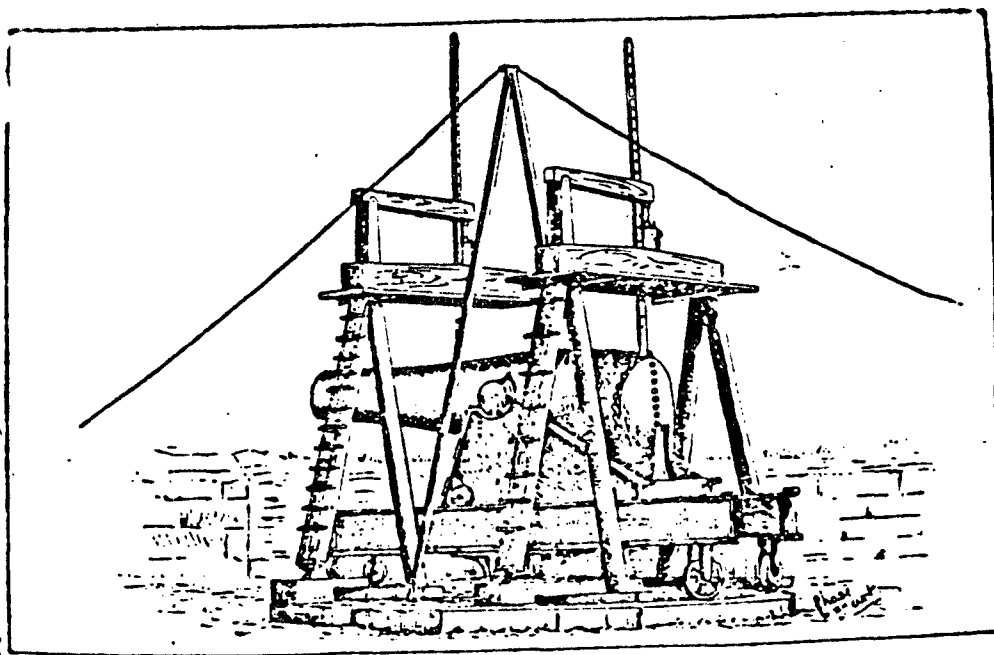


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~~NOTE~~

NOTES ON THE PRESERVATION OF THE 15 INCH RODMAN
GUN, TOP CARRIAGE, AND CHASIS
SHIP ISLAND
GULF ISLANDS (MISS.) NATIONAL SEASHORE



SOURCE: INSTRUCTIONS FOR HEAVY ARTILLERY 1879

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July 8, 1980

1952



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I. INTRODUCTION

The task is summarized in the Category of Support statement (Appendix 1). Further, the prime directive of the preservation ethic demands the preservation and retention of as much of the original fabric as possible. It is also axiomatic in museum conservancy and structural preservation that as little damage as possible be done to the original fabric. This not only entails the careful dismantling and handling of an object or structure, saving as much of the fabric as possible, but the need for refraining from offending the object with some irreversible process. This will be discussed further in later pages. Simply stated, we don't want to do anything we can't undo.

While appearing to be shabby and shop worn, the Gun, Top Carriage, and Chassis have withstood the ravages of a salt air environment, with little appreciable maintenance over a period of decades, as successfully as any other like machinery in this country. The builders have no need to apologize for their product. It should be noted that the equipment was designed not only to withstand, as much as possible, a hostile environment, but battle damage. Consequently, by many standards, it would seem to be over-built. That is very much to our advantage.

We should recognize right now that we are addressing a problem for which no one to date has produced a perfect answer. We will not achieve perfection in this project, but considering the technological talent being brought to bear on the endeavor, we can certainly achieve a goodly amount of success.

The following notes, therefore, address the problem in that context.

TURNER KIRKLAND'S GRANDFATHER'S ORIGINAL TOMAHAWK

The well-known arms dealer, Turner Kirkland, once wrote a short essay concerning the conservancy of his grandfather's original tomahawk. During the course of the object's career, the handle had been broken three times and had been replaced, the head lost on one occasion, damaged on another occasion and replaced. But still it was Grandfather's Original Tomahawk.

Kirkland's wry little parable is something for museum conservators and structural preservationists, as well as arms collectors, to remember.

In this instance, our goal is to preserve as much of the original fabric as possible, even if it means considerable extra trouble, mental and physical.

II. NOMENCLATURE

In any operation of this nature it is necessary for all hands to speak the same language. Therefore, there are three main componets with which we are working:

The GUN is that monstrous, near 50,000 pound shootin' iron that sits on top of the other two main components. It is a one-piece machine with no moving parts. A full description from The Ordnance Manual for the Use of Officers of the United States Army, Third Edition, Philadelphia, Lippincott & Co., 1861, will be found as Appendix 2.

The TOP CARRIAGE is a simple structure which any field engineer will recognize as having the strength of a triangle despite its sandwich construction. In this instance its function is two-fold; to support 25 tons of GUN, and to carry that GUN in recoil over the RAILS of the CHASSIS. In this project, we have no intention of restoring it to the second function. The weapon is somewhat obsolete; the need for a fully functioning weapon of the nature for national defense is somewhat doubtful.

All of this material rests upon the CHASSIS, over which the GUN and the TOP CARRIAGE recoil. Originally, this CHASSIS was designed to rotate 360 degrees. For reasons stated above it is not necessary to restore the CHASSIS to that capability.

All other nomenclature of components will be found in Reference: Drawer 165, Sheet 41, "Barbette Carriage for 15-Inch Rodman Gun, Details of Chassis for Center Pintle," and Sheet 42, "Details of Top Carriage for Front or Center Pintle."

Further, in the field of Nomenclature, we consistently use the period name, Ordnance Department, which was the official designation prior to the use of the present name, Ordnance Corps.

