**Construction Rules**

1. **Period, Reference, Source and Scale**
	1. Period
		1. Only ships that were laid down between January 1, 1900 and January 1, 1946 may be used, except sailing ships which are not authorized
		2. Only ship designs that construction was actually started on prior to Jan 1, 1946 can be built. Designs that were only "considered" but never implemented are not allowed. This means that the design must be one of the following
			1. It is the design that was used when construction started
			2. It is the design of the ship as it was completed
			3. It is the design of ship after modifications that were started prior to Jan 1, 1946
	2. Ships of a Class
		1. All ships of the same class may have the technical specifications of the most desirable ship of the same class
		2. Ship can not be built by pulling the best components of any and all ships in that class. One ship must be chosen and all characteristics are based on that ship
	3. Reference Source
		1. Conway’s All the Worlds Fighting Ships 1906-1921 and Conway’s All the Worlds Fighting Ships 1922-1946 (two books) shall be the only authorized reference sources for ships
		2. If a person wants to build a ship not listed in the authorized reference resources this may be acceptable provided plans and specifications can be verified by at least two other reputable sources. The Technical Officer and the Commanding Officer must agree on the suitability of the vessel for before it can be authorized
		3. Under certain circumstances defined in defined in these rules the club officers are authorized to approve waivers to the authorized references
	4. Scale
		1. All ships must be built to a scale of 1:144 (one inch equals twelve feet)
		2. Ships are allowed a +/- 5% tolerance is allowed for honest building errors in addition to any changes to a ships dimensions allowed elsewhere in these rules
	5. Modifications
		1. Modifications which are determined to give a ship an unfair advantage will not be allowed and shall not be approved for waiver
2. **Hull Construction**
	1. Penetrable Area
		1. Penetrable areas are defined as all points below the main deck and cap-rail to a point one inch below the waterline
			1. The area protected by the frames (ribs) as defined in this chapter is exempt from this specification
		2. Hull may be solid from the first frame forward and the last frame aft. These frames are typically 2" or less inward from the ends of the hull
		3. Only lightweight six-pound density balsa wood may be used on areas defined as penetrable
		4. The exterior of the hull may be covered with a single layer of lightweight one mil thick silkspan in addition to a thin layer of the approved paints
			1. The interior of the balsa sheeting must remain untreated
			2. Silkspan patches to holes in the hull must be applied to the exterior of the ship. These patches may not be wider than twice the diameter of the hole being patched, or half an inch, whichever is narrowest
		5. The thickness of the hull will be based on actual armor thickness at the thickest part of a given ships armor belt as listed here

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| **Armor Thickness of Ship** | **Maximum Balsa Thickness** |
| 0.00" to 6.99" | 1/16" |
| 7.00" to 11.9" | 3/32" |
| 12.0" and above | 1/8" |

* 1. Deck and Cap Rail
		1. Ships with at least one inch of penetrable freeboard the maximum combined thickness of the deck and cap-rail shall not exceed half of an inch
		2. Ships with less than one inch of penetrable freeboard the maximum combined thickness of the deck and cap-rail shall not exceed three-eighths of an inch
		3. On boats with a high bow the deck and cap-rail may be constructed so the bow is up to 3/8 inch lower than shown of the plans to allow guns to fire over the bow
	2. Frames (Ribs)
		1. Frames (ribs) may be no thicker than 3/8 inch, and on the bottom most interior surface of the boat may be no higher than 1 inch above the bottom
		2. Frames (ribs) must be spaced at least one inch apart, on center, for every 1/8" of frame thickness, rounded up. For example

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| 1/16 inch thick | = frames must be at least 1 inch apart, |
| 1/8 inch thick | = frames must be at least 1 inch apart, |
| 9/64 inch thick | = frames must be at least 2 inches apart, |
| 1/4 inch thick | = frames must be at least 2 inches apart, |
| 17/64 inch thick | = frames must be at least 3 inches apart, |
| 3/8 inch thick | = frames must be at least 3 inches apart |

