

# A Military Encyclopedia

## Based on Operations in the Italian Campaigns, 1943-1945.

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### *Chapter Nine*

## **ORDNANCE**

[Note: charts and forms of the original document have been reformatted here, without loss of information, for convenience of presentation. Each such document is delimited by "======" at top and bottom.]

### ***Section 1. Army Ordnance Organization***

Combat Zone Experience of Fifth Army Ordnance service established the sound principle that when an Army operates on a continuous front, all Army non-divisional Ordnance units should be assigned to an Army Ordnance Command Headquarters and organized vertically under three (3) field commands: one field headquarters to operate all third-echelon Ordnance service; another fourth-echelon Ordnance service, Class II and IV supply, and evacuation; and a third to provide ammunition service. (See Chart 1.) This organization was made sufficiently flexible to operate on a horizontal basis during the initial phase of an independent division or separate corps operation.

In accordance with established procedures, this Army Ordnance organization supported corps and division Ordnance organizations. Details of the organizations, policies and procedures used to provide Army Ordnance services are presented in subsequent articles.

### ***Section 2. Army Ordnance Command Headquarters***

Experience has proven that when the Army Ordnance section is employed in a dual capacity (as contemplated in par. 62 of FM 9-5) as a special staff section of Army headquarters, with its activities coordinated with those of all other Army staff sections, and as the Army Ordnance Command headquarters charged fully with the responsibility of furnishing combat zone Ordnance service, it is a most valuable asset to the Army Commander, particularly in a fast moving situation. The responsibility of planning for Ordnance service within the Army, of placing the "Ordnance Plan" in operation, and for maintaining close liaison with the Theater Ordnance officer and the Base Section, was within the scope of this coordinated dual capacity Army Ordnance section and command headquarters.

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## **CHART 1 : ARMY ORDNANCE ORGANIZATION**

Headquarters  
Ordnance Group  
Command Headquarters  
Fifth Army Ordnance Service

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Executive Section  
|  
|\_\_\_ Maintenance and Supply Section  
|  
|\_\_\_ Ammunition and Bomb Disposal Section  
|  
|\_\_\_ Operation Section  
|  
|\_\_\_ Administration - Personnel and Procurement Section

|  
|  
|\_\_\_ Hq & Hq Det, Ordnance Battalion or Group  
| (Assignment: Army Class V Supplies)  
|  
|\_\_\_ Hq & Hq Det, Ordnance Group  
| (Assignment: Army 3rd Echelon Maintenance and Supply)  
|  
|\_\_\_ Hq & Hq Det, Ordnance Group  
(Assignment: Army 4th Echelon Supply, Evacuation, and Salvage)

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To facilitate this, there are normally two CPs [Command Posts]; one with the forward Army CP; one with the rear Army CP. The forward CP maintained close liaison with the Army Commander and the tactical staff sections, in order to provide effective Ordnance service for current operations and to plan for future operations. The rear CP coordinated and supervised administration, ammunition, operations, and maintenance and supply functions.

a. *Administration Section:* - All Army Ordnance administrative, personnel and procurement activities were coordinated and supervised by this Army Ordnance command headquarters. Authority for the transfer of enlisted men was delegated to the subordinate group headquarters but the authority for transferring officer personnel was retained. Local procurement activities and civilian labor pay and control which were supervised by this section, are described under "Utilization of Local Resources", paragraph 19.

The general operating policy was to delegate Ordnance service responsibility to the lowest echelon possible, thereby achieving decentralization and establishing control in a unit which was completely familiar with details of the service it was providing. In this way duplication of effort and the pyramiding of controlling agencies was practically eliminated.

b. *Operations Section:* - This section coordinated and supervised Army Ordnance operations. It published a daily Ordnance operations bulletin which furnished information on the tactical situation, the status of the ability of the Army Ordnance service to sustain it, and Ordnance technical information to Army Ordnance field commanders, and staff officers in supporting echelons, including the Chief of Ordnance.

c. *Maintenance and Supply Section:* - This section coordinated and supervised Army Ordnance maintenance and supply responsibilities in close conjunction with the other Army staff sections, particularly the Army G-4 [Supply] section. All combat and general purpose vehicle allocations were issued by Army G-4 through this section, while all armament allocations were directly allocated to this section. Stock records on controlled major items were maintained.

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Coordination of Army supply activities with the theater Ordnance section and the Base Section were also accomplished by this section. As part of the special Army staff this section acted in an advisory capacity to the Army G-4 section, determined the availability of supplies, expedited their delivery to Army and initiated investigations of proposed field expedients which would improve the field use of Ordnance equipment.

d. *Ammunition and Bomb Disposal Section:* - Working in conjunction with Army G-4 who allocated all controlled ammunition, this section controlled and coordinated all ammunition and bomb disposal activities. In addition, technical information was supplied to all echelons, special items of ammunition were obtained, and Army ammunition status reports were prepared.

### ***Section 3. Third Echelon (Non-Divisional) Ordnance Field Headquarters***

Since there was no official agency existing at the beginning of the Italian Campaign to coordinate the efforts of the third echelon Ordnance battalions in the field, a provisional battalion was formed as the forerunner of a third echelon Ordnance Group headquarters. Many of the practices and controls of the provisional battalion were eliminated as a result of experience, and the following functions were found the most suitable for delegation to the group commander by the Army Ordnance commander.

a. *Administrative Section:* - Since there was no administrative section authorized by T/O, it was necessary to form an administrative section similar to that of an Infantry regimental headquarters.

b. *Operations Section:* - This section was responsible for providing third echelon Ordnance support to all Army, Corps, and Division troops. Thus, to provide this, one Ordnance battalion supported Army transportation, service units and separate Armored units, and one battalion supported each Corps.

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The assignment of companies to these battalions was made by this section under the direction of the third echelon Ordnance group commander. A tactical situation map showing the locations of all Ordnance installations was maintained, as was a card file on all units giving third echelon service. This section published a daily bulletin giving the latest location of third echelon Ordnance units and changes in Ordnance service responsibilities, in addition to a weekly troop list. Close coordination between this section and the maintenance and supply sections was absolutely necessary to insure uninterrupted Ordnance service.

c. *Maintenance Section:* - The primary aim of this section was to cope with maintenance problems arising in the field, and to attempt to foresee maintenance difficulties sufficiently in advance to make plans for avoiding them. In order to keep all echelons informed of the condition of serviceable Ordnance equipment in the field, Ordnance specialists were assigned to this section to maintain close touch with all Ordnance equipment in the field. This section distributed, for the benefit of all concerned, worthwhile modifications or improvements which were made on Ordnance equipment in the field.

d. *Supply Section:* - This section coordinated and supervised the supply responsibility of third echelon Ordnance battalions and their companies. It served also as a means of liaison between all third echelon units and the fourth echelon group in matters regarding major items, Ordnance supplies, and the manufacture of certain unavailable items. In addition, this section assisted the battalions in every possible manner to secure critical spare parts; it furnished the maintenance and operations sections of the group with general information on supply matters for planning purposes; and when necessary it controlled the distribution of certain critical supplies.

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#### ***Section 4. Fourth Echelon Ordnance Maintenance, Supply and Evacuation Field Headquarters***

An Ordnance fourth echelon Group headquarters was assigned to coordinate and control fourth echelon maintenance, supply and evacuation. Normally three battalions were assigned to this field headquarters; one battalion controlled and operated Class II and IV supply activities, another operated evacuation and reclamation, while the third coordinated and controlled fourth-echelon maintenance.

a. *Administrative Section:* - This section was similar to that of an Infantry regimental headquarters.

b. *Operations Section:* - This section was the coordinating and controlling agency of this headquarters. The employment of evacuation companies to move armored units and to evacuate battle casualties and salvage was one of the particular functions of this section. Salvage operations were coordinated with supply needs and arrangements to investigate field expedients were made by this section.

c. *Maintenance Section:* - The maintenance section set and supervised maintenance standards, analyzed special maintenance problems, established production schedules and coordinated maintenance activities between third and fourth echelon, and Army.

d. *Supply Section:* - This section regulated the flow of major items, maintained stock control of such items, and issued them on allocation of Army G-4, as transmitted to the group commander by the Army Ordnance Commander. The allocation system, which was organized so that the time that elapsed from the loss of the old item to the receipt of the new item was less than 24 hours, was effectively operated as directed by the Army Ordnance commander in full coordination with Army G-4. Major item requisitions on

the Base Section were prepared and all activities between the depots and Army were coordinated by this section.

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Supervision of "Deadline Requisitions" procedures and all depot operations was also effected.

## **Section 5. Ammunition Service Field Headquarters**

This field headquarters had the responsibility of providing ammunition service. It varied in size from a group headquarters with two battalions to one battalion with five companies. In addition, eleven (11) Bomb Disposal Detachments were attached. The main functions of this field headquarters were:

- a. *Administrative Section:* - This section had the normal administrative duties of a battalion or group headquarters.
- b. *Operations Section:* - This section ordered all ammunition resupply, supervised stockage levels, conducted reconnaissance for new ASPs [Ammunition Supply Points], erected and maintained direction signs for all ASPs, consolidated daily ammunition status reports, and issued ammunition on Army allocation for controlled ammunition or on certificates of expenditure for uncontrolled ammunition as directed by Army Ordnance commander.
- c. *Maintenance Section:* - A Technical Service section, which was used in lieu of an ammunition renovation company, modified ammunition, changed fuze, and renovated ammunition when necessary.

