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THE GENERAL BOARD

United States Forces, European Theater

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SALVAGE AND EVACUATION OF EQUIPMENT

MISSION: Prepare report and recommendations on the procedures and organizations used in the Field Armies for the evacuation and salvage of U. S. equipment and supplies and captured enemy material.

The General Board was established by General Orders 128, Headquarters European Theater of Operations, US Army, dated 17 June 1945, as amended by General Orders 182, dated 7 August 1945 and General Orders 312, dated 20 November 1945, Headquarters United States Forces, European Theater, to prepare a factual analysis of the strategy, tactics, and administration employed by the United States forces in the European Theater.

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UNITED STATES FORCES, EUROPEAN THEATER  
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SALVAGE AND EVACUATION OF EQUIPMENT

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SECTION 1

INTRODUCTION

1. Mission. This study reports and makes recommendations on the procedures and organizations used in the field armies for the evacuation and salvage of United States equipment and supplies, and captured enemy equipment.

2. Scope.

a. Analysis of the major salvage and maintenance operations are being presented in other studies of the Theater General Board, discussing the problems from the viewpoints of the Services concerned. The generally accepted conclusions are that their operations filled a vital part in equipping and maintaining the combat forces, that the procedures and organizations of the Services were generally suitable for the task, that their problems were technical and peculiar to each Service, and that technical refinements should be made and more organizations be provided. Except for discussion of combined services, collecting and shop agencies, the conclusions of the Services are accepted and not repeated in this report.

b. The matters of improvement of efficiency and availability by use of combination agencies, the reduction of the load of salvage on army installations, and increased benefit from captured enemy materials are presented in this study.

3. General.

a. "The prompt salvage of equipment which has been abandoned on the battlefield and in bivouac areas, exploitation of captured supplies, and utilization of waste materials are important measures for conservation of military resources." (Paragraph 529, Field Manual 100-10, Field Service Regulations, Administration.)

b. In the European Theater the concept of the salvage operation varied from a viewpoint of overall concern with the rehabilitation of all inoperative or unusable equipment and supplies, to a viewpoint of restriction to reclamation of only those military items found on the field after battle. In this study salvage is considered to include all operations saving materials for further use. Most of the Services have their own procedures, classifications, and terminology. The procedures in salvage operations fell into three general classes. These were the direct exchange of inoperative equipment for a replacement, between the using unit and a supply and repair point; the repair of inoperative equipment and its return by a supporting maintenance unit, usually the maintenance operation; and the collection in the battle area of serviceable or unserviceable equipment and supplies, whether abandoned or turned in by the using unit, their delivery to collecting points, and classification and evacuation to salvage points for re-use, repair or scrap.

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c. Observation of the means taken and results achieved in saving equipment and supplies for further use showed the possibility of securing greater benefits, and led to comments by individuals and organizations suggesting improvements of the salvage operations. These comments with suggestions from maintenance and salvage personnel of the Theater General Board and review of other studies prepared by the interested services, have provided the material for this report.

### SECTION 2

#### SALVAGE PROCEDURES AND ORGANIZATIONS

##### 4. Procedures.

a. The salvage procedures used in the armies were generally uniform and conformed to the standing operating procedure published by the Theater Headquarters for maintenance and salvage operations of the Communications Zone for the support of the field armies.<sup>1</sup> Each Service was made responsible for the maintenance and salvage of its type equipment and supplies, with certain reservations for special equipment. The Quartermaster was given general responsibility for various items coming into the control salvage companies and for miscellaneous scrap. The Ordnance was given general responsibility for metal and rubber scrap. The procedures included instructions for the care and maintenance of materials to reduce wastage, and for the controlling unit to safeguard collected salvage.<sup>2</sup> The procedures and organizations are summarized in this section for general background.

##### 5. Direct Exchange.

a. Direct exchange of inoperative equipment was generally used for special and delicate equipment, such as instruments and radio sets. Damaged Medical and Signal Equipment and Engineer instruments were normally returned by the using unit to the supporting army supply point of the Service and exchanged. The salvage operation or repair was performed by the repair elements associated with the army depot. Repaired equipment was returned to stock, or the damaged equipment was evacuated to a communications zone installation for repair or scrap.

b. Typical operations in direct exchange are described in Chapter 2, "Signal Supply, Repair and Maintenance," Study No. 110 of the Theater General Board.