* + 1. To increase the displacement and allow installation of hardware, frames (ribs) may be 3/8 inch higher than specified on boat plans for boats less than 15,000 tons displacement, heavy load. The water line shall be at the same placement and the free board shall be the same area as shown on the plans
		2. On boats with a high bow the frame may be constructed so the bow is 3/8 inch lower than shown on the plans to allow guns to fire over the bow
	1. Penetrable Areas Forward and Aft of Ribs
		1. Non-penetrable hull areas are allowed in the bow and stern. These areas may be made of any material provided the combined length of these two sections does not violate the rules and provided the ship does not have an unfair advantage as determined by the Technical Officers
		2. As much of the length of the ship shall be made penetrable as is possible given the ship design and available plans. It is the Technical Officer's decision what is possible but the following limits always apply to what the TO may allow
			1. Other as described above for ribs any impenetrable areas of the hull must be at the extreme ends of the hull, before the first window or after the last
			2. Under no circumstance can either impenetrable area be large enough, or maximized to constitute an unfair combat advantage, by providing a nearly impenetrable cross section across bow or stern
			3. A waiver is not needed if the combined lengths of the impenetrable areas at the bow and stern is not more than 10% of the length of the ship at the waterline
			4. If the combined lengths of the impenetrable areas at the bow and stern is more than 10%, but not more than 15% of the length of the ship at the waterline the ship can be waivered if the TO feels that every effort was made to minimize the penitrable areas at the bow and stern. However, under no circumstance can the combined lengths of the impenetrable areas at the bow and stern be more than 15% of the length of the ship at the waterline. Waivers will not be given for ships violating this point
	2. Allowances to Reward Scale Detail
		1. Armor Plate
			1. To give the effect of armor plate on ships that had such, a horizontal stringer made of any material 1/8 inch high and flush with the outboard side of the frames(ribs) may be installed
			2. This will provide additional non-penetrable area of 1/8 inch around the horizontal perimeter of the armor plate and shall not be interpreted to further increase the non-penetrable area
			3. The stringer may not be within half an inch of the waterline. If the scale location of the armor plate is within half an inch of the water line than the horizontal stringer may not be added to the model
		2. Hull Crenellations
			1. Many ships had pronounced hull crenellations along the edge of the deck (usually for secondaries). If there is not at least 1/4" between bottom edge of these crenellations and the bottom of the caprail, then these crenellations need not be made penetrable
		3. A model may not have both in-penetrable hull crenellations and a non-penetrable stringer for an armor plate
1. **Superstructure**
	1. The superstructure may be made of any material and must resemble the profile of the real ship, from all directions
2. **All Ships Must Sink**
	1. The finished ship must be capable of sinking below the waters surface
		1. No means of delaying, or slowing down the sinking of any ship is allowed other than pumps complying with Chapter Two, Section Nine
	2. Ships may be constructed of a neutral buoyancy design which prevents the ship from sinking to the bottom of the pond
		1. This must be accomplished within the design of the superstructure. No buoyancy may be added to the hull, or interior of the hull of the ship to retard it from sinking and the deck itself may not be made buoyant
		2. The superstructure or a portion thereof may remain above the water surface allowing ease in recovery of the vessel
		3. 95% of the ship must sink below the waters surface
3. **Recovery Device**
	1. All ships must have a recovery device in the form of a float with line securely attached to the ship and float

