permitted. Any oil filters or valve cover breathers are permitted. One oil accumulator with a two quart maximum volume is permitted, connected by a single oil line.
- K.** Gaskets, spark plugs, wires, bearings, filters, fuel lines, hoses, fittings, valve covers, timing belt covers, breathers, nuts, bolts, washers, fittings, and exhaust system may be of any manufacturer. Studs may be used in place of bolts.



1. ENGINE BLOCK & CRANKSHAFT

- A. Cylinder blocks may be bored, honed, align bored, deburred, and resurfaced to achieve the desired deck height. Deburring is not to be confused with grinding/polishing. Grinding and polishing to reduce weight and/or gain a performance advantage are prohibited. Engines may be painted internally to enhance oil flow. External parts may be painted or chromed to enhance appearance. All unnecessary parts outside of the engine may be removed to permit installation into the boat. Water and oil passages may be blocked, water passages may be modified, Lifter valley baffles, standpipe and/or screens are permitted in stock engines.
- B. Rotating and reciprocation components of the engine may be balanced. Total assembly may not be lightened to gain added performance.
- C. Sleeves may be installed to repair worn or damaged cylinder bores.
- D. Bore 3.825 maximum and stroke 3.126 maximum.
- E. Flywheels: aluminum flywheels are mandatory. The ring gear shall remain stock with 132 teeth or the 2000 Pinto ring gear with 135 teeth and a minimum wall thickness of 0.468 inches must be maintained throughout the aluminum plate except for pilot and mounting holes. No additional holes permitted. Spot removal of material for balancing purposes only is permitted.
- F. Water passages may be blocked.
- G. Windage tray and/or crankshaft wipers are permitted.
- H. Starter: any starter that functions like the stock starter. Blocks may be clearance to allow for starter installation only.
- I. Crankshaft main bearing journals and rod journals may be reground. Stock configuration of crankshaft counterweights must be maintained in the balancing process. Knife edging and chamfering of these weights are prohibited.
- J. Top of piston must be below the top surface of the compressed head gasket a minimum of 0.040”.

2. PISTON & CONNECTING RODS

- A. Connecting rods may be bushed for the use of floating pins.
- B. Federal Mogul #H435P or #495P, additionally SRP #148221 or #148222. Pistons may not be reversed. The minimum distance from the top of the piston to the top of the first ring shall be no less than: Federal Mogul: 0.245”, SRP: 0.195”. Straight walled piston pins as received from the piston Manufacturer shall be used. Piston rings must be of the type supplied by Ford. The first and second rings (compression) must be one-piece design. The third ring must be a three-piece design consisting of two rails and one expander.
- C. No gapless rings allowed.

3. HEAD, CAMSHAFT and VALVETRAIN

The following items (A to F) are to be **included in Cylinder heads options 1,2 and 3.**

- A. Cylinder heads may be flat milled to achieve allowable combustion chamber volume. Machining of valve seats and valves must meet class specifications as well as all components



used in the head and valve train.

- B.** Parts must be used as furnished by Ford or OMC. No alterations permitted except as specified herein.
- C.** Bronze wall valve guides are permitted. Valve guides may be machined to accept any stock or stock replacement valve stem oil seals. Replacement valve seats are permitted (must meet OEM specifications.)
- D.** Camshaft: Any aftermarket cam can be used providing it meets profile under these class rules. Maximum lift at valves 0.406 inches (+ or- 0.004). (See inspection procedure to check camshaft). Cam may be advanced or retarded.
- E.** Lifters: any stock or stock replacement hydraulic lifter may be used. Anti-pump-up lifters are permitted.
- F.** Rocker arms will be stock or stock replacement with a ratio of 1.64 to 1. Roller rocker arms are not permitted. Stock replacement followers with wear pads.
- G.** For the measurement of the volume (cc) of cylinder opening in the cylinder head gasket. HRL will only consider the value specified by the manufacturer. Teams are required to provide the name of the manufacturer and the part number of the cylinder head gasket used, as well as all technical details relating to the Hydroplane Racing League – HRL by email administration@hrlhydroplane.com