## **Section 6. Providing Ordnance Service to Using Units**

Third echelon Ordnance units had the responsibility of providing complete, continuous, and automatic Ordnance service directly to the using unit, except in the case of the Infantry division whose support was given through the Ordnance (LM) [Light Maintenance] unit.

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### **1. Tasks Assignments**

In order to provide this service, every unit in the Army was serviced by a designated Ordnance Company. Changes in these assignments for Ordnance service were kept to a minimum since it was proved that confidence in Ordnance service was more easily maintained in this way. In as far as the tactical situation permitted, permanent task assignments were made, normally as follows:

- a. *Battalions:* - One Ordnance Battalion supported each Corps and one Ordnance Battalion supported Army Transportation, service units, and separate Armored units.
- b. *Companies:* - One Ordnance (MM) [Medium Maintenance] Company provided support for each Ordnance (LM) Company of an Infantry division and other separate units which operated in

the vicinity. One Ordnance (MM) Company supported Corps Artillery and other nearby units. Because of the shortage of maintenance companies, and the different amounts of Artillery in the two corps serviced in the latter part of the campaign, one Ordnance (MM) Company provided Artillery maintenance support for the Corps having the greatest amount of Artillery, while the Artillery maintenance support for the other Corps had to be provided by Ordnance maintenance units which already had other primary missions assigned to them. Since very few AAA units were employed in the latter phases of the campaign only one Ordnance (AAA) Company was necessary. Shortage of Ordnance (MAM) [Medium Automotive Maintenance] companies made it necessary for them to support as many as 2000 vehicles each, with one Ordnance (MAM) Company operating a rehabilitation center. Separate Armored units were supported by the one available third-echelon Ordnance (MM) Tank Company. This company was assigned to support the Corps which had the largest number of these units, while the separate Armored units in the other Corps were supported by the Ordnance (MM) Companies which had other primary missions.

## **2. *Ordnance Contact Parties in the Combat Zone***

Ordnance contact parties as described in FM 9-10 were modified and were used primarily as a method of maintaining liaison between the supported Ordnance Company and the using units.

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Since the beginning of the Italian Campaign the sending of daily Ordnance contact parties to the using units was standard procedure. At first, these contact parties consisted of small groups of Ordnance technical specialists, sent out by the supporting Ordnance Company to visit each assigned unit daily. Their purpose was to provide technical advice and to give all possible assistance in the inspection, repair and replacement of all items of Ordnance equipment. This system of sending trained Ordnance specialists out to "ride the roads" all day without the time or facilities to handle any reasonably large jobs encountered, proved to be a waste of skilled manpower, and the composition of the contact party was gradually changed until it consisted primarily of liaison men allowing the trained men to work in the shops all day, except when sent out for a special mission coordinated by the contact party.

The contact party's mission was to contact the divisional Light Maintenance Companies, the service batteries, the maintenance sections, motor pools, and the unit S-4 [Supply] sections where they received all requests for Ordnance service for each unit supported. Each company reported these contacts daily to their Ordnance Battalion headquarters giving location of the using unit, signature of person contacted, and information received or work performed. In order to assure efficient handling of the "Contact System", Ordnance battalion and company commanders made periodic calls on the officers responsible for Ordnance service in the units being supported.

This system proved itself very satisfactory not only as a means of giving uninterrupted Ordnance service to the using unit, but as an effective means of notifying all echelons of the exact locations of all units serviced.

## **3. *Changes in Ordnance Support of a Using Unit***

Due to the constantly changing situation, Ordnance units found that the list of units, for whose maintenance and supply they were responsible, changed frequently.

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Although task assignments for large tactical units generally remained permanent, a number of smaller combat and service units had to be supported by a succession of Ordnance units. In order to provide uninterrupted Ordnance service for these units it was necessary to establish an efficient flexible system of transferring the maintenance and supply responsibility from one Ordnance unit to another. This was done by requiring each Ordnance Maintenance Company supporting a combat or service unit to maintain records of the status of the Ordnance support of that unit. When the support of that unit was transferred to another Ordnance Company these records as well as peculiar Ordnance Class II supplies were passed promptly from the old Ordnance Company to the new supporting Ordnance Company.

This system, known as the "Envelope System", operated as follows:

a. *Action by Old Supporting Ordnance Company:* - To accomplish this transfer, the old Ordnance Company was required to prepare and forward within 24 hours, to the next higher Ordnance headquarters an "Ordnance Status Report" envelope or folder. This was delivered through Ordnance channels to the new Ordnance supporting company and contained the following:

(1) A letter of transmittal with pertinent information as to official designation of unit, T/O & E, location, commanding officer's name, motor officer's and motor sergeant's name, name of person usually contacted, date unit was last contacted and last inspected, and any remarks regarding maintenance and supply problems peculiar to this unit.

(2) The latest "Ordnance Materiel in Hands of Troops Report" with any pertinent changes thereto together with a list of Ordnance materiel authorized in excess of T/O & E.

(3) A "Status of Allocation of Major Items".

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(4) An "Ordnance Status of Modification Work Order Report".

(5) An "Ordnance Artillery Report". (See "Balanced Artillery Firepower", paragraph 15.)

(6) An "Ordnance Status of Work Orders Report", indicating amount and disposition of work remaining in the shop.

(7) A "Consolidation of Unfilled Requisitions Report". (A copy of this report was also forwarded to the supporting Ordnance Depot Company in duplicate. Those items or quantities which were not desired or which, if received, resulted in an overage in the reporting company were especially noted with the request that they be cancelled from the depot dues-out to the reporting company. Items or quantities not so noted were not cancelled and remained due-in to the reporting company. The depot then returned one copy of the "Consolidation of Unfilled Requisitions Report" to the reporting company, showing action taken.)

b. *Action by New Supporting Ordnance Company:* - The new Ordnance Company upon receipt of this "Ordnance Status Report" reviewed the dues-out with the supply officer of the using unit for cancellation of supplies no longer required or for additional supplies which were then immediately requisitioned.

c. *Action by Ordnance Group and Battalion Headquarters:* - Group and battalion commanders continuously checked to ensure that the principles and details of the envelope system were carried out.

## **Section 7. Third Echelon Maintenance Procedures**

Ordnance units which operated in the combat zone found that a very large percentage of the work done for combat troops must be carried out during the rest periods for these units.

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Whenever a combat unit was withdrawn from the line and sent to a rear area for a period of time, The Ordnance equipment of that unit was given full attention by the supporting Ordnance service. This was the only period during which all of the division's equipment was available for inspection, repair, overhaul, etc., and it was placed in the best possible condition for its return to combat where Ordnance attention was necessarily limited for an indefinite period of time. During this short rest period, usually ten to thirty days, a program of Ordnance rehabilitation was pressed.

### **1. Ordnance Rehabilitation Plan**

Details of this rehabilitation program are:

a. *Planning:* - Planning for the necessary crews, control and scheduling of the work was jointly arranged by one officer from the responsible Ordnance (MM) Company and one officer from the division Ordnance section. The officer from the Ordnance (MM) Company provided a brief plan of the program in order to acquaint the crews with the schedule and the type of equipment involved, and made appropriate requests on higher headquarters for any additional support. The officer representing the division Ordnance officer arranged the work scheduled by alerting the various units on the dates when their equipment became available.

b. *Policies:* - A complete inspection and repair (or replacement) service, using second echelon unit motor maintenance sections in conjunction with light maintenance and medium maintenance companies was provided. The automotive repair work fell to the lowest echelon of maintenance capable of handling it. It was usually possible to obtain the necessary work crews from one Ordnance Battalion without seriously affecting its regular operation; however, if two or more divisions were rehabilitated at the same time, additional help was obtained from other third or fourth echelon Ordnance Battalions.

c. *Work Crews:* - Rehabilitation work crews accomplished, on the average, the inspection and repair shown in Chart II (These crews worked in the motor pool of bivouac area of the unit being rehabilitated).

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d. *Supplies:* - Crews carried spare parts in the anticipated amounts and types consistent with their mission. The supply officer of the responsible Ordnance Company arranged for a depot priority for a reasonable stock of uncontrolled major items and provided for a flow of parts and major items to the work crews and units serviced. Contact men visited each work crew twice daily in order to provide a constant flow of parts. Stock levels of crews working completely independently of their own companies were kept at their original level by the supply section of the responsible Maintenance Company.

e. *Responsibilities:* - The Ordnance (MM) Company was responsible for the complete Ordnance rehabilitation and submitted a detailed report on the conditions found, certifying that the equipment "is now serviceable for combat".

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## CHART II - REHABILITATION WORK CREW DATA

[data is expressed in equation form thus:  $2 \times 3 = 6$

Average Crew Size x Average Days = Average Man-Days]

Rehabilitation of Infantry Regiment:

Instrument:  $5 \times 8 = 40$

Small Arms:  $4.7 \times 8.8 = 41.3$

Artillery :  $4 \times 8 = 32$

Automotive:  $20 \times 15 = 36$  [?]

Rehabilitation of Field Artillery Battalions:

Instrument:  $6.1 \times 4 = 24.6$

Small Arms:  $4.5 \times 3.2 = 15.6$

Artillery :  $5.5 \times 5/8 = 32$

Automotive:  $16 \times 10 = 162$

Rehabilitation of Infantry Division HQs:

Instrument:  $4.5 \times 0.7 = 3.3$

Small Arms:  $4 \times 0.7 = 2.8$

Artillery : -

Automotive:  $8 \times 10.1 =$  - [?]