		1. The float shall break free of the ship as the ship sinks and the line shall deploy
		2. The line shall be of sufficient length to allow the float to reach the surface of the water when the ship is on the bottom, marking the location of the ship and allowing recovery of the ship from the waters surface
4. **Blast Shields**
	1. These are devices to prevent rounds from passing through both sides of a ship's hull, or from damaging internal hardware
		1. Blast shields may be made of any material and must be mounted no closer than 5/16 inch away from the hull skin of the boat on the interior of the boat
		2. Rounds must be free to penetrate the hull, strike the blast shield and fall away from the hole towards the bottom of the boat
		3. The blast shield may not impede water flow in any way, or allow rounds (balls) to impede water flow
		4. The blast shield may NOT be sealed to any water-channeling device in such a manner as to prevent the water from reaching the bottom of the hull
5. **Watertight Compartments**
	1. Electrical and electronic gear that would become damaged by water immersion may be protected by placing it in watertight compartments
		1. These compartments may not be larger than is needed to contain the gear that is being protected
		2. These compartments may not increase the buoyancy to the ship at any time
		3. These compartments may not subdivide the hull or impede the flow of water through the hull
6. **Water Channeling**
	1. Water channeling to direct water towards the pump is approved
		1. Channeling shall be no higher than 1/2 inch above the bottom most interior surface of the hull and must allow water to run over and flow into the rest of the ship when there is more than 1/2" of water on the bottom of the hull
		2. Blast shields shall not be sealed to the water channeling
7. **Pumps and Pumping Capacity**
	1. All ships may have one or more bilge pumps, but the combined pumping capacity shall not exceed the rates defined here

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| **Category** | **Displacement** | **Gallons / Hour** |
| 0 | Under 13,499 | 30 |
| 1 | 13,500 to 24,999 | 45 |
| 2 | 25,000 to 34,999 | 60 |
| 3 | 35,000 to 47,999 | 75 |
| 4 | 48,000 to 64,999 | 90 |
| 5 | Over 65,000 | 105 |

* 1. The pumping capacity of all unarmed convoy ships, liners, cargo ships or oilers shall not exceed category zero, regardless of the ship’s displacement
	2. The pumping capacity of all armed convoy ships, liners, cargo ships, oilers or raiders shall not exceed category one, regardless of the ship’s displacement
1. **Rudders**
	1. Rudders may be made of any material and may be up to 25% larger in surface area than on the real ship. Rudders must be the same shape and installed in the same position as on the real ship, but all rudders need not be installed or operational
	2. Convoy vessels and Raiders converted from transports may have rudders twice the area as shown on the plans
2. **Propellers and Screws**
	1. Propellers
		1. Boats may have up to the same number of propellers as the real ship
		2. All propellers need not be installed
		3. Propellers that are installed must be in the same position as on the real ship
		4. Propellers may be up to 50% larger in area than would be correct for scale
	2. Bow thrusters
		1. Bow thrusters may be used only if the real ship was so equipped
3. **Propulsion and Speed**
	1. All ships have a maximum scale speed which is based on the type and maximum speed of the ship being modeled
		1. The scale speed of warships is either the maximum speed of the original ship in knots, or twenty-four knots, whichever is faster
		2. The scale speed of non-warships is either the maximum speed of the original ship in knots, or twenty-two knots, whichever is faster
		3. "Trials Speeds" are not authorized
	2. The maximum speed of the model ship is determined by timing how long it takes for the ship to travel one-hundred feet (100’) in a strait line at full throttle. The time it takes for the ship to travel the distance can be no less than the time (in seconds) listed here for each scale speed

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| **Scale** | **Time** |  | **Scale** | **Time** |  | **Scale** | **Time** |  | **Scale** | **Time** |
| 22 | 51.1 |  | 30 | 37.5 |  | 38 | 29.6 |  | 46 | 24.5 |
| 23 | 48.9 |  | 31 | 36.3 |  | 39 | 28.9 |  | 47 | 24.0 |
| 24 | 46.9 |  | 32 | 35.2 |  | 40 | 28.1 |  | 48 | 23.4 |
| 25 | 45.0 |  | 33 | 34.1 |  | 41 | 27.4 |  | 49 | 23.0 |
| 26 | 43.3 |  | 34 | 33.1 |  | 42 | 26.8 |  | 50 | 22.5 |
| 27 | 41.7 |  | 35 | 32.1 |  | 43 | 26.2 |  | 51 | 22.1 |
| 28 | 40.2 |  | 36 | 31.3 |  | 44 | 25.6 |  |  |  |
| 29 | 38.8 |  | 37 | 30.4 |  | 45 | 25.0 |  |  |  |