Plate 1 NOMENCLATURE

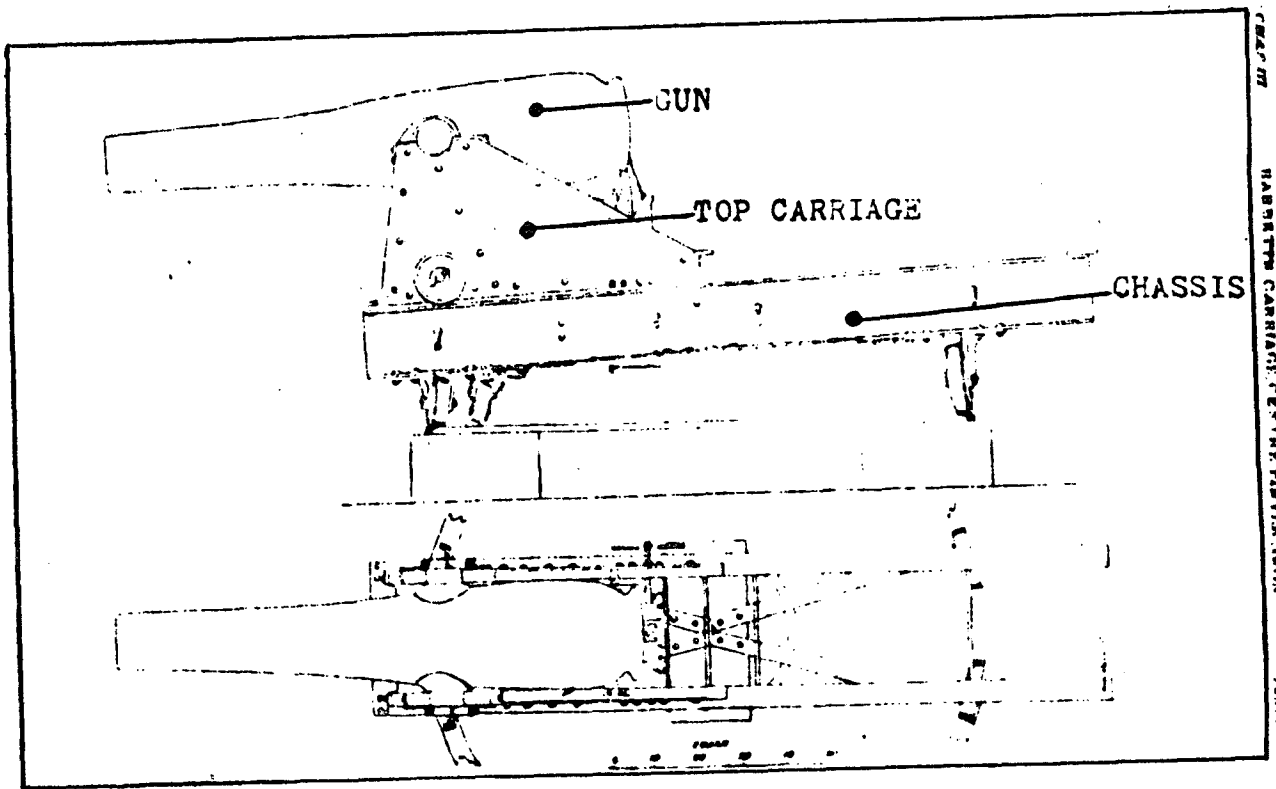


FIG. 11
HARRIS CARRIAGE CENTER PIVOT POINT
PLATE 11

SOURCE: ORDNANCE MANUAL 1862

III. INSPECTION REPORT

On Tuesday, 24 June, 1978, we conducted an inspection of all major parts of the GUN, TOP CARRIAGE, CHASSIS, and PLATFORM. These observations are based on visual checks, probing, and sounding.

- A. The PLATFORM: While this is not actually part of the task, it serves as the foundation for the major assembly with which we are concerned and therefore merits our first attention. The overall impression of the PLATFORM is that it is in relatively good condition. The granite blocks that make up the major portion are all intact, without major cracks or flaws, and are reasonably well fitted. A check with a level indicated a slight grade inclination to the rear of the piece in line with the muzzle-breech axis of the weapon. As this is a minor slope no real problems are involved. However, in remounting care should be taken to keep the GUN and BARBETTE CARRIAGE in the same line.

Some minor grouting may be in order between a few of the stones. In several areas weeds have grown up in the cracks. These should be removed. Vegetation produces byproduct acids which in the long run prove harmful to masonry and stone work.

A few of the red sandstone trim pieces show deterioration and spalling of the surface. This may require attention in the future, but does not weaken the PLATFORM.

OUTER TRAVERSE CIRCLES AND BOLTS: These are all intact and in remarkably good condition. Their bolts are all there and the fit of the segments is acceptable. No doubt one of the reasons for their excellent condition is the continued good drainage. As part of routine maintenance, care should be taken to see that sand and vegetation are not permitted to accumulate near them. Such accumulations tend to gather and hold moisture. A sweeping of the platform several times a week will help insure the tracks continued good condition.

The TRAVERSE CIRCLES and BOLTS should also be wire brushed lightly and given a primer coat, topped with a finish coat of gloss black exterior enamel. Great care should be taken to avoid overpainting and dripping on the platform stones. The task can be accomplished by a careful painter after the removal of the TOP CARRIAGE and CHASSIS.

INTER TRAVERSE CIRCLES: These show some pitting in areas where the PINTLE TRAVERSE WHEELS have been in contact for so long. However, their overall condition is very good. They should receive the same treatment as described for the OUTER TRAVERSE CIRCLES. Their BOLTS also are in fairly good condition. No removal or replacement is required.

PINTLE: This is anchored into the PINTLE BLOCK. It is in good condition and will not require removal or replacement.

After removal of the CHASSIS and its PINTLE TRANSOM, no doubt mild to medium pitting will be found where the two objects were in contact. The entire exposed section of the PINTLE should be polished clean with strips of emery cloth used "shoeshine" fashion. Any large remaining rust flakes on the lower section or in the KEYWAY should be chipped off and the exterior of the KEYWAY dressed with a small fine

cut file. Only as much metal removal as required should be permitted to avoid enlarging the KEYWAY. The object should then be given a very light coat of primer and paint for protection until the CHASSIS and TOP CARRIAGE are returned to the Fort. After reinstalling, it will probably be necessary to retouch the paint.

Note: the other TRAVERSE CIRCLES and PINTLES in the fort will benefit from a similar treatment.

PINTLE KEY: This object has been subject to a good deal of corrosion and has lost about 25% of its thickness. However, it appears to be sound. It should be immediately picked and chipped as clean as possible and a good penetrating oil applied to the area passing through the PINTLE KEYWAY.

Removal, after soaking in oil, should be accomplished with a light sledge. Care should be taken not to burr the edge. Oversize burrs should be dressed with a file.

The KEY should be protected during hammering by a piece of heavy brass stock.

After extensive cleaning it may prove necessary to secure the KEY from theft by drilling a small hole through the protruding section for a cotter pin or a peened nut-bolt.

B. The CHASSIS: is an assembly consisting of the following main sub-assemblies:

Two CHASSIS RAILS of sandwich construction in a general "I" beam configuration, resulting in a hollow assembly strengthened by two INNER RAIL BRACES and five OUTER RAIL BRACES. The CHASSIS RAIL PLATES are capped top and bottom by RAIL TOPS AND RAIL BOTTOMS of "T" shape cross section.

The two complete CHASSIS RAILS are joined horizontally by five TRANSOMS and additionally stiffened by four sets of "X" shaped DIAGONAL BRACES. The RAIL TOPS have HURTERS at the front and rear to limit the movement of the TOP CARRIAGE. The FRONT HURTERS contain additional loops at the front to receive the CRANE which attaches to a similar loop on the RAIL BOTTOM.

Attached to the center of the RAIL BOTTOMS are two large BOLSTERS through which passes an AXELTREE for the two PINTLE TRAVERSE WHEELS. The PINTLE TRAVERSE WHEELS each have a three-branch HANDSPIKE SOCKET, vaguely resembling the top of a candleabra, into which can be inserted the HAND- SPIKE for shifting the eccentric AXELTREE.

The BOLSTERS are connected to a PINTLE TRANSOM which ties the CHASSIS to the PINTLE.

On the forward end of each CHASSIS RAIL is an assembly of two TRAVERSE WHEELS connected by a three segment WHEEL FORK ASSEMBLY. On the rear of each CHASSIS RAIL is a single REAR TRAVERSE WHEEL and the two-piece FORK.

In addition a small CHASSIS STEP is attached to each OUTER RAIL PLATE.

Inspection of the CHASSIS assembly revealed the following:

FRONT and MIDDLE TRAVERSE WHEELS (both sides): These objects appear to be in excellent condition. Upon cleaning, you will discover that each socket hole has a small drain hole at its bottom. These should be cleaned and care taken not to plug them with paint. They are drain holes. They will need primer, however, and a pipe cleaner could serve to paint them.

All four WHEELS are in good condition: no repair or replacement is required. It will be advisable to apply grease to the journal holes before reassembly. You will also note that a lubrication opening is present which runs from the outer web to the journal hole. This should also receive grease.

FRONT, DOUBLE, and MIDDLE TRAVERSE WHEEL FORKS: These objects appear to be sound and in very good condition; both sets, right and left. All bolts and nuts are intact and no repair or replacement should be necessary. These objects should be Magnafluxed with particular attention being paid to the holes and angles.

JOURNALS for FRONT and MIDDLE TRAVERSE WHEELS: All four are present and complete with their nuts. Care should be taken in their removal as they are keyed into the FORKS by a raised nub near the head. The nuts should be loosened and removed to all but the last few turns, then driven straight out without twisting. We wish N.D.I. to test these items.

BOLSTERS. They appear to be in good condition, but may have minor pitting where they have been in contact with the PINTLE TRANSOM. The bolts of the PINTLE TRANSOM may also have corroded in the BOLSTERS and may require drilling out. Otherwise they are sound and should require no repair or replacement. Please note that oil holes exist on the inside and should receive an immediate dose of penetrating oil to aid disassembly. Painting will require the same precautions that are to be taken for the TRAVERSE WHEELS.

