A NAVAL GUNNERY TARGET

FIELD

This application relates to targets for naval gunnery practice.

BACKGROUND

Naval gunnery targets are used to simulate enemy ships for the purpose of training ships' gunnery teams. There are many different types of targets currently in use depending on the type of guns used in training. For realistic training with smaller caliber guns, self propelled radio controlled mobile targets can be used. However, for greater cost effectiveness, towed targets are often used even though they are less realistic than self propelled mobile targets. Among the different types of towed targets, inflatable types are most popular because of the relative ease with which these can be deployed at sea. It is also relatively easy for a small boat to tow such targets at high speed because the inflatable towed targets are relatively lightweight. However, once hit by gun rounds, the inflatable targets are often damaged beyond economical repair, resulting in a high number of targets being discarded after target practices and therefore increasing the cost of using inflatable targets.

SUMMARY OF THE INVENTION

A naval gunnery target is provided. It comprises a flotation structure supporting separable modules that are attachable together to form a single body for receiving gunfire. In this way, damaged modules may be individually repaired or replaced. Such modularity enables the target to be deployed even from small vessels that are not equipped with a crane. The target can be assembled one module at a time alongside the vessel from which it is deployed. By using a modular construction method, damaged modules can be replaced even when the target is on the water such that the target can be quickly returned to service. The modularity also allows for easy

improvements to be made to the flotation structure supporting the body for different operating conditions.

According to a first aspect, there is provided a target for naval gunnery practice, the target comprising: a body configured for receiving gunfire, the body comprising a plurality of separable modules; and a flotation structure configured to support the body for receiving gunfire; each of the plurality of modules configured to be individually releasably securable to the flotation structure.

The target may further comprise fasteners provided on each of the plurality of modules for attachment of one module to another module.

Each of the plurality of modules may be configured to be inflatable and deflatable.

The plurality of modules may be identical.

Each of the plurality of modules may be provided with an inflation tube configured for allowing the plurality of modules to be simultaneously inflated.

The flotation structure may comprise a buoyant hull and a frame attached thereto, the frame being configured for supporting the body and for releasably securing each of the plurality of modules of the body thereto.

The target may further comprise a plurality of straps for releasably securing each of the plurality of modules to the flotation structure.

Attachment points may be provided on each of the plurality of modules and on the frame for engaging the plurality of straps securing the plurality of modules to the flotation structure.

The target may further comprise at least one reflector selected from the group consisting of: corner reflectors and radar reflectors. The target may further comprise a plurality of reflector securing straps for releasably securing the at least one reflector to the body. The plurality of reflector securing straps may be configured for engaging the attachment points.

The target may further comprise laser reflective elements.

The target may further comprise self-propulsion means for moving the target on water.

According to a second aspect, there is provided towing vehicle configured for towing the target described above.

BRIEF DESCRIPTION OF THE DRAWINGS

An example of the invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of an exemplary embodiment of the target;

FIG. 2 is a front view of the target of FIG. 1;

FIG. 3 is a side view of the target of FIG. 1;

FIG. 4 is a top view of the target of FIG. 1;

FIG. 5 is an exploded assembly view of the target of FIG. 1;

FIG. 6 is a perspective view of two modules of the target of FIG. 1;

FIG. 7 is a perspective view of a frame of the target of FIG. 1;

FIG. 8 is a top view of the frame of FIG. 7;

FIG. 9 is a side view of the frame of FIG. 7; and

FIG. 10 is a front view of the frame of FIG. 7.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

An exemplary embodiment of a preferred form of the invention will now be described with reference to FIGS. 1 to 10.

As shown in FIG. 1, the target 100 comprises a flotation structure 20 and a body 30. The flotation structure 20 is configured to support the body 30 for receiving gunfire. The body 30 comprises a plurality of separable modules 32.

The flotation structure 20 preferably comprises a buoyant catamaran-like hull 22 with a pair of flotation chambers 24 each disposed on either side of the hull 22. The flotation chambers 24 are preferably shaped as columns 24 to ensure better straight-line-keeping of the target 100 during towing. The pair of flotation chambers 24 also ensures that the target 100 will be stable under most high speeds and poor sea conditions. The flotation chambers 24 may be inflated using an air inflation system, such as a pump. Preferably, the flotation chambers 24 may be deflatable for ease of storage.

