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C.G. E. T. O. U.S.A.Initials *JW*  
Date JUN 27  
LN/OEE-GSE/ajHEADQUARTERS  
EUROPEAN THEATER OF OPERATIONS  
UNITED STATES ARMY

APO 887

27 June 1945

AG 475 OpGC

SUBJECT: Army Ground Force, Equipment Review Board, Preliminary Study

TO : The Chief of Staff, United States Army, Washington, D.C.

1. Reference is made to letter from General Marshall to General Eisenhower, file DGDS/72740, dated 12 May 1945. (Inclosure 1)

2. The subject study has been reviewed by Headquarters, 6th and 12th Army Groups, Third, Seventh, Ninth and Fifteenth US Armies, XVIII Corps (Airborne), and this headquarters.

3. Each section of the board report is attached as an inclosure with the remarks and recommendations of this theater. (Inclosures 2 through 20)

4. This theater is in general agreement with the majority of the recommendations expressed in the board report. The major exceptions and additions are briefly outlined below:

a. Armor with the Infantry Division (Section II, par 8c(5)).

It is the opinion of this theater that some armor should be organic in the infantry division (See Cable E-96884, this headquarters, dated 10 February 1945).

b. Tank Destroyers (Section V).

It is recommended that future development of tank destroyers and tanks be combined to produce vehicles capable of performing the missions currently being performed by both of these weapons.

c. Airborne Equipment (Section VIII, par 46).

It is recommended that the development doctrine for airborne equipment be the minimization of special equipment. It is not believed practicable to eliminate the special equipment required to transport, drop, and assemble airborne personnel and equipment, and that required for use during the purely airborne assault phase when troops are expected to have to operate as a group of unintegrated, self-sustaining units.

d. Air Support equipment (Section IX, par 11a).

It is recommended that all high performance aircraft remain an organic part of the air force, and that normal ground force requirements for liaison and helicopter type aircraft be assigned to the ground forces, but continue to be supplied and maintained by air force type units.

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~~SECRET~~e. Seacoast Artillery Equipment (Section X, par 52a).

It is believed that the basic concept of coast defense as outlined in the board study should be revised to lay emphasis on mobile equipment with a minimum of fixed installations.

f. Communication Equipment (Section XVIII, par 88).

The maximum practicable integration of the communications system is a worthy objective upon which to base the future development of signal equipment. However, it is not believed practicable to effect complete integration under the responsibility of a single agency and maintain the highly desired, present basic principle of command responsibility for signal communications. Tactical development and training should be a responsibility of the Signal Corps.

FOR THE THEATER COMMANDER:



R. B. LOVETT  
Brigadier General, USA  
Adjutant General

## 20 Incls:

Incl 1 - Ltr, Gen'l Marshall to Gen'l Eisenhower,  
dtd 12 May 1945.

Incls 2 to 20 - ETOUSA Review of AGF Equipment  
Review Board Preliminary Study (Sections  
II through XX in duplicate).

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WDGDS/72740  
 Col Shinkle/wdg 12 May 1945

Dear Eisenhower:

Brigadier General Benjamin G. Ferris and Colonel H. P. Van Ormer are delivering to you copies of Army Ground Forces Equipment Review Board Study. This study is sent to you for your review, remarks and recommendations. Identical copies are being sent to General MacArthur, General McNarney, and to the major commands here in Washington. This procedure is being followed to get the best opinions available on the equipment needs now and in the future for our army. The data so gathered will form the basis of a study which will have a strong and lasting effect on our equipment.

I consider this study of equipment of paramount and lasting importance. You will remember the Westervelt Board after World War I and its direct effect on the weapons with which you are now equipped. Upon the excellence of this new study will depend to a large degree our future progress in the all-important field of weapons.

General Ferris and Colonel Van Ormer are at your disposal to assist in the mechanics of your review. I should appreciate it if they can return to the War Department with your remarks and recommendations on the study of the Equipment Review Board prior to 30 June 1945.

Faithfully yours,

(Sgd) G. C. Marshall

General of the Army Dwight D. Eisenhower  
 Supreme Commander, Allied Expeditionary Forces  
 Headquarters, Communications Zone  
 European Theater of Operations, U.S.  
 Paris, France

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY REPORT -

SECTION II, INFANTRY EQUIPMENT

Section II is concurred in with the following additions and exceptions:

1. Add to par 7: "The proposed weapon should be capable of automatic and semi-automatic fire, should have a grenade discharger as an integral part, and should be equipped with a bayonet stud and cleaning rod. Consideration should also be given to the provision of a flash hider and silencer similar to the attachment on the German MP44."

2. Add to par 8a(1): "This gun should have the following desirable features:

a. Automatic headspace adjustment.

b. Barrel which will not overheat under sustained fire, or a barrel designed for rapid interchange.

c. A provision to permit the use of both belt and magazine feeding."

3. Add to par 8a(2): "This weapon should also have a quick change barrel and automatic headspace adjustment features."

4. Add to par 8b(1): "Traverse should be increased without loss of stability. Research should be conducted in the use of light-weight alloys and metals for the purpose of reducing the weight of all mortars."

5. Delete par 8c(2). Reason: The development of tank destroyers as a separate category of vehicles is not recommended (see Section V). The 75mm recoilless gun is believed to be a satisfactory current replacement for the 57mm gun.

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6. Delete par 8c(5). Reason: It is strongly recommended that tanks be organic in the infantry division. The tank-infantry team is insoluble in attack and must be thoroughly integrated as an organic team.

7. In lieu of last sentence, par 8d(1), substitute: "This weapon will replace and not supplement the 2.36 inch launcher."

8. Add to par 9b(3): "The new vehicle should be more rugged than the present Weasel and designed to withstand long trips over paved roads at convoy speeds."

