MISC

N-15422

REPORT

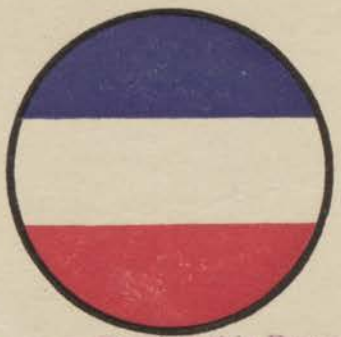
of the

Army Ground Forces Board No. 3

FORT BENNING, GEORGIA

DISTRIBUTION:

12 CG, AGF
2 File



Instructors Reading this Document

Sign Below (File No. _____)

Signed _____ Date _____

Project No. 2044

LECTURE

TRENDS OF DEVELOPMENT
IN

INDIVIDUAL WEAPONS AND EQUIPMENT
CLOTHING AND FOOD

Date 17 March 1947

Cy #12

13274 FT. BENNING, GA. 10 MAY 46 1,000

8 APR 1947

P.O. Req # H-6085

ARMY GROUND FORCES BOARD NO. 3
Fort Benning, Georgia

350.001(18 Mar 47)GNBOM

18 March 1947

SUBJECT: Orientation Lectures, Trends of Development, for Use in ORC and National Guard Courses during Summer, 1947

TO: Commanding General, Army Ground Forces
Fort Monroe, Virginia
ATTN: GNDEV-21

1. Reference your letter (325(19 Feb 1947)GNDEV-2), dated 19 February 1947, Subject same as above, inclosed is Orientation Lecture prepared by this Board.

2. The President, Army Ground Forces Board No. 3, has knowledge of and approves this lecture.

FOR THE PRESIDENT:

ERNEST C. PETERS
Lt Colonel, Infantry
Recorder

Incl
Orientation Lecture,
Project No. 2044

PREFACE

The enclosed lecture "Trends of Development in Individual Weapons and Equipment" was prepared by Army Ground Forces Board No. 3, Fort Benning, Georgia.

This lecture is designed to cover a period of one (1) hour.

A number of photographs are appended to be shown either by slide or bell optican in conjunction with the lecture. The proper place for showing of these photographs is indicated in the text of the lecture.

An indexed list of reference data is attached to the lecture as background material for the instructor presenting the lecture. In a few cases reference data can be obtained from the publication "Trends in Development" or other available W.D. publications.

LECTURE

TRENDS OF DEVELOPMENT

in

INDIVIDUAL WEAPONS AND EQUIPMENT,

CLOTHING AND FOOD

TRENDS IN DEVELOPMENT IN INDIVIDUAL WEAPONS AND EQUIPMENT,

CLOTHING, AND FOOD

(PURPOSE AND GENERAL INFORMATION)

The purpose of this lecture is to acquaint you with the progress made since the war in the development of individual weapons and equipment, clothing, and food, and to acquaint you with the trends of the future. The items to be discussed today are those which have been, are being, or will be tested by Army Ground Forces Board No. 3 at Fort Benning, Georgia. This Board has jurisdiction over the following:

a. Light weapons (man-carried) with necessary fire control equipment and mortars to include 125mm.

b. Individual clothing and equipment.

c. Ground Quartermaster equipment.

d. Ground Chemical Warfare equipment.

e. Maintenance equipment for above.

This jurisdiction carries with it certain responsibilities, among which are the following:

a. Evaluation of all recommendations for the development of new or the improvement of existing equipment which may be sent to the Board.

b. Review and study of foreign equipment.

c. Preparation of military characteristics and recommendations for development.

d. Performing service tests.

e. Recommending modifications in or standardization of test items.

f. Recommended basis of issue.

g. Continuous observation and review of reports of performance of standard items.

I shall discuss briefly the major projects which have been handled by Board No. 3 during recent months.

In the development of individual and hand-carried weapons, an effort is being made to increase accuracy, penetration and performance

and to decrease weight, flash, smoke, and fatigue of operation. It is still necessary to compromise to secure the most desirable characteristics for different types of weapons.

(PISTOL)

The pistol will be retained as a weapon for those individuals who are not normally engaged in the forward areas of the combat zone but may have occasional use for a protective weapon which can be easily carried. While the present automatic pistol is fairly light, weighing 39 ounces, and has a remarkable accuracy in the hands of a skilled user, it is believed that a lighter-weight pistol can be developed. It has been recommended that a pistol be developed, which will not have a caliber greater than .~~38~~ 25 nor weigh more than ~~40~~ 25 ounces. The normal method of carrying the pistol will, no doubt, be changed from the previous method used by the Ground Forces to a shoulder holster, which was an expedient adopted by many officers and men during the war. A shoulder holster was standardized to meet this requirement.

(CARBINE)

The present caliber .30 carbine, M2, which has selective semi-automatic and automatic fire will be retained. With the inclusion of the automatic feature on this weapon, there seems to be no further requirement for a sub-machine gun.

(RIFLES)

The present caliber .30 rifle, M1, is an excellent weapon, but it is believed that its weight can be reduced. There is being developed a rifle which will weigh not more than seven pounds and will be capable of selective semi-automatic and automatic fire. There has already been developed a modified M1 rifle which is capable of selective semi-automatic and automatic fire. This is the T27 rifle. (Photo 1) The automatic feature is accomplished by fourteen new parts and modification of two parts of the present M1 rifle. It utilizes the same clip for feeding as the present M1 rifle. (Note button just above trigger guard for selective automatic and semi-automatic fire.) Another recent development is the T20E2 rifle. (Photo 2) It has the selective semi-automatic and automatic features. This rifle is fed by a 20-round magazine similar to but not interchangeable with the BAR. Both these rifles are furnished with a bipod and weigh only slightly more than the M1. Of the two, the T27 seems to have more merit. Some thought was given to adopting the T27 as an interim rifle pending perfection of the new light-weight seven-pound rifle. This idea has been abandoned. This rifle is also being considered as a possible replacement for the present BAR.

Results of recent winter tests have shown that the M1 rifle cannot be fired easily and its sight and windage screws cannot be adjusted when heavy mittens are worn. (Photo 3) To overcome this difficulty, new types of triggers and extensions on sight and windage adjusting screws are being developed to permit proper operation of the rifle when heavy mittens are worn. (The top rifle is an unmodified M1 rifle. The two lower rifles are modified rifles.)

(MACHINE GUN AND TRIPOD)

There is under process of development an all-purpose caliber .30 machine gun which, ~~when fired from a bipod, will replace the BAR and when fired from a tripod~~ will replace all present caliber .30 machine guns. This new machine gun will not exceed 20 pounds in weight, which is considerably less than the present water-cooled machine gun, which weighs 37 pounds, and the present A4, which weighs 30 pounds. The bipod for this gun should not weigh more than two pounds. (Photo 4) There has already been developed a new tripod, the T113, weighing about 25 pounds, to replace the present 1917A1 tripod, which weighs 53 pounds. The lightness of this tripod is obtained by the use of aluminum in its construction. To overcome the large dispersion which is inherent in a light-weight tripod, a recoil mechanism has been built into the cradle. With a few modifications, this tripod will be very satisfactory. (Photo 4 shows the M1917A1 machine gun mounted on the T113 tripod.) (Photo 5 shows the 1919A4 machine gun mounted on the T113 tripod.)

(SNIPERSCOPE)

During the war development in the infrared field began. There were developed night-driving devices and a sniperscope for the caliber .30 carbine to enable the firer to see and fire on his target at night. Development continues to improve and lighten the sniperscope. Its maximum effective range at present is 100 yards. The sniperscope is being adapted to all types of rifles, machine guns and the 57mm recoilless rifle. (Photo 6 shows the sniperscope mounted on the M1C rifle.)

(MORTARS)

The present standard 60mm mortar is the M19. (Photo 7) This mortar furnishes either bipod fire or one-man operation, with the tube hand-held. This mortar now may be either trigger-fired or fired by the drop method. While this weapon has proven to be excellent in its present state of development, more improvement can be made in its sights. (Photo 8 shows the mortar being fired from a high-angle position.) (Photo 9 shows the mortar being fired from a low angle.)

The present standard 81mm mortar is the M21. (Photo 10) This mortar employs a two-piece barrel and two-piece baseplate, which enables it to be used either as a short-barrel or long-barrel-weapon. This mortar can be broken down into loads, no one of which weighs more than 28 pounds. Future developments of this mortar will be the addition of a third piece to the firing tube, to increase its range, and an improvement in the characteristics of the ammunition. (In the picture the M21 mortar is on the left, the old M1 mortar is on the right.) (Photo 11 shows it as a short-barrel weapon.)

During the war, the 4.2" chemical mortar proved very effective in close support of the Infantry. (Photo 12) New fuzes, M8 and M9, for the 4.2" mortar have been developed to replace the fuzes M2 and M3, found defective during the war. At the conclusion of the war, there was under development a 105mm mortar. (Photo 13) Phase II of this mortar weighs approximately 300 pounds and is designed to be broken down into six hand-carried loads of 50 pounds or less. Although designed to produced ranges up to 4400 yards, a maximum of less than 3000 yards was attained during tests. This is believed to be the faul of the ammunition. The projectile for this weapon weighs 26 pounds. This mortar is fired by the drop-fire method only.

Phase III of this mortar is similar in design to the Phase II mortar, but is not intended to be hand-carried. (Photo 14) It is designed to be transported on the cart, T33. (Photo 15) This mortar weighs approximately 400 pounds. It was designed to produce ranges up to 6000 yards, but like the Phase II mortar, this range was never realized because of the faulty ammunition. Further development of this caliber mortar is being continued. The final design will include the best features of the 4.2" chemical mortar, which is rifled, and Phase II and III of the 105mm mortars, which are smooth bore.