* 1. Only electric motors may be used in conjunctions with factory sealed batteries
	2. Motors or throttles may not be set to increase power in a turn to improve the maneuverability of a ship, or to increase power during acceleration or deceleration to improve the starting and stopping characteristics of a ship
	3. Modifying the profile of the bow or shape of the hull to increase drag as a means of slowing down the ship is not allowed
1. **Waterline and Boots**
	1. All ships shall float at scale waterline as shown on the ship plans
	2. Boot toppings shall be in scale position as shown on ship plans, must be 1/4 inch wide and may be painted or striped with one layer of hobby pin stripe tape
	3. Aircraft carriers are inherently top heavy, so to achieve a stable balance the waterline of aircraft carriers may be raised one half of an inch provided that at least 1 inch of penetrable free board remains above the waterline. This will reduce the freeboard and increasing the displacement of the ship
2. **Lamination, Paints, Fillers, Wood Hardeners**
	1. Lamination
		1. Lamination is not permitted in penetrable areas
		2. Holes in penetrable areas may be plugged, or hull sections replaced, or holes may be covered with one layer of light weight silk span
		3. The silk span may not exceed more than 3/8 inch beyond the size of the hole being repaired and may not overlap areas of previous repairs. This means that multiple layers of silk span can not be allowed to build up on the hull, increasing the thickness of the hull as multiple repairs are made
	2. Paints
		1. Only model dope, lacquer based paints, water based paints or acrylic enamel paints may be used on penetrable areas and epoxy, oil based, or house type latex paints may not be used
		2. No paint shall be used on penetrable areas that increases the hardness, strength, or elasticity of the balsa wood
	3. Fillers and Hardeners
		1. Water based wood fillers may be used, but such fillers shall not add strength or thickness of the balsa wood of penetrable areas. Lightweight wall spackle works well as a filler and is easy to sand
		2. Wood hardener materials such as penetrating liquids may not be used on the wood covering the penetrable areas of the hull
3. **External Hull Modifications (Keels, stabilizers, etc.)**
	1. Any modifications not present on the ships plans or not of scale must be submitted for a waiver
4. **Radio Control Devices**
	1. Conventional R/C Radios
		1. Each ship can have one channel reserved for it
		2. Channels are reserved first-come first-serve
		3. If the ship for which a channel is reserved is not present than another ship may use that channel with the approval of the CO (or XO in the CO's absence)
		4. If the ship does not participate in a club event for one year then the channel is considered available for other ships to reserve
	2. Custom Control Devices

Do to the difficulty in regulating such devices it is left to the builders to regulate themselves. The following restrictions always apply

* + 1. If custom devices are to be used then the owner must demonstrate, to the satisfaction of all participating captains, that the device(s) does not conflict with any other control devices
		2. If two or more custom control devices interfere with each other then none of the devices can be used until the conflict is resolved
		3. If any custom control device interferes with any convention R/C radio then the custom control device may not be used until it is changed to not interfere with any convention radio