9. Amend par 9c(1): "The present individual web equipment should be improved by reducing its weight, increasing its comfort, and providing better fastenings without otherwise changing its characteristics."

10. Add to par 9d:

"(5) Night firing devices should be provided for all infantry weapons.

"(6) An improved form of diffused light to create artificial moonlight for infantry operations should be provided and placed under division control."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

## SECTION III, ARMORED EQUIPMENT

Section III, is concurred in with the exceptions and additions outlined below:

1. Add to par 12a:

"(1) The power to weight ratio must be increased over present standards to provide for greater flexibility and a power reserve for extra hard going.

(2) More simple mountings and couplings should be developed to expedite engine changing. Less inflammable fuels should be exploited."

2. Add to par 12b:

"(1) The suspension system must be so designed as to provide for continued temporary operation even though damage has been incurred in part of the system.

(2) Primary consideration in track design should be given to reduction of ground pressure; eight (8) pounds per square inch is suggested maximum.

(3) Interchangeability of tracks between corresponding type of vehicles should be maximum practicable, and the general purpose combat track should be capable of mounting ice cleats or caulks."

3. In lieu of par 12d, substitute: "The development of guns should be predicated on the principle that the best tank destroyer gun is the best tank gun. This development should be based on the requirements of, and under the direction of the using services.

(1) Long gun tube life should be reduced in favor of high velocities.

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(2) Tank gun ammunition for present calibers should be fixed, and of such length and diameter of base of shell case as is necessary to insure adequate rate of fire and ammunition stowage capacity; and to avoid excessive gun breech size, crowding of the fighting compartment, and excessive manipulation of ammunition in unpacking, stowing, and loading."

4. Add to par 12:

"f. The noise produced by tanks and other full tracked vehicles must be reduced by reduction of engine, exhaust, track and other mechanical noises.

g. Intensive scientific research should be initiated with a view to producing improved armor plate of greater strength and resistance and less weight. Methods of counteracting the effectiveness of projectiles employing the Monroe shaped charge principle must be discovered. Continuing effort should be made to exploit radical designs in tank hulls to obtain maximum advantage of conformation to provide increased protection without increase in weight.

h. Every effort should be made to minimize crowding of the fighting compartment consistent with fire power requirements."

5. Reference par 13a (1), (2) and (3): It is recommended that the classification of tanks as light, medium, and heavy be abandoned, and the tanks listed in these paragraphs be referred to as "reconnaissance", "exploiting", and "infantry supporting" tanks, respectively.

6. Add to par 13c: "Amphibious tanks should be designed especially

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for assault landings, and future development should provide for firing the tank gun while still floating. Tracks should be designed with special equipment to aid in crawling up steep or slippery banks. These tanks should be operated by organic amphibious assault battalions and not by standard battalions trained and re-equipped for special operations."

7. Add to par 13d: Amphibian kits should permit the use of the primary weapon while the vehicle is floating. Development of tank landing kits should also meet the requirements of river crossings, including ability to cross currents.

8. Add to par 14:

"a. Rocket launchers must not interfere in any way with the use of the tank's normal armament.

b. A flame thrower as a primary weapon should be capable of 250 to 300 yards range with a fuel capacity of 500 gallons, and output of at least five gallons per shot, and a positive ignition system."

9. Add to par 15c:

"(1) Consideration should be given to the provision of seats that face out, and armored sides equipped with a quick release device to facilitate rapid dismounting.

(2) All personnel carriers should be designed large enough to carry the combat bed rolls and rations for the crew as well as the men and their equipment.

(3) One of these cargo carriers should be readily adaptable as an armored command post vehicle.

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ETOUSA REVIEW OF  
 - ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
 PRELIMINARY STUDY -

## SECTION IV, FIELD ARTILLERY

Section IV is concurred in with the following exceptions and additions:

1. Add to par 19b: "However, sufficient fire control equipment should be retained in units to preclude complete dependence upon the common fire direction center when it is necessary or desirable to decentralize."

2. In lieu of last sentence par 21a, substitute: "The missions formerly performed by the 4.5-inch gun should be undertaken by all-purpose antiaircraft guns in the caliber band 90 - 120mm assigned to artillery units."

3. Add to par 21a: "Improvement in these weapons is desirable both as to accuracy and as to wearing qualities, particularly with reference to the 8-inch gun. An accuracy equal to that of the 8-inch howitzer should be sought for all howitzers."

4. Add to par 21b: "It is possible that missions that will be assigned to these guns could be performed better by free rockets and guided missiles; however, until such time as the accuracy of these weapons can equal that of artillery, a limited number of such guns should be developed."

5. Add to par 21c: "It is recommended that a rocket with similar capabilities be developed."

6. Add to par 23: "It is desirable that all guns, howitzers and mortars be capable of firing at a minimum range of 4,000 yards. Tank destroyer guns as such should be omitted from the chart. (See remarks, par 28, Section V.) It is further considered that either, but not both, a 76mm gun or a 3-inch gun should be developed." (Note - Chart should be amended accordingly.)

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7. Add par 26a: "Maximum traverse should be incorporated in the design of all carriages."

8. Add a par 27a(4): "In conjunction with other electrical equipment for locating, directing, and adjusting the fire of all direct or indirect fire weapons on hostile targets, radar equipment should reduce the use of maps, survey, and observation in the maneuver of fire of these weapons."