AXELTREE: The item is in good and serviceable condition, but has at ends where HANDSPIKE SOCKETS attach. The two sets of stop pins for the AXLE BOX have just about completely disappeared, having been reduced to nubs by corrosion. Judgement as to their replacement must be made after a thorough cleaning. Overall, no major repair or replacement is required.

HANDSPIKE SOCKETS. These objects are missing and will have to be fabricated. They are triple branched castings of iron. Source for pattern and foundry work will be appended. A total replacement is required.

PINTLE TRAVERSE WHEELS: Both objects appear to be in pretty good condition, despite some heavy masses of corrosion where they contact the INNER TRAVERSE CIRCLES. It appears that an attempt was made to weld them to the TRAVERSE CIRCLES. Test probing of the weld (or attempted weld) shows it to be soft and non-effective. At the most, some quick work with a small cold chisel should clean out any

remaining weld. The WHEELS should not have suffered any significant adverse effect from their early encounter with historic preservation.

These objects also have lubricating holes, and they fit tightly to the AXELTREE. The same cautions about lubrication holes and painting as given earlier apply here. No repair or replacement should be required.

PINTLE TRANSOM: This plate, originally one inch thick, has severely corroded and exfoliated downward until it is in contact with the PINTLE BLOCK. Testing is necessary to determine if any significant amount of sound metal exists. As an arbitrary figure, if it has less than .35 or .40 inch of sound metal, we may wish to consider total replacement or possible lamination to a 1/2 inch thickness to restore strength. The need will be determined by cleaning and testing. Doubtless, many, if not all, of the countersunk bolts attaching the object to the BOLSTER may require replacement.

REAR TRAVERSE WHEELS: Both are in good condition. The same precaution concerning drain holes, lubrication holes, and painting, mentioned earlier apply here. No replacement or repair is required.

REAR TRAVERSE WHEEL FORKS: These two-piece assemblies are complete and in good condition. However, N.D.I. should check them for flaws. Until found otherwise, no repair or replacement is required.

REAR TRAVERSE WHEEL JOURNALS: The objects appear to be in good condition. Again the same precautions detailed for the FRONT TRAVERSE WHEEL JOURNALS should be observed in removal.

RAIL PLATES: There are four right and left, inner and outer. All appear to be in good condition, with most metal intact. They seem to be reasonably straight when checked with a straight edge and their vertical parallelism is almost perfect. No repair or replacement should be necessary.

Under no circumstances should any dismantling of rails take place inasmuch as this would involve destruction of a large number of rivets.

There is a hollow area between the two pairs of assembled plates, 1-1/4 inch in depth. This cavity should be inspected by N.D.I., using a 90 degree fibre optic borescope. Spot ultrasonic checks should be made to check amount of sound metal in the plates.

The complete assembly is quite large and unhandy. Mechanical removal of corrosion and salt from the interior will be impractical. We suggest that the bolt holes be plugged with rubber corks, the joints at the RAIL BOTTOMS and the RAIL TOPS be caulked temporarily with window putty and the interior flooded with a passive alkaline soak such as a 5% Sodium Carbonate, a 5% Sodium Sesquicarbonate, or a 2% Sodium Hydroxide solution. The flooding and flushing processes will have to be repeated several times. A silver nitrate test should be used to check progress. (See Appendix 5)

RAIL BOTTOM: These two pieces, right and left, consist of a "T" shaped rail, the leg of which provides for the separation of the RAIL PLATES. Under no circumstance should destruction of the rivet joint be attempted. Inspection revealed that there was a fair amount of exfoliation of the lower edge of the RAIL BOTTOM, amounting to 25 to 30% of its thickness. This is probably not sufficient to significantly threaten its strength inasmuch as the main load is borne by the vertical RAIL PLATES.

Exterior surfaces should receive the normal cleaning process; internal surfaces will be attended to during the passive alkaline soak. We see no need for full disassembly, repair, or replacement.

RAIL TOP: These two pieces, right and left, are in only fair condition.

RAIL TOPS are similar in construction to the RAIL BOTTOMS and the same cautions about treatment and disassembly apply. The main damage to the RAIL TOPS consists of an area of very heavy pitting extending under that on which the TOP CARRIAGE rests, an area about 102 inches in length. The depth of the pitting appears to range from 1/4" to 3/4" deep. This may have been brought about by simple collection of moisture between the RAIL TOP and the SHOE IRON. However it appears that in an effort to prevent the scrapping of the structure an attempt was made to weld the SHOE PLATE to the RAIL TOP. Except for that deep pitting, the ravages of time and salt air have made this weld academic at best. Separation will probably not even require a cold chisel. Apparently the weld may have already been broken in the process of lifting the GUN from the TOP CARRIAGE.

Both RAIL TOPS show almost identical damage and deterioration. Despite the poor condition, these members are fairly sound and should not be replaced. We recommend that fill weld (of similar material) be laid over the deeply pitted area. The fill weld should extend above the original level about 1/8 inch, permitting dressing with a hand surface grinder and "shading in" of the weld. In addition a very slight crown should be left to assist in shedding water and to prevent moisture from accumulating in the affected area.

Repairs are required but no replacement is required. Both RAIL TOPS are basically sound. Fill rod should be as close as possible in composition to prevent electrolytic reaction between the materials.

CHASSIS TRANSOMS: There are five separate CHASSIS TRANSOMS, designated FRONT TRANSOM, SECOND FRONT TRANSOM, MIDDLE TRANSOM (includes ANGLE IRON FLOOR CLEAT), MIDDLE REAR TRANSOM and REAR TRANSOM. Overall they are uniformly in good shape, despite some rusting and deep pits. Many are missing bolts and nuts that connect them to the RAIL PLATES, but this is a simple matter of replacement.

The ANGLE IRON FLOOR CLEAT attached to the MIDDLE TRANSOM is in poor condition, but as its function, that of supporting a wooden floor, is no longer necessary, replacement should not be necessary.

The overall condition is good and no repair or replacement should be required.

INNER RAIL BRACES: It was impossible to examine these as they are housed in the sealed hollow area between the RAIL PLATES. However, their condition would logically be about the same as the INNER END RAIL BRACES. They should be examined by N.D.I. using a 90 degree fibre optic borescope. Conservancy and treatment of the INNER RAIL BRACES will be accomplished when the RAIL PLATE ASSEMBLIES are flooded with passive alkaline soak.

No repair or replacement is desirable or possible on these parts without destruction to fabric.

OUTER RAIL BRACES: There are a total of ten OUTER RAIL BRACES, five to each OUTER RAIL PLATE. The OUTER RAIL BRACES utilize identical nuts and bolts as the CHASSIS TRANSOMS. As noted many of these (60% plus) are missing. This condition has resulted in looseness and the formation of moisture traps causing rather spectacular exfoliation on the surface next to the RAIL PLATE. The problem, however, has probably not had any structural effect on the OUTER RAIL BRACES.

All five OUTER RAIL BRACES are still intact on the left CHASSIS RAIL but the rearmost one is missing on the left side. A suitable original replacement is available and was picked up from the scrap pile in the other 15-inch gun position during the inspection. This item will serve as a replacement. No repairs should be required.

CHASSIS STEP: The CHASSIS ASSEMBLY is missing both right and left CHASSIS STEPS. These will have to be fabricated in the shop. Plans of these are shown on Plate 41.

Summary of CHASSIS Inspection: While the first impression may be one of dismay at the seeming mass of rust, the examination of individual parts shows surprisingly good overall condition and soundness. Visual and mechanical checks for alignment and solid metal proved to be a pleasant surprise.

While the CHASSIS may not hold up to the constant shock of discharge and the effect of counter battery fire, it should be more than able to continue in public service as a museum exhibit for another century or so.

C. **The TOP CARRIAGE:** The assembly consists of the following main subassemblies: Two CHEEK ASSEMBLIES of sandwich construction in a general vertical triangular configuration, of which the major components are two sheet metal CHEEK PLATES, inner and outer, right and left. These are bound together around their circumference by "T" shaped FRONT CAPS, REAR CAPS, and at the bottom by SHOE IRONS. At the very top is the loop-shaped TRUNNION BED which receives the TRUNNIONS of the GUN.