**Armament Rules**

Posted Wed, 01/27/2010 - 20:38 by Brian

1. **Cannons**
	1. Number and Placement
		1. The number of cannons allowed are the same as on the real ship. However, not all need to be installed.
		2. The The Technical officers may approve waivers to scale gun placement to allow guns to fit into a particular ship provided:
			1. The cannon is placed as close as possible to the scale location
				1. A waiver should always be given if the cannon could not be placed correctly in the model because of rules requirements obstructed their placement then the cannons may be moved to the nearest possible position. This exception does not apply to space concerns not directly caused by these rules.
			2. There must be no significant tactical advantage to the alternate location
				1. Increasing overall magazine size beyond what is achievable at the correct scale location is disallowed as an unfair advantage.
			3. A waiver is not needed if the cannon's placement is within +/-5% of the correct scale location (measured to center of rotation for turret). This allows for honest building mistakes.
		3. Cannons and torpedo tubes of a single battery shall not have converging barrels that allow the balls fired to strike at the same point at any given distance.
		4. Performance and operating parameters of guns and torpedoes is covered in this chapter under Weapons Testing Procedure and Operating Parameters.
		5. The minimum spacing between barrels shall be 0.5 inch center-to-center
	2. Barrels
		1. The length of barrels must be the same as on the real ship within 5%. Barrel length is measured from the end of the barrel to the face of the correctly scaled turret cover.
		2. Gun barrels may not elevate higher than horizontal, which is defined as parallel with the waters surface, at any point in the arc of rotation.
		3. Gun barrels may not depress more than fifteen degrees below horizontal at any point in the arc of rotation.
		4. Weapon caliber's shall be the same as on the real ship to the scale size defined here:

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| **Caliber on Real Ship (metric)** | **Caliber on Scale Model** |
| 3" to 6.9" (76.0mm to 179mm) | 0.177 inches |
| 7" to 10.9" (180mm to 279mm) | 3/16 inches |
| 11" to 14.9" (280mm to 379mm) | 7/32 inches |
| 15"+ (380mm +) | 1/4 inches |

* + 1. Gun Rotation
			1. Only ships that had rotating guns may have rotating guns and these guns shall be in the same position as on the real ship.
		2. Operating Parameters
			1. Maximum operating pressure shall not exceed 140 psig, but may be required to operate at below 140 psig to meet the penetration requirements defined herein.
			2. Only CO2 or compressed air may be used as a propellant.
			3. Maximum penetration shall not exceed that described in this section.
		3. Weapon Testing
			1. Maximum weapons system pressure is 140 psi. However, system pressure must be reduced as required to prevent shot from exceeding these penetration test requirements.
			2. When testing a particular cannon, use only the propellant that the cannon is designed for.
			3. Test weapons by firing into DOW Styrofoam, Square Edge Extruded Polystyrene Insulation, 2 inches thick. Do not substitute 2 layers of 1" thick material.
			4. Firing into 2" thick FOAM test material:
				1. Secure the foam solidly, 12" from the muzzle of the cannon's barrels. If need be, build a frame for the foam and anchor it solidly, or strap it against a stable object such as a desk, and fire into area of the foam that has no support directly behind it.
				2. If ANY rounds go through the foam, adjust the system pressure down and re-test. Repeat this process until no rounds pass through the foam.
1. **Torpedoes**
	1. Torpedoes are simulated using cannons in place of torpedo tubes.
		1. All restrictions applicable to cannons also apply to cannons simulating torpedoes.
		2. Only ships that had torpedoes may be so armed.
		3. The maximum number of torpedoes on any ship shall not exceed the number of tubes on the real ship.
		4. Torpedo tubes must be angled down to limit their range to 4 feet.
	2. All torpedo tubes are simulated by 1/4 inch or smaller cannons regardless of the diameter of the prototype torpedo tube.
2. **Aircraft**
	1. Aircraft may be simulated using 1/4 inch cannons.
		1. For every ten combat aircraft the ship carried a single 1/4 inch barrel may be installed.
			1. If the number of aircraft carried is not a multiple of ten then the number of barrels that can be install is the number or aircraft divided by ten, rounded down.
		2. The cannons must be installed under the deck with approximately half of the guns pointed directly forward and the remainder pointed directly rearward
		3. These cannons may not rotate.
	2. Launching Scale Model Aircraft
		1. Aircraft carriers may launch scale replicas of aircraft carried on the real ship.
		2. Aircraft must be launched from the flight deck forward over the bow.
		3. One aircraft may be launched every eight seconds.
		4. Aircraft must be constructed such that they are recoverable and may not be allowed to sink to the bottom of the pond and be lost after firing.
3. **Rate of Fire for Cannons and Torpedoes**
	1. The rate of fire for cannons and torpedoes is as follows:

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| **Scale Caliber of Cannon** | **Rate of Fire** |
| 0.177 inches (bb) | 1 round per barrel every 4 seconds |
| 3/16 inches | 1 round per barrel every 4 seconds |
| 7/32 inches | 1 round per barrel every 6 seconds |
| 1/4 inches (except Torpedoes) | 1 round per barrel every 8 seconds |
| Torpedoes | Non-Reloading |

1. **Mines**
	1. Mines are simulated using lengths of string held afloat with small floats. Ships become caught in the string.
		1. Mine strings must float and be recoverable.
		2. Mines strings are limited to one foot for every ten mines the ship historically carried plus three or more feet (determined by Referee for battlesite) for an anchor.
		3. The mine string must be weighted at one end with sufficient weight to anchor it. The nearest float to the anchor must be three feet away from this anchor.
		4. There must be one additional float every five feet, spaced evenly between first float and the last float at the unweighted end.
		5. The individual deploying the mine is responsible for recovering the mines at the end of battle.
2. **Other Weapons/Shipboard Systems**
	1. Lights, anchors, horns, and similar devices are allowed. Shipboard smoke generators are allowed, provided no propelled/exploding pyrotechnics or liquid fuels are used. Commercially sold smoke bombs are acceptable, but should be placed in a hollowed out smokestack lined with a nonflammable material.
	2. All other weapons/ship board systems added that are visible on the exterior of the ship, must maintain the scale look and profile of the ship.
	3. Aiming devices to simulate radar are allowed under R&D.
	4. Automated devices that fire a weapon without human input are not allowed.
3. **Weapon System Safety**
	1. C02 Tanks, Air Tanks and Air Compressors

		1. All systems must be of a commercial design suitable for the pressures used in combat vessels.
		2. The maximum pressure delivered to the weapon systems shall not exceed the limit specified herein.
		3. Air tanks and C02 tanks and all fittings operating at non-regulated pressure must be of a commercially approved design and must meet state and local laws, and must be rated at 150% the operating pressure at a minimum.
		4. No device may be installed in any pressurized portion of the CO2 system that will prevent the pressure regulator from performing it's function throughout the entire system.
	2. Regulators

		1. These items are pressure relief regulators, set to a maximum of 140 psi
	3. Pressure Gauges

		1. All combat ships with CO2 bottles or compressors must have a Clippard quick disconnect fitting on the highest pressure line in the ship.
		2. The TO has the right to require that the quick disconnect be repositioned.
	4. Gas for Gun Systems

		1. Only liquid CO2 or compressed air may be used.
	5. High Pressure Tanks (HP)

		1. High Pressure tanks, lines and valves are those that are operated in excess of 300 psi.
		2. Members utilizing tanks for the purpose of dispensing gas to another tank shall do so as described below:

			1. The transfer of HP air or CO2 shall be done in the designated area.
			2. A tank intended to supply gas, receive gas and the associated supply lines shall be of a type and design suitable for such HP gas.
			3. Upon the completion of the transfer of gas, each tank valve shall be closed, and any gas pressure remaining in the transfer line shall be released immediately.
		3. High Pressure Tanks & Hoses:

			1. All HP tanks are to be pressure tested every 5 years (hydrostat) as applicable.
			2. The date of test and PSI rating must be stamped on all HP tanks.
			3. At no time shall a tank be pressurized above the stamped PSI rating on the tank.
			4. No HP line or valve stall be used above its rated pressure.
	6. Safety Switch

		1. All ships with weapons systems shall be equipped with a safety switch.
		2. When in the "safe" position, the switch shall allow no gas to flow to the firing valves or actuators, nor allow any current to pass to the firing solenoids (on electrically fired systems), no matter which position the firing servo is in.