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ETOUSA REVIEW OF  
 - ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
 PRELIMINARY STUDY -

## SECTION V, TANK DESTROYER EQUIPMENT

1. This theater does not concur in the basic premise of Section V, viz., that a separate line of tank destroyer vehicles is required. The characteristics required in tanks and in self-propelled tank destroyers for fighting tanks are so alike that there is no justification for a separate line of tank destroyer vehicles. The following discussion on the basic characteristics of tanks and tank destroyers is presented in support of this nonconcurrence:

a. Gun Power: It is an essential requirement of tanks that they carry guns of the maximum armor-piercing power that can be mounted on the vehicle. This is also the primary requirement of a self-propelled tank destroyer. For example: if the 25-ton light tank destroyer can carry a weapon that will shoot through 8 inches of armor at 1,000 yards, then why is not this same vehicle the 25-ton light tank? The answer is that if the 25-ton vehicle can carry the more powerful gun, it should carry it and it should be the 25-ton light tank.

b. Mobility Mobility is the second most important characteristic in tanks, particularly of the light and medium classes, and especially in those tanks intended for use with armored divisions. Mobility is also the second most important characteristic in the design of tank destroyer equipment to be used with armored divisions. In the case of tanks to be used in close support of infantry divisions, armor protection assumes greater importance and there is a universal opinion that less mobility, particularly as regards speed, can be accepted in a tank for this purpose. In combat, in support of infantry, there is less opportunity

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for maneuver, the terrain is generally less suitable for tanks, and they are frequently canalized, preventing maneuver; thus the value of armor increases. These factors have developed a desire for greater protection in the tank used in this role. Likewise, with respect to the tank destroyer equipment, combat in FRANCE has demonstrated that the superior mobility of our tank destroyer vehicles, particularly as to speed, was not an essential requirement. Like the tank, more armor protection was desired for operations of this type in close support of infantry.

c. Armor Protection: Thickness of armor takes third place in the conflicting characteristics in both the tank and tank destroyer vehicles when considered for employment in the role of an armored division. As outlined in paragraph b above, when in support of infantry divisions, greater protection is desired and a sacrifice in mobility, particularly with respect to speed, is acceptable.

d. Overhead Cover: Initially our tank destroyer vehicles had open top turrets. The fighting in EUROPE has demonstrated a requirement for closed tops to the turrets.

e. Machine Guns: To date our tank destroyer vehicles have carried no machine guns except for AA machine guns. This lack of machine guns has proven to be a disadvantage, particularly in offensive battles. In this connection, it is well to note that the United States fights defensive wars but offensive battles.

The additional weight and complication required to put comparable machine gun fire power into the tank destroyer design is amply justified by the additional offensive and defensive power that can be obtained at a negligible loss to the vehicle's AT capabilities. Providing machine gun fire power for these self-propelled AT guns enables them to fight with the infantry on a par with a tank and thus be employed profitably in the absence of immediate and large-scale tank threats.

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f. Fire Control: The same type of integrated direct fire control system and auxiliary indirect fire control equipment are required in both tanks and tank destroyers.

g. Miscellaneous: Other characteristics required in the two vehicles, such as ground pressure, speed, vision, etc., are essentially the same.

h. Turrets: So long as self-propelled tank destroyer guns must have turret gun mounts permitting 360° traverse, then their characteristics will be basically those of a tank. It is agreed that self-propelled tank destroyer guns should be constructed with 360° traverse. Only by abandoning the 360° turret can an AT gun motor carriage be built that will differ materially in silhouette and characteristics from a tank. The 360° turret is an essential feature of the gun mount stabilized in elevation and azimuth as visualized in this paper.

2. It is recommended that Section V be deleted and the following additions made to other sections of the report:

a. Change par 13a, Section III, Armor Equipment: Replace "The following tanks should be developed" by "The following tanks, for use also as tank destroyer (i.e., tank/tank destroyer), should be developed."

b. Add a par 21e, Section IV, Field Artillery Equipment: "There should be a towed tank destroyer gun developed whose primary mission is the destruction of tanks with maximum thickness of armor."

3. If tank destroyers are to remain in their present status, the following changes are recommended in Section V:

a. Delete par 29a.

b. Add to par 29b: "Capable of road speeds of 40 miles per hour."

c. Add to par 32a: "Indirect fire control equipment should also be provided."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD  
PRELIMINARY STUDY -

SECTION VI, CAVALRY EQUIPMENT

Section VI is concurred in with the following addition:

1. Add to par 35c: "These vehicles are special purpose vehicles and are intended for general use, rather than for organic equipment of mechanized units."

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-ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD  
FIELD DIARY STUDY-

## SECTION V.I, ANTI-AIRCRAFT EQUIPMENT

Section VII is concurred in with the following additions:

1. And to par 40: "In addition, mobility of all mounts should be increased and better on-carriage sights should be provided for automatic weapons. A certain amount of armor for protection of personnel is also desirable for automatic weapons mounts. Since antiaircraft is an integral part of the ground force team, the improvement of weapons should also be directed towards greater adaptability to ground roles. Mounts should be capable of rapid emplacement and withdrawal, and weapons should be capable of firing at negative angles of elevation in all directions."

2. And to par 42a: "All mounts for antiaircraft units in army areas should be of the self-propelled, multiple type. The caliber .50 antiaircraft machine gun is of such value that careful consideration should be given before replacing this weapon by the 20mm gun. In order to be effective, the following minimum rates of fire must be met by the new super-velocity gun:

- (1) a single weapon, 700 rounds per minute.
- (2) a multiple weapon, 3,000 rounds per minute."

3. And to par 42c: "This unit should be capable of engaging sea targets at a minimum range of no greater than 4,000 yards, in order to overlap the line of the projected 75mm gun."

4. And to par 43a: Research should include new methods of fire control for the provision of defense against V-2 missiles."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

## SECTION VIII, AIRBORNE EQUIPMENT

Section VIII is concurred in with the following additions and exceptions:

1. In lieu of par 46, substitute: "The Airborne Division should be capable of the same sustained action as the ground division and should be organized and equipped in accordance with this concept. In addition to the combat equipment of the standard infantry division, special equipment is required. This equipment involves that necessary for transporting, dropping, and assembling of personnel and equipment after dropping, and material designed to be used during the airborne assault phase when the airborne troops are expected to operate as a group of unintegrated self-sustaining units. The following are special equipment requirements considered essential:

- a. Non-oscillating parachute, possibly of triangular design, with means of deceleration.
- b. Light-weight parachute for gliderists.
- c. Quick release device for parachute which obviate removal of equipment.
- d. Small equipment bundle complete with canopy which may be jumped on parachutists, released during descent and controlled by line attached to jumper.
- e. Quick release tie-down for lashing equipment in glider.
- f. Improved equipment for dropping supplies and heavy equipment.