Cylinder Head Option 1:

- A.** Any cast iron cylinder head supplied by Ford with correct valve size may be used that meets the minimum chamber volume (heart shaped chambers do not meet the minimum). Dual plug heads prohibited. Angle milling is not permitted. No changes are permitted in the valve area. The following Ford 2.3 conversion head plates may be used: Goodson Automotive part number FAP-2300-EFI or K-Line part number KL9661. This plate may be fitted to the cylinder head. Total thickness of adapter mounting flange and 2 gaskets (1 each side) not to exceed .500" total combined.
- B.** Valve head diameter: Intake valve 1.735". Intake valve may have 20 degrees back cut, not to exceed .205 in width. Exhaust valve 1.500" with no back cut. Intake and Exhaust valve seats may be narrowed by cutting at 90 degrees or less, not to exceed .250 from combustion surface into bowl area. Minimum valve stem diameter: 0.340".
- C.** Valves: Any stock or stock replacement steel valve may be used if the stock stem diameter is maintained throughout (no reduced diameter, undercut stems). Face angle: 45 degrees only. Intake and exhaust head diameter tolerance +/- 0.005" unless otherwise noted. Stainless steel valves may be used. Back cutting the valve (relief angle) unless defined within the specific class rules is not permissible. Swirl, titanium, hollow stem, or sodium filled valves are not permitted.
- D.** Valve Springs: Any spring that fits the head without machining. Maximum spring O.D. 1.460", no Conical springs permitted. Any stock or stock steel replacement retainer that fits the stock keepers may be used. Retainer must not be modified.



Cylinder Head Option 2:

Casting flash may be removed from the lifter valley.

Esslinger Ford Aluminium D-port, Ford part number M-6049-E23A. **MUST** be purchased through the Hydroplane Racing League – HRL by email administration@hrlhydroplane.com

- A. Heads must always have the official HRL stamps.
- B. Heads must remain UNALTERED in any way. Except for flat milling of deck. (No angle milling). No changes are permitted in the valve area. Bronze liner allowed.
- C. Valves: Exhaust: Manley # 11793 and 11795. Single 45-degree angle only. Intake: Manley # 11792 and 11794. Single 45-degree angle only.
- D. Valve Springs: maximum spring O.D. 1.460", no conical springs permitted. Any steel replacement retainer (1.460" max diameter) and keepers permitted, no titanium. Spring seat may be machined to hardened spring seats and 1.460" valve springs.
- E. Combustion chamber: minimum 61 cc.
- F. Intake and exhaust valve seats may be reworked (valve job) but touching and/or altering the aluminum part of the bowl is prohibited.

Cylinder Head Option 3:

Any cast iron D-port cylinder head supplied by Ford and modified by BoPort Racing Heads (www.BO-PORT.com, 775.884.3000). Heads must have "BOPORT, CNCST3" marking on it. Except for the work done by BOPORT, head must remain unaltered in any way. No changes are permitted in the valve area. Combustion chamber volume: 61cc minimum. Intake and Exhaust valve seats may be reworked (valve job) but touching and/or altering any area of the bowl is prohibited. 43.6.5.3.1 Valves: Exhaust Manley # 11793 and 11795 (dia. 1.590" ± 0.010 "). Single 45-degree angle only. Intake: Manley # 11792 and 11794 (dia. 1.890" ± 0.010 "). Single 45-degree angle only. 43.6.5.3.2 Valve Springs: Maximum spring O.D. 1.460", no conical springs permitted. Any steel replacement retainer (1.460" max diameter) and keepers permitted no titanium. Spring seat may be machined to accept hardened spring seats and 1.460" valve springs.