(RECOILLESS WEAPONS)

During the war, there was great development in recoilless weapons. We now have the 57mm (Photo 16) and the 75mm recoilless rifles, (Photo 17) which are standard, and the 105mm recoilless rifle, which is still experimental. They are exceptionally accurate. However, the recoilless weapons have two major disadvantages. The first is the tremendous back-blast. This blast is inherent in the weapon as now designed and at present there is no prospect of successfully eliminating this blast. The second is our inability as yet, and the prospects to date do not look good, to fire a fin-stabilized, hollow charge with great penetrating efficiency. At present, the HEAT round of the 57mm rifle will penetrate only three inches of homogeneous armor. The 75mm HEAT round will penetrate only three and one-half inches. Neither of these approaches the 2.36" rocket or the 3.5" rocket. (Photo 18. The 2.36" rocket launcher is shown on the left, the 3.5" on the right.)

(ROCKETS)

The bazooka, or 2.36" rocket launcher, is an exceptionally fine weapon. The increased range and accuracy of the T69 rocket, which will penetrate eight inches of armor, will be tremendous assets. (Photo 19: The new T59 rocket is shown on the right, and the *standard M3A3 rocket on the left.)*

(FLAME THROWER)

The present standard portable flame thrower is the M2-2. (Photo 20) The E3R1 flame thrower has been designed to replace the M2-2. (The standard M2-2 is shown on the left, the E3R1 on the right) The E3R1 contains many improvements: safety, ease of operation, and maintenance. However, it weighs 39½ pounds, while the M2-2 weighs 32. It has been recommended that when the weight of the E3R1 is reduced to that of the M2-2 it be standardized. There has also been developed a one-shot flame thrower. (Photo 21) This is the E16R1. This flame thrower weighs 30 pounds, has a range of 25 yards, and a burning time of three to four seconds. After being used, it is to be left on the battlefield and picked up later.

(DUST RESPIRATOR)

In a further effort to reduce the weight and bulk of the dust respirator and to produce an item acceptable to all troops, easily carried, comfortable and still provide adequate protection against dust (Photo 22), the type E23 dust respirator was developed. It is an expendable item. This dust respirator was found superior to the present standard dust respirators but needs slight modifications prior to being standardized. (The E23 dust respirator is shown on the left, and the M2 in the center, with the M1 on the right.)

(GAS MASK)

A new type gas mask, the E48-Hill-E15 has recently been tested and found satisfactory. (Photo 23) It is lighter, more easily carried, easier to wear and interferes less with a man's activity than the present gas mask. The face piece of this mask is made of butyl rubber which does not set in cold weather, down to 0°F., or storage. The carrier is made of waterproof canvas. These features are improvements on present equipment. (The E48 mask is shown on the left, the M5, M8, and M9 in order from left to right.)

(BODY ARMOR)

Military characteristics have been set up for body armor. (Photo 24) These characteristics call for an armor which weighs not more than eight (8) pounds, affords maximum protection against shell fragments and low velocity missiles, is flexible, does not aggravate

seriousness of wounds, does not appreciably increase soldier's body discomfort, is worn on the outside of the uniform and is capable of easy and quick removal. An armored vest, M12, weighing 12.3 pounds and an armored apron, T65, weighing 1.7 pounds, have been developed which meet all requirements except that of weight. (Photo 25 is a rear view of the armored vest M12.) Future design will include a reduction in weight.

(CLOTHING)

The next subject is clothing. In extremely cold climates and mountainous terrain more casualties have been caused by inadequate clothing and equipment and the improper use of adequate clothing and equipment than have been caused by enemy forces. Each soldier must learn a special technique to enable him to live comfortably and safely in the field under adverse conditions. Ignorance and carelessness in using and caring for specialized clothing and equipment is far more serious in mountainous and cold climates than elsewhere. Remember that a soldier who has become a casualty due to the weather is just as useless as one knocked out by enemy fire.

Let us now review the basic principles for keeping warm. Materials used for clothing are either good conductors or good insulators. Those which resist the transfer of heat are said to be good insulators. Suitable cold weather clothing is not warm in itself. It is merely a good insulator and a poor conductor of heat. The heat of the body is held in by the clothing and prevented from escaping into the atmosphere. Since still air is an excellent insulator, the best cold weather clothes are those which entrap a considerable amount of air. The warmth of a woolen sweater lies mainly in the thousands of tiny air cells between the woolen fibers. Fur is warm because of the air trapped among the hairs. Several thin layers of cloth are better than one thick, heavy, matted piece of material, because of the air pockets formed between the layers. Cold weather clothing must be roomy. If it is tight, much of the insulating air will be squeezed out. Moreover, the pressure on the body will restrict the circulation of the blood, which must move freely if frost-bite is to be avoided. Loose-fitting clothes are perhaps not as smart in appearance as most military clothing, but they are essential if casualties from the cold are to be avoided. Dirt and grease mat clothing and fill the air pockets which give it its warmth. Grease makes clothing a good conductor of heat and a poor insulator. Therefore, dirty clothes are cold clothes. Clothes which are to be worn in cold weather must, therefore, be kept as clean as possible. Moisture is a good conductor of heat. When clothing gets damp, the spaces previously occupied by the extra insulation become filled with heat-conducting moisture, which allows body heat to escape. Clothing must be kept dry if it is to furnish good insulation. Since perspiration is the one factor most likely to cause wet clothing, shed clothing

before getting wet. In cold weather it is better to be slightly chilly and dry than to run the risk of sweating. To stay warm, avoid getting hot. There is a second reason for avoiding perspiration. Evaporation of perspiration causes a great loss of body heat. Regardless of care taken, short periods of strenuous activities will always result in some perspiration. In such cases, loose clothing can be opened at the neck, sleeves, waist, and ankles to allow air to circulate over the skin and evaporate perspiration before the body becomes overheated.

I am now going to show how a soldier should be dressed for a temperature of 14° above zero while standing still or a temperature of zero while marching with a light pack.

First, his undergarments. (Photo 26) These consist of woolen undershirt, woolen underwear and a pair of wool cushion sole socks. (Photo 27) Next, a flannel shirt, wool trousers and a pair of ski socks are added. (Photo 28) The third layer consists of a high neck sweater, field cotton trousers, and a second pair of ski socks. (Photo 29).

The fourth layer consists of a field pile jacket, a field cap, wool glove inserts and a pair of shoe pacs. (Photo 30)

The final layer is the field jacket M1943, with hood and leather gloves.

(WORK SUIT)

Here is an item of equipment which has been found unsatisfactory. (Photo 31) It is a one-piece working suit with drop seat. It was designed to provide a better working suit for motor mechanics, vehicle drivers, and armored crews. Its main features were that it was weather-proof, snag-proof, and had a drop-seat. However, it had the following deficiencies: It was found difficult to adjust underwear, it was unsatisfactory for wear in hot weather and the zippers on the drop seat were uncomfortable. (Photo 32)

(ANTI-PERSONNEL MINE PROTECTIVE SHOE)

A special item of equipment is an anti-personnel mine protective shoe. (Photo 33) This shoe has a sponge-rubber sole with a water-proof envelop to prevent absorption of water. It weighs about 5.5 pounds. This shoe reduces the ground pressure of a man from normal of 6.5 to 7 lbs. per square inch to 1-1/2 lbs. per square inch. It gives adequate protection against shoe and S-mines in hard ground, medium soft ground, and loose sand. This item has been found suitable for adoption if modified to be more durable and more water-tight at the ankle. (The T-2 shoe, the one described, is shown on the right. A prior model, the T-1, is shown on the left).

(FRONT LINE SLEEPING SUITS)

There are now under test four different types of front-line sleeping suits. (Photo 34) Type I has elbow-length sleeves with no closure to the sleeves. The legs are without zipper openings, but the feet and the lower portion of the legs for about 12 to 14 inches are reinforced with durable material so that a man can walk about in the suit without destroying the material. (Photo 35) Type II is similar, except that this type has close-fitting, full-length sleeves with wool cuffs. (Photo 36) Type III has close-fitting wool cuffs and a vertical zipper on the inside of each leg so that a man can remove his feet from the sleeping suit. It is placed on the inside to force the bulk to the outside of the leg when he opens the suit and sticks his feet out of it. (Photo 37) Type IV is one without any sleeves, but with zippers on the sides, the zipper closures are operated from the inside of the suit. These sleeping bags were tested by our Winter Task Forces and were favorably received.

(HELMETS)

Development continues in helmets. There are two types of Doron helmets. (Photo 38) The Doron, Type I, consists of layers of white fabric made of spun glass and cotton, molded into position by a thermo-plastic binder. This helmet softens under heat, losing its shape. The Doron, Type II, has an inner layer of brown cloth instead of white. That is one of the distinguishing features of the two helmets. It does not soften on heating. Neither has a liner, and neither is as heavy as our M1 helmet. Neither is as durable as the M1, especially around the rim. Both are non-magnetic. (The Doron Type I is shown on the left, the standard M1 in the center and the Doron, Type II, on the right). (Photo 39 is a side view of those same helmets). In addition, there has been tested an aluminum compound helmet with a nylon liner. (Photo 40) It is also non-magnetic. Its shape is somewhat different from that of the M1 and also from the Doron. (The aluminum helmet is on the left, the standard M1 on the right). (Photo 41 shows the aluminum helmet on the left, the standard M1 on the right). The Doron, Type II, and the aluminum have both shown up in tests with better anti-fragment characteristics than has the M1. It is expected that the Doron helmet Type II, with liner, will be returned for further tests, as well as the aluminum, with a different shaping, and all three helmets will be subjected to thorough tests to determine which of the three is best.

(CLOTHING DEVELOPMENT)

Further development in clothing and equipment is being made towards refinement in design, improvement of existing material, and development of new techniques for subsequent incorporation into military garments.