The present method of dropping supplies is inefficient with reference to the ratio of pay load to gross weight, and lacks necessary pattern control. The use of bomb-like containers, technique of release, and aid to develop ac-

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curacy should be investigated so that dropping of equipment and supplies can be done from varying altitudes with the pattern and accuracy of present day bombing. The use of bomb-like containers with time or proximity (fuse) parachute release devices should be investigated to permit dropping of supplies from high altitudes and at greater speeds. Research should begin immediately for the development of para-crates and frames to drop larger caliber artillery, vehicles, radios, etc. It is believed that loads of greater weight and dimensions of the one-quarter ton truck can better be landed by glider.

g. Improved communications, aircraft to aircraft, to permit last minute instructions and coordination between units.

h. Improved communications, ground to air, to permit airborne troops already on ground to instruct incoming troops as to best landing areas.

i. Continued improvement in pathfinder technique to include use of infra-red, radar and directional antenna.

j. Lighter weight gas mask.

k. Streamlined aids for briefing airborne troops at take-off air-dromes. Time allowed for this all-important instruction is often inadequate. The use of rubber sand tables and recently developed photos is suggested.

l. Camouflaged jump suit with removable liner.

m. Infantry rifle recommended in Section II of shorter length or detachable stock to facilitate jumping.

n. Light-weight waterproof covers for all weapons.

o. Operations tent and equipment bundle for units down to company which can be dropped by parachute.

p. Improved day and night assembly aids for personnel and equipment. Use of infra-red, direction antenna and induction frequency locator recommended.

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q. Pack boards and other equipment carrying devices to be used during the initial stages of an airborne assault.

r. Psychological weapons, such as battle-field noise making devices, to be dropped in enemy lines.

s. Improvement in airborne medical supplies."

2. Add to par 47a: "Airplane and glider development should include controlled deceleration, helicopter descent, self-sealing fuel tanks, protective armor and armament, and high cruising speed."

3. Add to par 47c(1)(a): "Further study should be made toward using fighter type aircraft as a more practical solution for towing gliders."

4. Add to par 47c(1)(b)<sup>1</sup>: "This glider is practical only in case it does not require too large a landing zone."

5. Add a par 47c(1)(b)(3): "Power gliders capable of taking off empty or lightly loaded with casualties and returning to base."

6. Add a par 47e: "For operation over water, aircraft should be capable of floating with full load."

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ETCUSA REVIEW OF  
 - ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
 PRELIMINARY STUDY -

## SECTION IX, AIR SUPPORT

Section IX is concurred in with the following additions and exceptions:

1. In lieu of par 48a, substitute: "All high performance aircraft should remain an organic part of the Air Forces and normal Ground Force requirements for liaison and helicopter type aircraft should be assigned to the Ground Forces, but should continue to be supplied and maintained by Air Force type units. It is desirable to have photographic and reconnaissance aircraft available with armies and corps as required, but under no circumstances should fighter-bomber and transportation type aircraft be placed organically in the armies."

This latter statement is made for the following reasons:

- a. Operations with fighter-bomber and transportation type aircraft can only be employed in a sector where we have gained air superiority.
- b. The successful employment of fighter-bombers and transportation type aircraft depends on their protection from enemy fighters by top cover which will continue to be furnished by Air Force fighters.
- c. The fact that fighter-bombers are not assigned as organic aircraft to the ground forces does not preclude the development of equipment, tactics, and techniques for close support of ground troops. This requirement could be met by designating a portion of the Air Force during peace time whose primary mission is to develop close support techniques. This appears to be the most feasible method of insuring that development is carried on in this most important field.

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d. Assignment of fighter-bombers to ground forces would make it much more difficult to mass the air effort in front of any one army thereby resulting in a loss of flexibility of air power which has been a most important factor in our operations.

e. The loss of the effect of pattern bombing in close support operations will far outweigh any advantage the ground forces may gain by having fighter-bombers organically assigned.

f. In some operations the bombing effort was wasted due to poor selection of targets by untrained ground commanders. This waste, we feel, will be greatly increased if aircraft are assigned organically to ground forces.

2. Delete par 48b. Reason: Premise outlined in 48a above.

3. Delete par 48c(1). Reason: The operations in this theater have proven beyond doubt that personnel operating aircraft in direct support of ground troops may give excellent support with no knowledge of ground tactics other than that explained to them at the preflight briefing by the Ground Liaison Officer and the information they receive from the forward controller during the flight. The requirement for a team with one commander, we believe, will always be met as long as we continue to designate a Supreme Commander for a theater of operations.

4. Reference par 48c(4):

It is recommended that the priority be changed by designating different primary missions to separate sections of the air forces and charging them with a secondary mission of constantly arranging training programs which will enable other sections of the air forces to practice the tactics and

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techniques developed without devoting all their time to the development of the techniques.

It is believed that the air-ground team can be made much more effective by reorganizing and improving the TALO and GIO systems which were used so successfully in this theater. The use of a combined operations center is the most important factor in these operations and should be studied with the view of adopting the same type center for Army and Corps installations.