Rehabilitation of Infantry Division Signal Company:

Instrument:  $5 \times 0.7 = 3.7$

Small Arms:  $4 \times 1 = 4$   
Artillery : -  
Automotive:  $8 \times 10 =$  [?]

Rehabilitation of Infantry Division Quartermaster Company:

Instrument:  $5 \times 1 = 5$   
Small Arms:  $4 \times 0.5 = 2$   
Artillery :  
Automotive:  $20 \times 6 =$  [?]

Rehabilitation of Infantry Division Reconnaissance Company:

Instrument:  $7.5 \times 1.5 = 10$   
Small Arms:  $3 \times 0.8 = 2.1$   
Artillery :  $3.5 \times 1.6 = 5.5$   
Automotive:  $8 \times 6.2 = 40$

Rehabilitation of Infantry Division Engineer Battalion:

Instrument:  $5 \times 1.2 = 6.1$   
Small Arms:  $4 \times 2 = 8$   
Artillery : -  
Automotive:  $16 \times 13.8 = 220$

Rehabilitation of Infantry Division Artillery HQs:

Instrument:  $4 \times 1 = 4$   
Small Arms:  $4 \times 0.8 = 3.3$   
Artillery : -  
Automotive:  $6 \times 6.5 = 39$

Rehabilitation of Infantry Division Medical Battalion:

Instrument: -  
Small Arms: -  
Artillery : -  
Automotive:  $10 \times 16 = 160$

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Rehabilitation of Infantry Division (Complete):

Instrument:  $5 \times 48 = 240$   
Small Arms:  $5 \times 52 = 212$   
Artillery :  $4 \times 57 = 230$   
Automotive:  $(10 \times 60) + (20 \times 85) = 2300$

Note: These crews are equipped with all tools, special and standard equipment, to completely inspect and repair all equipment for which they are specialized.

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## **2. *Ordnance Maintenance of General Purpose Vehicles in the Combat Zone***

Ordnance maintenance of general purpose vehicles in the combat zone was provided in three ways: - Continuous maintenance accomplished by supporting Ordnance companies, maintenance provided by an Ordnance rehabilitation center, and periodic maintenance (inspection and repair) accomplished according to a prearranged Ordnance rehabilitation plan when the supported unit came out of combat into a rest period.

a. *Continuous Maintenance by Supporting Ordnance Company:* - In the case of Infantry divisions it was found that under normal operating conditions (when the division was in combat) the supporting light maintenance Ordnance companies normally evacuated three (3) or four (4) vehicles daily to their supporting Medium Maintenance Ordnance Company. Of these vehicles evacuated only one (1) or two (2) were repairable in third echelon and the others had to be evacuated to fourth echelon Ordnance. The remainder of the automotive work of the Medium Maintenance Company came from other Corps or Army units assigned to them for Ordnance support. In the case of Army Transportation Corps units, Ordnance (MAM) companies provided adequate support.

b. *Ordnance Rehabilitation Plan:* - Since all of the Infantry divisions normally only became available during rest periods, the complete Ordnance rehabilitation plan, previously described, put emphasis on the rehabilitation of general purpose vehicles.

c. *Ordnance Rehabilitation Center:* - There were difficulties in the field in completely rehabilitating all the fifteen hundred vehicles of an Infantry division during a limited rest period, especially if two, three, and sometimes four divisions were withdrawn from combat during the same period of time. Just such a situation led to the establishment of a large rehabilitation shop which could rehabilitate general purpose vehicles at a high rate on an assembly-line basis. This shop was used to reduce the overload thrown on the rehabilitation schedule when several divisions were brought back into rest, and at the same time provided continuous maintenance by rehabilitating vehicles from each division at a steady rate.

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Eventually this reduced the work necessary during the rest periods and improved the general operating condition of the vehicles. The supporting light and medium maintenance Ordnance companies could not attempt such a program since they worked at capacity on normal division, corps, and Army automotive work. Their load was kept balanced by the Ordnance Battalions. Experience in operating this Ordnance program showed that:

(1) An Ordnance Medium Automotive Maintenance Company given the responsibility of a complete vehicle rehabilitation shop in a large building in a rear area and augmented by three hundred civilian (Italian) workmen can maintain a daily output of fifteen (15) vehicles per day. This rehabilitation consisted of all second and third echelon lubrication, inspection and repairs.

(2) For efficient operation it was found necessary to have ninety (90) vehicles in process at all times plus twenty (20) waiting to enter.

(3) Infantry divisions received priority in receiving this rehabilitation service because difficult weather and combat conditions handicapped their effort to perform first and second echelon vehicle maintenance work.

## ***Section 8. Ordnance (MM) Company Sub-Depot Operations***

Each Ordnance (MM) Company providing third echelon service was charged with the additional responsibility of supplying all of its supported units, except the Ordnance (LM) Company which it supported. This provided complete Ordnance support and gave the Medium Maintenance Company complete knowledge of the supply status of the units served. In effect, each Ordnance (MM) Company acted as a sub-depot, and performed the following supply functions:

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- a. Maintained a complete stock record system with minimum and maximum levels.
- b. Delivered items of supply by contact parties.
- c. Maintained an adequate back-order system.
- d. Maintained an "Envelope System" (See " Changes in Ordnance Support of a Using Unit", paragraph 6).
- e. Edited organizational requisitions based on intimate knowledge of the status of the supported unit's equipment.

This system proved most effective throughout the Italian Campaign in helping to provide uninterrupted Ordnance Service.

## ***Section 9. Fourth Echelon Maintenance Procedures***

The primary mission of fourth echelon maintenance was to give close and immediate support to third echelon Ordnance units. In order to provide this, fourth echelon, in addition to performing normal overhaul, rehabilitation, equipping, etc., frequently manufactured small parts, continuously rebuilt assemblies and sub-assemblies, and completely disassembled salvaged vehicles and equipment so that maximum use could be made of the parts or assemblies reclaimed. It was found that the most efficient operating procedure was to consider all fourth echelon work unassigned and to have it revert to Army stock upon completion.

Centralized control of all maintenance companies allowed certain companies to specialize. This arrangement permitted mass production, facilitated using highly skilled personnel (both military and civilian), concentrated critical parts thereby preventing many deadlines, and tended to raise maintenance standards.

Several of the fourth echelon operations which played an important part in the Italian Campaign are described below: -

a. *Rebuild Operations:* - There were periods during the Italian Campaign when the supply of major assemblies could not meet the demands which were imposed by mechanical mortality rate. As a result it became necessary to establish extensive rebuild facilities within fourth echelon.

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There were two underlying causes for the inadequate supply of major assemblies, both of which were counteracted by the establishment of a fourth echelon rebuild policy. First, the shortage of major items (vehicles) to replace combat losses resulted in proportionate increases in vehicle overhaul operations, and additional major assemblies had to be readily available to these shops in order that the "down-time" for rehabilitation be held to a minimum. Second, the shortage of sufficient rebuild parts to maintain efficient operation of Base shop mass-production overhaul schedules reduced the number of major assemblies received from the Base Section.

To use effectively the limited supply of rebuilt parts, fourth echelon assembly rebuild operations were established, which involved only disassembly, individual part replacement and refitting within the assembly. It was shown that the total parts consumption in this type of rebuild is considerably smaller than that required to perform Base Section rebuild which involves complete disassembly and does not utilize individually matched parts from the original assembly.

An indication of the type and volume of work performed by rebuild operations in fourth echelon is shown by the following tabulation of production figures for one Ordnance Heavy Maintenance Company. They cover a three (3) month period during which time there was a shortage of replacement major items, as well as a critical situation with respect to the supply of sufficient rebuild parts to maintain Base shop production. Also during this period 876 vehicles of all types were given fourth echelon repair.

Major Assemblies (all types of vehicles)	Total Quantity Rebuilt
Axle Assy, front	178
Axle Assy, fwd rear	124
Axle Assy, rear	181
Carburetor Assy	650
Distributor Assy	637
Engine Assy, complete	572
Generator Assy	710
Motor Starting Assy	844
Voltage Regulator	482

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Transmission Assy	207
Transfer Case Assy	244

b. *Manufacture of Critical or Special Items:* - Many times during the Italian Campaign it was necessary to manufacture critical or special items. Standard items of supply such as firing pins for various weapons, obturator spindle plugs, machine gun booster caps, mortar traversing nuts, steering bushings, hardware, and a considerable number of other items were manufactured in quantity whenever the rate of resupply was not sufficient to meet the current requirements. Improvised mortar night lighting devices, machine gun flash hidens, connecting surgical cuffs for severed arteries, extended tank grousers to improve tank flotation, combat Infantry sleds for combined Infantry-Tank use, and special maintenance tools are a few of the special items which were improvised and manufactured in sufficient amounts to meet immediate tactical requirements. During one week in fourth echelon alone, a total of 105 different items were manufactured in quantities as high as 835 of some items. The manufacturing of critical and special items was an important phase of Ordnance supply.

c. *Reclamation:* - Originally all salvaged items were stripped to the fullest extent of all serviceable and reclaimable parts by *both* third and fourth echelon Ordnance units. It was found, however, to be more efficient and economical if the complete reclamation of these items was made by fourth echelon. In fourth echelon cheap, semi-skilled labor which could economically perform a complete reclamation, was readily available, effective use could be made of every part reclaimed, and complete control over reclamation could be maintained.