Further stiffening of the plates is provided by radially arranged braces; the FRONT BRACE, MIDDLE BRACE, and REAR BRACE.

Piercing the lower edges of the CHEEK PLATES are four holes which mount the brass AXLE BOXES. Through the AXLE BOXES pass two long eccentric AXLETREES which mount TRUCK WHEELS and HANDSPIKE DOUBLE SOCKETS at their extremities.

The plans do not show the REAR TRUCK WHEEL ASSEMBLY which is present on the subject TOP CARRIAGE. There should be no great wonder at this state of affairs: The TOP CARRIAGE is a common variation developed during the constant experimentation by the Ordnance Department

Two pairs of CHEEK STEPS are provided on top of each REAR CAP TOP surface.

Spacing between the two CHEEK ASSEMBLIES is provided by three TRANSOMS, designed FRONT BOTTOM TRANSOM, which sits horizontally; FRONT TOP TRANSOM, which sits vertically and is notched to clear the GUN; and the REAR BOTTOM TRANSOM which sits horizontally. The FRONT BOTTOM TRANSOM also mounts on its lower side the two FRONT GUIDES and two CHAFE DISCS. (These two CHAFE DISKS do not show on existing plans and the assignment of the name is arbitrary. There is some possibility that their contact with the RAILS may be adjustable and that they could serve as recoil brakes. They should be examined again with this thought in mind.)

The REAR BOTTOM TRANSOM also mounts a similar pair of CHAFE DISCS on its underside along with a REAR GUIDE HOOK BAR to assure straight recoil of the TOP CARRIAGE on the CHASSIS.

Elevation of the GUN is effected by use of the FULCRUM which mounts on the top side of the rear BOTTOM TRANSOM. Additional support and stiffening is provided by the REAR TRANSOM BRACE on the bottom side.

Inspection of the TOP CARRIAGE revealed:

SHOE: There are two SHOES, one each, right and left. In fact, to be more accurate, there are the remains of two once proud SHOES, which were apparently welded to the RAIL TOPS in an effort to hold scrapping operations. The effect has been the almost total destruction of both SHOES. The only solid metal that remains is at either end where the SHOES take a verticle bend.

There is no doubt that in this instance replacement of parts will be justified to assure the stability of the entire assembly. However, every effort should be made to utilize the still intact ends on the new fabrication. These ends may in fact contain markings such as date, location of manufacture, inspector's initials, U. S. stamp, and serial number. Care should be given to the preservation and treatment of these parts.

Plans for the SHOE are given on Sheet 42. However, as our TOP CARRIAGE also sports a set of REAR TRUCK WHEELS and an additional clearance cut, similar to the forward one, is required. Extensive repair and replacement of large sections is required.

FRONT CAP: There are two FRONT CAPS, right and left. Both are in a rather advanced state of deterioration. It may be that after cleaning and testing they will prove to have enough sound metal (say 40 - 50%) that will make them worth saving. We expect that the leg of the "T" which fits between the CHEEK PLATES may be in pretty good condition. If so, and if less than 75% of the cross bar section of the "T" be gone perhaps only the external crossbeam section will require replacing. Every effort should be made to save the original FRONT CAPS, and reuse them. After cleaning, the front surface should be carefully examined for markings, though it is doubtful that any have survived.

Extensive repair and possible partial replacement is required. Such a need will become evident after cleaning.

REAR CAP: There are two REAR CAPS, right and left. Both appear to be quite sound. Care should be exercised in cleaning to look for markings on the outer surfaces. These items should be quite serviceable and no repair or replacement required.

TRUNNION BED: There are two TRUNNION BEDS, right and left. Both are in good condition. It would be advisable after cleaning for N.D.I. to Magnaflux them to check for flaws inasmuch as they bear the full weight of the GUN. They should be cleaned carefully with an eye toward any markings on the two end top surfaces.

If testing reveals any serious flaws, a weld repair may be in order. Such a repair should be as invisible as possible. Otherwise no apparent repair or replacement is required.

CHEEK PLATES: There are four CHEEK PLATES in the TOP CARRIAGE. The INNER CHEEK PLATES are identical but care should be taken to keep their correct position for reassembly. The right and left OUTER CHEEK PLATES differ only on the exterior countersinking for the bolts of the AXLE BOXES.

The CHEEK PLATES all appear to be pretty sound despite some interior corrosion and exfoliation outward. All are less than perfectly flat. However, the bowing over a large area seems to be 1/2 inch at most. Restoration of correct bolts and alternate snugging down of nuts (in a manner similar to installation of heads or intake manifolds on engines) should remove this bowing.

The RIGHT OUTER CHEEK PLATE has a portion about 20 inches long at the rear that bends out 2-1/2 to 3 inches. It is doubtful that this condition is due to exfoliation or corrosion. We suspect that an attempt was made to pry this loose sometime in the recent past. It may be necessary to apply heat along the area of the bend to return it to flatness. Care will be needed inasmuch as excessive heating will tend to anneal it at a cost of structural strength.

ALL CHEEK PLATES show metal loss where they were in contact with the now defunct SHOES. The condition, however, will not affect their usefulness and only minor repair, but no replacement will be required for any of the CHEEK PLATES.

FRONT, REAR, and MIDDLE BRACES: It was not possible to inspect these without removing the OUTER CHEEK PLATES. We suspect that upon examination their condition will be much better than anyone has predicted. If it appears through testing that they retain a fair

amount of metal and strength they should continue in service. N.D.I. should test these and make a decision. Our opinion is that these objects serve mainly as "stiffeners" leaving the CHEEK PLATES to accept most of the weight. This opinion is furthered by a statement in Ordnance Memorandum #28: "Inner braces have been inserted between the cheek plates to give additional stiffness."

If testing shows replacement to be necessary, the metal used should be of the same type originally used to prevent electrolytic reaction of dissimilar metals. It should also be thoroughly primed or coated inasmuch as it is normally not accessible for routine maintenance.

Repair, reuse, or replace, depending on testing.

CHEEK STEPS: Each CHEEK requires two CHEEK STEPS, which are missing, necessitating replacement. The metal shop at the Air Force Base should have no trouble fabricating them. Plans appear on Sheet 42. Care should be taken to align the CHEEK STEP bolt holes with existing holes on the REAR CAP. Here we need a complete replacement.

AXLE TREE: There are two AXLE TREES for the TOP CARRIAGE, a common variation of the published plan. The FRONT AXLE TREE shows the effects of corrosion common to forgings (longitudinal deep pits) but it is still sound and serviceable. The REAR AXLE TREE is in good, sound, shape. On both, the BOX AND SOCKET PINS are little more than numbs and will require replacement. They should be drilled and drifted out anyway as they will interfere with the removal of the AXLE BOXES.

Only minor repair and no replacement is required, except for the PINS.

AXLE BOXES: There are four AXLE BOXES, identical front and rear AXLE TREE which will present a very special problem as they are constructed of brass, a fairly soft metal. The AXLE BOX bolts should be removed, freeing the OUTER CHEEK PLATES for removal. Penetrating oil should be freely applied in the area of contact with the INNER CHEEK PLATES. The INNER CHEEK PLATES are then drifted out and away from the AXLE TREE/AXLE BOX assembly, front and rear and for both sides.

Separation of AXLE BOXES from AXLE TREES may prove to be difficult. The BOX and SOCKET PINS should be drifted or drilled out to provide clearance. Again, penetrating fluid is to be applied freely. A soft copper sledge or soft drift should be used to gradually tap loose the AXLE BOXES from the AXLE TREES. The tapping should be done as close to the AXLE TREE as possible, rather than out on the edge.

The paint should be removed by wire brush or very fine sand blasting. The components should then be cleaned by a soak in household ammonia, or brass cleaner. All traces of either substance should be washed away after cleaning.

The interior may require some polishing with a cylinder hone, but care should be taken to remove as little metal as possible. The AXLE TREE area that passes through the AXLE BOX should also be polished smooth. During reassembly liberal amounts of grease should be applied. It may be desirable to dress slightly the edges of the AXLE TREE hole if they are damaged during disassembly.

