Paloma Alta Project - Spain

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Introduction

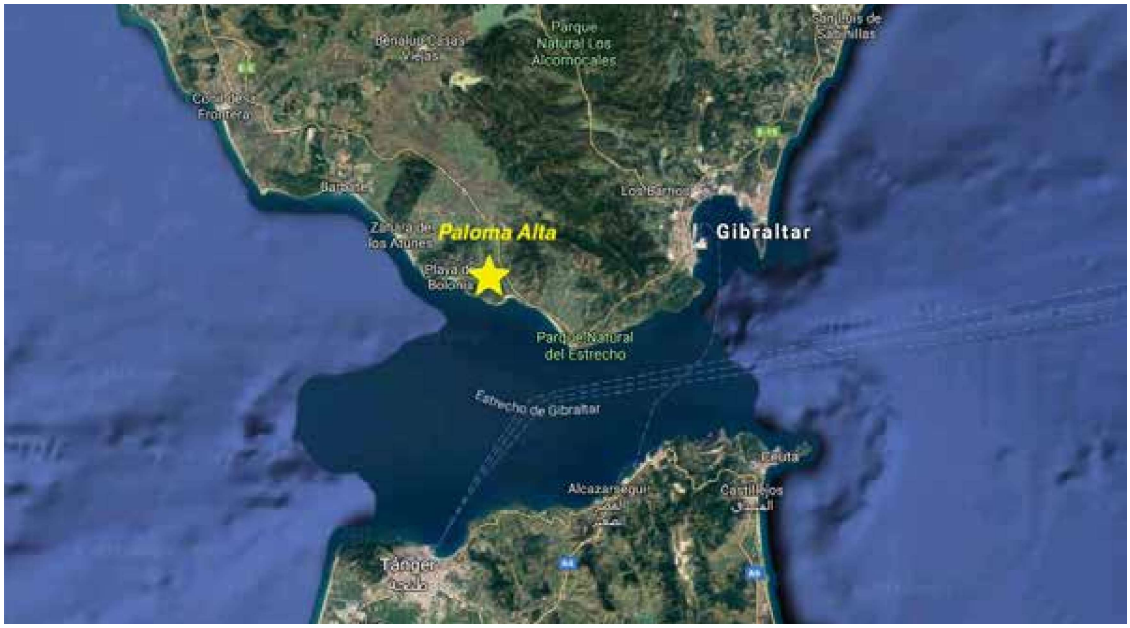
The last three 15-inch Vickers coastal artillery guns, model 1926, deployed in Tarifa, Spain, on the coast of the Strait of Gibraltar and in active duty until 2008, will be a museum, thanks to Spain Artillery Association's "Conde de Gazola" initiative.

The challenge is to restore unique guns engineered in the 1920s. Only 18 were built and all were acquired by Spain between 1926 and 1930. They were similar to those mounted in *Hood*-class British battleships but with longer barrels. They are masterpieces of industrial and mechanical archeology.

The Paloma Alta Project will provide Andalusia with a Cultural Center of Excellence, in which there will be a Coastal Artillery Museum, a History and Nature Investigation Center, a number of convention and exhibition areas, and a wide variety of tourist services. All this, jointly with the nearby Roman Ruins of Baelo Claudia, in Bolonia, and the Middle Ages Castle of Tarifa will be the beginning of the envisaged Fortifications Route of the Strait, running all over the very south of Spain.

Collaboration between the Artillery Association and the Spanish Ministry of Defense, to promote the artillery and defense values and culture all over the area, is helping to facilitate agreements with local and regional authorities and local enterprises, supporting the economy and employment in the southern part of the country.

Few places like Paloma Alta combine the green color of the Mediterranean pine trees with the magic sea blue of the Strait of Gibraltar, called by the Romans *"Fretum Gaditanum,"* that right here widens to become the great Atlantic Ocean. Paloma Alta is located on the south face of Sierra San Bartolome, flanked by the well-known dune areas of Bolonia and Valdevaqueros, 13 kilometers west of Tarifa (Cadiz, Spain) at an altitude of 190 meters over the Punta Paloma beach.