##### 6. Maintenance Repair.

a. Salvage by maintenance repair was normally used for organizational heavy equipment such as combat vehicles, transportation and construction machinery, and for armament. Damaged Ordnance and Engineer equipment was evacuated to a maintenance unit by Wreckers or Transporters of the using unit, of the maintenance unit, or of an evacuating or collecting unit for repair and return. When appropriate, field contact elements of the maintenance unit made on-the-spot classification and repair. Items requiring repair beyond the capacity of the maintenance unit were evacuated to heavy installations in the rear for repair, stripping for assemblies and parts, or scrapping. Similar procedures were used for Chemical and Quartermaster organizational equipment. The general practice included inter-service cooperation by evacuation and maintenance units for special jobs. At times maintenance units built up small stocks of ready-for-issue equipment and made direct exchanges.

b. Typical operations in maintenance repair are described in

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"Requirement for Ordnance Recovery Company", Study No. 96 and in Chapter 5, "Engineer Organizations", Study No. 71, of the Theater General Board.

7. General Salvage.

a. The local collection of miscellaneous materials, serviceable and unserviceable, for which special provisions had not been made, and abandoned on the battlefield or turned in by units, was done by the local combat or supporting service units. Combat units normally used the returning ration vehicles to deliver the materials to the army salvage collecting points established near the Class I supply point serving the unit. Quartermaster salvage companies classified the miscellaneous salvage, returned items of other branches to Services as appropriate, and evacuated materials to army salvage points. Items were returned to army supply points for re-issue, delivered to army Quartermaster laundry, fumigation, or salvage repair companies, or evacuated to the Communications Zone for scrap.<sup>3</sup> Cleaned or repaired items were returned to army re-issue stocks. Priority in rehabilitation was given to items for which shortages existed.

b. Much individual equipment and many small items of supply were left on the battlefield and in bivouacs or billets in operations. In heavy going in obstructed terrain troops abandoned automatic rifles, mortar and rocket ammunition, and similar heavy loads. Blankets, bedrolls, shelter tents, shoe-pacs and overshoes were left behind when sudden moves were made from bivouacs or billets. When the opportunity presented, troops going into combat would load up with grenades and small arms ammunition, later abandoning those unused. Speed of movement, and carelessness, repeatedly resulted in the abandonment of gasoline cans, which became critical in supply. Artillery ammunition was left at positions. Corrosion of metal surfaces exposed to the weather, abrasion, and the effects of rain, snow, and wind rapidly deteriorated abandoned equipment and supplies. Special divisional and army service teams were improvised to search the battlefields and billets, particularly for gasoline cans, small arms, and ammunition of all classes. Allied civilian and prisoner of war labor was used for collection and rehabilitation. Strong measures were necessary to raise the quality of performance of supply discipline. The recurring use of improvised searching parties indicates the possible need for assignment of a unit to this specific duty.

c. Typical general salvage operations are described in "Service Operations of the Quartermaster Corps", Study No. 108, of the Theater General Board.

8. Maintenance and Salvage Organizations.

a. In the European Theater the type army consisting of Army troops, corps troops of three corps, and 10 infantry and 4 armored divisions, totalling about 350,000 in strength, employed about 85 company sized units in maintenance, collection, and rehabilitation of materials. Excluding from the count the service and transportation units used occasionally, a strength of 15,000, or about 4.3 percent of the total army strength, was engaged in maintenance and salvage. It is noteworthy that the maintenance and salvage units formed a material part of the total army service troops, which in the 12th Army Group averaged 14.8 percent of the total troops.

b. Details of assignments of maintenance and salvage troops to the armies of the 12th Army Group are given in "Notes on Service Troops", publication of the G-4 Section, Headquarters 12th Army Group,

18 July 1945.

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9. Volume of Maintenance and Salvage.

a. The volumes of work done by the maintenance and repair units in direct exchange and maintenance repair salvage were so overwhelmingly great as to make it clear that without their full operation it would have been difficult to sustain combat operations. The repair and re-issue of such items as radio sets, automatic rifles, tanks, trucks and bulldozers provided equipment that could not have been replaced in time from the zone of the interior. The generally critical condition of spare parts supply, and the extensive use of local manufactures, improvisations, rehabilitated civil shops, civilian employees and prisoners of war show clearly that more could have been returned to combat service had there been more repair units and repair parts.