5. Delete last line of par 49b. Reason: Premise outlined in 48a, above.
6. Add to par 49e: "A very definite need for this type aircraft exists for immediate re-supply of isolated units. It is suggested that a pool be established at Army level for attachment to operating Corps and Divisions."
7. Add to par 50a: "Further study and development of micro-wave early warning and SCR-584 radar will do much to improve the effectiveness of close support bombing."
8. Add to par 50b: "Further study and development of the Ground Liaison Officer system will do much to remove the possibilities of a short bombing. A better method of reporting front line locations should be developed such as the British Phantom system."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

SECTION X, SEACOAST ARTILLERY EQUIPMENT

Section X is concurred in with the following additions and exceptions:

1. Add a new par 52a, and renumber 52a, b and c as 52b, c and d, respectively: "a. In the development of seacoast artillery materiel, fixed seacoast defenses should be developed for strategic points, but emphasis should be placed on mobile equipment with a minimum of fixed installations."
2. Add a par 53c: "c. Smaller caliber automatic antiaircraft weapons, to include the 20mm, 40mm, and proposed 75mm guns, will be used in a dual purpose role for defense against high speed motor torpedo boats and other fast surface craft."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

SECTION XI, FREE ROCKETS

Section XI is concurred in with the following addition:

Add to par 6ld: "Illumination, noise-making, 'window', and leaflet dis-  
tributing projectiles should also be developed."

Add par 6le: "See recommendation for rocket in par 2le, Section IV."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

## SECTION XII, GUIDED MISSILES

Section XII is concurred in with the following exceptions and additions:

1. Change par 63b to read: "To supplement the Tactical Air Forces."
2. Change par 63c to read: "To supplement the Strategic Air Forces."
3. Add to par 65: "Illumination type missiles should be developed."
4. In lieu of sentences two and three of par 66, substitute: "The missiles in the first three bands would have their principal use as long-range artillery for ground force operations. The very long range missiles should be employed by the artillery in the support of strategic operations, and should have the maximum range obtainable with a reasonable degree of accuracy."
5. Add to par 69: "Projectiles designed on the hollow charge principle should be investigated."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

## SECTION XIII, RECOILLESS GUNS

Section XIII is concurred in as written. The recoilless gun development program should correct the functional difficulties and limitations experienced with this weapon by this theater; reference 1st Ind, Hq ETO to CG, AGF, file AG 472 OpGC, 22 June 1945, to letter Hq AGF to CG, ETOUSA, file 472 (s)(14 April 1945) GNRQT-11/22276, subject: "Recoilless Weapons", dated 14 April 1945.

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ETOUSA REVIEW OF  
-ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY-

## SECTION XIV, AMMUNITION

Section XIV is concurred in with the following additions:

1. Add to par 72a(1): "A finish to be applied like paint should be developed that provides a completely uniform surface."

2. Add to par 72a(2): "The minimum requirement for the steel should at least equal the core in present HVAP ammunition."

3. Add to par 72a:

"(5) Further design on the study of AA projectiles should tend toward increasing the ratio of the weight of the bursting charge to the weight of the shell proper.

"(6) Continued research must be conducted to improve ammunition packaging. The following points should be stressed:

(a) Packages must be portable by one man (75 lbs or less).

(b) There should be protection from deterioration under all climatic conditions. Powder bags for separate loading ammunition should be completely waterproofed. Increments for mortar shells should be inclosed in improved containers.

(c) Package must be easily opened.

(d) Package must withstand rough handling during shipment.

(e) Package must be easily and economically stacked.

(f) There should be standardization and reduction of different types per caliber.

(g) Marking for easy identification in darkness should be improved. It is further recommended that some simple type of color code be adopted so that where unskilled labor is used in handling, the different types

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can readily and easily be distinguished.

(h) Model and code numbers should be reduced.

(7) Uniformity in exterior ballistics should be sought among the various types of projectiles fired from the same weapon.

(8) There should be additional research in hollow charged projectiles for all calibers from 75mm up.

4. In lieu of par 72b, substitute: "Cartridge Cases. (1) Due to possible shortage of copper, research should be conducted to develop a metal or other substance; possible plastic, having the same or better physical characteristics than brass for use in manufacture of cartridge cases.

(2) Reduction in weight is an essential consideration. Research should include the possible use of a stable, durable explosive case which will supplement the charge and be self destroying.

(3) A cartridge case to eliminate difficulties of extraction and stoppages with particular reference to small arms should be developed."

5. In lieu of first sentence par 72c(1), substitute: "There is an urgent and uniform demand for moisture resistant propellants possessing smokeless and flashless characteristics."

6. Add to par 72c(2): "This increased velocity should not be obtained by a decrease in the weight of the projectile."

7. Add to par 72c(4): "..... , but not at the cost or loss of essential velocities. Undue emphasis on reduction of erosion will result in loss of velocity, and as a result high velocity guns may be developed that will not give peak performance on the battlefield."

8. Add a par 72c(9): "All rounds should be manufactured and issued to include propellant increments up to the maximum charge."

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- 3 -

9. Add to par 72e: "Means should also be provided for adjustment of the sensitivity of VT fuzes so that maximum effectiveness can be obtained against different types of targets."

10. Add to par 72f: "The possibility of determining the amount of propellant from each powder lot required to establish a standard muzzle velocity for each charge for every weapon should be investigated. Powder increments should be assembled to produce this standard velocity, thus obviating dispersion from one powder lot to another. All components of the complete round of fixed and semi-fixed ammunition must be of the same lots to insure identical powder, shell weight, and finish. Accuracy is important, but it is essential that the necessity of segregating artillery ammunition by lot number at the firing position be eliminated. HE and smoke shells should have same ballistic characteristics to allow the use of smoke shell in registration."

11. Add to par 72g: "A packaging for tracers should be developed that is light in weight, and provides adequate protection under all climatic conditions. A delay action tracer is required for all calibers that will commence illumination at 300 yards."