The flotation structure 20 preferably further comprises a frame 26 centrally disposed on the hull 22. The frame 26 is preferably laterally symmetrical as shown in FIG. 8. The frame 26 is suitably reinforced and is made of stiff and rigid materials, preferably a metal. The material for the frame 26 should be lightweight, such as aluminium. The frame is preferably able to be assembled from smaller aluminium segments that are bolted together or extended by some joint method from a more compact size frame for stowage and shipping purpose within the same shipment box as the flotation chambers

24. The frame 26 is attached to the hull 22, preferably using a system of bolts and nuts or other alternative attachment means. At least one towing line connector 29 is preferably provided at a front end 28 of the frame 26 for attaching one or more towing lines (not shown) thereto. To avoid water collecting at the base of the hull 22, a rear end 25 of the hull 22 preferably comprises a self-draining transom 25. The front 26 of the hull 22 shall be such as to provide good streamline effect whilst the target 100 is being towed underway so that water entering into the base of the hull 22 will be minimized.

The body 30 is configured to receive gunfire and comprises a plurality of separable modules 32. Each of the plurality of modules 32 is configured to be individually releasably securable to the flotation structure 20. The modules 32 are configured such that a plurality of modules 32 can be assembled together as a body 30 to form a larger target 100. Assembly of the modules 32 to form the body 30 may be done on the deck of a launching vessel or individually deployed while the target 100 is already on the water, subject to available space and sea conditions.

The modules 32 are preferably secured to the flotation structure 20 via the frame 26, by means of straps 34. Preferably, each strap 34 comprises an elasticized cord provided with simple or karabiner hooks (not shown) at each end for engaging attachment points 36 provided on the modules 32. Two attachment points 36 may be provided on each module 32. In this way, the module 32 may be quickly secured to the flotation structure 20 by attaching one end of a strap 34 to a first attachment point 36-1, passing the strap 34 under a hook 23 provided on the frame 26, and attaching the other end of the strap 34 to a second attachment point 36-2. A plurality of straps 34 are preferably used to secure each module 32 to the flotation structure 20, one strap 34 on either side of the body 30 as shown in FIG. 2. Accordingly, pairs of hooks 23 are

provided each on either side of the frame 26 for engaging with the straps 34 attached to the modules 32.

Each module 32 is preferably lightweight to allow manual handling without requiring use of a crane, and more preferably, inflatable and deflatable. Accordingly, each module 32 is preferably made of a flexible material so that it may be collapsed and folded to reduce bulk for ease of storage and shipment. The flexible material should be impermeable to inflating gases, which may be air, carbon dioxide or any other gas which is compatible with the material. As an example, polyvinyl chloride or hypalon sheeting or other lightweight material may be used for forming each module 32. The gases used should preferably not be flammable or explosive in order to avoid any explosions upon destruction of the modules 32 during target practice.

The modules 32 are preferably identical, each being formed to a shape useful for gunnery targeting. Preferably, the shape of the body 30 is tubular in nature. Accordingly, when inflated, each module 32 preferably takes the shape of a short cylinder such that a plurality of modules 32 placed end to end results in the body 30 having a generally cylindrical shape as shown in FIGS. 1, 3 and 4. Space requirements of the modules 32 during transportation is minimised as the modules 32 can be stored deflated and subsequently inflated using a shipboard compressed air system or using an electrical air pump inflation system. The body 30 and the flotation structure 20 can be assembled on a ship's deck by securing the modules 32 onto the frame 26 already attached to the flotation chambers 24, so as to be launched as a complete target 100. The modules 32 can be easily inflated for use when necessary.