Teams are required to send the manufacture's invoice as well as its technical data sheet of the BoPort cylinder head to the Hydroplane Racing League – HRL by email administration@hrlhydroplane.com



4. PROCEDURE

A. Check cam/valve action: Install adjustable lifters in place of hydraulic lifters on one intake and one exhaust valve. Set dial indicator on intake valve spring retainer. Install an 8-inch degree wheel on cam pulley bolt. Install a pointer on block. It is recommended that the degree wheel have one-degree markings. To read angles to one degree rotate the cam until the lobe is clear of the rocker arm. Adjust the valve to zero lash and set the dial indicator to zero. Set the degree wheel to zero degrees, rotate the cam in normal direction of rotation to 0.050 inches valve lift. Set the degree to 17 degrees. Repeat for each 0.050 of increasing and decreasing valve lift as shown in the table. At the point of maximum lift, note the angular width of the flat area. Repeat with the exhaust valve. Compare recorded data with the table data.

Valve Lift Thousandths Intake Angle Degrees Exhaust Angle Degrees

.050 17 17

.100 22 22

.150 27 27

Opening 200 32 32 Opening

Ramp 250 37 37 Side

.300 43 43

.350 51 51

.400 67 67

.402* 70* 70*

Max lift at valve with zero lash

.402* 73* 72*

.400 75 74

.350 91 90

.300 99 99

Closing .250 105 104 Closing

Ramp .200 110 110 Side

.150 115 115

.100 120 120

.050 126 126

*Edge readings for "flat" area.

B. Check lobe spacing (Use setup of prior check): Set dial indicator on intake valve spring retainer. Rotate the cam until the heel is clear of the rocker arm. Adjust valve to zero lash and stop at .0005 inches valve lift. Set the degree wheel to zero degrees. Rotate the cam in normal direction of rotation to 0.050 inches valve lift. Record the degree wheel reading. Repeat the above procedure on the exhaust valve except that the degree wheel is not reset to zero. The two angle recordings are subtracted to obtain lobe spacing; 111 degrees.



5. INTAKE, CARBURETOR and FUEL SYSTEM

- A. Intake manifold OMC part number #912470 or Esslinger engineering part# 2724.5 (626-444-4919).
- B. Carburetors: Holley model 2300 part #0-4412 and HP 0-80583-1 venturi diameter 1.380 max., throttle bore diameter 1.690 max. Holley #2300, part #0.7448 and HP 0-80787-1 two jet venturi size 1.190 max., throttle plate size 1.502 max. 350 CFM carburetor. Removal of air cleaner base for installation into boat is permitted. Must be a booster type carburetor. No polishing allowed. Choke plate may be removed but choke horn must remain untouched, only the original components of the carburetor manufacturer may be used (No billet metering blocks, or boosters). Fine tuning of jets, power valves, float bowl, metering block, accelerator pump and nozzles are permitted.
- C. C. Throttle shaft may be altered or modified for connecting to the throttle cable. No thinning of throttle shaft is allowed; must maintain stock diameter.
- D. Two (2) return springs mandatory. An over-center throttle stop is recommended.
- E. A carburetor wedge may be used. The total dimension of wedge and gaskets measured from the intake manifold to carb base shall not exceed 1.250 inches.
- F. Fuel pump: must be original stock or stock replacement mechanical or electric fuel pump sold on open market for general automobile trade. A fuel pressure regulator may be used.
- G. Velocity tube or ram type air scoop on carburetor is permitted.
- H. H. Port matching of the intake and the spacer is allowed by grinding the inside of the intake plenum to a maximum of 0.750" deep.

6. FUEL & OIL LINES

- A. Fuel is restricted to gasoline.
- B. Any pump fuel allowed.
- C. Specific gravity must fall within the range: .715 to .765 at 60 degrees F.
- D. Maximum oxygen content is 4% by weight.
- E. Ethanol content must be less than 25% by volume.
- F. F. No alcohol or additives allowed.
- G. Fuel lines must mount in a position to reduce damage, usually on front side of pump.
- H. No fuel lines shall pass through the driver's compartment.
- I. No plastic fuel filters.
- J. No plastic pressure lines - No pressurized fuel tanks.
- K. Any type of fuel pump allowed. (Electric pump must be connected to oil pressure switch).

7. IGNITION

- A. Distributor: any single fire electronic or point distributor that fits the engine without modification is permitted. Magneto crank triggered or multiple spark discharge systems are not permitted.