b. Similarly, the volume of general salvage was great and furnished an important part of the supply of the armies. In the Third Army, a total of about 9,000,000 pieces were handled by the Quartermaster salvage agencies in the operations from August 1944 to May 1945. Reclaimed clothing and equipment returned to Third Army Class II and IV supply in this period totalled 3,151 tons.<sup>4</sup> In an interview with the Assistant Chief of Staff, G-4 of the Third Army it was stated that during part of the operations it would have been difficult to provide the army with clothing but for the reclamation operations. In the 12th Army Group, comprising the First, Third, and Ninth Armies in active operations, the weekly salvage collecting operations averaged about 818,000 pieces throughout the campaign. Of these, about 11 percent were repaired weekly for re-issue, 36 percent were on hand in the salvage dumps, and 64 percent were shipped to communications zone weekly. In the spring of 1945, when the volume of shipments was large because of the simultaneous turn-in of winter clothing and the materials left behind in long advances of the armies, a backlog of about 2,500 tons of unclassified salvage accumulated in the communications zone central salvage depot.<sup>5</sup> Despite the general use of improvised agencies and augmentations of personnel, there were constant backlogs of unclassified and unrepaired materials.

10. Maintenance and Salvage Capacity.

a. The capacity of the collecting and repair units of the Services in the armies was sufficient to sustain operations under the supply situations which existed. The constant backlogs of unclassified and unrepaired materials, particularly in miscellaneous general salvage, show that greater salvage capacity would have been advantageous in reducing the demands on supply stocks. Further, it would have reduced the haul of replacement supplies, releasing the scarce and badly needed transportation for other purposes.

b. Several means are possible for increasing salvage capacity, one is the incorporation of a salvage collecting element in each division in order to expedite the re-issue of useful materials collected, and to reduce the deterioration due to weathering. Another means is the substitution of an army general recovery unit, possibly of battalion size, for the present collecting and evacuating units of the Army Services, both to centralize the responsibility for collection and to increase the availability of recovery means for all classes of materials. Such an agency could also conduct or supervise searches of the battlefield. A third means is the combination of the present maintenance and repair shops of the Services into all-purpose shops capable of handling the majority of types of repair operations required in the army areas. Such shops could be sited according to troop dispositions, and afford maximum accessibility.

11. Recovery and Collection.

a. Inclusion of a salvage collecting section in the Quartermaster utility company proposed to be incorporated in each division has been recommended in another study of the Theater General Board. The section should be of material advantage in expediting reclamation and reducing deterioration due to weather. The section would have the advantage of familiarity with the divisional troop locations. Its presence in the division would aid in focusing attention on the importance of salvage. It is suggested that this section, in addition to collecting salvage from units, could profitably be used to conduct searches of the battlefield.

b. Combined recovery and collection service in the armies offers the advantage of fixing and centralizing the responsibility for recovery, and may gain a slight administrative economy. The mission of the combined unit could be extended to include searching the battlefield. An all-purpose recovery company would be unwieldy due to the wide range of truck, wreckers, trailers and transporters required to handle the variety of loads in an army area. This disadvantage could be overcome by grouping into a battalion a number of recovery companies of various classes. This in turn would have the disadvantage of interposing one more element in the salvage chain. A wide range of technique would be essential for the classification of repair of all types of equipment, and for moving all classes of equipment to shops without further damage. In comparison with separate recovery elements of the Services, it is probably that response to calls by a combination unit would involve a longer time delay, due to the coordination of service calls. In summary, it does not appear that a combined service for recovery and collection in the armies would afford a marked improvement over that now given by the separate units of the Services.

12. Combination Shops.

a. Combined repair shops may have the advantage of a greater accessibility by their dispersion through the areas according to the troop dispositions. This potential gain is lost when the travel to the repair point must be combined with other purposes, such as calls at supply points. By having shops designed for service to any unit, there is a probability of having a volume of work in hand ample to keep all classes of repair machinery busy. There are numerous important disadvantages, particularly for the direct exchange and maintenance repair operations. It would be necessary for the shops to maintain a full range of all the spare parts required for repair of equipment in the army area, and to have a wide variety of repair machinery and operators. Such a shop would be cumbersome and unwieldy, lessening the chance of its being accessible. A large shop would require detailed shop records to be able to keep track of all types of work being done for many units.

b. By far the greatest part of the repair problem in the armies is the operation of the Ordnance Service. Ordnance personnel constitute about 12,000 of the 15,000 persons concerned with maintenance and salvage in the type army of 350,000 strength described earlier in this report. It does not appear that combining other repair specialties with the Ordnance operations, or dividing the Ordnance load among general purpose combination shops, will aid either the large Ordnance problem or those of the other services.