12. Add to par 72h: "Research should develop an improved method of shell filling to obviate the tendency of the WP filler to settle 'off center' during storage, thus causing erratic flight. The following should be developed:

- (1) Colored smoke for spotting charges for heavy calibers.
- (2) An improved incendiary filler for grenades, rockets, and all types of artillery shells.
- (3) A thin case, base ejection shell for use with incendiaries, flares, and propaganda leaflets."

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- 4 -

13. Add a par 72i: "Illuminants. Range and effectiveness of battlefield illuminants should be increased. Both parachute flares and ground burning flares should be available for projection from a variety of weapons. Ballistics of illuminant shells should be identical with those of the standard projectiles. 'Silent Sentinels' such as ground flares operated by trip wires, should be improved."

14. Add to par 73a:

"(1) A safe, impact type of offensive hand grenade with maximum blast effect should be developed.

(2) A combined hand and rifle grenade should be developed with improved projection features that eliminate the necessity for special cartridges. The possibilities of an 'on the spot' conversion of the grenade into an improved shape charge for digging of individual emplacements should be exploited.

(3) Special effort should be made to improve hand grenade fuzes to:

(a) Eliminate noise of ignition of delay fuzes.

(b) Eliminate sparks during burning of delay fuze.

(c) Eliminate smoke prior to detonation.

(d) Provide better water proofing.

(4) A small hook should be provided on the body of all grenades in order to facilitate convenient attachment on equipment, and thereby make the grenade available for instant use with cold, gloved, or muddy hands."

15. Add to par 73c: "The possible use of standard artillery ammunition should be considered for ground firing of AA guns of corresponding caliber."

16. Add to par 73d: "The possible use of bacteriological agents as a filler should also be investigated. The propellant for guided missiles should and throughout the flight of the missile, maintaining or increasing the velocity."

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17. Add to par. 73f: "This development should include research on radio controlled mines capable of being activated, de-activated, and detonated by remote control."

18. Add to par 73a:

"h. Line Carrying Projectile. A projectile should be developed that will carry a line, a telephone wire, prima cord, etc., with or without grappling hooks.

i. High Frequency Vibrations. The destructive effect of high frequency vibrations should be extensively researched. One discovery in this field may well render our present arsenal of weapons completely obsolete. Further research on weapons and ammunition should take into account all new discoveries in the field of physics and chemistry, as well as endeavoring to improve our present line of weapons."

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ETOUSA REVIEW OF  
 -ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD  
 PRELIMINARY STUDY-

## SECTION XV - ENGINEER EQUIPMENT

Section XV is concurred in with the following additions and exceptions:

1. In lieu of last sentence of par 75a, substitute: "Careful consideration should be given to the determination of the responsibility for providing mapping information. Adequate support should be given to the responsible agency."

2. Add a par 75b(2)(c): "A plane capable of performing night photographic missions."

3. Add to par 75b(4): "The following are desired:

(a). A light, rapid direct process reproduction machine to replace the present slow, bulky, gelatin process machine, to be used in the reproduction of overlays.

(b). Possibilities of retogravure or some continuous tone method for reproduction of photomaps should be investigated.

(c). A two color offset press of capacity and characteristics similar to present Webendorfer Lithographic Press.

(d). A forced dryer for 24" x 30" or larger negatives for installation in the reproduction train.

(e). A safe model heater requiring little maintenance for use in the reproduction train.

(f). A compact, rapid printer and developer for reproduction of tracings.

(g). A portable, sturdy single control rectifying camera.

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(h). Redesign multiplex equipment with longer focal length so that high altitude photography may be secured at larger scales than are now possible with 6 inch cameras.

(i). A base film or acetate less subject to changes in size as a result of temperature and humidity variation than the present topo base film or acetate.

(j). A simple field process for color separation work.

(k). A more durable and waterproof paper.

(l). Luminous maps.

(m). A method of portraying relief more easily interpreted by the average reader.

(n). A mapping camera and mount that will automatically adjust itself for tip and tilt and varying light condition.

(o). A simple and portable field instrument for compilation of topographic detail from aerial photographs.

(p). Simplified methods of obtaining mass production of vector-graphs.

(q). A new slotted templet cutter, adjustable to any scale of photograph with ancillary equipment.

(r). A machine precision pantograph for cutting plaster models both on a plane surface and a dome surface (earth curvature).

(s). A special hydraulic press for production of paper models from cement or metal dies.

(t). A mobile one-frame multiplex unit capable of operating in the field.

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(u). Experimentation should be continued on multi-color printing papers to permit color reproduction of limited numbers of colored maps.

(v). A precise aerial camera with levelling equipment and remote control navigation equipment (such as radar) for mapping photography.

(w). Improved equipment for the duplication of negatives automatically.

4. Add to par 76: "The development of a continuous purification process to replace the present sedimentation method should be undertaken. The present portable equipment should be mounted in a trailer. Equipment should be developed for rendering sea water potable. Research should be conducted in decontamination of chemically impure water. The discharge hose in the present purification equipment should be improved to increase its life."

5. In lieu of par 77a(1), substitute: "Experimentation should be continued with the present 50 and 80-ton bridges and the projected 125-ton bridge to secure a capacity of 200-tons with the same equipment. The use of cellular type float construction to provide flexibility in constructing bridges and fixed piers of different capacities should be investigated. Treadway bridges should be provided with solid decks instead of treadways."

6. In lieu of par 77a(2), substitute: "The present footbridge is unsatisfactory in that it lacks strength at the joints. A new bridge should be designed which is simple, readily portable, easily assembled by the using troops, and capable of supporting men with full field equipment at 2-pace intervals and in currents up to 10 feet a second. Consideration should also be given to the development of an armored transporter, to be self-launching"

7. Reference par 77b(1): "Recommend variable length transoms so that

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roadway width may be varied."