No repair or replacement is required.

TRUCK WHEELS: There are four TRUCK WHEELS. All are missing and will require replacement. They are gray iron castings and possibly the foundry patterns exist inasmuch as sets were produced in 1975. (See Appendix). In fabricating, drain and lubrication holes must be included.

Total replacement required.

HANDSPIKE DOUBLE SOCKET: There are four of these casting required. Refer to previous paragraph. In addition, four SOCKET PINS need to be fabricated.

Total replacement required.

FRONT BOTTOM TRANSOM: This item may prove to be another problem. The FRONT BOTTOM TRANSOM has suffered heavy corrosion in two areas. Near the lips corrosion has fully penetrated the metal. The rest of the center and the lips appear to be fairly sound. Final decision on this item must await cleaning and N.D.I. lab work.

Three possible courses of action present themselves:

1. Clean and reinstall existing TRANSOM. This plate takes no strain when the GUN is in stationary position.
2. Clean, plug with metal strips of similar metal welded into place, and surface grind.
3. Clean, and if piece completely disintergrates in the process, replace.

Needless to say, No. 1 is the most desirable course of action, with No. 2 less desirable, and No. 3, the last resort.

The course of action will depend upon the findings of cleaning and testing.

REAR BOTTOM TRANSOM: This item is in good overall shape despite some medium corrosion. It should not require repair or replacement.

REAR TRANSOM BRACE: Another item that is in pretty good shape and will prove serviceable for our purposes. No repair or replacement will be required.

FRONT TOP TRANSOM: This item has suffered some thinning of metal from corrosion. However it should prove to be more than sound and serviceable for display purposes.

No replacement will be required.

FRONT GUIDE: The two FRONT GUIDES, attached to the underside of the FRONT BOTTOM TRANSOM, are in a highly advanced state of corrosion and less than 50% sound metal remains. Their function, however, is merely to guide the TOP CARRIAGE in recoil, and as we are unlikely to fire the gun in the near future, these items should only be cleaned and reinstalled.

No repair or replacement required.

REAR GUIDE HOOK BAR: This item is also in an advanced state of deterioration. However, the comments on the FRONT GUIDES apply here.

FULCRUM STEPS: The STEPS appear to be in sound shape. However, their obvious function and the public's propensity for climbing as high as possible on cannon require that the STEPS and their bolts be checked by N.D.I. If weaknesses appear, they should be repaired. Weak bolts will require replacement.

Repair or replacement to be determined by testing.

CHAFE DISCS: (An arbitrary term but one that sounds more professional than "round whatchamacallits). The four items are in poor shape but as they are non-functional for display purposes, they simply need to be cleaned and reinstalled.

Summary of TOP CARRIAGE inspection: Like the inspection of the CHASSIS, the TOP CARRIAGE proved more sound than was originally suspected or than one would believe from casual examination. While it needs repair, the sum of the parts is reassuring.

Overall its condition is somewhat poorer than that of the CHASSIS, due in part to the lighter construction of the components. It does appear to have much more than the necessary strength to continue to support the GUN, particularly so after the recommended repairs and replacements have been accomplished. In a few instances, as noted in the report, final decision on action will have to await initial cleaning and testing. The overall impression is good and it seems hopeful that most of the original fabric can be retained with full safety to the structural integrity of the complete mechanism.

D. THE GUN: It appears that the cast iron GUN, all 25 tons of it, is in relatively stable condition. The reason for this is unknown at this time. It shows signs of medium pitting under its recent paint layer, but no sign of recent exfoliation, flaking, blistering of paint, or leaching out of chlorides. This is something of a puzzle. However, it does make life a lot simpler for all concerned.

Recommendations for treatment are simple. The surface should be lightly wire brushed by hand to remove any dirt or loose paint and then dusted with a rag. A fresh coat of gloss black paint should then be applied to the exterior surfaces.

It is doubtful that any muzzle markings remain, but if you desire to search for them, the paint on the muzzle face may be stripped with paint solvent and a wire brush. The cleaned area should then be flushed with distilled water (not the chloride bearing Ship Island water), primed, and painted.

Excess paint in the area of the vents should be removed with a .20-inch twist drill and the vent interior lightly painted with a pipe cleaner. There is no need to clear the vent beyond a depth of 2 or 2-1/2 inches.

The best way to treat the bore involves inspection with a flashlight (or bullseye lantern if one wants to be authentically 19th-century)

and removal of sand and debris on the bottom of the bore with a simple curved plywood-bladed hoe. Maintenance should be able to fabricate one.

The bore should not be painted, but should receive a good, heavy coat of grease. The Air Force should be able to supply something in this line. It should be of a type suitable for long preservation, and fairly heat resistant. The Air Force may have available whatever the Space Age equivalent to the old cosmoline.

This can be applied by a long handled paint roller with the head straightened, or by a 90 degree brush on a long handle.

An interesting side effect of such an application will be a wane of public enthusiasm for exploring the interior of 15- RODMAN GUNS.

E. CHEMICAL TESTING

As part of the inspection, silver nitrate tests were conducted to determine chloride levels. Naturally, these were short range tests, but they showed a positive reaction that would be intensified had we been able to work with the material for the usual two weeks rather than for three days. The tests also revealed a relative lack of carbonates.

While we have an analysis of Ship Island water, (see Appendix 4), we were not furnished with a report for either Keesler Air Force Base nor for Davis Bayou. A test of the Davis Bayou tap water indicated a relative lack of carbonates and a significant amount of chloride.

Since the general pattern of the area seems to be one of a relatively high chloride content, the reports on Keesler Air Force Base water should be examined. A high chloride content there will have to be taken into consideration in any passive alkaline treatment.

IV. DISMOUNTING AND REMOVAL OF TOP CARRIAGE

Step I: The GUN should be lifted by use of the Laidley style gun lift until there is 5 to 7 inches of clearance (more if possible) between the highest point of the TRUNNION BED and the lowest edge of the TRUNNION. Breech or muzzle should be higher depending upon the direction the TOP CARRIAGE is removed. If the TOP CARRIAGE is to be removed from the breech end, the breech should be higher.

Step II: The Top Carriage must be temporarily reinforced for removal and the trip to the Air Force Base. It will be removed and travel as a one-piece assembly. Disassembly will take place at the Base.

Leaving designated holes vacant to receive bracing, as many as possible of the others must receive temporary bolts and nuts, the bolts to be 3/4 x 4 inches. Two large flat washers must be used with the bolts to prevent damage.

The TOP CARRIAGE must then receive interior bracing through its upper and center sections, accomplished by cutting 1-inch interior diameter pipe to the length of the interior carriage width (approximately 50-1/2 inches, but measure at the site). Then install a five-foot length of full threaded 3/4 inch ready rod through the corresponding CHEEK PLATE holes, pipe, and out the other side. This is to be snugged up with nuts and washers. We recommend that at least four such braces be installed.

Step III: Padding with a block of wood, the CARRIAGE assembly should be jacked and blocked from under the REAR BOTTOM TRANSOM. It should be raised about four inches.

The same procedure should be repeated from under the FRONT BOTTOM TRANSOM. Care should be taken to distribute the weight as nearly as possible over the lower surface in view of the poor condition of that member.

Step IV: Planks such as 2 x 6's or 2 x 8's should be laid down the RAIL TOP, five or six pipe rollers of 2" outside diameter, x 60" inserted and the SHOE protected by a 9 foot length of 2 x 6 to separate it from the pipe rollers.

Step V: The protective planking under the TOP CARRIAGE SHOES must be cleated by 2 x 2 cleats tacked down to the plank. Construct cribbing and skid track at the end from which removal will take place.

Step VI: Using a "come along," hitch to a pipe/ready rod brace and haul away. It will be necessary at times to stop and shift the pipe rollers to assure a straight and smooth removal.

For every few inches of movement the piece must be securely chocked. Great care should be taken not to damage the GUIDES and CHAFE DISCS which protrude beneath the SHOES.