13. Supply Discipline.

a. The repeated evidences of abandonment of valuable service-

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able equipment and supplies, and the stress on care, maintenance, and recovery given in administrative orders show that supply and salvage discipline of individuals and organizations was not at a high level. Individuals and units tended to overestimate their needs and to hoard for eventualities. Under stress of operations, or when transportation for movement was lacking, individuals and units stripped to current immediate needs and left behind their accumulations. Conditions seldom permitted return to former sites to pick up the cargo left behind, and few reports were made to elements which might have made recovery. The attitude that re-supply was unlimited and that no personal responsibility existed led to abuse and abandonment of equipment and supplies

b. All troops were given supply training in their basic and later military training, but the results show that it was inadequate. Supply training must be applicatory so that each individual understands the load that abuse and abandonment place on the supply system. Further, it must be backed up by command responsibility, both downward by the unit commander holding individuals responsible for their own and general issue supplies, and upward by holding the unit commander personally responsible to his superior for all consumption exceeding established rates of attrition.

**BIBLIOGRAPHY**

**SECTION 2**

1. Standing Operating Procedure No. 30, "Maintenance and Salvage", Hq ETOUSA, 31 July 1944, with changes.
2. Annex 2, "Report of Operations - 20 October 1943 - 1 August 1944", First U. S. Army.
3. "Notes on Service Troops", publication of G-4 Section, 12th Army Group, 18 July 1945.
4. 1st Indorsement, Hq Third U. S. Army, 14 November 1945, file AG 400,93 GNMCD - 3, with 6 inclosures.
5. Appendix 1, "Service Operations of the Quartermaster Corps", Study No. 108, Theater General Board.

**SECTION 3**

**CAPTURED ENEMY MATERIALS**

14. **General.**

a. Comments and field observations on captured enemy materials showed some deficiencies in exploitation, and that the benefits gained from the use of captured materials were not critically related to operations, with certain exceptions.

b. The procedures in the armies for reporting, classifying, safeguarding and applying captured enemy materials to use were generally uniform and conformed to the standing operating procedure for maintenance and salvage, published by the Theater Headquarters. With the exception of the army petroleum testing laboratory sections, the technical intelligence teams of the Air Forces and of the Theater Services, and special intelligence agencies of Supreme Headquarters, no organic personnel were provided exclusively for dealing with captured materials and installations. Army and higher headquarters supply staffs established subsections for coordinating the use of captured materials. Within the armies, units capturing materials and installations provided the guards and notified the appropriate Service at the

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army headquarters. Capturing troops made such use of the supplies as their operations required. Each army supply Service then made issues as required with normal supply personnel. Items surplus to army needs were reported to army group headquarters for disposition. Except for small items, captured dumps were seldom combined with United States materials. Provisions were made for the demolition of enemy materials or installations which could not be moved and were likely to be of benefit to the enemy in the event of recapture.

15. Exploitation.

a. The quantities of materials captured were small in the initial operations, and consisted mainly of unserviceable armament, combat vehicles, and transportation, and the contents of unit trains. Where his defensive held, the enemy removed valuable materials and booby-trapped such items as he left behind. As the rapidity of the advances across France, and later that into Germany increased, larger supply depots and equipment parks were captured. In the final operations the major depots and installations of the enemy zone of the interior were captured.

b. The capturing troops were seldom able to spare adequate guards for captured materials and installations, and frequently considerable lapses occurred between the time of capture and the time army supply control was placed on the property. Though continuing use of booby-traps deterred some personnel, unnecessary damage was done to captured materials by overzealous or curious personnel of our forces. The haphazard removal of parts or souvenirs often made important equipment useless. Unavailability of sufficient trained technical personnel and guards resulted in improper or wasteful application of valuable items.

16. Application.

a. With a few exceptions, captured enemy materials exercised little effect on supply services. Captured installations, such as rail-ways and wire communications lines, were valuable. It does not appear that capture of any class or item of enemy material had a critical effect on our operations except as discussed in b and c below.

b. One of the exceptions was bridge material.<sup>6</sup> Due to the difficulty of demolishing or evacuating bridge materials, these often were found intact or only superficially damaged. The rapid bridge reconstructions that sustained our long, deep advances could not have been made without the use of captured bridge dumps. The bridge dumps, and exploitation of local resources, saved the necessity for diverting critical transportation to hauling bridge materials. Captured electric<sup>6</sup> generators formed a valuable complement to our spartan basic allowances. Captures of enemy food dumps, individual equipment and clothing stores increased as operations progressed. While the captured food was of little value to our forces, it reduced the diversion of our rations to prisoners of war. Captured food and mess equipment were of great value in feeding the masses of displaced persons liberated in the advance into Germany.<sup>7</sup> Material use of rehabilitated captured transportation was also made for this purpose. Captured medical supplies, equipment and hospitals were used in the treatment of displaced persons and prisoners of war. Some use was made of captured armament and ammunition. Captured 88mm and 105mm cannon and ammunition, 80mm mortar ammunition and rockets were used by our forces during the period of ammunition stringency. Captured cannon, automatic weapons, small arms and ammunition were used to equip newly formed military units of liberated nations, reducing the loads on United States supply.