## **Section 10. Supply Procedures**

Varying from the early conception of combat Ordnance service, in which the balanced Ordnance Battalions consisting of maintenance, ammunition, and depot companies were employed, the vertical organization used by Fifth Army Ordnance assigned to one Ordnance Battalion the mission of organizing, administering, and operating all Ordnance general supply depots in the Army.

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All Ordnance Depot Companies were assigned to this Supply Battalion, and were employed generally as follows: One advance mobile field depot supported each Ordnance 3rd echelon Battalion; and one semi-mobile Army Rear Depot, consisting of two Depot Companies, supported the advance depots and the Ordnance 4th echelon Battalion. The Supply Battalion headquarters was located at all times with the Army Rear Depot. Balanced Ordnance Battalions, including one or more Depot Companies must of course be employed in special cases such as an initial beachhead landing or independent operation of a corps or division.

a. *Ordnance Class II Depot Battalion (General Supplies):* - In addition to the administration of the assigned units, the operating functions of the Supply Battalion were as follows:

(1) Moving depots to maintain close support to maintenance units.

(2) Transferring and balancing stocks between depots by means of periodic depot reviews.

(3) Controlling stock levels within depots.

(4) Anticipating and informing rear supply echelons of quantities of supplies needed during future periods.

(5) Preparing stock reviews on critical and fast moving supplies.

(6) Preparing lists of items in short supply for manufacture by 4th echelon shops.

Ordnance depots supplied using troops through their supporting third echelon maintenance units, as these were the only Ordnance units that directly contacted the using troops for maintenance and supply.

Requisitions from advance depots and units of the 4th echelon Battalion were placed on the Army Rear Depot. The Army Rear Depot was the sole requisitioning agency on Base. This benefited Base in that only large orders from one source were received from Army.

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And it also allowed Fifth Army to know the consolidated status of all supplies in the Army.

Back orders were established and accurately maintained in the Army depots. Approximately 40,000 active stock record cards were in the files of the Army rear depot. (See "Stock Control Procedures" and "Army-Base Inter-Operating Procedures", paragraphs 13 and 14.)

b. *Major Items Storage and Issue:* - An Ordnance (MM) Company was used as a major item depot and distributing company. Its mission was:

(1) To receive, check, store, and issue all major Ordnance items.

(2) To provide constant 1st and 2nd echelon maintenance on all such items, while in the depot.

(3) To combat load, and to equip where applicable, all such items with the necessary supplies and accessories, regardless of the service source of such materiel.

(4) To arrange for the shipment of such items from Base.

(5) To assure combat serviceability of all such items prior to issue.

Normally, the delivery of vehicles was made by personnel of this Ordnance (MM) Company, but this was an unsatisfactory arrangement as most of these men were skilled mechanics and were needed to process and maintain vehicles in the depot. During periods when the front was advancing, additional demands for vehicle deliveries were made on this depot and deliveries were often made over distances of 100 miles. This generally necessitated using additional skilled personnel from fourth echelon Ordnance

maintenance units during a period when increased maintenance demands were also being made upon them. The use of native labor as drivers was not a practical solution.

The assignment to Army of an Ordnance Motor Vehicle Distributing Company would solve the vehicle delivery problem and preclude the necessity of highly trained men inefficiently.

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c. *Redistribution of Critical Items of Supply*: - Due to the extended front covered by Army Ordnance Units, it was necessary to provide repair parts and supplies to a great many units dispersed over a large area. This required the establishment of a system whereby parts, no matter where they were stocked, were readily available to all forward units that needed them. Thus, no major unit was kept out of service for lack of a part that was on hand in the Army area.

In third echelon Ordnance units, a major item in the shop was considered deadlined when necessary parts for its repair were not available in the unit's stock. When this was the case these parts were immediately requested from the supporting Ordnance Depot on a "Deadline Requisition". If the parts were not available at this depot, the Supply Battalion headquarters was notified. Automatically all fourth echelon units were contacted to locate the parts in their stocks, or in salvage operations being carried out by them. In the meantime, the third echelon unit which needed the parts, as soon as they were found to be unavailable in the supporting depot, informed its battalion headquarters which, in turn, contacted all its companies, or if necessary, group headquarters, in an effort to obtain the parts.

By using the system outlined above, the parts were normally found and forwarded to the unit needing them within a few hours. However, if the parts were not located by this means the supply battalion submitted a consolidated "Deadline Requisition" on the Base Section Ordnance Depot for further action. Such a system minimized the ill-effects caused by any mal-distribution of third or fourth echelon parts.

d. *Maintenance Company Stock Reviews*: - To reduce mal-distribution of 1st and 2nd echelon parts, tools, and accessories, stock reviews of selected items were made. (Mal-distribution of 3rd and 4th echelon parts was negligible and was remedied by the system described in "Redistribution of Critical Items of Supply".)

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The procedure used was as follows:

(1) The Army Depot Battalion periodically prepared review sheets of critical 1st and 2nd echelon parts, tools, and accessories, and forwarded them for completion to each Army non-divisional Maintenance Company through the supporting Depot Company. Piece mark, item, present stock balance, "dues-in" and "dues-out" were the main features of these review sheets.

(2) Maintenance Companies filled in requested information and forwarded one copy to the Army Depot Battalion through the supporting Depot Company, one copy to its own Battalion headquarters, and one copy to Group headquarters.

(3) When required materiel was not available in the Base Section, the Army Depot Battalion transferred stock on hand in maintenance companies that had no "dues-out" to maintenance companies that had "dues-out" with no stock on hand to meet this unfilled requisition. These transfers of stock were made through the supporting Ordnance Depot Company accompanied by copy of the transfer order.

(4) The number of items listed on the review sheets was kept at a minimum to avoid overworking Maintenance Company supply sections.

## **Section 11.        *Evacuation Procedures***

The evacuation of Ordnance equipment was accomplished by utilizing the personnel and equipment of Army Ordnance evacuation, maintenance, and supply units. This consisted of:

- a.        Clearing battlefields of both ours and the enemy's disabled Ordnance equipment, and transporting such materiel to collection and evacuation points.
  
- b.        Transporting repairable equipment from forward collection and evacuation points to third echelon shops, fourth echelon shops, or base shops, depending on the echelon of repair required.

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- c.        Evacuating materiel from lower echelons of maintenance to higher echelons of maintenance.
  
- d.        Transporting salvage materiel to QM Salvage yards.
  
- e.        Daily visits to graves registration units, hospitals, and QM salvage yards to recover Ordnance materiel.

In addition to their evacuation mission, Ordnance evacuation companies transported the tracked vehicles of Armored units whenever the tactical situation demanded, and delivered tracked vehicles from Army depots to the using units.

Evacuation from the Army area to the rear is normally a Base Section function but due to the limited number of transporters that were available for use by the Base Section and the insufficient rail and truck lift, it became necessary for Army Ordnance service to assist in this operation. Because of the long periods of static warfare during the campaign, Army Ordnance was able to assume a portion of this responsibility, but during active operations and a forward movement of the lines all available transporter and truck lift was needed for operations within the Army area. Large quantities of materiel accumulated during these periods in collection points and it was necessary to divert personnel and equipment from other tasks to guard and preserve it properly. Fourth echelon units were hampered in their attempts to move forward rapidly in close support of advance Ordnance echelons because these large quantities of materiel had to be repaired, salvaged, or evacuated.

During the latter part of the campaign the Base Section agreed to take over all collection points within 72 hours of notice of evacuation by Army. To permit an orderly transfer of these areas, Base attached an evacuation section consisting of one officer and several enlisted men to the Army main collection and evacuation yard which was located in close proximity to fourth echelon shops. Their mission was to reduce as rapidly as possible all materiel in the yards before any transfer was accomplished. They established priorities on materiel to be evacuated; arranged with Army transportation section, 4th echelon shops and depot companies for all available lift; inspected loaded materiel as to proper crating and preservation; and scheduled the convoys to Base Section.

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The above evacuation procedures from Army to Base were expedients to overcome a shortage of evacuation equipment and personnel in the Base Section. Sufficient facilities and personnel should be made available to Base Section to accomplish this mission fully, thus freeing Army Ordnance service to perform its primary mission in the Army area.

## **Section 12. Methods of Reporting on Major Item Supply Status, Maintenance, and Supply Status Changes**

Reports were required from all Army Ordnance units to keep Army Ordnance abreast of all changes in supply status of major items and of the status of maintenance activities. As a consequence, units were only required to submit materiel status reports every three months. These reports were of three types as follows:

- a. *Daily Stock Report*: - This form furnished the daily status of all major items in Army stock, giving the following information for each item:

=====

[Form Heading]

DAILY ARMY STOCK REPORT AS OF 1800 HOURS [date]\_\_\_\_\_

FROM: \_\_\_\_\_

TO: \_\_\_\_\_

[Column Headings]

Item No.

Item

Prev. Total Stock

Recd from Base Sect

Recd from Shop or Trps

Recd Transfer

Issued

Stock Balance

- Serv Comp

- Serv Inc
- Unserv

=====

(1) Previous Total Stock. Total stock, serviceable and unserviceable, as shown under stock balance on previous day's report.

(2) Received from Base. Quantity received in stock from the Base Section during the 24-hour reporting period.

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(3) Received from Shop or Troops. Quantity received in stock from fourth echelon shops or from turn-in by troops during the 24-hour reporting period. (Used by third echelon companies only in the case of items received from troops and placed in stock instead of being evacuated.)