Refinement in design is being made to make items more acceptable to the user and to reduce the number of required sizes. A study of footwear is being made to furnish it in narrow, medium and wide widths and in whole sizes only. Outer garments will be sized in small, medium and

large with short, regular and long being provided in each of these sizes. Some items, as jackets, will also be furnished in extra large size. These sizes will replace chest measurement sizes in short, medium and long.

Existing materials are being improved to make woolen fabric water repellant and shrink resistant and to waterproof leather. Examples of development in new materials and techniques are as follows: Water impermeable but water vapor permeable fabric; spun plastic insulation for possible use in clothing and sleeping bags; adhesives for use in fabrication of military equipment.

(KITCHEN TENT)

Board No. 3 is experimenting with various types of tents and portable shelters. One is a kitchen tent, Type II. (Photo 42) It is a double ridgepole, stack type tent, 17 x 10 x 9 feet. The stack, to help dissipate heat and fumes, is 2-1/2 feet taller than the tent. (Photo 43) It has nylon screens with "lift-the-dot" fasteners. The full weight of this tent without poles and pins is 216 pounds, and it has 216 square feet of floor space. Modifications called for on this tent are as follows: A washable interior canopy; a redesign of the chimney; a zipper-closed entrance in the rear; and larger stake flaps.

(PORTABLE SQUAD SHELTERS)

Two types of portable squad shelters have been developed and are being tested. Each of these types is 16 x 32 feet. Type I of these shelters has an aluminum roof and vents (Photo 44). Type II of these shelters has a plywood roof and vents. (Photo 45). These shelters have been developed as a replacement for the Tent, Squad, M1942, and/or the Tent, Sectional Hospital. They are designed to provide adequate protection from the weather, dust, and insects for no less than two years of field use under tropical and temperate conditions. Its intended uses are:

a. Shelter for personnel.

b. Field hospital.

c. Aid station.

d. Field kitchen and bakery.

e. Ordnance maintenance company shelter

f. Supply depot.

g. Warehouse.

(MOBILE KITCHEN)

The Mallan mobile kitchen which is used by the Marine Corps has been recently tested. (Photo 46) This range with a 250 man capacity cooks on the steam pressure principle. However, this range weighs considerably more than the present field ranges; it cannot be broken down into small loads; it is difficult to maintain; and it cannot be broken down into components for use with small detachments. Likewise, it would be unsatisfactory for frigid regions.

Military characteristics have been submitted for a mobile kitchen to be mounted on a standard 2-1/2-ton truck chassis. The components of this kitchen may be dismounted from the truck when it is needed for other purposes in cases of emergency.

(MESS TRAY)

Two types of mess trays, a plastic and a steel, have been tested. (Photo 47) Each type contains six compartments. The shape and size of these compartments are almost the same; however, the compartments of the plastic tray are deeper than those of the steel tray. Each tray weighs about 1.7 pounds. Tests proved the plastic tray superior. It has been recommended that this type tray but with five compartments instead of six replace the meat can for feeding the soldier in the field and that it be used in garrison mess halls. It has also been recommended that a container be provided to carry these trays and the necessary knives, forks and spoons. These trays will be organizational and not individual equipment. Under this system the trays will be used for feeding at the kitchen whenever combat conditions permit. When hot food is sent to the men in advance positions, trays will be forwarded with the meal. Upon completion of the meal the trays will be collected and returned to the kitchen. Under all conditions, the trays, knives, forks and spoons will be cleaned by kitchen personnel. It is believed that this procedure, in addition to being more sanitary, will eliminate a distasteful chore of the front line soldier.

(FOOD CONTAINER)

AGF Board No. 3 has also tested a new-type insulated food container. (Photo 48) It is a modification of the present standard food container M1944. This food container contains three aluminum pails which are rectangular in shape. These pails fit in an aluminum case, on the inside of which is spun plastic and a liner. A detachable cover fits over the pails. This container, having a total capacity of 5 gallons, is very satisfactory for carrying hot food to front line units.

(RATIONS)

A ration has been developed lately to replace both the present K and C ration. (Photo 49) This ration, called the E ration, consists of seven cans plus two accessory packets. Three of these cans contain meat units; two contain the biscuit units; one contains a four-ounce loaf of fresh bread and one contains a fruit unit. One accessory packet

contains toilet paper, spoon, salt tablets and can opener. The other packet contains nine cigarettes. This ration weighs about 5-1/2 pounds and has about 3900 calories. In order to obtain variety ten different meat units and four different fruit units have been developed. The biscuit units and bread units are the same in each ration. This ration has been extensively used at Camp Carson, Colorado, and by all the Winter Task Forces and was found to be quite satisfactory.

(The picture shows the seven cans and two accessory packs of the "E" Ration in the center panel. In the left panel are the breat unit (center, top) and the contents of the two biscuit cans. One can contains jam, sugar, soluble coffee, biscuits, candy and orange powder; the other can contains jam, sugar, cereal, biscuits, cocoa and soluble coffee. In the right panel is the next item, the Post Assault Meal, which consists of two cans, one containing a meat unit and the other a biscuit unit, and an accessory packet, shown at the top. In the center of this panel are shown the contents of the biscuit unit, cereal, candy, biscuits, soluble coffee and chewing gum. At the bottom are the contents of the accessory packet; can opener, spoon, toilet paper and heat tablets).

The Post Assault Meal was developed in order to give the soldier, who is out of reach of his kitchen, or any supply agency, some sustenance until his regular ration can be furnished. The main feature of this ration is its container. (Photo 50) It is a sardine-type can which, it is believed, is a tremendous improvement over the round type can which at present contains the C ration. The size of this can is somewhat deceptive. There is less than 1/2-ounce difference between the contents of this can and one of the C type ration cans. The soldier can heat this ration much easily than he can the C ration by using the biscuit can of this ration as a stove in which he places his heat tablets for fuel. Taking his meat unit can, opening the lid, all except for one end, and by using the lid as a handle, he can uniformly heat his ration. Those of you who have had experience with the C ration know that when the top of this can is removed the food spills over the side. Further, it is almost impossible to heat the contents with a heat tablet.

The Quartermaster General is now developing an assault ration utilizing a cylindrical tin (3 1/2" diameter and 1 1/2" height) capable of being carried in the pocket of the Field Jacket M1943. It is believed this type can will serve as a stop gap until the optimum type of can is produced by the can industry.

(REVISION OF MARKSMANSHIP COURSES)

A project is under way to revise rifle, automatic rifle and machine gun marksmanship and training in order to introduce more realism into small arms training.

In this project marksmanship will be broken down into individual and team training. Individual training will be divided into three phases; known distance firing, technique of fire, and transition firing.

Known distance firing will generally follow present courses.

Technique of fire will test the individual's knowledge of range estimation, target recognition, target designation, fire orders and fire distribution.

Transition firing will include the present transition course, firing at moving targets, assault fire, and a quick firing course similar to the old so-called combat course.

An individual must attain a certain per cent in each course in order to qualify.

Team training will be divided into two phases: Field firing, when no tactical situation is involved and combat firing, when a tactical situation is involved. Both will include squad and platoon firing exercises.

Changes may be made in the above as result of tests.

In this revision, consideration will be given to various camouflage targets suggested by General Hodges, First Army Commander, in the effort to introduce realism into the training. (Photos 51, 52 and 53 show some of the camouflage targets being considered).

(NECESSITY FOR APPROPRIATIONS)

In conclusion it is desired to point out that constant effort is being made by AGF Board No. 3 to give the soldier greater mobility, improve his armament and equipment, and provide him with more effective fire. Rate of progress in development is directly related to the funds provided by Congress for this work. To maintain a steady and suitable rate of progress in research and development will require through the peace-time years, sums of money without previous precedent in peace-time appropriations. Obviously, if our army is to be equipped with the modern arms, ammunition, clothing, rations, and the other many items of individual and unit equipment demanded in this age of total, lightning war, funds must be provided by the Congress for their continued development. It is the duty of every citizen, especially those personally connected with and responsible for our National Defense, to keep this vital fact constantly before the public and the Congress.

T27 Rifle

Note button just above trigger guard for selective automatic and semi-automatic fire.

T20E2 Rifle

Note magazine feed

1 - M1 Rifle unmodified

2 - M1 Rifle with grip trigger extension assembly. Exploded assembly is shown beneath rifle.

3 - M1 Rifle with modified trigger.

Note windage and elevation knobs on center rifle designed for cold weather hand gear.

1917A1 Machine Gun, Cal. .30,
mounted on T113 Tripod

1919A4 Machine Gun, Cal. .30,
mounted on T113 Tripod.

Sniperscope mounted on M1C rifle.

Photo also shows brackets for mounting sniperscope on other infantry weapons.

The 60 mm M19 Mortar

The 60 mm M19 Mortar

At high angle, the M19 mortar can be lanyard-fired in this position. At low angle, however, it displaces too much to the rear, unless the base plate has firm support.

The 60 mm M19 Mortar

A satisfactory position for low-angle firing.

81 mm Mortars

M21 Mortar

M1 Mortar

M21 Mortar with single section of firing tube and center section of base plate, for use as short barrel weapon.

4.2 inch Chemical Mortar

105 mm Mortar

Phase II mortar set up, with base plate not dug-in.

105 mm Mortar

Phase III mortar with barrel clamp in mid position and bipod legs at minimum extension.

105 mm Mortar

Phase III mortar on the cart, showing how base plate rests on the ground for attaching to, or removing from, the cart.