Preferably, the modules 32 have a base colour that makes for easy visual tracking, such as day glow orange. However, other colours may be optionally used if desired to

blend the target 100 in with the surrounding sea and environment for less visual contrast if required. This allows for more challenging shoots using optical tracking systems. The target 100 may be of a size ranging from three to nine metres long, and have a diameter ranging from 1 to 3 metres. In a preferred embodiment, the body 30 has a length of about 5 metres and a diameter of about 2 metres. The overall length of the target 100 from the towing connector 29 to the end of the last module 32 may be about 6 metres.

As shown in FIG. 6, a fastening system comprising fasteners 35, 37 is provided to separably attach the modules 32 to each other. The fasteners 35, 37 may be affixed to the outer surfaces of the modules 32 by adhesives or other suitable means such as by stitching. A preferred form of fasteners 35, 37 would be hook-and-loop fasteners such as Velcro®. As shown in FIG. 6, each cylindrically shaped module 32 is provided with a male fastener 35 located externally on one of its two flat sides and a female fastener 37 located on the other of its two flat sides. The male fasteners 35 comprise a layer of hooks while the female fasteners 37 comprise a layer of loops. A number of modules 32 may then be attached to each other by bringing the male fastener 35 of one module 32 into contact with the female fastener 37 of an adjacent module 32. A plurality of the modules 32 can thus be attached together to form the cylindrically shaped body 30. The individual modules 32 are thus also separable from each other by detaching the male fastener 35 of one module from the female fastener 37 of its adjacent module 32. The size of the body 30 can thus be altered by adding or removing modules 32 accordingly as desired, provided that the final size of the body 30 so formed shall not substantially exceed the length of the frame 26 to which the modules 32 are secured.

One or more reflectors 40 may be attached to the target 100 to increase radar cross-module of the target 100. The reflectors 40 are preferably releasably secured to the

body 30 with reflector securing straps 42 engaging the attachment points 36, or may be inserted into slots (not shown) provided on the frame 26. In this way, reflectors 40 that are not damaged may be reused even if the modules 32 are damaged during target practice. The one or more reflectors 40 may comprise corner reflectors or commercially available radar reflectors such as Luneburg lens radar reflectors.

For use as a target for air to ground gunnery firing, the modules 32 may accordingly be lined with laser reflective elements such as strips or tape (not shown) to enhance beam reflection.

To assemble the target 100 on the deck of a launching vessel, a number of modules 32 are first lightly inflated by pumping inflating gases through an in inflation valve 38 provided on each module 32 until each module 32 assumes the tubular form that it would take once fully inflated. The lightly inflated modules 32 are then attached to each other using the fasteners 35, 37 provided on the modules 32. The attached modules 32 are then further inflated until the tubular modules 32 are each well inflated and good end to end contact between the modules 32 is achieved, thereby forming the body 30. Increasing the pressure in each of the modules 32 ensures that the inflated modules 32 are attached more securely to each other as the modules 32 become firmly pressed against each other due to the increased inflation. Similarly, deflating the modules 32 slightly allows them to be removed by separating the fasteners 35, 37.

When the modules 32 have been fully attached to each other to form the body 30 of the target 100, the body 30 is then secured to the flotation structure 20 by securing the modules 32 to the frame 26 using the provided straps 34. Once the body 30 has been secured to the flotation structure 20, the entire target 100 can now be launched from the vessel either manually or by using a crane. Launching lines are preferably secured

to securing points on the frame 26 for manual release of the target 100 over the launching vessel's side or for attaching to a crane.

When the target 100 is to be launched from a vessel that does not have adequate deck space to assemble the entire target 100, the target 100 can be assembled in the water. To do so, the flotation structure 20 which comprises the catamaran-like hull 22 already affixed to the frame 26 is first launched in the water. Modules 32 that have been lightly inflated are then lowered to the sea where they are then placed onto the flotation structure 20 one at a time. A specially configured inflation tube (not shown) may be provided and affixed to the inflation valve 38 of each module 32 for subsequent use when the module 32 is assembled in water instead of on deck. This inflation tube is to enable all the modules 32 on the flotation structure 20 to be inflated simultaneously from a single pump, thus ensuring rapid target assembly and readiness.