8. Add a par 77c: "Miscellaneous:

(1) A scissors type bridge should be developed capable of carrying a medium tank over a span of 80 feet. The transporter should be armored.

(2) Portable equipment should be developed for reinforcing existing bridges of all types."

9. In lieu of par 78a, substitute: "The engineers are at present without an armored reconnaissance vehicle. A vehicle should be provided which is the latest type standard armored reconnaissance car."

10. Add to par 78b: "The motor and chassis of this vehicle should be of a standard Ordnance type."

11. Add to 2nd sentence, par 79b: "- under all conditions of water, mud, ice and/or snow and will not require highly skilled operators or be so slow in operation as to be impracticable."

12. Add a par 79c: "Miscellaneous:

(1) An effective method of laying and neutralizing mines from the air should be investigated.

(2) Mine fuzes should be developed that are detonated by induction from mine detectors, together with means for defeating similar type fuzes developed by the enemy.

(3) 'Tarnsand' or a substitute should be provided for use in facilitating removal of friendly non-metallic mines.

(4) Protection should be developed for use of personnel engaged in clearing mines and attacking fixed fortifications.

(5) Line detonator equipment should be developed which produces a strong field of radio energy and thus would set off radio activated mines at a safe distance.

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(6) A mine which becomes inoperative and safe to handle after a six-month or other period of time should be developed."

13. Add a par 79.1: "The following are additional equipment requirements:

a. A military angle dozer with integral front armor for both operator and engine, with a front mounted cab. Present armor on bulldozers is inadequate.

b. A quick-starting, silent, dependable portable motor for propulsion of assault and storm boats. The electric motor has possibilities in this field. The present outboard motor is unsatisfactory in that it is exceedingly difficult to start, undependable in operation, requires excessive maintenance and a highly trained operator.

c. A lighter weight assault boat that is seaworth in swift waters and with a minimum capacity of 13 men.

d. A light, stable reconnaissance boat of 6-man capacity, easily maneuverable in currents up to 11 feet per second and with a noiseless propulsion unit.

e. A self-propelled craft having shallow draft, low silhouette, loading and unloading ramps, capable of transporting 50-ton loads such as tanks or heavy artillery, and with such overall dimensions and weight as to permit easy cross country transport and easy launching. This craft should be maneuverable in 11 feet per second currents.

f. Self-propelled rafts capable of operating in currents of 11 feet per second and with capacities from 80 to 150 tons are required in order to provide early armored support in river crossing operations.

g. Standard protective booms for bridges. These booms should be

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portable, easily erected, and effective against floating mines, underwater swimmers, midget submarines, barges, and explosive loaded speed boats.

h. The development of 'ASDIC' for use in streams should be continued.

i. A shaped charge powerful enough to penetrate 15 feet of reinforced concrete."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

## SECTION XVI, CHEMICAL EQUIPMENT

Section XVI is concurred in with the following exception and additions:

1. Add par 81c: "A sampling kit should be developed which will provide a suitable means of collecting samples of agents in the field from contaminated ground or vegetation and from gas clouds or aerosols."
2. Delete par 82b: Reason: It is believed that the logistics and danger to friendly personnel would make this weapon unsatisfactory and that a rocket or jet propelled weapon would be more feasible.
3. Add a par 82e: "Research should be continued to improve the mechanical smoke generators."
4. Add a par 82f: "Research should be continued on time, delay and VT fuzes for 4.2" mortar."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY

## SECTION XVII, TRANSPORTATION

Section XVII is concurred in with the following exceptions and additions:

1. Add a par 85g. "Miscellaneous:

(1) All motor vehicles should be designed with a view to eliminating as many special maintenance tools as possible, particularly in the lower echelons of maintenance.

(2) As a matter of principle, reliance on commercial vehicles should be abandoned, and military types developed with emphasis on standardization of component parts and assemblies.

(3) Close coordination must be maintained with communication development agencies in order that vehicle electrical systems will be readily adaptable for radio and radar.

(4) A shelter or superstructure to fit on the 2½-ton truck and/or a suitable trailer to convert them into a CP vehicle for commanders, a shop truck, or supply truck is required.

(5) Provision should be made for self-sealing fuel tanks in airborne vehicles."

2. Add to par 86a:

"(5) Improved tread design for wet and dry traction.

(6) Development of an airtight pneumatic casing on a safety rim to eliminate inner tubes."

3. In lieu of par 86b(7), substitute:

"The development of an improved general purpose track with attachments for snow, ice, sand, etc."

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~~SECRET~~4. Add a par 86c(6):

"The development of a series of standard engines having four, six, eight, and twelve cylinders, all engines having interchangeable parts, such as pistons, connecting rods, bearings, valves, electrical accessories, oil filters, and instruments."

5. Add a par 86f:

Miscellaneous. Automotive research should also include:

- (1) The development of clutches and brakes to last the normal life of the vehicle.
- (2) Improved sealing of assemblies against water and dirt.
- (3) The development of waterproofing methods and materials which will eliminate necessity for immediate de-waterproofing after wading or swimming of vehicles.
- (4) The development of better safety features, and elimination of vehicular blind spots, such as cab posts and body projections.
- (5) The development and provision for all vehicles of an explosive charge, and place for same, for their emergency destruction."

6. Reference par 87b(1) and (2): Recommend substitution of 3/4-ton truck for 1 $\frac{1}{2}$ -ton truck.

7. In lieu of par 87d, substitute: "This group should be eliminated when developments in full track or wheeled vehicles provide superior military characteristics."

8. Add to par 87i: "The development of a lightweight motorcycle not to exceed 250 lbs and capable of sustained operation under 30 miles per hour is necessary for traffic control and messenger service. Such a vehicle should be adaptable to parachute dropping and should replace the present airborne motor scooter. High speed is not a prime requisite in military motorcycles."