An observer with no other duties must be employed to warn of possible toppling.

Step VII: Hitch up to the copter is up to the military but should be agreed to by the NPS for soundness and possible damage.

Step VIII. Placement and landing at the Air Force Base should be on blocks and skids to prevent damage to GUIDES and CHAFE DISCS, which protrude from beneath the SHOE.

V. DISMOUNTING AND REMOVAL OF CHASSIS

Step I: The Top Carriage being removed, all missing bolts in the Transom and DIAGONAL BOLTS will be temporarily replaced with 3/4 x 4-inch bolts and nuts with a large flat washer on either side to protect the metal.

STEP II. Alternately jack and block all four corners one inch at a time, continuing until the PINTLE TRANSOM is clear of the PINTLE. (The PINTLE KEY having been removed as described in the INSPECTION Report). Remove the PINTLE TRAVERSE WHEELS which are now free and will be transported separately from CHASSIS.

STEP III. Place blocking at least 14 inches high under the DOUBLE TRAVERSE WHEEL FORK and between the FRONT and MIDDLE TRAVERSE WHEELS.

Place similar blocking at 26 inches high directly under FRONT BRANCH OF REAR TRAVERSE WHEEL FORK.

STEP IV. Construct cribwork and skid rails at rear of CHASSIS as before.

STEP V. Two planks 18 feet long are to be inserted under the six sets of Traverse WHEEL BLOCKS under the BOLSTER and cleated together by three 5 foot timber cross pieces. The effect is to construct a pallet under the CHASSIS which will then roll on the pipe rollers and block. It may also be desirable to block under the BOLSTER.

STEP VI. The entire CHASSIS and attached pallet is now raised to admit skids and pipe rollers. A secure hitch is made with one or more "come alongs" and the CHASSIS and pallet hauled up the skids and crib until it is free.

STEP VII. The copter hitch up is made, as before, transporting pallet and CHASSIS to the Air Force Base for landing. PINTLE TRAVERSE WHEELS will be transported separately.

Note: An observer, without other duties must stand at the muzzle end and give warning of any possible danger. At each few inches of movement the CHASSIS must be securely chocked.

VI. TESTING

Nondestructive testing of the fabric should be carried out by the Non Destructive Inspection laboratory, giving us as many of the answers as possible as were provided by Lee Wan and Associates, Inc. for the carriages and chasses at Fort Sumter. The bare minimum of information should be the thickness of solid metal in order that a structural engineer may compute the carrying capacity of the fabric.

VII. CORRISION CONTROL

The hostile, salt air environment has obviously taken its toll. That the fabric is damaged is all too visible. Moreover, we do not know of anyone who has completely, successfully coped with the problem on the scale facing us. Neither the Air Force nor the National Park Service has vats large enough to handle the material in question.

Keesler Air Force personnel are well versed in these matters, and thoroughly understand the problem. We ask them to keep us informed of the processes they use.

Were we undertaking this project, we would, of course, sandblast with fine or medium grade sand as is specified in the Category of Support statement. In addition, we would repeatedly steam clean the fabric, following that with a through scrubbing with a 5% solution of sodium sesquicarbonate or sodium carbonate daily for three weeks. We would then dry the fabric under the type of heat lamps used in the painting of automobiles, and apply a primer coat while the metal is still almost hot to the touch.

Admittedly, this will not solve the problem completely, but like chicken soup, it couldn't hoit! It will reduce some of the chloride and that in itself, is a help.

Although the use of Colmonoy Wirespray Equipment was discussed, we do not believe it should be used at this time. This would seem to be an irreversable treatment, and in view of our inability to rid the fabric of all chlorides, might simply set up an aluminum shell behind which the ferrous metal would continue to disintegrate. We would like to see this process tested on smaller metal objects that have been exposed to a salt air atmosphere before attempting to use it on a large weapon.

VIII. FABRICATION OF PARTS

Relatively few parts will have to be fabricated. Sheets 41 and 42 will give sufficient detail for the Metal Shop. These items should be manufactured of metals as close to the original as possible to avoid reaction.

For castings, see Appendix 3 for sources of patterns and parts.

IX. PAINTING

We will wish to be informed, for our own future use, of the type of primer the Air Force specialists elect. Inasmuch as this is something of an experimental project we only ask that no irreversable process be used.

The finish coat is described in Ordnance Memo No. 23, 1879, as "Oriental Red." Consistent with Ordnance practices of the period, it was a high gloss paint. (Specific color will be specified by the National Park Service at a later date.)

While the GUN, the PINTLE, and the RAILS would be gloss black, we are not sure about such items as the WHEELS, the TRUNNION BED, and other items. An examination of contemporary photographs will give the proper color scheme, which will be furnished subsequently.

During the priming and painting process it will be necessary not to obscure any markings, which will be found on the Muzzle face of the GUN, and possibly on the INNER END RAIL BRACES, on end of the CHASSIS RAILS, on the ends of the CARRIAGE SHOES, REAR CAP, FRONT CAP, or TRUNNION BED. Other pieces may bear assembly marks in the form of Roman numerals.

Any marks revealed by cleaning must be recorded through photography and museum record notes before painting. These should include text, size, and exact location.

In painting, these areas should be "brushed out" by hand.

X. RETURN AND REMOUNTING OF PIECE

After completion of preservation and painting at the Air Force Base the TOP CARRIAGE AND CHASSIS are to be returned in much the same manner as they were removed.

It would be all too easy and glib to take the Ordnance Manual approach to the problem (i.e. "Re-Assemble in Reverse Order"). However, this may be just about the case.

Certain precautions must be observed at the finish of the work:

1. Nuts and bolt heads burred in disassembly must be dressed before priming and painting.
2. In no event should there be bare metal to bare metal contact. Even inaccessible interior surfaces should be flooded with a primer coat.
3. When the move is imminent, a single, responsible person must go over the entire assembly, comparing it with the detailed plans, accounting for placement of each part, and trying each nut and bolt with a wrench.
4. The pallet construction must be recreated under TOP CARRIAGE and under CHASSIS.
5. All hands, in the air and on the ground at the fort site, must know the exact location and orientation to which the finished products are to be delivered.
6. The Chief, Division of Cultural Preservation, Southeast Region National Park Service must be consulted about the feasibility of temporarily leveling the earthwork aft of the present breach site of the GUN in order to ease reinstallation angle.
7. All slings, guy lines, cable hitches, and the like, must be sufficiently padded to prevent damage to treated and preserved surfaces.
8. A supply of primer and touch up paint must be on hand for immediate cover of accidental scars to finish.
9. PINTLE and all WHEELS must be lubricated prior to reassembly and remounting. TRUNNION BEDS will receive the same treatment before receiving the GUN.
10. All work on PLATFORM, TRAVERSE CIRCLES, and PINTLE must be completed at least one week before projected return.
11. After reinstallation, all parts must receive another check and all bolts and nuts snugged.

XI. MISCELLANEOUS NOTES ON SEA-COAST ARTILLERY

We should begin this by saying these may be miscellaneous notes on 18th and 19th-century military technology and training in general.

There is a general and understandable tendency to doubt military and industrial technology of a century or two centuries ago as being crude, inefficient, and non-professional. It was anything but that.

The "...bombs bursting in air, and the rocket's red glare," was not a Jules Verne phantasy. It was accurate reporting by an eye witness who committed his thoughts to verse, which in turn was put to the tune of an old English drinking song to become, eventually, a national anthem.

We cannot resist the wry comment here that the particular nation is probably the only one in the world that has as its national anthem the tune of a drinking song, and yet tried to live with Prohibition.

That observation aside, the "bombs" were extremely effective heavy, explosive mortar shells, fired from specially constructed ships. The rockets were just exactly that--Congreve Rockets. They were somewhat erratic, but the basic technology was not bettered until World War II.