Each module 32 is immediately secured to the frame 26 as it is received on the flotation structure 20. As each module 32 is lowered for securing to the frame 26, care is taken to ensure that adjacent modules 32 are arranged with their fasteners 35, 37 correctly oriented so that the lightly inflated modules 32 become attached to each other via their fasteners 35, 37 as they are secured to the frame 26. Once all the modules 32 have been secured to the frame 26, the modules 32 are then further inflated. To do so, the inflation tubes that already attached to each module 32 are collected together to a master inflation port for simultaneous inflation using a hand pump or a machine pump from the ship. When inflation of the modules 32 is completed, the body 30 is formed and already secured to the flotation structure 20 so that the target 100 is ready for use. The modules 32 can therefore be assembled without the need of a crane.

In use, modules 32 of the body 30 that have been damaged during firing runs of target practice can be easily detached from their neighbouring modules 32 and released from the frame 26, thereby removing them from the target 100 for easy replacement with new modules 32. In this way, repairs to the target 100 can be carried out in situ and damaged modules 32 can be individually removed for onboard repairs or replacement without having to recover the entire target 100. By replacing only damaged modules 32 instead of the whole target 100, cost of use can be kept low.

Preferably, the inflatable target 100 is towed by a towing vehicle using a towline (not shown). A buoyant towline is preferred. The towline is attached to the towing vehicle and to the towing line connector 29. The towed target 100 thus simulates a moving target in the water. A multitude of targets 100 can be towed at once to simulate a plurality of enemy ships for target practice.

Whilst there has been described in the foregoing description preferred embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design or construction may be made without departing from the present invention. For example, the flotation structure may be of an integral piece instead of comprising a hull and a frame separately. Alternatively, the flotation structure may comprise one or more pontoons, a boat, a raft. Instead of hook and loop fasteners, other releasable fastening means such as belts may be used to attach the modules 32 to each other. The modules 32 may have other shapes and sizes besides that of short cylinders, so as to simulate targets 100 of different shapes and sizes. The modules 32 need not be identical with each other depending on a desired shape of the target 100 to be formed. By creating different types of modules, it may be possible to create a target having the shape and size of a small dinghy or other small floating structures as may be desired. The target 100 may

additionally be provided with self-propulsion means such as an outboard motor for moving the target 100 on water, and movement of the target 100 may be configured to be remotely controlled.

CLAIMS

1. A target for naval gunnery practice, the target comprising:

a body configured for receiving gunfire, the body comprising a plurality of separable modules; and

a flotation structure configured to support the body for receiving gunfire; each of the plurality of modules configured to be individually releasably securable to the flotation structure.

2. The target of claim 1, further comprising fasteners provided on each of the plurality of modules for attachment of one module to another module.

3. The target of any one of the preceding claims, wherein each of the plurality of modules is configured to be inflatable and deflatable.

4. The target of any one of the preceding claims, wherein the plurality of modules are identical.

5. The target of any one of the preceding claims, wherein each of the plurality of modules is provided with an inflation tube configured for allowing the plurality of modules to be simultaneously inflated.

6. The target of any one of the preceding claims, wherein the flotation structure comprises a buoyant hull and a frame attached thereto, the frame being configured for supporting the body and for releasably securing each of the plurality of modules of the body thereto.

7. The target of any one of the preceding claims, further comprising a plurality of straps for releasably securing each of the plurality of modules to the flotation structure.

8. The target of claim 7 when dependent on claim 6, wherein attachment points are provided on each of the plurality of modules and on the frame for engaging the plurality of straps securing the plurality of modules to the flotation structure.

9. The target of any one of the preceding claims, further comprising at least one reflector.

10. The target of claim 9, wherein the at least one reflector is selected from the group consisting of: corner reflector and radar reflector.

11. The target of claim 9 or claim 10, further comprising a plurality of reflector securing straps for releasably securing the at least one reflector to the body.

12. The target of claim 11 when dependent on claim 8, wherein the plurality of reflector securing straps are configured for engaging the attachment points.

13. The target of any one of the preceding claims, further comprising laser reflective elements.

14. The target of any one of the preceding claims, further comprising self-propulsion means for moving the target on water.

15. A towing vehicle configured for towing the target of any one of the preceding claims.