57 mm Recoilless Rifle mounted on T113 Tripod

75 mm Recoilless Rifle mounted on T113 Tripod

1 2

1 - The 2.36" Rocket Launcher

2 - The 3.5" Rocket Launcher

Confidential

45107-2

1 2

Rockets for 2.36" Launcher

1 - T59 Rocket

2 - M3A3 Rocket

4.6232-2

M2-2 Flame Thrower

E3R1 Flame Thrower

E16R1 One-shot Flame Thrower with bipod open for firing from the ground.

M23
Dust Respirator

M2
Dust Respirator

M1
Dust Respirator

1 2 3 4

1 - Experimental Gas Mask M48-M11-M15

2 - Standard Gas Mask M6-11-7

3 - Standard Gas Mask M8-11-10

4 - Standard M3-10-6

Body Armor

Vest, M12 and Apron, T65

Armored Vest, M12

Winter Clothing

Winter Clothing

Winter Clothing

Winter Clothing

Winter Clothing

46148-4

Inverted "V" Drop-Seat Suit - Front View

46148-3

Inverted "V" Drop-Seat Suit - Rear View

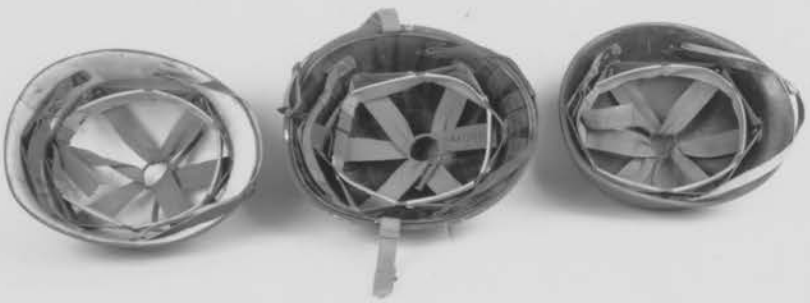
Anti-personnel Mine Shoes

Front Line Sleeping Suit, Type I

Front Line Sleeping Suit, Type II

Front Line Sleeping Suit, Type III

Front Line Sleeping Suit, Type IV



1 2 3

1 - Doron Type I, showing natural white cloth lining

2 - Steel w/Liner

3 - Doron Type II, showing natural brown lining.

46489-2

Doron Type I Steel w/liner Doron Type II

T21E1 Helmet w/liner

M1 Helmet w/liner

T21E1 Helmet

M1 Steel Helmet

Tent, Kitchen, Type II, Closed

Tent, Kitchen, Type II, Open

Shelter, Squad, Portable with Aluminum Roof (open)

Shelter, Squad, Portable with Plywood Roof (closed)

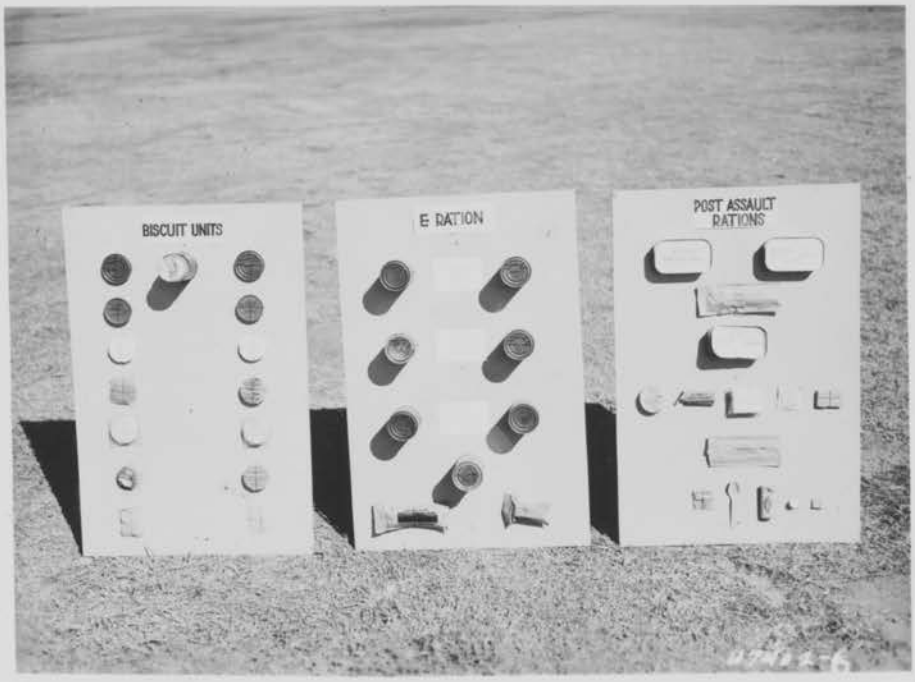
Kitchen, Mobile (Mallan)

Tray, Mess, 6-Compartment, Plastic

1 2

1 - Container, Food, Insulated, M-1944 "Production Model"

2 - Container, Food, Insulated, M-1944 "Production Model" (Modified)



Left - View showing Biscuit Components of E Ration

Middle - View showing E Ration Complete

Right - View of Post Assault Ration

ق-1

Post Assault Meal and Utilization of Rectangular Tin.

"B" unit, "M" unit (pork and beans) and accessory pack.

A B

A - Standard "D" Target

B - Experimental Target D1

Note scoring spaces are identical on both targets.

A B

A - Standard "D" Target

B - Experimental Target D2

Note scoring spaces are identical on each target.

3-4

A B

A - Standard "D" Target

B - Experimental Target D3.

TABLE OF CONTENTS

REFERENCES

Reference material on the following items appear in issues of "Trends in Development":

T20E2 and T27 Rifles	August 1946
Kitchen, Van Type	August 1946
T113 Machine Gun Tripod Mount	January 1947

Reference material on the following item is available in TM9-314:

57 mm Recoilless Rifle

Reference material on quartermaster clothing and equipment is available in Research Program 1946-1947, Office of the Quartermaster General.

AGF Board No. 3 Project No. 1927, 21 Dec 1945

CONTAINER, FOOD, INSULATED, M-1944 (PRODUCTION MODEL)

1. Description of material: The container, food, insulated, M-1944, is constructed of lightweight material, is rectangular in shape, 20.5 x 9.7 x 15.5 inches (outside dimensions), the outer shell of the container and outer cover are embossed and painted olive drab. The outer cover is secured to the container by means of four draw-down closure clamps, two of which are fastened both to the container and cover and serve as hinges.

Three rectangular inserts are provided, which fit inside the container, anyone of which may be removed independently of the others. Each insert is equipped with a triangular carrying bail and a gasketed cover, which under the pressure of the closed outer cover provides a partially watertight seal.

The production model differs from the pilot model, previously tested as follows: The production model is embossed in a different manner and to a greater extent. The sides of the container in the production model are made of two pieces of metal joined together whereas in the pilot model they were made of one piece of metal joined at one end of the container. The draw-down closure clamps of the production model are larger and the handles of the clamps are bent further up the shaft, which causes them, unlike the pilot model, to protrude at an angle from the side of the container. The insulating material used in the production model is a spun plastic whereas that of the pilot model was a cork-like substance. The inner compartment and the inserts of the production model appear to be of seamless construction in contra-distinction to the pilot model. The insert covers of the two models differ in design to a minor degree.

2. Conclusions: The Board therefore concludes that:

a. The production model of the Container, food, insulated, M-1944, is suitable and satisfactory for general use and is highly desirable to replace the standard Container, round, insulated, M-1941.

AGF Board No. 3, Project No. 1960, 24 April 1946

MORTAR, 81MM, M21 (MODIFIED)

1. Description of Materiel:

Subject weapon is an 81mm mortar, capable of being broken down into 6 loads instead of the three loads of the M1 mortar. The tube, bipod and baseplate can be divided into two loads each. The mortar is generally similar to the T19E9 mortar tested by the Board previously. Subject mortar differs from the T19E9 in a number of details. Two major changes are the method of clamping the two sections of the tube together and the size and design of the baseplate.

2. Discussion:

a. Subject mortar is a further development of the T19E9 mortar. The Board concluded that the T19E9 mortar, modified as recommended, would be a desirable replacement for the M1 mortar.

b. Subject mortar includes most of the modifications recommended on the T19E9 mortar, with a few additional changes. Subject mortar represents a definite improvement over the T19E9 mortar, although some additional defects have been discovered, as is common with experimental materiel.

c. It is believed that subject mortar, when modified as recommended herein, will be superior to both the M1 and the T19E9 mortars.

3. Conclusions: The Board concludes that:

a. There is a military requirement for an 81mm mortar which provides for maximum flexibility in hand-carrying and in firing.

b. Subject mortar will meet this military requirement, when further modifications have been made.

4. Recommendations: The Board recommends that:

a. Subject mortar be modified.

b. When so modified, the mortar, with an additional muzzle section, be submitted to this Board for further tests.

AGF Board No. 3 Project No. 1999, 4 Nov 1946

KITCHEN, MOBILE, (MALLAN)

1. Description of Materiel: The Mallan Mobile Kitchen (USMC Mobile Field Range M1945) is a self-contained cooking unit mounted on a two-wheeled trailer, and is designed to feed a maximum of 250 men. The range proper is a compact unit which weighs approximately 1,680 pounds and is fastened to the trailer by four bolts. In normal operation, the range is equipped with a burner which will operate with either Diesel oil, kerosene, or gasoline as a fuel. However, by removal of the burner, burner plate, and the floor plate of the fire box, the range may be used with wood or coal as the fuel.

The trailer for this kitchen consists of two parts, the body and the chassis. It is a standard 1-ton water tank trailer. The body is welded to the chassis frame and is of all-steel construction. The forward part of the body has a bowl-shaped cowl with a meat block built in over a drawer and cabinet. Adjacent to the meat block on either side are storage compartments. The covers of these two compartments, equipped with cushions, provide seats for two riders.