In its surroundings we find several archeological sites and the main Roman quarries that supplied the city of Baelo Claudia with construction materials for its buildings. This Roman town that still exists today, became a well-known commercial emporium, competitor, and partner of other neighbor cities like Tingis (Tanger, Morocco), Carteia (Algeciras, Spain), Septem Frates (Ceuta, Spain) and Tamuda (Tetuan, Morocco). All of them formed the so-called Circle of the Strait that exported "salazon" (salted fish) and its derivatives to the rest of the Roman Empire.

Baelo Claudia Roman Ruins *Author*

In this environment is located our coastal artillery battery, known to many as the *"thirty-eight with one"* (15-inch = 38.1 cm) and also called the *"Navarone of the Strait,"* in memory of the famous 1961 WWII movie "The Guns of Navarone."

History of the 15" Spanish Guns

Gun in the Factory *Courtesy Sanchez Alcazar*

The icons of the Paloma Alta Site are the Vickers-Armstrong 15-inch (381/45) Mark B, model 1926, coastal artillery guns. They were built by Barrow & Furnes Co. in UK, based on an original design for the Brazilian Battleship *Riachuelo*, before it was cancelled by the Brazilian government.

During the Primo de Rivera Government, between 1929 and 1935, Spain decided to put in place a defense program to protect the most important navy installations and so they acquired 18 of these naval guns, the only ones built. These were to be deployed as coastal artillery. They were similar to the ones mounted in the *Hood*-class British battleships, but the Spanish guns had longer 45-caliber barrels versus the 42-caliber British barrels. This meant longer range, to meet coastal artillery requirements. They were the most powerful artillery deployed in the country, the only equivalent to the 12-inch (305/50) double turrets taken out the *España*-class battleships, two of which, from the battleship *Jaime I*, are still abandoned to the weather and vandalism, at "Vigia" and "Cascabel" sites in the vicinity of Tarifa.

Once the eighteen guns arrived in Spain they were deployed as follows:

Ferrol Naval Base - Galicia, Northwest of Spain (8 units – four batteries):

2 units in "Campelo Alto," dismounted between 1940 and 1941 and transferred to Tarifa.
2 units in "Prior Sur," out of service in 1997, scrapped.
2 units in "Lobateiras," out of service in 1997, scrapped.
2 units in "San Pedro," converted in a museum and park. Visit recommended.

Cartagena Naval Base – East Coast of Spain (4 units – two batteries):

2 units in "Cenizas," out of service and conserved for visiting.
2 units in "Castillitos," converted into a park. Visit recommended.

Mahon Naval Base – Menorca, Balearic Islands (6 units – three batteries):

2 units in "La Mola," converted in a museum within a fortress. Visit highly recommended.
2 units in Favaritx, dismounted between 1942 and 1943 and transferred to Tarifa.
2 units in Llucalary, out of service in a private property as a hotel attraction.

Of the 18 units, four were scrapped, ten are currently open for visiting as museums/attractions, three are in Paloma Alta, and the one that is missing had an accident and the barrel was scrapped.

Looking at the distribution of the guns, a simple question arises; why were there no guns deployed, in 1927, to protect Cadiz Naval Base, an important base in the south of Spain, and the Strait of Gibraltar? And why was Ferrol over defended? There are no easy answers to this question today, but there are some stories about it. One of the most popular dates the relationship between Spain and UK and some kind of agreement between the two countries for not deploying any gun that could reach Gibraltar. These guns had a range of 35 kilometers, so none of the current sites were appropriate for them. Whether or not this account is true or not, the fact was that in 1927 the strait stayed with no artillery at all.

This situation changed right after the Spanish War, with the coming of World War II. In 1940 the Spanish Government decided to deploy coastal artillery in 18 sites, south of Cadiz and some other sites in Ceuta and Melilla, to protect the south of Spain and the Strait of Gibraltar in the international conflict.

That is why, in 1940, and as part of this program, two guns from Galicia ("Campelo Alto") were transferred to Tarifa. One of them suffered an accident, during the final site testing in 1942. The barrel, the cradle and some other parts were damaged beyond repair, so a decision was made to first transfer one gun from one of the batteries in Menorca (Favaritx) and at the end of the process the second gun was transferred too. So the site in Paloma Alta stayed with three guns as it is now, the only coastal artillery battery in the world with three guns of this caliber, except for the Johore Battery in Singapore that also had three guns, but of the short barrel 42-caliber design, supposedly taken from HMS *Queen Elisabeth*, HMS *Barham*, and HMS *Valiant*.