(4) Received by Transfer. Quantity received in stock through transfer of stock from another Army Ordnance unit. (Items received in third echelon companies on Army allocation for immediate delivery to troops were not picked up on daily stock report.)

(5) Issued. Quantity issued to troops, transferred to another Army Ordnance unit, turned into Base Section or otherwise disposed of from stock.

(6) Stock Balance. Current stock balances (previous totals, plus receipts, minus issues and transfers) were divided into *Serviceable*, *Serviceable Incomplete*, and *Unserviceable*.

b. *Daily Maintenance Report*: - This report showed the status of accumulated work and measured the production activity of all Ordnance shops. Items reported on this form included items belonging to troops, in for repair or modification; battle losses in or awaiting evacuation to fourth echelon; and stock items in for repair. For each major item the following information was given:

=====

[Form Heading]

DAILY ARMY MAINTENANCE REPORT AS OF 1800 HOURS [date]\_\_\_\_  
 FROM: (Unit)\_\_\_\_  
 TO: (Unit)\_\_\_\_

[Column Headings]

Item No.  
 Item  
 Prev. Total  
 Rec'd  
 Repaired

Evac or Salv  
Bal on Hand  
Under repair  
Awaiting repair  
Deadlined for parts

=====

(1) Previous Total. Quantity shown under Balance on Hand on previous day's report.

(2) Received. Quantity of unserviceable items received during the reporting period for repair, salvage or further evacuation.

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(3) Repaired. Quantity repaired and returned to stock or to using troops during the 24-hour reporting period.

(4) Evacuation or Salvage. Quantity evacuated or salvaged during the 24-hour reporting period.

(5) Balance on Hand. Total quantity of unserviceable items on hand for repair, salvage or evacuation.

(6) Under Repair. Quantity in shop actually in process of repair. (Included in total shown under 5.)

(7) Awaiting Repair. Quantity awaiting repair on which work had not yet commenced. (Included in total shown under 5.)

(8) Deadline for Parts. Quantity deadlined for lack of critical parts or assemblies. (Included in total shown under 5.)

c. *Daily Major Items Status Changes Report:* - Each reporting Ordnance Company showed on this form (see below) all major items received and all major items disposed of during the 24-hour reporting period, together with the following explanatory data for each item.

=====

[Form Heading]

MAJOR ITEMS STATUS CHANGES AS OF [time]\_\_\_\_ HRS [date]\_\_\_\_  
FROM: \_\_\_\_ ORDNANCE COMPANY (\_\_\_\_)  
TO: ORDNANCE GROUP \_\_\_\_

[Column Headings]

Item  
Quant Rec'd  
From Whom Rec'd  
Basis for Receipt  
Quant on cl Rec'd  
Alloc Req  
Quant iss.  
To Whom iss.  
Basis for iss.  
Date Hour Del of Alloca

=====

(1) Item. Name of major item

(2) Quantity Received. Quantity received during the reporting period.

(3) From Whom Received. Name of unit from whom received; or other source such as "battlefield recovery".

(4) Basis for Receipt. Basis for receipt of the item, e.g., unserviceable, excess, stock, delivery, previously reported certificate of loss.

(5) Quantity on Certificate of Loss Received. Quantity for which certificate of loss was received from troops.

(6) Allocation Requested. Quantity for which allocation was requested.

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(7) Quantity Issued. Quantity issued, evacuated, salvaged or otherwise disposed of during the reporting period.

(8) To Whom Issued. Name of unit to whom item was transferred, or other disposition (such as salvaged, mounted on combat vehicles, etc.).

(9) Basis of Issue. Basis for disposition such as Army allocation, direct exchange, certificate of loss, unserviceable, evacuated, salvage, stock transfer.

(10) Date, Hour, Delivery of Allocation. Date and hour that delivery of items on Army allocation was accomplished.

These reports proved invaluable in maintaining a continuous record of the quantity of Ordnance major items in the hands of each Fifth Army unit, in determining battle losses and recovery, and in knowing the status and production of all maintenance activities.

## **Section 13. Stock Control Procedure**

The following stock control procedures were standard in Fifth Army Ordnance Service: -

a. *Stock Levels:* - Maximum and minimum stock levels for each item were established and posted on each stock record card. Maximum levels were established at a 15 day level of Ordnance Class II supplies in the Army Depot Battalion. The basic load of divisional and non-divisional maintenance companies was interpreted as 15 days of supply with a maximum level of 25 days and a minimum of 5 days. The amounts needed to meet these levels were adjusted frequently to reflect actual issues over a similar period of time and under similar conditions. Anticipated additional needs such as seasonal requirements were requisitioned only when a definite known requirement existed. Excess stocks accumulated by changes in the density of equipment supported, turn-backs from using troops for which they had no further use, and reclamations were not necessarily evacuated from third echelon maintenance companies if they did not exceed a maximum level of 45 days.

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Depot and fourth echelon maintenance units were authorized a maximum level of 60 days for all excess stocks acquired in the same manner. An up-to-date list of the quantities and types of major items being supported were maintained at all times and adjustments of stock levels were made when significant changes occurred in the quantities of items supported.

b. *Requisition Objectives:* - Non-divisional and divisional maintenance companies and the Army requisitioned on a 30-day objective. In the case of the maintenance companies they requisitioned due-outs plus 25 days authorized maximum level plus 5 days ordering to shipping time. The Army Depot Battalion requisitioned due-outs plus authorized 15-day level plus 15 day ordering to shipping time.

c. *Inventory of Stocks:* - Each maintenance and depot company made a complete physical inventory of all stock once every 30 days. This inventory was scheduled throughout each 30-day period, approximately one thirtieth (1/30) of the stock being inventoried each day, in order to cause the least possible interruption to normal operation.

d. *Operation of Unit Stock Record System:* - All units adjusted their stock control system, where necessary, so that stock cards were located centrally. All transactions concerning requisitions, receipts, issues, dues-in, dues-out, cancellations, and adjustments were controlled from this central point. Practices which tended to decentralize the central stock control system and which resulted in inaccurate stock control procedure were eliminated.

e. *Requisitioning Schedule:* - All maintenance units submitted regular requisitions for stock on their supporting Ordnance Depot, in accordance with a schedule established by the Army Depot Battalion. This schedule was so arranged that requisitions for each SNL would be received in the Army depot Battalion during the 10-day period preceding the day the Army Depot Battalion requisition was submitted to the Base Section. Only deadline and emergency requirements were requisitioned at other than the regular times.

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If unusual demands or other unforeseen reasons reduced the stock level below the minimum before the scheduled requisitioning date an emergency requisition was submitted.

f. *Confirming Requisitions:* - All Ordnance maintenance companies submitted confirming requisitions to their supporting depot once every 90 days. The schedule for submitting confirming requisitions was established by the Army Depot Battalion, so as to coincide with the regular 10-day requisitions. Confirming requisitions for each SNL group were scheduled to be submitted by all companies during the same 10-day period. The confirming requisitions showed total amounts on hand, due-in, and required for each item on the requisition, and listed all items for which the stock record card showed dues-in, or for which there was a requirement. The depot made new postings on their stock record cards on the basis of total dues-in plus amounts shown in the "required" column of the unit's confirming requisition. Such new posting automatically brought about a balance between depot dues-out and unit dues-in. When stocks of critical items were received in Army depots in insufficient quantities to fill all dues-out, back orders were given priority in accordance with standard operating procedure for deadline requisitions.

g. *Interchangeability and Substitution:* - The Army Depot Battalion prepared interchangeability studies which were published in the Ordnance Operations Bulletin from time to time. All companies having new or additional information on interchangeability forwarded it to the commanding officer, Army Depot Battalion, for editing, consolidation and publication for the benefit of all concerned. Stock reference cards were cross-referenced for interchangeability, both within SNL group and between SNL groups. All companies posted substitutions made by Army Depot Battalion to stock record cards, using as a basis the returned copy of their processed requisition.

h. *Requisitioning of Non-Addendum Items Replaced by Kits and Items for which a Newer Item was Substituted:* -

(1) If a company needed non-addendum items to remove vehicles from deadline, a special requisition was submitted to the Army Depot Battalion, and an effort was made to procure the items from salvage or from the Base Section.

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(2) Items formerly requisitioned separately but which appeared in the addenda as part of a kit were continued to be requisitioned separately until stocks in Army Depot Battalions were exhausted, at which time the Army Depot Battalion substituted the kit containing the desired part. Thereafter the kit was requisitioned.

## **Section 14. Army and Base Inter-Depot Operating Procedure**

During the greater part of the Italian Campaign approximately 75% of all Ordnance items (at times as many as 20,000) requested by Army were not available at the Base Section and consequently had to be back-ordered. This made it necessary to establish and to maintain an efficient Army-Base inter-operating procedure. Specific details of the system used were:

a. *Requisitioning Procedure:* -

(1) Normal requisitions were prepared by the Army rear depot listing "dues-in" and the date of the SNL used in preparing the requisitions. These requisitions were submitted in quadruplicate, on a 10-day schedule, to the requisition section of the Base Section who receipted for them, registered them, and submitted all copies to the Base Section shipping section through the Base editing section.

(2) Immediate action requisitions were submitted at any time and were processed as indicated above.