2. Conclusions:

a. That the fuel consumption was greater for the standard field range than with the experimental kitchen.*

b. That the weight of the standard type kitchen was less than the experimental kitchen.*

c. That there was little difference in the mobility of the standard field range and the experimental kitchen.*

d. That the standard field range was easier to maintain and repair than the experimental kitchen. When the fire unit of the experimental kitchen was out of adjustment, its repair was beyond the knowledge and skill of the average mechanic.

e. That, starting with a cold kitchen, more time was required to prepare a meal with the experimental kitchen than with the standard field range. That, with a warm stove, the time required for food preparation was the same.

f. That the cooking utensils of the experimental kitchen were easier to clean than the utensils of the standard field range. This was due to encrustation of food on pots and pans, which were of the substitute type furnished with the standard field range during the war.

g. That the same type transportation was required to haul either type range.

h. That, due to inconvenient arrangement of cooking compartments, the experimental kitchen was slightly less convenient to use in the field than the standard field range.

i. That the cooking capacity of the experimental kitchen was greater than that of the standard field range; i.e., more different types of cooking could take place simultaneously.*

j. That there was no difference in washing mess gear by the use of either range.

k. That the feeding capacity of the experimental kitchen was between 250 and 300 men.

l. When using gasoline, that there was a greater fire hazard to personnel operating the experimental kitchen than to personnel operating the standard field range.

m. That the durability of the experimental kitchen was less than that of the standard field range. It was considered unsatisfactory.

n. That the versatility of fuel for use with the experimental kitchen was greater than that with the standard field range.

o. That the reaction to freezing weather was greater with the experimental kitchen than with the standard field range.

p. That the experimental kitchen and the standard field range are both equally capable of producing a balanced meal.*

q. That either the experimental kitchen or the standard field range could be used on troop trains. However, to mount the experimental kitchen in the troop train is a laborious procedure and requires additional heavy equipment. The standard field range can be mounted with comparative ease and requires no additional heavy equipment.*

r. That feeding under combat conditions, the experimental kitchen was better than the standard field range, due to the former being mounted on a vehicle, which permits cooking at all times. However, the fact that the experimental kitchen could not be subdivided into units as in the case of the standard field range, precluded its use by company detachments on widely separated missions.

s. That more adequate utensils were furnished with the standard field range than with the experimental kitchen.*

t. That the experimental kitchen was designed to be used for cooking while on the march. The standard field range could be so employed only after other kitchen baggage is unloaded from the truck.

u. That inasmuch as the experimental kitchen was an integral part of the trailer, damage to the trailer would result in a loss of its cooking facilities. Under similar conditions the standard kitchen could be unloaded and operated in the immediate vicinity or transferred to another truck.

*Note: This conclusion is based upon a comparison between the experimental field range and a standard three-unit kitchen range.

3. Recommendations:

a. That the Mallan Field Range be considered unsatisfactory as a kitchen unit to replace the present standard field range.

b. That a Mobile Kitchen be procured and furnished this Board for service test.

Infantry Board, Project No. 1879, 30 September 1945

SUIT, WORKING, ONE-PIECE, WITH DROP SEAT

1. Material:

a. Three types of one-piece working suits, with drop seat, were furnished for test:

(1) TYPE "A". This garment is generally similar to the standard herringbone twill, one-piece coverall, except that it has a zipper closed, inverted "V" shaped drop seat, zipper closures on the front and on the left breast pocket. Protective flaps over the zippers are secured by means of snap fasteners. The garment is also provided an inside waist drawstring.

(2) TYPE "B". This garment differs from the Type "A" suit only in the shape of the drop seat which resembles an inverted "U", the cargo pocket on the leg is seven inches lower and an additional patch-type pocket is provided on the outside of the left leg, below the knee.

(3) TYPE "C". This garment is similar to the Type "A" and "B" suits but the seat opening is a zipper closed vertical slit, slightly to the right of the back center seam, extending from a point just below the waist line to a point well below the crotch on the inside of the right leg. The zipper has no protective flap. The breast pocket and front are provided with snap fasteners.

b. The standard herringbone twill one-piece working suit and standard herringbone twill two-piece working suit were included in the test for purposes of control and comparison.

2. Conclusions: The Board concludes that:

a. The subject Suits, Working, One-Piece, with Drop Seat, Types "A", "B", and "C", are of improper and unsatisfactory design.

b. A one-piece working suit with a drop seat designed as described in the preceding paragraph would more fully meet the proposed military characteristics and would be suitable and desirable for use by personnel for whom a one-piece working suit is provided.

3. Recommendations: The Board recommends that:

a. No further consideration be given the subject Suits, Working, One-Piece, with Drop Seat, Types "A", "B", and "C".

b. The one-piece working suit be considered unsatisfactory as a uniform for the Infantry combat soldier.

TRAYS, MESS, 6-COMPARTMENT, STAINLESS STEEL AND PLASTIC

1. Description of Material:

a. General:

(1) The stainless steel and plastic trays each have six shallow compartments (two rows of three each). The sides of the compartments are flat surfaces, inclined at an angle of 45° to the bottom of the trays to facilitate nesting.

b. The plastic tray is the Army Medical Department Issue Item No. 9958400. It is 15.68 inches by 11.81 inches, weighing 1.77 pounds. The compartments are one inch deep. It has a pleasing mottled tan color.

c. The stainless steel tray is 15.53 inches by 11.62 inches; has an interior depth of .72 inches; and weighs 1.70 pounds. It has a brushed, "satiny" appearing surface; in contrast to the mirror-like surface of the issue-type stainless steel tray.

2. Conclusions:

a. A mess tray is desirable and practical as an item of organizational equipment and the meat can as an item of issue can be done away with.

b. The design of either tray is suitable for the intended purpose.

c. The number, shape, and depth of the compartments are not satisfactory.

d. (1) The stainless steel tray is more durable than the plastic tray, but the durability of the plastic tray is satisfactory.

(2) The plastic tray produces less noise than the stainless steel tray.

(3) The weight of both type trays is about the same. The bulk of either type tray is not excessive and is less than that of an equal number of meat cans.

(4) Either type tray can be cleaned satisfactorily with means now provided.

e. A container for carrying the trays is necessary. This container should have a compartment for knives, forks and spoons to accompany the trays.

f. No special equipment or changes in authorized kitchen equipment is necessary other than listed in paragraph 2 e above.

3. Recommendations:

a. 200 each plastic mess trays of five (5) compartment design be made and submitted to this Board for further test.

b. A container suitable for carrying these trays be designed; that this container provide a separate compartment for knives, forks and spoons; and that total weight of container and contents not exceed 50 pounds.

c. Consideration be given to replacement of china in garrison messes by mess trays.

Infantry Board Project No. 1856, 28 Aug 1945

105MM MORTAR PHASE II (MORTAR T13, BASE PLATE T15, MOUNT T26E1)

105MM MORTAR PHASE III (MORTAR T33, BASE PLATE T12, MOUNT T26, CART T12

1. Description of Materiel:

a. Mortar, 105mm, Phase II.

This item was designed for a maximum range of 4400 yards, for break-down into suitable loads for man-pack for short distances, and for greater stability than that of the Phase I Mortar. It consists of the following principle components:

(1) Mortar, T13: This assembly is a two-piece smooth bore tube joined by a split ring type of locking collar. The base cap is provided with a stationary firing pin for drop firing. A base firing mechanism is not provided.

(2) Base Plate, T15: The base plate assembly consists of a circular base plate section for firing at short ranges and an annular section which can be attached to the circular section to provide additional flotation for long-range firing. Clamps attached to the annular section provide the means for locking the two sections together. The assembled base-plate is dished to avoid the overturning moment of the recoil and increase stability.

(3) Mount, T26E1: This assembly consists of:

(a) A bipod similar to that used with the 60mm Mortar and identical with that used with the Phase III 105mm Mortar.

(b) A traversing mechanism of the inclosed screw type with a shock absorber and a sight leveling device incorporated. This mechanism is basically the same as that with the Phase III Mortar but has been lightened for man-carry.

b. Mortar, 105mm, Phase III:

This item was designed for a maximum range of 6000 yards, and the greatest possible stability and mobility. It is transported by towing on its own cart behind a 1/4-ton truck, and does not break down into loads suitable for man-carry except for short distances. It consists of the following principal components:

(1) Mortar, T33: This is a one-piece tube with base firing mechanism. It has annular corrugations for a portion of its length to provide non-sliding attachment to the bipod.

(2) Base Plate, T12: This is a single piece circular base plate weighing 162 pounds, provided with a central depressed seat for the base-cap ball and a recess forward of the seat to provide clearance for mounting and for traverse at low angles. The base plate is equipped with four carrying handles and clips for attachment to the cart.

(3) Mount, T26: This item is similar to the Phase II Mortar mount described above, except for the following:

(a) The cradle is corrugated to match the corrugations on the mortar tube.

(b) The traversing and shock-absorber assemblies are heavier and more rugged.

(4) Cart, M12: This item consists of two pneumatic tired wheels and axle with a horizontal yoke for attachment of the mortar tube and bipod legs, and a vertical yoke for attachment of the base plate. The lunette for towing is mounted at the forward end of the horizontal yoke. The assembled mortar, base plate and mount are loaded to and unloaded from the cart by turning the horizontal yoke into a near-vertical position and moving the wheels for engagement and disengagement of mating parts.

The cart and base plate are similar in design to those used on one of the Russian mortars.

c. Ammunition: Except for the propelling charges, the ammunition is the same for both the Phase II and Phase III Mortars. No propelling charges for Phase II and III Mortars have been furnished. All tests to date have been conducted with the propelling charges furnished for the Phase I Mortar. These charges consist of a base charge and 4 increments. Additional increments were provided for the longer ranges. Projectiles received weigh 26 pounds, are equipped with combination SQ-delay fuzes, and are of two types: HE and WP.