Vickers FDS Calculator & Plotting Tables

Barr & Stroud Telemeter Range Finder in San Pedro-Galicia

The technology of these guns, from the mechanical and electrical points of view, was extremely advanced for the time they were built. The fire direction system was the real precursor of the current sophisticated computers managing the most modern weapons. Its accuracy was incredibly high, considering that all calculations were made by electro-mechanical machinery. They were able to continu-

Castilla FDS system on display at the Artillery School – Segovia

9KA-410 FDS Radar Antenna

9KA-410 FDS Consoles *Courtesy Sanchez Alcazar*

ously calculate the elevation and orientation angles for the guns, so that the route of the target, its speed and course, was always known, enabling the battery to predict the future point of impact for the shell to hit the ship.

It is interesting to see that all new technological museums are proud to have a Pascal or a Babbage machine and it is so difficult to preserve these calculating and plotting tables of the coastal artillery. These are real masterpieces of industrial, mechanical, and electric archaeology.

The eyes of the battery and the main element for target acquisition were two telemeters-range finders, or in American terms, horizontal-base self-contained range finders. In our case they were a British design made by Barr & Stroud, huge instruments with a 9.4-meter optical base and a sophisticated indicator and communication system. The ones of our Paloma Alta Battery are exhibited in the 4th Coastal Artillery Regiment Museum located in Cadiz. These range finders were supported with smaller ones, with 2.4-meter optical bases, double checking and providing more accurate reading of every measure. In 1972 the telemeters were replaced by RX80 Marconi radar. This radar became the main target acquisition element, leaving the telemeter system as backup.

The fire direction system went through three different phases during the life of the battery. It started using the original Vickers System, but once the third gun was added the Vickers system could not manage a third gun, so an upgrade was needed. In 1943 a system designed and manufactured in Spain was installed in Paloma Alta. It was called the "Costilla Fire Direction Calculator," because its inventor was Juan Costilla, Colonel-Artillery. It was also electro-mechanical and able to control three integrated guns at a time. Both the Vickers and Costilla systems coexisted for a long time as a double check to assure the accuracy of the firing data. But with the advance of time and technology, a third phase came. In 1985 the whole fire direction system - analog and electro-mechanical calculators and radar telemeters, were replaced by the new Philips 9KA-410 Computer System, which stayed in service until the end of the battery life. It was fully electronic with electro-optical sensors (radar and optic) and a digital computer system standardized for all Spanish coastal artillery guns. During the last 23 years the battery became a really unique piece of machinery, with fully mechanical technology of the 1920s being controlled by fully electronic computers of the 1980s. The 9KA Fire Direction System, in an upgraded version designed and maintained by the Spanish company INDRA, is still in-service, managing current coastal non-fixed units.

Gun Number 1 Paloma Alta *Author*

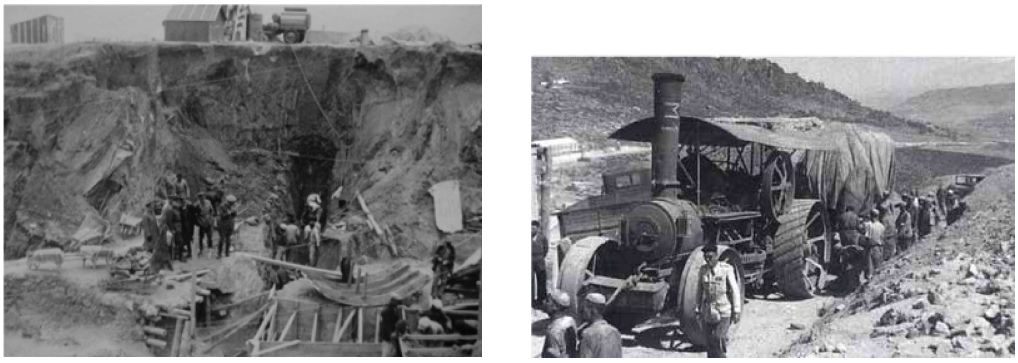
We cannot forget the heart of each gun; the engine room. Every movement was powered by hydraulic energy. The energy was generated by a 125 Hp semi-diesel engine, with an auxiliary accumulator sending hydraulic fluid through the pipes and stabilizing the pressure with the weight of a massive 100-ton vertical-moving cylinder. The electricity needed to serve the gun was generated by a 25 Hp engine activating a 24 volts CC dynamo. The original system (motors, accumulators, valves, etc.) was upgraded several times through the life of the battery, but they always maintained the same principle of operation. The last upgrade was done in 1992 by the Spanish Bazan Company, a well-known Navantia Ship Builder.