(3) Requisitions for heavy lift items and assemblies were prepared separately by the Army rear depot.

b. *Action by Base Section:* -

(1) Editing Section: - Army rear depot requisitions were edited for nomenclature, authority, and the inclusion of fifth echelon parts.

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Extracts of items not approved for issue by the Base Section were forwarded immediately to the Theater Ordnance Officer with an information copy to the Army rear depot.

(2) Shipping Section: - The Base Section shipping section retained one copy of the requisition and forwarded three copies to the operating groups (Tally-outs or shipping orders showing Army Rear Depot requisition numbers accompanied all shipments.

(3) Operating Groups: - Base Section operating groups indicated on all copies of the requisitions the quantities filled and after selecting the stock forwarded two copies direct to the control group and one copy with the materiel to the packing or shipping section. All copies of the requisition were signed and dated by the person selecting the stock.

(4) Stock Control Section: - The Base Section stock control section posted the quantities issued and any quantities which were back-ordered on appropriate stock record cards. After posting, one copy of the requisition was marked "posted" and was filed. The other copy was immediately dispatched to the Army rear depot by a special Army rear depot courier service. A register was maintained at the Base stock control section showing the date this copy was dispatched and the Army rear depot courier receipted for the returned requisition.

c. *Back-Order Releases:* - Back order releases were also made out in four copies and were handled in the same manner as requisitions.

d. *Correction Sheets:* - Correction sheets were prepared by the Army rear depot on "over" and "short" shipments and were honored by the Base Section and posted accordingly.

e. *Readjusting Records and Expedition Shipments:* - Army and Base Section records were periodically adjusted by cancellation or re-requisitioning. Critical item stock reviews of each SNL group on a 10-day schedule were prepared by the Army Depot Battalion to inform the Base Section of the items on which expedited shipping was desired.

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## **Section 15. *Balanced Artillery Firepower***

In order to sustain artillery in the combat zone, it was found that the shipment or resupply of artillery tubes, recoil mechanisms, spare parts, and all other supplies which were consumed in proportion to the amount of ammunition expended should be based on the quantity of ammunition shipped. This, in essence, is "Balanced Artillery Firepower".

To establish and sustain "Balanced Artillery Firepower" in the Army, it was necessary to know the ammunition allocated to Army for the coming month, the number of weapons serviced, the life expectancy and status of critical artillery assemblies, and estimates on the future operational use of these artillery weapons. To facilitate this, all Ordnance companies charged with the responsibility of maintaining artillery in the hands of troops, submitted bi-weekly reports which, in brief estimated the number of replacement tubes, recoil mechanisms, equilibrators, gas check pads, etc., required during subsequent periods for the number and types of artillery indicated of the forms. In addition, the reports gave the status of tubes at the end of the reporting period (i.e., the estimated life of the tube in rounds by the best obtainable information on the expected number of future rounds to be fired per day per gun) and the number of rounds fired on the various tubes, recoil mechanisms, equilibrators, and gas check pads replaced since the last reporting period. (Since valuable information on the expected life of tubes, recoils, etc., was obtained from these reports, each assembly replaced due to causes other than normal wear was appropriately marked.) Based on these reports and on the ammunition allocation to Army, a monthly requisition on the Base Section depot was prepared at the Army Ordnance depot showing the requirements for the coming month (broken down into three 10-day periods.) A stock review showing the status of present supplies was also given.

"Balanced Artillery Firepower" proved itself not only an excellent means of maintaining serviceable artillery in the hands of troops and in the planning for future requirements, but it provided considerable technical data of the performance and life expectancy of tubes, recoil mechanisms, equilibrators, and other artillery materiel.

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## **Section 16. *Replacement of Major items***

Fifth Army Ordnance maintenance units were authorized to issue immediate replacements for unserviceable major units on a direct exchange basis, i.e., the exchange of an unserviceable item for a like serviceable item. Due to the inability of Theater Ordnance Service to sustain the Army level of serviceable reserve major items this was not always possible, in which case, the using unit obtained replacement by one of the following methods:

a. *Certificate of Loss*: - By preparing a certificate of loss to the supporting Army Ordnance maintenance unit in exchange for the replacement major item. This method applied only to uncontrolled units.

b. *Allocation*: - By allocation from Army G-4, upon request of the Ordnance maintenance unit. This allocation was based upon a certificate of loss or upon the receipt of a like unserviceable unit. This method applied in the case of certain controlled (sometimes critical) major items short in supply.

c. *Automatic Replacement*: - By the automatic replacement of shortages, by allocation, based on reorganization reports or periodic status reports. In this method requisitions were not submitted by the using unit.

The daily status reports (see "Method of Reporting on Major Item Supply Status, Maintenance, and Supply Status Changes") made rapid replacement possible. These reports which were rendered as of 1800 hours by all Army Ordnance units and consolidated that night in the 4th echelon group, were ready to be acted upon in conjunction with Army G-4 the following morning.

The immediate replacement of Artillery weapons required maintaining an Army reserve large enough to permit these major items to be kept in the areas of the third echelon Ordnance maintenance companies, and in some cases even in lower echelons where they were ready for immediate use.

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## **Section 17.        *Replacement of "War Weary" General Purpose Vehicles***

Since replacement general purpose vehicles were not received at addendum rates, it was necessary to expend great amounts of labor, time, and spare parts on vehicles which had considerable mileage on them. Experience proved that this was uneconomical in view of the probability of their future inefficient operation and constant need for additional repairs. A large number of deadlined vehicles usually resulted because the allowances of parts and assemblies, which were predicated on the receipt of replacement vehicles at addendum rates, were not adequate to meet the additional demand caused by repairing these "war weary" vehicles.

In order to ascertain the status of Army's transportation, to recommend the replacement of "certain "war weary" vehicles, and to plan for future requirements, mileage surveys were made by Ordnance at appropriate intervals. Within the limits of the replacement vehicles made available by the War Department, a program of replacement of "war weary" vehicles was initiated.

The need for vehicle replacements at or approaching addendum rates, in order to maintain efficient operation, was amply demonstrated.

## **Section 18.        *Introduction of New Equipment***

Whenever new items of equipment are issued to an Army for combat use, sufficient spare parts and tools should be provided simultaneously. Also appropriate manuals, items of equipment for instructional use, and pertinent tactical and technical instruction (including technicians) should be provided in advance of the arrival of the new equipment.

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Complete technical instruction should be provided to the supporting echelons of maintenance in addition to the pertinent tactical and technical instructions which should be given the using arm. Such a policy will allow rapid employment of the new materiel by the using arm and will insure that the new equipment will be adequately maintained by supporting echelons.

## ***Section 19. Utilization of Local Resources***

The selection, training and utilization of native labor and the exploitation of local machinery and materiel materially assisted Ordnance maintenance and supply. The purchasing and contracting subsection of Fifth Army Ordnance service had the responsibility of supplementing, from local sources, the supplies and Ordnance spare parts received from the Zone of Interior. Both raw materials and manufactured items were procured. Structural steel and steel sheets comprised the greater part of the raw materials, with brass, copper, aluminium, and wood in many forms completing the list. The list of manufactured items was large and varied. Nails, screws, nuts, bolts, hinges, sewing machines, sealing wax, paint, paper, electric motors, thread, watch makers' tools, and grinding machines were part of the list. In many cases items were manufactured by Italian firms on orders placed upon them by Fifth Army Ordnance service. In the Florence area there were four machine shops, two sawmills and a bronze foundry working exclusively for Ordnance. The establishments were managed by various 4th echelon Ordnance companies, and production directed by the 4th echelon Ordnance Battalion. The purchasing and contracting section settled any claims which arose out of these arrangements and furnished raw materials for the work.

In addition to the above, some 3,000 tops, truck, 1/4 ton, C & R, were manufactured, 2,000 engine crates constructed, 80,000 brake lining rivets, 5,000 truck bows, 15,000 metal bow corners, 15,000 feet of one inch rope, 450 boxes sniper's rifle, 30,000 brake lining shims, and about 70,000 stock record cards and parts cards of various types, were a few of the other items manufactured.

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Some projects were very involved, as in the case of the tops, truck, 1/4 ton, C & R, when canvas, thread, grommets, straps, and buckles were purchased or manufactured and gathered for fabrication. The construction of the engine crates involved logging operations which included the sawing of logs and cutting the lumber to size. The crates were assembled with nails manufactured particularly for that job.

Early in the Italian campaign, when the shortage of Ordnance maintenance and ammunition personnel became acute, towns and villages were scoured for men of definite mechanical skills and for laborers to store and issue ammunition. Many thousands were screened, trained, and re-screened until there were over 6,000 Italian civilians working with Fifth Army Ordnance units. Hundreds of these employees were skilled and semi-skilled machinists, mechanics, electricians, welders, carpenters, ammunition handlers and other artisans who lived and worked with the units. Their contribution to the Fifth Army Ordnance effort of furnishing uninterrupted Ordnance service to the combat troops was considerable.

They lived and worked in the closest harmony with the American soldier and developed a fine spirit of unit loyalty and efficiency in production.

## **Section 20. Watch Repair in the Field**

The extent to which facilities for watch repair in the field (particularly in third echelon) should be provided has always been a controversial issue, but experience showed that, in order to provide satisfactory Ordnance service to the troops in combat, it became necessary to have watch repair service available in third echelon Ordnance shops.

The following summarizes the experience of third echelon in watch repair service.