2. Recommendations: The Infantry Board recommends:

a. That the development program for the Phase II and Phase III mortars be continued as a high priority project.

b. That ammunition suitable for tests at maximum range be made available as soon as practicable for further tests of the subject mortars.

c. That study be given to a further reduction or breakdown in weights of Phase III mortar components for man-carry, even at the expense of increased total weight of the complete mortar and cart assembly, provided such action does not reduce stability accuracy, or maneuverability.

60MM MORTAR, T18E6

1. Description of Materiel:

The subject mortar designed for one-man operation, consists of a standard 60mm mortar tube, combination base cap with selective hand-operated trigger and fixed-firing-pin firing mechanism, and base plate, all joined to form assembly which is capable of separation into its basic components. A T59 sight, mounted on the T6 sight bracket is provided for laying the mortar. The hand operated trigger firing mechanism is designed for use at all angles of elevation of the mortar. The fixed firing pin, hence automatic ignition of the propelling cartridge, may be used when the angles of elevation of the mortar are such as to permit the shell to slide down the barrel with sufficient velocity to ignite the propelling cartridge upon its impact with the fixed firing pin. When the angle of elevation is such as to prevent this, then the hand operated trigger firing mechanism is used. The T59 sight for mounting on the T6 sight bracket is provided for laying the mortar. A web-carrying strap is provided for carrying the assembled mortar consisting of the T6 sight bracket, combination base cap and trigger firing mechanism and base plate. The following data are applicable to the subject mortar:

Weights (lbs)

Mortar tube only	9.54
Sight bracket, T6 and Sight, T59	0.87
Base Plate, T1 and carrying strap	3.56
Split nut	0.71
Base cap and firing mechanism	4.84
Total (lbs)	19.52

Dimensions (ins)

Length, overall, muzzle to base plate	33.2
Length, mortar tube only	26.6
Length, mortar tube with base cap and firing mechanism	32.1
Size of base plate (Approx.)	4x7

2. Conclusions: The Board concludes:

a. That there is a requirement in the Infantry for a means of converting the standard 60mm mortar to one-man use, as a platoon or squad mortar, when conditions render the use of a team-operated mortar impracticable.

b. That the firing mechanism and base-plate of the subject mortar are adequate and satisfactory means of adapting the standard 60mm mortar, when desired, to one-man operation, but should be improved by decreasing the force required on the lanyard.

c. That the T59 sight is inadequate and does not permit the exploitation of more than a small proportion of the full capabilities of the subject mortar, in that:

(1) The elevation scale is inadequately graduated for accurate laying except in the neighborhood of 45 degrees.

(2) The sight furnishes no means of avoiding cant or "trunnion tilt" and its accompanying errors in deflection.

d. That the application of the base firing mechanism of the subject mortar to all standard 60mm mortars, for future production with concurrent issue of the subject base-plate as an accessory, would greatly increase the flexibility and effectiveness of the standard 60mm mortar and increase the all-around battle effectiveness of the Infantry.

e. That a sighting line of white or luminous paint on the mortar barrel is desirable and would contribute to the effectiveness of the mortar.

3. Recommendations: The Infantry Board recommends:

a. That the base-plate and base firing mechanism of the subject mortar be adopted as standard accessories with all 60mm mortars issued to the Infantry, but that efforts be made to obtain functioning without the use of excessive force on the lanyard.

b. That the T59 sight be considered inadequate and unsuitable for use with the subject mortar.

c. That a suitable sight for the subject mortar be developed incorporating:

(1) Elevation graduations, applying equally to the "iron-sights" and to the levelling bubble, in increments of not exceeding one degree from zero to 60 degrees.

(2) A means of judging and avoiding cant in laying for direction.

d. That mortar tubes be marked with a longitudinal sighting line.

AGF Board No. 3 Project No. 1980, 2 Aug 1946

E23 LIGHTWEIGHT EXPENDABLE DUST RESPIRATORS

1. Description of Material:

a. Dust respirator E-23: A small cotton fabric mask designed to cover the mouth and nose of the wearer and to provide dust protection through the filtering action of the closely woven cloth cover. A small pliable lead bar in the upper band of the mask permits molding of the mask to the contours of the nose and face. A small copper wire in each side seam holds the mask in shape and permits the mask to be molded to fit the contour of the cheeks. The mask is held in position by a single adjustable elastic head harness.

b. Dust respirator M-2: A small triangular shaped mask with molded rubber edges, which fit the contours of the nose and cheeks. The cover of the mask is a felt material and provides dust protection through its filtering action. A rubber outlet valve in the lower portion of the felt cover facilitates exhaling.

c. Dust Respirator M-1: A large rather elaborately designed mask consisting of a molded rubber facepiece completely covering the mouth and nose and equipped with an intake and outlet valve. The rubber facepiece is studded with rubber projections which provide a dead air space between the rubber facepiece and the felt cover. This completely covers the mask and provides a dust filter.

2. Conclusions: The Board concludes that:

a. There is a military requirement for dust respirator of the E-23 type.

b. The E-23 Dust Respirator is superior to either the M-1 or M-2 type for general utility and issue.

c. The dust protection afforded by the E-23 dust respirator is slightly less than that afforded by the M-2 respirator but is adequate for normal operations.

d. The head harness of the M-2 dust respirator is superior to that of the other two types.

e. The following modifications would increase the utility of the E-23 dust respirator:

(1) Adopt the head harness currently provided on the M-2 type.

(2) Improve the workmanship of the side seams of the facepiece and blunt the ends of the copper wires to prevent their working through the fabric.

(3) Provide a tighter woven cloth, or layers of cloth, to improve the dust filtering quality and to increase fabric stiffness, to provide constant air space in front of the mouth and nose, without increasing the present breathing resistance.

3. Recommendations: The Board recommends that:

a. The E-23 Dust Respirator be modified as shown in paragraph 2 e, above.

b. When so modified, 100 of these masks be furnished this Board for further tests.

AGF Board No. 3, Project No. 1936, 10 July 1946

HELMETS, DORON AND HELMETS, T21E1

1. Description of Materiel:

a. Twelve Doron Helmets (six each of Types I and II), w/head bands.

(1) Type I consists of layers of white cloth, of spun glass and cotton, moulded into shape by use of a thermoplastic binder which softens on heating.

(2) Type II is similar to Type I except that the inner layer of cloth is brown instead of white and the binder is of a thermosetting compound which does not soften upon being re-heated.

b. Twenty Helmets T21E1, w/liners were received. Helmet is made of an aluminum alloy. The liner is of laminated nylon duck.

2. Summary of Tests:

a. Relative Comfort. The T21E1 Helmet with Liner is more comfortable to wearer than the M1. There is no appreciable difference in comfort between the Doron type and the M1 when worn under combat conditions. However, because it has a removable liner, the M1 helmet would be preferable to the Doron types from the viewpoint of comfort during peace time training and in rear areas during combat because the Doron does not have a removable liner and if worn at all must be worn in its entirety.

b. Silhouette and protection afforded to wearer. The silhouette of the T21E1 Helmet is lower than any of the other types but it does not afford as much coverage to the head and neck. The T21E1 Helmet and the Doron Type II Helmet afford the best protection against penetration by small arms and grenade and shell fragments. Of the two, the T21E1 affords better protection against shell fragments; and the Doron Type II is better against small arms.

c. Durability. The T21E1 Helmet and the M1 Steel Helmet are about equal in durability under normal usage. Since they are made of metal, they are both more durable than either type of Doron Helmet.

d. Effect upon magnetic instruments. The M1 Steel Helmet has a slight effect upon magnetic instruments. Neither the T21E1 nor the Doron Helmets have any effect upon magnetic instruments.

e. Suitability for use by paratroops. All of the different types of helmets are suitable for use by paratroops. However, the standard chin strap must be replaced by the Release, Chin Strap, T-1 in order to be suitable for wear in jumping from planes.

3. Conclusions: The Board concludes that the Doron Helmet Type II and the T21E1 Helmet, w/liner are worthy of further development.

4. Recommendations:

a. The Board submits the following general recommendations:

(1) Research be continued toward the development of a new design of helmet with lower silhouette than the M1, and which will more adequately protect the region of the forehead, temple, ears and base of the skull subject to the limitation that it must not unduly restrict free movement or interfere with wearer's normal duties,

(2) Eliminate the chin strap except for providing D-rings on helmets for the attachment of the Release, Chin Strap, T1, which is required for paratroopers.

(3) Continue research in the field of impregnating liners with radio-opaque substance for the detection of fragments which lodge in brain tissue.

b. The Board submits the following specific recommendations on the helmets under consideration.

(1) Helmet T21E1.

(a) Change design so as to provide greater protection in the region of forehead, temple, ears and base of the skull.

(b) Improve the manufacturing process of the liner to insure more uniform shape, better painting and more uniform application of the binder substance.

(c) Pre-shrink the head band of the liner.

(d) Modify the head band

(e) Provide for a space between the liner and the helmet so that they do not come in direct contact one with the other, except along the edges.

(2) Helmet, Doron, Type II.

(a) Change design so as to provide greater protection in the region of the forehead, temple, ears and base of skull.

(b) Provide a liner, with light chin strap. Liner and helmet to be constructed so that when worn the two do not come into contact except along the edges.

(c) Provide a non-magnetic protective bead.

(d) Provide a more substantial stud arrangement for fastening chin strap to helmet.

(e) Provide better binding material and stronger cloth in manufacturing the helmet.

(3) Helmet, Doron, Type I. No further consideration be given to this helmet.