The whole gun, including the protective casemate, weighed 617 tons. The guns could fire at an angle of -5 to +40 degrees, with an effective horizontal spread of 300 degrees. The barrel could be automatically loaded at +13 degrees, or 0 degrees for the manual mode. It had a length of 17.671 meters, weighed 86.9 tons, and was able to fire an 885 kg projectile 35,100 meters. The number of powder bags could be varied to produce different ranges. For maximum range, 200 kg. of powder was used. The complete shell weighed about one ton. Using the automatic mode, two shots per minute could be fired.

One of the most beautiful and sophisticated pieces is the breechblock. Today it is the most requested item to be exhibited in the museums. In fact, the breechblock of the third gun of Paloma Alta is on display in the Cadiz Coastal Regiment Museum. It has a highly sophisticated, powerful, and strong screw mechanism that hermetically closed the combustion chamber to resist the 3000 kg/cm2 pressure produced by the powder, necessary to launch the projectile at 762 mts/sec, as far as 35 kilometers.

The protective casemate was an armored housing with a steel shield 7 mm thick. The gun was installed in a three-story well, six to nine meters deep. The upper plant, at surface level, had the firing room with the barrel, brake and recoil system, loading system, and pointing mechanism. Underground, below the surface level, the medium plant was dedicated to maintenance activities, and the lower plant contained ammunition rooms for projectiles and powder, engine room, lift and loading system, maintenance area, and access tunnel. Fifteen to twenty artillerymen commanded by a lieutenant served the gun.

Given that these guns were designed for ships, installing them on the coast called for really immense constructions. The location of these sites and the transportation means of those days made the job extremely difficult. The coast of Spain and specially the south coast is very rough, so the engineering efforts to take the guns to their sites remains in the history books as one of the best leadership actions of our engineers and artillerymen at the beginning of 20th century.



Construction of the Paloma Alta Battery *Courtesy Sanchez Alcazar*

Fortunately, the battery never had to get in combat, but it was our main guardian in the strait. During the 66 years in which the battery was on active duty, 389 projectiles were fired during annual fire exercises. So, we can proudly say that each gun is a 130-salvo veteran.

The three guns of Paloma Alta are close to one century old. Their control systems and machinery, their service tunnels, and underground galleries are unique in the world today. They were installed in record time because of WWII and the most important thing; thousands of our young Spaniards gave part of their youth to loyally serve the nation during their military service.

Project Master Plan for Paloma Alta

Based on unique characteristics of Paloma Alta and considering it as a historical asset of the Spanish Artillery in accordance with statutes, a Project Master Plan to restore the site was presented by the "Conde de Gazola" Association in December 2018 and approved by the General Assembly March 2019.

The project has the following objectives: Enhancing the value of Paloma Alta site, restoring guns and control systems, as well as the old barracks, to transform the site into a Cultural Center of Excellence, including a Coastal Artillery Museum, History and Nature Investigation Center, and Convention/Exhibition Areas to transmit historical values, natural diversity, and artillery influence in the strait area to all visitors, leaving traces for the new generations.

Offering visitors a complete tour to understand the operation of the guns, looking at the exhibits, going up to the strait observatory, and enjoying the unique views of two continents and two oceans on clear days, walking throughout the natural site, and finishing with a good meal in a restaurant.

Opening the trekking and bike routes already existing in the area, previously cut due to military restrictions, and integrating the site as a permitted area within the Strait Natural Park already in operation.

Since the battery is located within the grounds of the National Park of the Strait, establish an infrastructure and organization to collaborate with the current bird-watching and nature conservation centers already existing in the area.

The Project Master Plan defines the actions needed to achieve these objectives. The plan was presented to the Army Chief of Staff for approval and also to Andalusia Regional Government and local authorities as well as to a certain number of important Spanish companies to support the funding. At the time this article was written, approval to go ahead with the project has been signed and now the process is on its way to manage how the grounds in which the site is located can be transferred to the regional government, who have already made the decision to fund the initiative. Once this step is finished the project will progress with the detailed design and beginning construction over 2020.