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a. *Repair, Without Parts:* - A survey revealed the following facts concerning the average watch repair schedule per 30 days in each Medium Maintenance Company:

No. Watches Received in Shops:	170
No. Repaired without Parts:	102 (60%)
No. Repaired with Straps and Crystals:	17 (10%)
No. Repaired with Other Parts:	34 (20%)
No. Evacuated:	17 (10%)

I.e., 60% of the defective watches were repaired without parts and an additional 10% were repaired by simple crystal and strap replacement. Civilian type watches accounted for about 20% additional load and were necessarily repaired without regular issue parts.

b. *Preventative Maintenance:* - Since third echelon watch repair service was convenient, and only required a minimum of downtime. the using arm consistently made use of this service for routine inspection as well as repair. Thus, this system was responsible for maintaining a large number of watches in continuous satisfactory operation.

c. *Only Limited number of Parts Required:* - It has been found that only a limited number of parts were needed in large quantities and if watchmakers' lathes were available at least four of these parts could be manufactured. The items which should be provided in abundant quantities in all repair kits were:

- (1) Staff, balance
- (2) Arbor, winding
- (3) Crown
- (4) Crystal
- (5) Spring, main assembly
- (6) Straps, web or leather, with buckle
- (7) Spring, hair assembly
- (8) Stem, winding

- (9) Hands
- (10) Balance jewels
- (11) Screws

Most other parts can be obtained by cannibalization.

d. *Effective Utilization of all Parts Available:* - A system of cooperation among all Ordnance companies of making the best use of all available parts regardless of where they were stocked was effected.

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e. *Watch Repair Tools:* - It was found that Tool Set, Junior Watch Repair No. 2 was not complete enough for efficient operation. The most necessary tools for watch repair in the field were: -

1. Staking tool and punches
2. Truing calipers
3. Roller remover
4. Air blower
5. Screwdrivers
6. Main spring winder
7. Anvil
8. Wrenches for waterproof cases

Other supplementary tools which proved useful were watchmakers' lathes, washing machines, oil cups and devices for inserting plastic crystals.

f. *Watch Repair Facilities:* - A watch repair shop in the field should be separate from the instrument shop, be free from dust, provide adequate working space, be easy to heat, have ample illumination and be sufficiently mobile. The most practical solution to this problem was a trailer of medium size, either one improvised from a salvaged 2-1/2 ton truck frame or one built on an enlarged 1 ton trailer. With a wise selection of materials and some ingenuity, all of the above features can easily be incorporated in a shop constructed on a 1 ton trailer.

## **Section 21. Brake Drum Turning and Relining**

Wet and muddy operating conditions necessitated frequent replacement or relining of brake drums on general purpose vehicles. Experience during two rainy seasons in Italy showed the necessity of providing adequate brake turning and relining facilities. Sufficient supplies of brake lining, shim material, rivets, and replacement brake drums must also be provided.

An effort was made to have brake drum turning machines in the lowest echelon possible. Each Ordnance Medium Maintenance Company should have one or if this is impossible at least one machine should be in each Ordnance Battalion. As an expedient a turning machine for the repair of 1/4 ton truck brake drums was improvised by using a mandrel with the standard issue lathe.

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An improvised "stick" micrometer for measuring the amount that the brake drum is turned down also proved valuable.

## **Section 22. Ammunition and Bomb Disposal Policies and Procedures**

a. *Types of ASPs used:* - In general there were two types of ASPs [Ammunition Storage Points] which were used extensively during the Italian Campaign. They were the area-type storage and the roadside-type storage. This latter type storage was used whenever the ground was not suitable for area-type storage. Area-type storage generally consisted of bays of 10 to 16 thirty-ton stacks each 30 yards apart. These bays were separated by approximately 500 yards, whenever possible. In roadside storage, bays of 10 to 16 thirty-ton stacks 30 yards apart were stacked along a secondary road. These bays were also placed about 500 yards apart whenever possible. More strict compliance with this inter-bay safety distance was observed during dry weather.

b. *ASP Locations:* - ASPs were located as far forward as was considered tactically feasible. Since this made ammunition readily available, it tended to prevent units from carrying excess loads which they might later have to abandon and, of course, shortened the turn-around time for using troops convoys. When a request was received from Corps for the location on an ASP in a general area, representatives from the Army ammunition service (ammunition field headquarters) made a reconnaissance of this area. When the tactical situation permitted representatives from the Corps ammunition section, the Transportation section, the Engineer section, and the Corps or Army G-4 section accompanied the Army ammunition service representatives. A suitable area was selected and a reconnaissance report was prepared. This report estimated the stockage capacity and recommended major improvements such as roads, culverts, drainage, bridges, etc., where necessary.

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The Transportation Officer recommended the road nets to be used, and, since suitable areas were limited, the G-4 section representative approved the selection of the area for clearance priority. In fast moving situations, as ASP locations were selected by the reconnaissance party, guides were left at the necessary points to give the necessary directions to the Ammunition Company which was following the reconnaissance party at several hours interval. Several hours after the Ammunition Company arrived at its new location the ammunition convoy would begin to arrive, and at times these trucks were unloaded into the trucks of using units, which were ready to begin drawing.

c. *Ammunition Status Reports:* - Each ASP submitted a daily status report as of 1800 hours containing the following information: -

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[Form Heading]

STATUS CLASS V STOCKS

ASP \_\_\_\_

TONNAGE REPORT \_\_\_\_

TO: \_\_\_\_ (Unit)  
FROM: \_\_\_\_ (Org. & Coord)  
FROM: \_\_\_\_ (Hour & Date)  
TO: \_\_\_\_ (Hour & Date)  
NO: \_\_\_\_

BALANCE LAST REPORT \_\_\_\_  
RECEIVED \_\_\_\_  
ISSUED \_\_\_\_  
DEPOT TRANSFERS \_\_\_\_  
BALANCE ON HAND

[Column Headings]

Code  
Nomenclature  
Bal. last Rpt.  
Rec.  
Combat Issue  
Train Issue  
Bal. O/H  
Depot Trans.  
Transd to Base

=====

These reports were consolidated at the ammunition field headquarters in two ways, one was a consolidation showing the closing balances in all ASPs, the other was a consolidation of the entire daily status report.

For critical items of ammunition, a daily report, which showed the closing balances of each ASP as of 0600 hours, was prepared to inform the Corps Ordnance officers of the quantities of these items available for use by their troops.

Telephonic status reports were also submitted by ASPs when unexpected issues brought the balances of certain types ammunition to a low level.

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d. *Use of Rolling Reserves:* - Following the breakthrough from the Anzio Beachhead and the rapid advance north of Rome, combat units were normally out of range of the ASPs before they were completely stocked. It was apparent that mobile supplies of ammunition should be maintained behind the troops. To provide this a rolling reserve of 100 trucks carrying a total of 400 tons of ammunition was set up to supply IV Corps. This rolling reserve was maintained until the operations became static enough to again warrant the using of ASPs.

e. *Ammunition Stockage Levels:* - The Corps gave the stockage "target" for forward area ASPs which generally was six days supply of artillery ammunition and two days supply of small arms ammunition. To facilitate resupply where lines of communication were uncertain or greatly extended, reserve depots were established in the Army area and stocked as directed by Army G-4.

f. *Modification and Repacking of Ammunition:* - Large quantities of 3", 90-mm, and 76-mm smoke shells were modified by drilling recesses in the TNT fillers and refilling these shells with HC smoke composition. A number of modifications on various shells to accept the deep cavity VT fuzes were made. A large number (sometimes 1,000 per day) of propaganda shells were prepared for use on the Anzio Beachhead. A considerable number of fuzes were changed from one type of ammunition to another to provide special types of ammunition, and to alleviate critical shortages of standard types of ammunition. Repacking of ammunition was done where necessary.

g. *Segregation of Ammunition by Lot Number:* - In order to increase the accuracy of artillery fire, efforts were made to provide firing units ammunition segregated by lot number. As far as possible, emphasis was placed on the delivery to ASPs of large amounts of ammunition so segregated. However, unless the Theater receives ammunition by lot number it is practically impossible for Army to effect the segregation. That is true especially for those types of ammunition which are used in large quantities or during periods when the front is advancing.

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This basic method of increasing the accuracy of artillery fire power should be constantly used to as great a degree as practicable. After this has been accomplished further refinements with respect to large caliber, high velocity cannon can be effected by calibration.

h. *Fire Fighting on the Anzio Beachhead:* - Fire fighting on the Anzio Beachhead was a serious problem as is indicated by the following facts:

(1) In 121 days 65 fires were started.

(2) The 65 fires destroyed 3807.9 tons of ammunition at an average of 58.6 tons pr fire or 31.5 tons per day.

All precautions such as dispersing ammunition and locating it in an area not subjected to constant shelling were immediately effected. The placing of ammunition in holes scooped out by bulldozers was not practical because of the terrain. Water collected in these holes and efforts to provide drainage by boring holes with Signal Corps augers were almost entirely unsuccessful. "L" shaped bunkers were then built above the ground, These bunkers, made by bulldozers, consisted of 4 to 6 feet high banks of earth placed between the ammunition and the enemy. About 30 tons of ammunition were placed behind each bunker, with a 30-yard interval between each bunker and an interval of 200 yards between each group of 10 bunkers. Besides protecting the ammunition these bunkers provided a shield for the fire fighters as well as a source of dirt to put out the fires.

Several of the methods used to extinguish fires were:

(1) A T-2 tank retriever or M4 tank with a bulldozer blade was used to approach and segregate burning stocks, then to cover the fire with dirt.