The Infantry Board Project No. 1834-A, 10 Aug 45

BASE PLATE FOR 60MM ONE MAN MORTAR (T1E1)

1. Description of Materiel:

The subject base plate consists of two main components:

a. Pressure plate: This component is similar in shape to the T1 but said to be made of steel that will resist bending more than the T1.

b. Clamping collar: This component is of the split collar type. Both halves of the collar are pivoted at one end and clamped at the other end by a wing nut and bolt. When fastened, the clamping collar is anchored to the base plate by a mating ring and groove on the collar.

2. Conclusions: The Infantry Board concludes:

a. That the T1 base plate is a usable but not adequate base plate for the 60mm one-man mortar. It is not wholly adequate for the following reasons:

(1) Tendency of the base plate to bend when not fully supported during firing.

(2) Rotation of split collar when barrel is rotated, causing either locking of the barrel to the base plate or unlocking to create excessive play between base plate and mortar.

b. That the T1 E1 base plate is adequate except for the clamping mechanism which is unsatisfactory due to breakage and also to limitation to almost zero of the ability to traverse and elevate mortar barrel without moving base plate. However, this mechanism permits rotation of mortar barrel without locking or unlocking the clamping mechanism.

c. That an adequate base plate for immediate issue is the T1E1 base plate with T1 clamping mechanism with any device, washer or other means, to prevent objectionable rotation of the split collar when the barrel is rotated.

d. That a base plate curved longitudinally to approximately 7 inch radius warrants further test because of indicated advantages. The Infantry Board should be furnished three such base plates using as a basis base plate T1 E1 and T1 clamping mechanism with suitable locking device for the split nut. This base plate with 7 inch radius is a separate study and should in no way interfere with the immediate production and issue of base plate recommended in par. 2 c above.

3. Recommendations:

a. That the T1E1 base plate with T1 base plate clamping mechanism with suitable locking device (washer or other means) be produced, and issued to replace T1 base plates as an immediate measure.

b. That six (6) of the production models of the recommended base plate be sent to The Infantry Board for expedited check test.

c. That for further study, but not to interfere with the production and issue of the recommended base plate, three (3) longitudinally curved base plates, be fabricated and sent to The Infantry Board for further tests.

The Infantry Board Project No. 1793, 17 Jun 45

PORTABLE, ONE-SHOT FLAME THROWERS, E16 AND E15

1. Description of Material:

a. The portable One-Shot Flame Thrower, E-15 consists of a single unit which contains a combination nozzle and ignition cartridge screwed in the head of the unit and pressure storage coils wrapped around the fuel tank. In the pressure coils 1.4 lbs. of CO_2 is stored when fully charged. The tank unit, made of stainless steel, has a movable piston separating an integral expansion chamber for the propellant at one end and a feul storage tank on the other. The propellant storage unit, which consists of 100 ft. of steel tubing, is wrapped around the fuel chamber and connected to the expansion chamber by a trigger operated impact release valve. When the unit is to be fired, the trigger locking pin is removed and the trigger depressed. This operation releases liquid carbon dioxide through an orifice and into the expansion chamber which forces the piston forward. As the piston moves forward under the expanding pressure the fuel comes under increased pressure and at approximately 200 p.s.i. the shear plug ruptures the shear disc. As the disc is ruptured the escaping fuel forces the match striker out through the nozzle hood. As the striker is forced out, the ignition cartridge is ignited, which in turn ignites the discharged fuel.

The E-15 Flame Thrower was found not to be sufficiently developed for field testing due to the faulty valves and inadequate safety feature; hence, it was withdrawn from further testing.

b. The E-16 Portable One-Shot Flame Thrower basically is the same as the E-15. The principal difference is that instead of using liquid CO_2 as in the E-15 type, this model utilizes a stick of slow burning Cordite powder. This powder is secured in a propulsion chamber located in rear of the tank unit. When the trigger is pulled a striker is released, causing a primer to fire, which in turn ignites a black powder wafer on each end of the Cordite powder stick. The black powder wafers ignite the Cordite, which burns at a constant rate under pressure controlled by a pressure orifice into the expansion chamber. The expansion of the high pressure gas developed by the burning Cordite forces the piston against the fuel and ignition is identical with that of the E-15 Flame Thrower.

2. Discussion:

a. From the above results it appears that the E-16 Flame Thrower represents a highly successful phase in reducing the weight of the M-2 Flame Thrower; however, the decrease in capacity (50%) has decreased its effectiveness for neutralizing or producing a lethal effect upon occupants within a medium sized or large type bunker. Furthermore,

the ignition system as furnished is not positive for firing thin fuel, and causes a delay of half a second or more of the three or four seconds of firing time. There appears to be no reason why the ignition cartridge on the M2-2 Flame Thrower could not be adapted to this unit in a more satisfactory manner.

b. The E-15 type was found not sufficiently developed for a field testing at this time. The valve and safety features of this type were found to be unsatisfactory and unsafe for a continued test. However, if this type were satisfactory, there still exists in the field a large problem of obtaining, transporting, and weighing the right amount (1.4 lbs.) of liquid carbon dioxide for the E-15 type. The Cordite powder principle used in the E-16 Flame Thrower, which provides a means of furnishing pressure appears to be the better method, considering all phases of operation and resupply for Infantry units in the field.

3. Conclusions: The Infantry Board concludes that:

a. A requirement exists for a Flame Thrower of less weight than the M2-2 type, and to simplify the problem of furnishing pressure, while retaining the reliability of functioning and effectiveness of the M2-2 Flame Thrower.

b. The E-15 Flame Thrower in its present form is unsatisfactory.

c. The logistical problem of supplying liquid carbon dioxide as a pressure source for the E-15 type would be excessive in comparison to that required in furnishing the small Cordite powder sticks for the E-16 type.

d. The ignition system on the E-16 Flame Thrower requires further development to facilitate more positive ignition of thin fuel, eliminate the unwanted delay in ignition of thickened fuel and unnecessary continuance of burning after final discharge of fuel. An ignition cartridge similar in design to that of the M2-2 Flame Thrower would be more desirable.

e. The following modifications of the E-16 Flame Thrower are desirable:

(1) Larger fuel capacity (3 gallons), to be accomplished by increasing diameter of tank rather than the length.

(2) Substitution of the M2-2 Flame Thrower ignition system or improve the present ignition system so that thin fuel will be ignited and no delay in ignition of the thickened fuel will result. In addition, the burning time of the ignition cartridge should cease when the last of the fuel has been discharged.

(3) Change the position of the trigger to a location in rear of the unit. A rotating hand grip with a safety latch, which can be depressed to allow the grip to be rotated slightly for releasing the firing pin. This change would greatly improve the ease of firing and assist in directing and controlling the fire.

(4) Redesign powder chamber with positive safety feature on the inside of the chamber over the blow-out disc.

(5) Redesign powder chamber for the use of Cordite powder in such a manner as to reduce the weight.

(6) Place a forward hand grip on the unit to be attached to the tank by an adjustable band. The grip should be constructed in such a manner that when turned 90° from the carrying position it could be used as a bipod.

f. The E-16 Flame Thrower is unsatisfactory in its present form; but if modified as indicated in Paragraph 3e, above, it would be suitable for procurement of a limited quantity for field tests.

g. The portable E-16 Flame Thrower, for maximum effectiveness, should be employed in mutually supporting pairs and, when the situation and terrain is such that it is impossible to advance with the M2-2 type, the E-16 Flame Thrower should precede and temporarily neutralize the bunker or pillbox until the standard M2-2 type can advance within range.

h. The E-16 Flame Thrower when modified as in Paragraph 3e is suitable for supplementing but not replacing the M2-2 Flame Thrower.

4. Recommendations: The Infantry Board recommends:

a. That no further consideration be given the E-15 Portable One-Shot Flame Thrower in its present form.

b. That the subject Portable Flame Thrower, E-16 be modified as follows:

(1) Increase the capacity of the fuel tank to 3 gallons, to be accomplished by increasing the diameter of the tank and not the length.

(2) Improve the present ignition cartridge along the line of that of the M2-2 Flame Thrower so as to accomplish positive ignition of thin fuel, eliminate the delayed ignition of thickened fuel and cut down the burning time so that the ignition ceases when the last of the fuel is discharged.

(3) Relocate the trigger to a position in rear of the fuel unit, utilizing a handle with a safety latch, which can be rotated to fire and serve as an aid in adjustment and control while firing.

(4) Redesign the powder chamber with a positive safety feature on the inside of the blow-out disc, i.e., some method to prevent the powder stick from plugging the exit holes.

(5) Redesign the powder chamber for the proper size stick of Cordite with a view to reduce the weight while retaining an ample safety factor.

(6) Substitute for the bipod a forward handle to aid in carrying and control while firing; this handle to be fastened to the tank unit with an adjustable band. The handle to be designed so that it can be turned 90° and used as a bipod if desired.

c. That when modified in accordance with Paragraph 4b, last above, the subject E-16 Portable Flame Thrower be procured and issued on a limited basis to combat theaters for a field evaluation of its tactical usefulness.

d. That the subject E-16 Flame Thrower modified as in Par. 4b, above, be considered only to supplement the M2-2 Flame Thrower.

e. That when so modified as in Paragraph 4c, above, The Infantry Board be furnished not less than six Flame Throwers for a check test.