The site has two very well-defined different areas; the gun area including the tactical site with all the artillery elements, and the barracks which include the living area in which the military assigned to the battery had their offices, mess, houses, etc. So, the restoration has two different group of actions: (1) the tactical area (2) the living area. It means that the project might be achieved in one phase at a time or in two phases, one per each area. Final decisions will be made during the first phase of the project when the detailed project plan is written.

As a main requirement and starting point, no new buildings will be built, but vintage buildings will be restored. The interior parts of all current buildings are very deteriorated but the structures are well preserved, so after a detailed review, restoration and usage for the intended purpose is feasible and there is no need for any new buildings.

As a good starting point, in 2011 various universities were interested in stablishing in Paloma Alta what we call in Spain a Summer University. In addition, we have to add the result of the market analysis we did within the Master Plan. Tarifa area is receiving about 200,000 travelers per year, expending more than 250 million euros per year. If we consider these travelers plus local tourists, the model we used, being conservative, is giving a forecast of close to 20,000 visitors per year, which is considered enough to maintain the installation, given the area in which it is located. With proper management, this number might be greatly improved because the battery is about 15 minutes from Baelo Claudia Roman Ruins, which receives 157,000 visitors per year.

Paloma Alta Battery Gun 1

Paloma Alta Battery Gun 2

Paloma Alta Battery Gun 3

As was mentioned above, the site is located within a National Park, inside a huge pine woods that significantly grew up during the last 10 years the battery was out of service. It means a very good advantage for the purpose of the new center, making it different from the other 15-inch guns sites/ museums that we have in Spain or even in the world, being unique from the natural environment point of view.

The project is budgeted at three and a half million Euros and is planned to be developed in three years, with a starting point by the middle of the present year. If everything goes according to plan, by the middle of 2022 we might have the opening ceremony.

Detailed Actions to Achieve During the Project

Restoration of the Gun Area

- Deep cleaning of invading plants and dirt not desired in many areas.
- Restoring one of the guns 100%, including all parts in and out of it, cannibalizing the other two as necessary. Actions to facilitate gun movement will be taken if possible. If movement is not possible, virtual reality will be used to show the operation of the gun.
- The other two guns will be restored to be shown just from the outside and the entrance to the service galleries, including the air defense sites of each one.
- The tunnels and galleries will be restored and the ammunition magazines will be filled with real demilitarized projectiles. Simulated powder bags will fill the canisters in the powders room.
- The engine room will be restored up to the feasible point of operation. We know that full operation is now impossible, but virtual reality will help in the process, as we applied it to the gun.

Restoration of the Former Coastal Artillery Operation Center

This is a four-story bunker in which many different systems have been installed overt time. The following actions will be done: Restoring the highest tower to install a covered observatory of the Strait.

Aerial view of the Coastal Artillery Operation Center & Battery Command Post

- Restoring the third plant to install a recovered and restored RX80 radar antenna, with explanation panels.
- Restoring the main plant to install three observation points with restored binoculars and exhibits of how the area worked. This plant also hosted the last battalion command post, so replicas or restored fire control systems and command consoles will be installed.
- Restoring the lower plant in which the big 9.4-meter optical base telemeter range-finder was installed. One of these range-finders will be restored and installed. All areas will be supplemented with exhibits, artillery materials, communication assets, etc.

Restoration of Former Communication Center

This building hosted the infrastructure for all communications for the battery. The real systems that were used are no longer available and have no real value as historical items. Most of them were cables and switching boxes. In addition to that, the building is centrally located in the gun area and is the first one seen as one walks towards the guns. A nice square in front of it is a perfect place to establish the visitor welcome center to explain the site. That is why the following actions will be done:

Old Communication Center to become the visitors center and theater *Author*

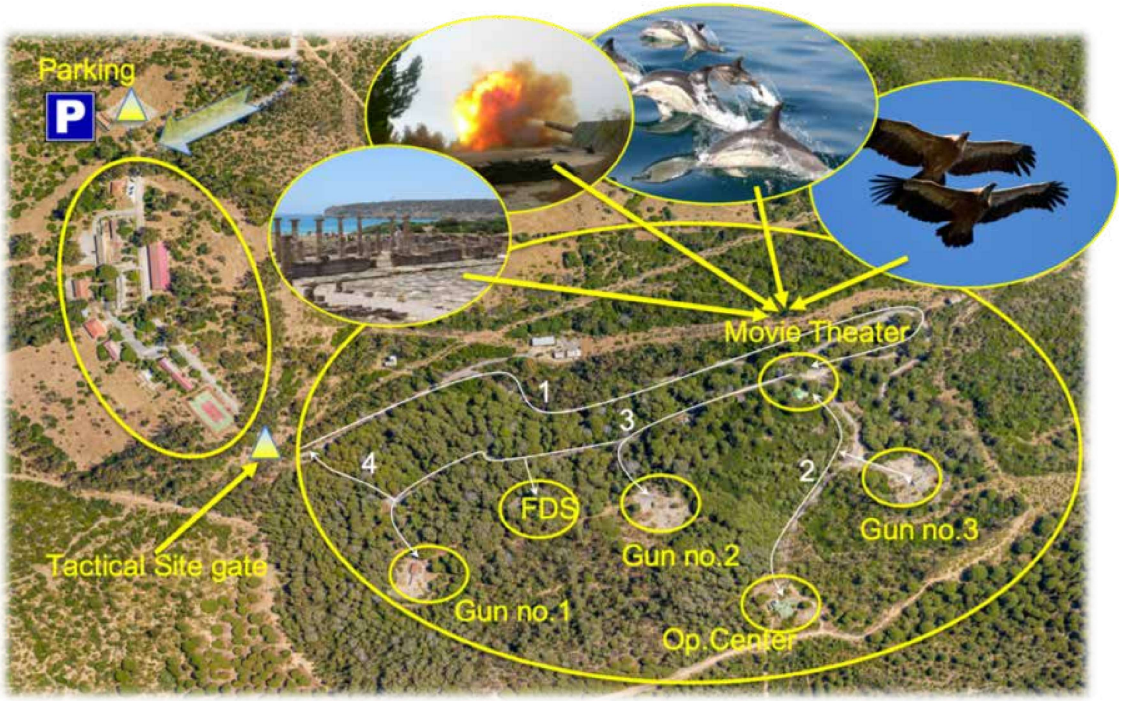
- Installing a surround audio-visual theater to show the operation of the guns and some other audio-video showing images related with the nature and history of the strait.
- Supplementing the place with exhibits and panels explaining the history of the site and area.

Restoring the Barracks and Living Area

In the living area 10 buildings will be refurbished to host different services to become the Cultural Center of Excellence. The following actions are planned:

- Four buildings will be dedicated to convention/exhibition rooms. They will have permanent museum assets and will host temporary exhibitions. They will also include offices and classes for the history and natural interpretation center included in the new installation.
- The old mess hall, kitchen, and auxiliary premises will be transformed into a restaurant and service/maintenance building.

- The old barrack will be transformed into a guest house with about 15 rooms.
- The old dispensary will host the administrative office of the new installation and also the security control center and first aid unit.
- One building will be the Honors Room, having a meeting room and special events area with a reception area for VIPs and visiting authorities.
- The old guard house at the entrance will be transformed into the ticket and shopping area.
- The last one will be a storage room for maintenance.



Aerial view of the Paloma Alta sites. White lines show visitor tour route.

View of the Strait and Tarifa from the Observatory *Author*

The Image of the Project

A set of logos for the new center has been designed to help market the initiative. The wings on the gun are a symbol of the name of the battery; in Spanish "Paloma Alta" literally means "high pigeon."

Conclusions

The three 15-inch guns of Paloma Alta were the last fixed coastal artillery battery in service in the world until September 2008, and the last ones pending restoration in Spain. It would be extremely irresponsible to let them be destroyed by the weather and vandalism. "Conde de Gazola" Association is leading all efforts to make it possible to have a museum and cultural center of excellence based on these masterpieces.

We want to pay tribute to all the artillerymen that served in our coastal artillery for so many years. Spain is probably the last country in the world maintaining all kind of fixed artillery in active service. The unique characteristics of Gibraltar Strait, and the fact that Spain is geographically almost an island, in the middle of the western world, with an 8,000 km coast and two strategic archipelagos, made the coastal artillery present and active throughout modern history. We must maintain and transmit this tradition and remember all its men and women and their families.

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