(2) M2 half tracks with three 40 gallon foamite fire extinguishers helped to extinguish the fires.

(3) Engineer fire fighter trucks provided additional aid.

i. *Use of Foreign Ammunition:* - Efforts were made to use foreign armament and ammunition, but a considerable number of difficulties were encountered.

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It was practically impossible to obtain all the necessary ammunition components, i.e., the correct projectiles, propelling charges, primers, fuzes, etc. Large quantities of one component would be available, but the other components would be unavailable or available in such small quantities as practically to eliminate the value of its use in a tactical role. However, Italian 81mm mortar ammunition which could be fired in American mortars was used when the supply of standard ammunition was critical. Firing tables for use of this Italian ammunition in American mortars were prepared and distributed to the troops with pertinent information for its use. German 88mm and 15cm ammunition was used to a considerable extent in weapons captured from the enemy.

j. *Bomb Disposal Activities:* - Bomb disposal squads were located at Corps headquarters and at other key locations in the Army area to provide complete bomb disposal service. Because of limited aerial activity it was necessary for these squads, which had been trained in bomb disposal technique for enemy materiel, to be used almost entirely for the disposal of American bombs on which they had not been trained. In addition to their bomb disposal duties they helped to identify enemy artillery shells from duds or shell fragments. By Theater directive it was a bomb disposal function to clear only enemy ASPs of mines and booby traps, but in emergencies other areas were also cleared. More effective bomb disposal service was given by impressing all units with the importance of rendering accurate reports on the location of unexploded missiles and the necessity of making estimates of whether it was urgent that the missiles be deactivated or removed.

## **Section 23. Special Projects and Field Expedients**

It was often necessary to modify existing equipment to meet current tactical requirements or to eliminate defects which caused an excessive amount of maintenance work.

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It was also necessary at times to design and manufacture new items of equipment to meet immediate tactical or maintenance demands. Ordnance Field Group headquarters had a special section for encouraging, investigating, reporting on and expediting the use of field expedients which increased the effectiveness of the materiel or decreased maintenance work. By means of an Army Ordnance operation bulletin information concerning these field expedients was disseminated to all echelons including the Chief of Ordnance, where they formed the basis for appropriate modifications or for new designs. The maintenance sections of the groups or battalions usually handled the special projects. A few of the special projects and field expedients which were improvised and manufactured, and which were not of a purely technical nature, are described below.

a. *Track Devices*: - Extended grousers which were intended to give added flotation to a tracked vehicle traversing marshy ground were manufactured and used by the Fifth Army. During the period 7 April to 12 May 1944, a total of 15,302 of these grousers were modified in order to complete this project in time for the break-out from the Anzio Beachhead.

During the icy winter weather several types of traction devices mainly of a spike type were designed as a temporary field expedient for use with steel track on tractors or tanks.

b. *Front End Type Hoists*: - Considerable use was made of improvised front-end type vehicle hoists. These hoists proved invaluable in unloading supplies, moving bulky equipment and in various maintenance operations, such as replacing engine assemblies.

Front-end type hoists were improvised for the 3/4 ton truck, the 2-1/2 ton truck, and in a limited degree for the 1/4 ton truck. In general, these hoists consisted of four (4) main components:

(1) The "A" Frame: - Generally constructed from 2-1/2" - 3" steel pipe (8-16 feet long) reinforced at appropriate sections.

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(2) Guy Cables: - Generally 3/8" - 1/2" steel cables reaching from the top of the "A" frame to the vehicle frame or some other suitable place behind the cab of the vehicle.

(3) Winch and Cable: - Generally an integral part of the vehicle.

(4) Outrigger: - A device for relieving the vehicle frame, spring, and axle of heavy loads.

c. *Velocity Measurement of Artillery Tubes*: - Velocity measurements of artillery tubes were used to determine tube wear and life expectancy. Valuable data were collected and useful estimates of the life expectancy of several types of artillery tubes revised upward. Velocity measurement to effect calibration of artillery tubes are practically valueless, unless ammunition is received by lot numbers.

d. *Track Performance in Combat*: - Surveys of all Fifth Army units were conducted to learn the type of track in use on all full track vehicles, the percentage of life remaining in the rubber track in use, and the preference of the using arms as to track type. These surveys revealed the following preferences of the crews of the various types of full track vehicles.

(1) M31 (T-2) and M32 (T-3) tank recovery vehicle operators almost universally preferred rubber chevron track.

(2) Artillery and AAA units equipped with M4, 18 ton, high-speed tractors preferred rubber chevron track.

(3) Crews of all M4, M4A3 and M4A3E2 medium tanks almost universally preferred rubber chevron track as first choice and steel chevron as second choice.

(4) M-7, 105 Howitzer motor carriage and M10, 3" Gun motor carriage operators preferred rubber chevron track as first choice and steel chevron as second.

(5) The crews of M-5 and M5A1 light tanks and M8, 75mm Howitzer motor carriage, preferred flat rubber track.

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They believed that a chevron rubber track for light tank and M8 motor carriages would be better than any type of track issued.

(6) No general conclusions were obtained on the preference of various units equipped with M-5, 13 ton, high-speed tractors.

Complete status reports on each organization consisting of statistical data on the type of track used and its remaining life were published for the information of all concerned.

e. *Modification of 40mm (AA) Gun for use against Ground Targets:* - At the request of the Fifth Army Anti-Aircraft Command several 40mm (AA) guns were modified for use against ground targets. The conversion involved the following modifications which in no way prevented reconversion of the weapon to AA use:

(1) Mounting a panoramic telescope on the breech casing.

(2) Providing azimuth and elevation indicators.

(3) Improvising means of locking the weapon in azimuth and elevation.

f. *Improvised 4.5" Rocket Launchers:* - Rocket launchers were improvised in order to obtain the added fire power when other ammunition was in short supply. Rocket launcher tubes and ammunition were obtained from the Air Corps for this purpose. Two types of launchers were designed: one was a tank-turret mounted 7.2" launcher modified to carry fifty-four 4.5" tubes; the other consisted of a group of fifteen 4.5" tubes mounted on the 37mm (AT) gun carriage. These weapons were used primarily against lightly fortified ground targets or for harassing fire.

g. *Manufacture of Infantry Sleds:* - Infantry sleds, which were designed to be towed behind tanks, were manufactured by Fifth Army Ordnance in order to provide direct Infantry support of Armor in the Anzio Beachhead breakout. Since it was necessary to make twelve sleds for each tank (1 man in each sled) there was a critical demand for materials such as channel iron, sheet steel and iron, and welding rods.

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By combining all materials available in Fifth Army, Base Section, and from local purchase, and by using Ordnance personnel from Army augmented by welders and equipment from the Base Section on a 24-hour a day 8-hour shift basis, 360 sleds were manufactured by the deadline date.

h. *Tank Fascine Carriers:* - The fascine carrier consisted of an M4 or M4A1 medium tank with the turret basket removed and the turret replaced by a superstructure to carry a cylinder six feet in diameter and twelve feet in length consisting of saplings formed around an internally-braced engineer corrugated culvert pipe, 12 feet long and 3 feet in diameter. The superstructure was bolted to the turret ring of the tank, and the tracks that permitted the fascine to roll down the front of the tank were welded to the tank. The fascine was held on the superstructure by two cables at one end and to the quick release mechanism at the other. Nineteen fascines were manufactured by Ordnance to permit the crossing of ditches and small deep streams which would ordinarily stop a tank, but obstacles not large enough to warrant the use of an Ark. In operation the carrier approached the ditch and at the proper instant the assistant driver operated the release mechanism, dropping the fascine into the ditch. The carrier, succeeding tanks, and wheeled vehicles could then proceed over the obstacle. Tanks modified as arks or fascine carriers were not permanently unserviceable for the normal tank role. Both the Ark and fascine modified tanks could function as a normal tank when the modifications were removed and the turret and basket replaced.

i. *M4 Tank Ark Assault Bridges:* - Fourteen tank Ark assault bridges were made by removing the turret and turret basket from an M4 or M4A1 tank and installing on the hull two sections of treadway bridge spaced so that the bridge could be used by either general purpose or combat vehicles. The approach and departure ramps and the main bridge sections were modified M2 or M1 Engineer treadway sections.

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A superstructure of 6" I-beam and gusset plates were welded to the hull and supported the main bridge on top of the tank. The main bridge ramps could be removed so that the engine could be replaced. In the traveling position the departure or front ramps were carried at a 45 degree angle to the horizontal, the approach or rear ramps were carried at a 30 degree angle to the horizontal. The ramps were held in the traveling position by two king posts (one for the forward ramps and one for the rear ramps) and a system of 6 cables. Two quick releases located inside the tank permitted dropping the ramps when the Ark was in desired position. The Ark was an offensive weapon used to make fast crossings of canals and like obstacles that would otherwise be tank barriers. In action, the Ark was run into the ditch and its ramps dropped, thus forming a bridge over which vehicles and tanks might cross the obstacle. The Ark was waterproofed up to the turret ring for use in streams and canals.

[end of chapter]

[The document as presented here is - within the limits of the my vision, alertness, and stamina - an accurate rendering of the original; but it is not a "true copy". Occasional misspellings and typographic errors in the original have been corrected. Further annotations - primarily abbreviation and acronym expansions - and insertions of clearly dropped words appear in 'square brackets'.

- Patrick Skelly, for milhist.net]

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