9. Reference par 87k(2): Recommend that wagon type trailers be eliminated.

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ETOUSA REVIEW OF  
-ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY-

SECTION XVIII, COMMUNICATION EQUIPMENT

Section XVIII is concurred in with the following exceptions and additions:

1. Reference par 88a: Concur in this as a guide for future development of equipment. .
2. Reference par 88c: Concur in this as a guide for future development of equipment. The maximum integration of the communication system is a worthy objective upon which to base future development of signal equipment. However, it is not believed practicable to effect complete integration under the responsibility of a single agency and maintain the highly desired, present basic principle of command responsibility for signal communications. Tactical development and training of personnel should be the responsibility of the Signal Corps. All communication personnel must also have training in the branch or arm to which assigned by that arm or branch.
3. In lieu of second sentence of par 89b, substitute: "However, no differentiation between speech security equipment for use on radio or wire circuits should be contemplated."
4. Add to par 89c: "That communication radio equipment designed for use by troops in forward areas, should be provided with appropriate remote control systems to decrease the casualties in both men and materiel, caused by enemy fire being directed on the antenna of the radio equipment."
5. Add a par 89e(5): "Increase the possibility of interchangeability of basic components such as oscillators, power supply, rectifiers, etc., by standardization of components and unit assemblies."

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6. Add a par 89f(4): "Development of silent hand wire laying equipment for use in forward areas is also necessary."

7. Add a par 89f(5): "A rugged van-mounted, multiple switchboard arranged for three hundred local trunk circuits on a four panel multiple basis, capable of expansion to six, eight or ten positions, should be developed for use in army communications."

8. Reference par 89i: Recommend assignment of a high priority to this activity.

9. Add to par 89n: "In addition to greater sensitivity, newly developed direction finding equipment should have antenna patterns giving greatly improved azimuth accuracy. Research should be continued to provide means to counteract the azimuth errors caused by surrounding objects such as trees and overhead lines. This equipment should not be further complicated by elaborate apparatus for determining sense."

10. Add to par 89o: "Standardization of these batteries should be stressed."

11. In lieu of par 89p, substitute: "Power units. A fundamental research project should be established in order to evolve a series of dependable power units having the following characteristics:

a. Be lightweight and capable of operating for extensive periods of time without replacement, and require absolute minimum amount of maintenance.

b. Be capable of generating light loads equally efficiently at full load requirements with very good voltage regulation throughout the range.

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c. Be capable of operating efficiently on the type of fuel most readily available to troops in the field.

d. Permit refueling and indicate oil level while operating.

12. Add a par 89r: "Photographic Equipment. There is a requirement for a single still camera embodying the Leica or Contax style of body using a standard (US) 80mm roll film, having a built-in flash equipment and supplied with a basic set of three lenses (wide angle, regular and telephoto)."

13. Add a par 89s: "Cryptographic Equipment. (1) The SIGABA should be redesigned to permit the cutting of tape simultaneously with the printing operation.

(2) A compact, simple and secure device for use by front line units, to replace the M-209, is required.

(3) There is a need for a high grade device, similar in principle to SIGGUM for use by headquarters down to and including division."

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AF USA REVIEW OF  
 -ARTY GROUND FC USES, EQUIP EMP LEVEL LOAD  
 PRELIMINARY STUDY-

SECTION XIX, SURVEY EQUIPMENT

Section XIX is concurred in with the following exceptions and additions:

1. Add to par 90c: "The establishment of projects for a means of detecting mortar locations and determining relative locations of units are of immediate importance."
2. Add to par 92a: "Flash ranging equipment should be designed to effect a more compact and safer instrument for combat use."
3. Add to par 92d: "Immediate need exists for lighter, soundplotting equipment and lighter, more compact sound ranging microphones."
4. Add a par 92i: "Recommend the following priority:
  - (1) For immediate development and procurement:
    - (a) Control of maps and map substitutes.
    - (b) Detection of mortar location.
    - (c) A means of determining relative locations of units and individuals.
  - (2) Long range planning:
    - (a) Survey equipment.
    - (b) Sound ranging equipment.
    - (c) Ocuograph.
    - (d) Meteorological equipment.
    - (e) Field Artillery counter battery radar.
    - (f) Ground control of liaison planes.
    - (g) Counter measure to radar guided missiles.

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f. Add to par 93a: "Recommend that a lighter and more compact meteorological equipment be developed and that provision be made for obtaining metro data deep in enemy lines for very long range artillery."

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ETOUSA REVIEW OF  
- ARMY GROUND FORCES, EQUIPMENT REVIEW BOARD,  
PRELIMINARY STUDY -

## SECTION XX, RADAR EQUIPMENT

Section XX is concurred in with the following additions and exceptions:

1. Add to par 95:

"c. A lightweight long-range radar to provide early warning for antiaircraft. Such a set should have a range of at least 120 miles and should be capable of detecting low-flying aircraft at a much greater range than the present equipment.

"d. A more positive means of identifying friendly aircraft than present IFF (identification of friend or foe) equipment should be developed as an integral part of all antiaircraft radar sets.

"e. The development of jet and rocket-propelled aircraft has reached the point where an entirely new system of antiaircraft measures is needed. It is believed that the guided missiles program should provide the basis for this new system. A long range research and development program should evolve a radar fire control system which will contain radar, computer and control equipment for the guided missiles as one piece of equipment."

2. Add to par 98a: "Consideration should be given to the detection by means other than radar if research and development indicate other systems are more desirable."

3. Add a par 98c: "An IFF device capable of being triggered by friendly radar, including ground and airborne sets, should be provided the individual soldier with the view to positive location of forward elements."

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4. Add to par 101a: "The necessary security devices should be incorporated in the design of this set."

5. Add a par 103: "In order to take full advantage of technological progress, future development of military radar equipment should parallel closely the developments of commercial equipment."

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