With this idea in mind, and the hope that we need not always be subject to 20th-century technological chauvinism, we would like to indulge in two quotations from 19th-century military sources:

It is possible, with the present arrangement, for four men to mount a 15-inch gun, if it be desirable, there being no operation which actually requires for its execution a greater number. The whole apparatus has been assembled and put up by six men and a director in twenty-six minutes from the time of commencing. A 15-inch gun has been raised from the ground and placed on its carriage in fifty-four minutes, and this was accomplished with an imperfect jack, not suited for the work, from which cause ten to twelve minutes were lost. A 15-inch gun has been dismantled from its carriage and laid on the ground in forty minutes.

Again:

The precautions necessary to be observed in all mechanical maneuvers with artillery, multiply rapidly with the weight of the piece.

To both of us, these messages come through loud and clear, just as loud and clear as any honest "Lessons Learned" section of a modern After Action Report.

The Lessons Learned are:

- (1) we are dealing with a hell of a lot of dangerous dead weight that really doesn't care who it kills;
- (2) the fewer people involved in the operation on the ground level on Ship Island, the better.

Category of Support

HOST will:

Provide fabrication Shop(s) services to include welding; sheet metal; NDI; corrosion control to include sandblasting, stripping and painting; machine shop; and fabric repair. Work will be performed IAW priorities established in AFM 66-1.

TENANT will:

Provide for pick-up and delivery of materials to location determined by Host. Reimburse Host for supplies and military and civilian labor IAW DOD/USAF directives. Tenant will coordinate with host prior to delivering materials/requesting services to ensure that host is capable of providing services requested. Tenant will provide technical specifications and/or technical services as required.

Request Keesler AFB Deputy Commander for Maintenance to assist us in restoring the 15 Inch Rodman-Columbia Cannon presently located on Fort Massachusetts on Ship Island. National Park Service will disassemble the unit and deliver the materials to Keesler AFB and provide new replacement parts if required. The services requested of Keesler consist of (a) stripping and/or sandblasting the materials and providing non-destructive inspection of materials under the guidance of an engineering consultant provided by the National Park Service. (b) Prepare metal surfaces and paint with materials to be provided by National Park Service. (c) Provide outside space for reassembly of unit by National Park Service to ensure proper fit of components prior to removal of unit.

Category of Support

Host Will

Tenant Will

(NZ) Fabrication Shops
(REIMBURSABLE)

Provide Fabrication Shop(s) services to include welding; sheetmetal; NDI to include SOAP samples; corrosion control to include sand blasting, stripping and painting; machine shop, fabric repair and outside storage space within their capability IAW priorities established in AFM 66-1

Coordinate with Host prior to requesting service/delivering items to insure Host is capable of providing services requested. Provide technical specifications and/or services as required. Provide for pick-up and delivery of items/materials to location determined by Host. Provide odd, peculiar or unusual parts/materials/supplies. Reimburse Host for supplies, military and civilian labor IAW DOD/USAF directives.

2. SUPPLIER (Name, Office Symbol & complete address) Keesler Tech Tng Center/LGXP Keesler AFB, MS 39534	2a. MAJOR COMMAND CODE FB30XX	2b. SUBORDINATE COMMAND CODE FB3010
	3. PRESENT AGREEMENT NUMBER FB3010-78102-001	
	4. TERMINATION DATE (Month and Year) 0483	
GEOGRAPHICAL AREA OR COUNTRY CODE: _____	3a. SUPERSEDED AGREEMENT NUMBER None	
5. RECEIVER (Name, Office Symbol & complete address) U.S. Department of the Interior National Park Service, Gulf Island National Seashore, 4000 Henley Rd. Ocean Springs, MS 39564	5a. DODAAC/FEDSTRIP NUMBER 144435	
	5b. MAJOR COMMAND CODE 14XXXX	5c. SUBORDINATE COMMAND CODE 145322
	GEOGRAPHICAL AREA OR COUNTRY CODE: 28	

SUPPORT AGREEMENT RESOURCE SUMMARY

6. CATEGORY CODES	SUPPLIER				
	b. MAN YEARS		c. GROSS ADDITIONAL COSTS		
	MILITARY	CIVILIAN	TOTAL	NON-REIMBURSEABLE	REIMBURSEABLE
AL			\$1,900		\$ 1,900
BS			500		500
BU			18,000		18,000
ST			12,000		12,000
MZ			8,000		8,000
TOTAL			\$40,400		\$40,400

6d. RECEIVER DATA (When applicable, provide similar data required in blocks 6a, b and c)

7. SAVINGS ACCRUED/COSTS INCURRED MAN YEARS SAVED EXPENDED TO FEDERAL GOVERNMENT			
7a. SAVINGS	7b. COSTS	7c. MAN YEARS SAVED	7d. MAN YEARS EXPENDED
FY: _____	FY: _____	FY: 0	FY: 0

8. FUNDING AND REIMBURSEMENT ARRANGEMENT (Include all details concerning billing/reimbursement procedures, funding limitations, and the appropriate "billing/submit thru" addresses. Also list those references which specifically apply to the type of organization being supported.)

The Air Force will submit standard form 1080, voucher for transfer between appropriations, to the U.S. Department of the Interior National Park Service, Gulf Islands National Seashore, 4000 Henley Road, Ocean Springs, MS 39564, for support rendered.

a. The Receiving Activity will provide the Supplying Activity projections of support required to accomplish its mission. Significant changes in the Receiving Activity function, mission or support requirements will be submitted by the Receiving Activity in a manner that will permit timely modification of resource requirements.

b. It is the responsibility of each agency providing support under this agreement to bring any required or requested change in support to the attention of KTTC/LGXP prior to providing/reducing unilaterally such additional/reduced support.

c. Activities providing reimbursable support in this agreement will submit a monthly statement of costs to KTTC/ACFM for preparation of billing document, SF 1080.

d. Manpower required in support of this agreement which is subject to return to the lending activity upon termination of the agreement: NONE (Enter number or if no manpower is required, enter "None").

e. All rates expressing the unit cost of services provided in this agreement are based on current rates which may be subject to change for uncontrollable reasons, such as Congressional legislation, DOD directives, commercial utility rate increases, etc. The receiver will be notified immediately of such rate changes.

f. This agreement will be reviewed biennially at least 120 days prior to the anniversary date. It may be revised at any time upon the mutual consent in writing of the parties concerned.

g. This agreement may be cancelled at any time by mutual consent of the parties concerned. This agreement may also be cancelled by either party upon giving at least 180 days written notice to the other party.

h. In case of mobilization or other emergency, this agreement will remain in force within supplier's capabilities, subject to normal cancellation provisions and will be subject to review at that time. This agreement will not be terminated if such action impairs the combat mission of the receiving activity as determined by higher headquarters.

10. REMARKS

11. COMPTROLLER CONCURRENCE (Supplier Signature & Date)

Stanley M. Brewer Feb-80

12. COMPTROLLER CONCURRENCE (Receiver Signature & Date)

Noel Pachter 12-10-79

TYPED NAME AND ORGANIZATION OF SUPPLIER APPROVING AUTHORITY
LARRY J. MATTINA, Maj, USAF
Chief, Resource Plans Div

13a. SIGNATURE
Larry J. Mattina

13b. DATE
14 FEB 80

TYPED NAME AND ORGANIZATION OF RECEIVER APPROVING AUTHORITY
Assistant Superintendent
USI Islands National Seashore

14a. SIGNATURE
Noel Pachter

14b. DATE
12-10-79

Principal Dimensions and Weights of Guns of pattern of 1861.