8. OPTION HONDA ENGINE

- A. For all Teams who want to use the Honda engine option in the 2.5 Litres or Formula 2500 classes of the HRL series will have to contact the HRL office by email at administration@hrlhydrolane.com for the purchase of the Honda engine.

Included and mandatory in the purchase of the engine will be the following: complete engine, computer (CPU), wiring harness, and fuel pump.

Exclusions will be headers, gearbox, Motor Mounts, starter, alternator, engine coupler, gas and water fittings, lines and filters and all other hardware etc.

B. GEARBOX

- Gearbox is permitted
- No multi-speed or variable-speed gearbox
- No clutch or belt drive system is permitted.
- Gearbox configuration should be as follows – See diagram.
- Must use only 2 gears – See Diagram
- Gears must be 6 spline & 1 inch wide and purchased “over the counter” – No custom-made gears permitted.
- No conical or exotic gears are allowed.
- The gearbox must be installed in the engine compartment and visible for inspector.



Computer (CPU unit): The Computer must be installed behind the cockpit in the engine compartment.

Headers: Schoenfeld Headers only is permitted part # P9284V3M(S) and part # F9233VY(S)

Fuel: Reference: ANNEX C - 2.5 Litres & Formula 2500 Technical Rules No.6 FUEL & OIL LINES

Oil System: One oil accumulator with a two quart maximum volume is permitted, connected by a single oil line



If it is not written here, you are not allowed to do it.

ANNEX D

Air System

- 1- All competing boats must always be equipped with air.
- 2- No manually activated mechanisms shall be permitted
- 3- The mask must cover the mouth and nose and be attached in such a way as to prevent its being dislodged or removed inadvertently and must be worn by the driver anytime the boat is under power.
- 4- All inboard boats with a permanent onboard system must carry a minimum 30 cubic feet of air tank. The air tank must be installed in the center section of the boat by two supports or moulded support straps.
- 5- All inboard boats with an ambient air system must have a minimum 6 cubic feet of air and held in place by adjustable leg holsters or moulded support straps.
- 6- All boats must have identification on the bottom of the boat to indicate which air system is being used. The word AIR and the letter corresponding to the system used:
 - **Permanent air system – AIR/P**
 - **Ambient air system – AIR/A**
- 7- Air hoses must be between ten (10) and fifteen (15) feet long measured starting at the center of the steering wheel and doubly protected.
- 8- Two quick connect male couplers must be installed between the first stage regulator and the second stage regulator located between ten (10) and fifteen (15) feet from the driver's mask or helmet except when using leg holsters.
- 9- When using stainless couplers use the Parker 60 series part number SH1-62/SH1-63. When using brass couplers use part number BH1-60/Bh1-61 with ball stop mechanism.
- 10- All connections in the air system must be done with commercially accepted or SCUBA type high pressure crimped at both ends. Hose clamps are not allowed.



ANNEX E

Capsule Training Procedures

IMMERSION TEST WITH AIR SYSTEM

All drivers taking part in HRL events must first pass an immersion test using their air system.

Drivers must first give a demonstration of their air system.

It is recommended that you have access to a professional training course on assembling and using proper equipment. PADI, BSAC and SAA are organisations that offer this type of training. By mentioning the criteria for the test, you must take, it will be possible for them to set up a training schedule to meet your needs.

The immersion test simulates being turned upside down in a safety capsule under water. Each driver will have two tries each lasting about 15 seconds.

PERSONNEL EQUIPMENT (DRIVER'S)

Drivers must wear the following personnel equipment:

- 1- Racing suit.
- 2- Shoes.
- 3- Gloves, if normally worn by the driver.
- 4- Helmet.
- 5-Air system – We will supply the necessary air bottle.

PROCEDURES

The rescue team has verified the procedures that will be given to you.

The test will be done using a reinforced capsule. The capsule will be turned over in such a manner that the strapped in driver is completely submerged under water.

The following equipment is part of the capsule:

- 1- An opening not larger than those found on reinforced capsules. The sides of the capsule should not be lower than the shoulders of the driver.
- 2- A harness such as those used in hydroplanes.
- 3- A steering wheel such as those used in hydroplanes.