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c. Wire communications lines of liberated nations and captured enemy civil and military lines supplemented and eventually almost entirely replaced military long lines. In several rehabilitation of important lines was delayed unnecessarily extensive demolitions done by our troops at the time of capture. Captured railway locomotives, cars, trackage and shops, both enemy and those liberated nations, furnished important parts of the transportation service throughout the campaigns beyond the beaches. Priority was given to reconstruction of bridges on military routes and to rehabilitation of stock. At times it was necessary to dump loads on captured cars to release the cars for military use.

d. Greater advantage could have been obtained from the captured materials and installations if the preparatory technical training had been more extensive and had been passed forward to lower elements, so that reporting and safeguarding the captures could have been done with greater appreciation of their potential importance. When the situation is such that the use of captured enemy materials or installations becomes important in supply operations, it is essential that the higher commanders assign additional units to the tactical commands for the safeguarding of captured materials or installations. In this situation, guarding becomes a major use of troops, combat or service, which a commander must weigh in determining their availability for other purposes. The burden cannot always be placed on the service elements of the tactical commands, who are then operating at their maximum load.

### 17. Intelligence.

a. Within the armies, there were no organic personnel allotted solely to derivation of intelligence from captured enemy materials and installations. Technical personnel of the maintenance, repair, and service organizations organic with the armies inspected captured materials and reported its intelligence possibilities. Detachments of technical intelligence sections of Communications Zone Services were attached to the armies and usually operated at corps headquarters. Teams or individual members of special scientific or economic intelligence sections of Supreme Headquarters or the War Department operated in army areas, and on occasions were attached to armies.

b. The attached technical detachments of the Services examined, reported on, and evacuated for further study specimens of new or modified captured enemy materials. At times their services were of direct value to the combat elements, as in the case of new pattern time-delay igniters for concealed mine charges. In other cases their preoccupation with technical problems and control by and direct communication with rear installations made them be regarded by the combat headquarters as parasitic elements giving little return for their upkeep. Their combat intelligence value increased as they became integrated with the headquarters to which they were attached.

c. Scientific and economic intelligence representatives from higher headquarters were generally interested in targets whose application was not of immediate interest to army. In numerous cases the installations they desired to examine were destroyed by ground or air combat operations before being taken, and in others the enemy had succeeded in evacuating their objective. Occasionally interference arose between the combat elements and the special intelligence personnel due to lack of coordination, or to failure of the intelligence personnel to identify themselves through the headquarters of the combat units controlling the area.

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### BIBLIOGRAPHY

#### SECTION 3

6. Letter "Engineer Salvage", 6 December 1945 by Col. H. S. Miller, CE, formerly Engineer, XIX Corps.
7. Memorandum "Comments on Captured Enemy Material Activities of the Seventh Army", 23 November 1945, by Col. J. F. Tweedy, Q&C, Quartermaster, Seventh Army.
8. "Organization and Operation of the Theater Intelligence Services in the European Theater of Operations", Study No. 14, Theater General Board.

#### SECTION 4

### CONCLUSIONS AND RECOMMENDATIONS

#### 18. Conclusions.

a. Combination of collecting and repair agencies to replace the present agencies is not advisable, however advantage can be derived from the inclusion of a general collecting element in the divisions, and from the improvement of the supply discipline of all individuals and units.

b. The relatively low importance of application of captured enemy materials to our use does not justify modification of the present means and agencies, but the potential value is sufficiently great to merit more intensive training in their use and care in safeguarding. In rapid deep advances, when necessity for use of captured installations develops, commanders must be prepared to assume the responsibility of safeguarding the installations for use by the Communications Zone. It is concluded that special supply staff and service troops agencies to control and operate captured materials are not required. It is further concluded that technical personnel for their examination are advantageous to army supply, and that greater intelligence value can be derived from captured materials and installations by coordination of special intelligence with combat intelligence.

#### 19. Recommendations. It is recommended that:

a. The proposal to include a salvage collecting element in the division be sustained;

b. Appropriate agencies of the War Department undertake more intensive applicatory training in supply discipline through command channels;

c. Supply staffs be given training in the potential values of captured equipment, and that the attention of intelligence staffs be invited to the desirability of coordination of scientific and economic intelligence with combat intelligence;

d. Tactical training of combat commanders recognize that at times the safeguarding of captured materials and installations may become an additional mission related to the furtherance of the principal mission.