	COLUMBIADS.			RIFLED.			Sledge Howitzer.	MORTARS.			
	Sea-Coast.			Siege.	Field.	Heavy.		Light.			
	15-in.	10-in.	8-in.	4½-in.	3-in.	6-in.		13-in.	10-in.	10-in.	8-in.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	
Diameter of bore.....	15.	10.	8.	4.5	3.0	8.	13.	10.	10.	8.	
True windage.....	0.13	0.13	0.13	.05	.05	.12	.13	.13	.13	.12	
Length of bore.....	165.	120.	110.	120.	65.	46.5	35.	32.5	20.5	16.	
Do. do. in diameter.....	11.	12.	13.75	26.66	21.66	8.91	2.69	3.25	2.05	2.0	
Semi-axis of ellipse, bottom of bore.....	9.	7.5	6.	3.375	2.25	6.0	9.0	7.5	7.5	6.	
Length from base-line to face of muzzle.....	170.	122.	111.5	121.	66.25	50.	33.	32.5	18.	14.	
Whole length of piece.....	190.	136.66	119.475	133.	73.3	60.	54.5	47.5	23.	22.	
Semi-diameter at base-line.....	23.65	15.03	12.5	7.8	4.71	8.75	21.5	15.	10.	8.	
Semi-diameter at muzzle.....	12.5	8.1	6.6	4.5	3.0	7.5	21.5	15.	10.	8.	
Distance between these semi-diameters.....	169.	121.	110.5	120.5	65.75	49.25	32.0	31.5	17.	13.	
Distance from face of muzzle to axis of trunnions.....	118.7	86.	78.75	78.35	41.415	26.09	24.45	22.8	13.	10.	
Distance between rimbases.....	48.1	32.1	25.7	15.0	9.5	18.0	43.4	30.4	20.4	16.4	
Length of trunnions.....	0.5	3.25	3.25	4.0	2.8	5.0	3.5	3.5	3.5	2.5	
Diameter of trunnions.....	15.	10.	8.	5.3	3.67	5.82	15.	12.	12.	10.	
Maximum diameter.....	48.	32.	25.6	18.	9.7	17.5	43.	30.	20.	16.	
Distance of the max. diameter from the face of muzzle.....	155.	110.	102.	110.	60.						
Weight..... pounds.....	49,099	15,059	8,465	3,450	820	17,120	7,300	1,900	1,010	
Preponderance..... pounds.....	1,200	519	350	300	40						

NOTE.—The vent is .2 inch in diameter, in all guns.

Patterns for TRUCK WHEELS and other needed parts should be available from Frederick Iron & Steel, Frederick, Maryland.

It would be well to contact Bill Brown, Division of Reference Services, Harpers Ferry Center, and ask his assistance in the matter. Should the patterns no longer be in existence from the previous Fort Sumter contract, it will be necessary to have new ones made. In that event, the contract should include provisions for turning the patterns over to the National Park Service for future use.

Nuts and Bolts can be obtained from McMaster-Carr Supply Company, P.O. BOX 4355, Chicago, Illinois 60680, (312) 833-0300.

ENVIRONMENTAL CONSULTANTS, INC.
 391 NEWMAN AVE. · P.O. BOX 37 · CLARKSVILLE, INDIANA 47130 · TEL. (812) 282-8481

U.S. Department of the Interior
 National Park Service
 Mr. Joseph P. Schock, Director,
 Public Health Service--National
 Park Service Environmental
 Sanitation Program
 1100 L Street, N.W., Room 3401
 Washington, D. C. 20240

Date- 4 February 1976

E.C.I. # 6193

Sample Description-

Southeastern Region
 Gulf Islands National Seashore
 West Ship Island *MS-2*

P.O. No.-

PX 6000-5-0557

Job No.-

7553-02

Alkyl benzene sulfonates (ABS)	<u><0.005</u> mg/l	Manganese (Mn)	<u><0.008</u> mg/l
Arsenic (As)	<u><0.002</u> mg/l	Mercury (Hg)	<u>0.003</u> mg/l
Barium (Ba)	<u><0.030</u> mg/l	Nitrate (NO ₃ ⁻)	<u>0.01</u> mg/l
Cadmium (Cd)	<u><0.002</u> mg/l	Nitrite (NO ₂)	<u>0.017</u> mg/l
Chloride (Cl ⁻)	<u>18.1</u> mg/l	Phenols (Phenols)	<u><0.001</u> mg/l
Chromium, hexavalent (Cr ⁺⁶)	<u><0.008</u> mg/l	Selenium (Se)	<u><0.005</u> mg/l
Copper (Cu)	<u><0.005</u> mg/l	Silver (Ag)	<u><0.002</u> mg/l
Cyanide (Cn ⁻)	<u><0.003</u> mg/l	Sulfate (SO ₄ ⁼)	<u>4.30</u> mg/l
Fluoride (F ⁻)	<u><0.1</u> mg/l	Total dissolved solids	<u>96</u> mg/l
Iron (Fe)	<u>0.03</u> mg/l	Turbidity (Turbid)	<u>22</u> J.T.
Lead (Pb)	<u><0.025</u> mg/l	Zinc (Zn)	<u><0.003</u> mg/l

Remarks:

Analyses Reviewed By

Robert E. Fuchs
 Robert E. Fuchs

APPENDIX 5

DESALINIZATION: PASSIVE ALKALINE SOAK

Metal artifacts contaminated with salts (actually, chloride ions) will continue to corrode unless kept at extremely low humidities (usually impossible to maintain continuously in this imperfect world) or unless the salts are removed as much as possible. One method to remove the salts involves washing them out with water. This is the procedure:

- 1) Remove as much adhering soil and encrustations as possible by brushing under running water, picking and so on. Then -
- 2) Place the object in fresh changes of tap water every few hours for a day. Then -
- 3) Place the object in fresh changes of tap water every day for a week or two. Brush away loose new rust. Then -
- 4) Place the object in fresh changes of tap water, to which has been added enough Sodium Sesquicarbonate or sodium carbonate, to make a 5% solution, every week for two months. (5% weight/volume would be 50g/liter of solution.) Then -
- 5) Place the object in fresh changes of a 5% solution of sodium sesquicarbonate or sodium carbonate, in tap water every month. Until -
- 6) When the chloride concentration is reduced to the level of that of tap water, use distilled or deionized water to make up the alkaline baths. Continue to change monthly. Then -
- 7) When the chloride levels reach that of the alkaline rinse for three successive changes, the process may be considered as complete as it can ever be.
- 8) The progress may be monitored qualitatively, by the silver nitrate test; quantitatively, by the mercuric nitrate chloride test, or by a specific ion meter with a chloride ion electrode; or indirectly, with a conductivity meter.
- 9) After washing, the object will need thorough drying and coating or impregnation to provide a barrier to new corrosion. In addition, storage in a benign environment would be the best way to eliminate further the changes of re-corrosion.

Dan Riss

SILVER NITRATE TEST FOR CHLORIDE IONS

The deterioration of metals, particularly iron, is greatly accelerated when the metal is contaminated with chloride ions. The chloride ion (Cl^-) is found in table salt, sea water, on our skin, and in the soil. It is a problem with buried artifacts, those recovered from under the sea, and metals handled with bare, sweaty fingers. In reducing the chloride levels in metals by electrolysis or a passive alkaline soak, the progress of the treatment is frequently monitored by testing the rinse water for the presence of chloride ions flushed from the object. The treatment is presumed complete when the final change of rinse water shows an absence of detectable levels of chloride.

Needed for the test:

- ...distilled or deionized water
- ...test tube, rinsed in distilled water
- ...dilute (5%) nitric acid, in dropper bottle
- ...silver nitrate test solution, with dropper
to make: dissolve 1.7g silver nitrate crystals/100 ml distilled water.
Keep in dark bottle, as the solution is light sensitive.
- ...black background with strong sidelight.

Procedure:

- 1) Place a sample (10-30 ml) of rinse water in the clean test tube.
- 2) Add a drop or two of dilute nitric acid. If alkaline rinse solution fizzes, continue to add till fizz stops.
- 3) Shake to mix.
- 4) Add two drops of silver nitrate test solution.
- 5) Hold test tube in front of a black background with side light.
- 6) Cloudiness or white precipitate indicates presence of chlorides.
If cloudiness is so weak as to raise doubts as to its presence, compare with a clear untested sample of rinse water.
- 7) No reaction indicates an absence of chlorides in the water.
- 8) Thoroughly rinse test tube with distilled water for next sample.

NOTE: There will be minimal but detectable amounts of chloride in the alkaline electrolyte, or alkaline soak solution as a result of its presence in small amounts in the chemical crystals or powders used to make the solutions. Chlorides are also detectable in tap water.