Under the supervision of the diver the driver must get out of the capsule in the following manner.

- 1- The capsule will be overturned.
- 2- The diver will signal the driver to begin.
- 3- The driver will unhook the canopy straps and open the canopy.
- 4- The driver will take off the steering wheel.
- 5- The driver will undo the safety harness.
- 6- The driver will place his hands on the sides of the canopy and do a forward roll to get out of the cockpit and move to the surface.

PERFORMANCE EVALUATION

The test is considered successful when a driver remains calm and comes to the surface in less than 30 seconds.

Exam failure may be due to the following points:

- 1- You moved before the diver gave you the signal.
- 2- You were unable to remove the canopy straps, steering wheel, or safety harness.

PRECAUTIONS

The rescue team must ensure that the divers are professionally trained to get drivers out in panic situations. Furthermore, the team must have someone qualified in CPR present for the entire test session. Every sequence will be explained to the driver before the test begins.



ANNEX F

Safety Inspection

Hull safety inspectors must inspect all hulls registered with HRL once a year using the official document "Safety Inspection Control" supplied by HRL. The Inspectors shall at the first race of the season or the first time a competitor participates in a race verify that the hydroplane meets all the regulations pertaining to safety. If a hydroplane does not meet all the safety requirements it may not participate until the necessary corrections are made and approved. Once a hull has been approved by the inspectors an adhesive safety sticker will be affixed to the back of the boat.

The Inspectors reserve the right to proceed with a safety inspection the moment a hydroplane enters the pits. If an irregularity is observed the inspectors will classify the problem as follows:

Level 1- Nonconformity noted – hydroplane not authorized to race.

Level 2- Divergence found – authorized to race / repair before next race.

Level 3- Involved in an accident – repairs must be done before the next event.

The Inspector must fill out a report concerning the irregularity and remove the safety sticker. Copies of the report shall be submitted to the Referee, HRL and the Owner/Driver. The hydroplane must be re-inspected at the following event. The Owner/Driver must present his copy of the inspection report to the HRL inspector or chief referee before he can be authorized to race. Only HRL Inspectors are authorized to approve any corrections.

When an Inspector approves the modifications, he will place a new safety inspection sticker on the hydroplane. The Inspector will also take a copy of the report of non-conformance from the owner, fill out the section regarding the correction and send it to the HRL office to be filed.

On no occasion shall a hydroplane be given a second chance to participate with a Level 2 infraction. Falsification of inspection documents results in an automatic suspension and will be discussed by the HRL committee. A decision will be made after examining the facts.

It is the drivers or owner's responsibility to ensure that the hydroplane passes a safety inspection. At the referee's discretion a new inspection may be ordered or after an accident before returning to competition.

Where a boat is damaged in an accident an inspection must be made by one of the inspectors before the boat can return to competition. The driver must point out to the inspectors any non-conformity to the rules.

Following a major accident of a hydroplane the inspectors must do a thorough inspection of the hull and send a copy of the report to the HRL group. At the owners request a copy of the report will be given to him.



ANNEX G

Boat on Restriction – Specifications

1- The hull suffers damage that punctures the inner and outer surface of the hull that sits below the water when a boat is stationary.

Ex.: inside of the tunnel, sponson, chine.

2- Delaminating occurs on a surface that comes in contact with the water during racing condition (Outside edge of sponson, outside rear chine, sponson bottom, bottom of the boat between the break point and the transom).

3- Damage occurs to any area of the hull that the skid fin and / or rudder is attached to fin bracket control arm area/bracket, rudder bracket.

4- Other situations where the inspector, chief referee and a builder agree on.



ANNEX H

Lane Assignement

		Q1			Q2			Q3			Q4									
2 Groups	Cr	1A	1B		Cr	2A	2B		Cr	3A	3B		Cr	4A	4B					
	1	1	2		1	16	15		1	15	16		1	16	15					
	2	3	4		2	13	14		2	13	14		2	13	14					
	3	5	6		3	12	11		3	11	12		3	12	11					
	4	7	8		4	9	10		4	9	10		4	9	10					
	5	9	10		5	8	7		5	7	8		5	8	7					
	6	11	12		6	5	6		6	5	6		6	5	6					
	7	13	14		7	4	3		7	3	4		7	4	3					
	8	15	16		8	1	2		8	1	2		8	1	2					
3 Groups	Cr	1A	1B	1C	Cr	2A	2B	2C	Cr	3A	3B	3C	Cr	4A	4B	4C				
	1	1	2	3	1	23	24	22	1	22	23	24	1	23	24	22				
	2	4	5	6	2	19	20	21	2	19	20	21	2	19	20	21				
	3	7	8	9	3	18	16	17	3	16	17	18	3	18	16	17				
	4	10	11	12	4	14	15	13	4	13	14	15	4	14	15	13				
	5	13	14	15	5	10	11	12	5	10	11	12	5	10	11	12				
	6	16	17	18	6	9	7	8	6	7	8	9	6	9	7	8				
	7	19	20	21	7	5	6	4	7	4	5	6	7	5	6	4				
	8	22	23	24	8	1	2	3	8	1	2	3	8	1	2	3				
4 Groups	Cr	1A	1B	1C	1D	Cr	2A	2B	2C	2D	Cr	3A	3B	3C	3D	Cr	4A	4B	4C	4D
	1	1	2	3	4	1	32	29	30	31	1	29	30	31	32	1	32	29	30	31
	2	5	6	7	8	2	27	28	25	26	2	25	26	27	28	2	27	28	25	26
	3	9	10	11	12	3	22	23	24	21	3	21	22	23	24	3	22	23	24	21
	4	13	14	15	16	4	17	18	19	20	4	17	18	19	20	4	17	18	19	20
	5	17	18	19	20	5	16	13	14	15	5	13	14	15	16	5	16	13	14	15
	6	21	22	23	24	6	11	12	9	10	6	9	10	11	12	6	11	12	9	10
	7	25	26	27	28	7	6	7	8	5	7	5	6	7	8	7	6	7	8	5
	8	29	30	31	32	8	1	2	3	4	8	1	2	3	4	8	1	2	3	4



ANNEX I

Safety Commission Chart

The Hydroplane Racing League takes their safety rules very seriously and requires high standards to make their races as safe as possible for all participants.

	Topics	S/F	JSS	H	GP	Notes
1.1	Air tank holder	x		x	x	Annex D and Rule 12.2.3
1.2	Belt Bolt attach	x	x	x	x	HRL supplied the washer during the convention in January 2020. If different, team must forward details to HRL for approval by the safety comitee
1.3	Communication		x			Rule 13.20
1.4	Cowling flotation	x		x	x	Must float by itself
1.5	Fire extinguisher	x	x	x	x	Rule 12.2.4
1.6	Head and neck restraint system	x	x	x	x	Rule 13.6
1.7	Hook in front of cockpit	x	x	x	x	Position for towing hook will be provided by HRL
1.8	No rod inside cockpit for wing	x		x	x	No rod inside the cockpit for the control angle of the wing
1.9	Rudder and skid fin bracket on the boat	x		x	x	Stainless steel fasterner for bracket fix on the boat. Every boat should have an aluminium backing plate on the transom with a minimum tickness: 1/4 inch for GP, 3/16 inch for Hydro 350, 1/8 inch for 2.5L and F2500
1.10	Stud and nut to fix blower				x	Steel fasteners
1.11	Sling two (2) hooks	x				Rule 12.2.2
1.12	Sling with steel ring		x			Rule 12.2.2
1.13	Accuclock	x	x	x	x	Position of lights must be approved by HRL
1.14	Window minimum 3/8 thickness				x	All windows of the cockpit
1.15	Window minimum 1/4 thickness			x		All windows of the cockpit
1.16	Driver's suit with handles on shoulders	x	x	x	x	To facilitate rescue if necessary
1.17	Reinforcement cockpit				x	New built January 1st 2020. Design and supplier must be approved by HRL. Chromoly roll cage or composite cage with composite reinforcement. Owner's choice
1.18	Reinforce sponsons			x	x	Owner's choice but highly recommended

ANNEX J

Technical Measurement