The Infantry Board Project No. 1784, 30 Apr 1945

75MM RECOILLESS RIFLE, T21

1. Description of Material:

a. The subject weapon is a 75mm rifled cannon, the essential part of which is the barrel and reaction chamber. Recoil of the weapon is eliminated by allowing the gases from the propelling charge to escape to the rear through venturi openings in the breech block in such amounts and at such velocities that the resulting reaction balances and cancels that from the launching of the projectile.

b. Because of this absence of redoil the only function of any mount used is to support the weight of the tube, chamber and breech-block while being loaded, laid and fired, and to furnish facilities for manipulating the weapon in elevation and traverse. The basic weight of the subject gun is about 103 lbs., to which must be added, when ready to fire, the weight of the sight and sight bracket and that of one round of ammunition. The only article of equipment now standard which seems to meet these requirements is the Tripod Mount, 1917A1, for the heavy machine gun, Cal. .30, and that item has therefore been chosen as an expedient mount pending the development of a more suitable one. The gun is supported on this mount through special brackets. The gun is then controlled in elevation and deflection by the same means as the heavy Cal. .30 machine gun. However, the total weight to be supported is nearly three times that for which the mount was designed.

c. Two sights, both telescopic, were furnished. The Telescope Sight T126E2 is designed for direct laying, and has a reticle graduated in mils. For indirect laying a panoramic type sight, consisting of Elbow Telescope M62, with Telescope Adapter M9 and Elevation Quadrant T13E1 is furnished.

d. The ammunition rounds consist of perforated large-capacity cases with various types of shells, including HEAT, HE and WP. The propelling charge, which is contained in a waterproof liner fitting inside the perforated cartridge case, is designed to produce a muzzle velocity of approximately 1000 feet per second, giving a maximum range of approximately 7000 yards. Ballistic characteristics are therefore substantially those of the 75mm pack howitzer with a propelling charge of equivalent effect. Except in the length of the tube, therefore, the subject weapon is, in effect, a 75mm howitzer.

2. Discussion:

a. The tests clearly indicate that this powerful recoilless, 75mm cannon in conjunction with other similar weapons gives promise of initiating a new era in infantry fire-power, and may restore the infantry arm to that independence under adverse conditions which is its original and

fundamental characteristic. Recent attempts to restore that independence by including in the infantry organization weapons and equipment borrowed from other arms and branches have not been wholly successful, and have, in effect, tended to create special types of units which, though infantry in name, are actually neither fish nor fowl, since they lack the cohesiveness of other specially equipped branches and the mobility and flexibility of infantry. Such units do not, with the present standard equipment, fill the gap they were intended to fill. The subject weapon and others of the same type do fill this gap, since they combine the power of the lighter types of field artillery weapons with the mobility and other basic characteristics of infantry.

b. The subject 75mm Recoilless Rifle is, in practical effect, a 75mm howitzer having certain inherent limitations but capable of operating with infantry troops when and where no conventional howitzer or gun of comparable power can possibly do so. It is highly accurate and its range is adequate for all legitimate infantry missions. It is basically suited to any direct or indirect fire mission within its range. However, it is still quite crude and undeveloped. The present design leaves much to be desired in portability of one of the essential components. No mount has been developed which permits exploitation of more than a small fraction of the full potentialities of the weapon, itself. The method of firing is awkward and slow and detracts from speed and accuracy against moving or fleeting targets. Whereas the weapon, itself, is admirably adapted to alternative use on a very light self-propelled mount, such as the quarter-ton truck chassis, or the Cargo Carrier M29C, no satisfactory method or appliance for so mounting it has been evolved. Whereas one of the important probable uses of the weapon is against armored vehicles and other moving targets, no adequate means of controlling it in tracking is present in the model tested. The expedient mount does not provide adequate elevation for the maximum range of the weapon in indirect fire.

3. Conclusions: The Infantry Board concludes:

a. That there is an urgent requirement for an infantry supporting weapon of the type of the subject Rifle, Recoilless, 75mm, T21.

b. That procurement and issue of the subject weapon in its present form is justified on a limited basis only as an expedient to meet an existing emergency, and only to the extent that present deficiencies cannot be remedied in the course of such production.

c. That the subject Rifle, Recoilless, 75mm, T21, is not suitable for standardization for Infantry use in its present form.

d. That the subject weapon will be suitable for standardization as a supporting infantry weapon, when and if the following modifications and improvements are made in the design:

(1) Separate the tube - reaction chamber component into separable parts each of suitable weight and dimensions for man-carry, over limited distances by one man, and over extended distances by two men in single file. Weight of any one piece not to exceed seventy (70) lbs.

(2) Provide a mount of stability and rigidity sufficient to maintain the lay of the weapon during the operations of loading, manipulation and firing, including all-around traverse on a free pintle, fine traverse adjustment by mechanical hand-wheel through an arc of not less than eight hundred mils; a coarse elevation adjustment up to eight hundred mils, and a fine elevation adjustment by hand-wheel over not less than 200 mils; and a ready means of eliminating trunnion tilt; provide a shoulder-stock for control of the gun in firing with a free pintle.

(3) Provide a quick and accurate means of adjusting the zero of the sights by bore-sighting or trial firing.

(4) Provide a means of firing the piece by the gunner without change of position and without interrupting his aim or his manipulation of the piece.

(5) Provide a more suitable propellant powder for the HEAT Ammunition.

(6) Provide a reticle, for the direct-laying sight, graduated for range in yards and for deflection in mils (or in units corresponding to the angular lead required on a target having a lateral speed of one mile per hour at an average range of 1000 yards).

e. That further tests of an adequate number of the subject weapons by The Infantry Board are essential to arrival at an adequate, ultimate design.

4. Recommendations: The Infantry Board recommends:

a. That limited procurement of the subject Rifle, Recoilless, 75mm, T21, in its present form, be authorized only in such numbers as will meet any existing urgent emergency.

b. That the subject weapon be further developed without delay so as to incorporate the modifications of gun and mount enumerated in Par. 3j, above.

c. That not less than four of the subject weapons be furnished to The Infantry Board for exhaustive tests to furnish a basis for a definite future program of development, employment and distribution.

The Infantry Board Project No. 1692-A, 24 Aug 1945

SHOES, PROTECTIVE, ANTIPERSONNEL MINE, T-2

1. Material: The subject shoe is essentially the T-1 shoe modified by the extension of the rubberized waterproof envelope around the sponge rubber body of the shoe upward to a point above the ankle, this envelope being drawn up and fastened around the ankle by means of a zipper fastener. The envelope eliminates absorption of water by the 2-inch thick sponge rubber body of the shoe and, at the same time, prevents water from softening, weakening and deforming the leather foot binding harness. It does not eliminate absorption and retention of water by the 1-inch thick sponge rubber sole of the shoe. The sponge rubber sole of the shoe has been further modified by the use of two 1-inch layers of soft density sponge rubber and one 1-inch layer of medium density sponge rubber in place of two layers of medium density and one layer of soft density songe rubber.

2. Facts determined by the tests:

a. The physical characteristics of the subject shoe and the T-1 shoe are similar except that the former is approximately one pound lighter and the waterproof envelope increases the height from 5.8" to 13.0".

b. The subject shoe affords adequate protection against Schu-Mines and S-Mines buried in hard ground, medium soft ground and loose sand but is less effective against such mines buried in soft marshy ground.

c. The subject shoe, when dry, is not adversely affected by exposure to temperatures ranging from +120 degrees F. to -10 degrees F.

When wet, and exposed to low temperatures, water absorbed by the shoe sole freezes and causes the sponge rubber to lose its resiliency and effectiveness

d. The waterproof envelope effectively prevents water from entering the sponge rubber layers of the body of the shoe and protects the binding harness. The sponge rubber sole absorbs 2.75 pounds of water, most of which may be squeezed out by wearing the shoe

e. The subject shoes are not particularly uncomfortable or tiring on the wearer and present little difficulty when walking through woods, and negotiating slopes of 40 degrees or less. Thick underbrush retards progress due to vines and small bushes entangling the shoe. When negotiating slopes greater than 40 degrees the wearer must use his hands. The sponge rubber sole lacks durability and wears excessively at the front and rear when used on dirt or hard surfaced roads.

f. The two 1-inch layers of soft density sponge rubber and one 1-inch layer of medium density sponge rubber forming the body and sole of the subject shoe are of equal resiliency to the two layers of medium density sponge rubber and one layer of soft density sponge rubber in the T-1 shoe. No added protective value is apparent.

g. The rubberized waterproof envelope is completely effective in preventing water from gaining access to the sponge rubber body and foot binding harness inside the subject shoe providing the wearer does not enter water deeper than the height of the envelope.

h. The foot binding harness of the subject shoe is identical with that of the T-1 shoe. Water causes the leather straps to stretch, become slippery and change shape.

3. Discussion: The foregoing facts indicate that the subject shoe affords adequate protection against antipersonnel mines of the Schu-Mine and S-Mine type.

The rubberized waterproof envelope is completely effective in protecting the sponge rubber body and the foot binding harness providing the wearer does not enter water deeper than the height of the envelope. The foot binding harness is identical with that of the T-1 shoe and is, in the same manner, adversely affected by water. A means of securing the envelope tightly above the ankle therefore appears desirable.

The soft density sponge rubber sole is sufficiently resilient to provide the desired protection but is so lacking in durability as to require a prohibitive rate of replacement.

4. Conclusions: The Infantry Board concludes:

a. That the general design of the subject Shoe, Protective, Antipersonnel Mine, T-2 is satisfactory.

b. That the soft density, sponge rubber sole of the subject shoe is inadequate and unsatisfactory because of lack of durability.

c. That the following modifications should be applied to the subject shoe:

(1) Construct the sole of more durable material or provide a flexible, durable, removable protective cover.

(2) Provide a means of securing the waterproof envelope tightly above the ankle.

5. Recommendations: The Infantry Board recommends that the subject Shoe, Protective, Antipersonnel Mine, T-2, be modified as above indicated and when so modified be considered suitable for adoption.

POST ASSAULT MEAL AND UTILIZATION OF RECTANGULAR TIN

1. Description of Materiel: The test item is a ration of the same general ingredients and quantity as the "C" ration, but packed in the rectangular emergency parachute ration container. Two of these containers, one containing a meat unit, the other a "B" unit, plus an accessory pack containing a wooden spoon, toilet paper, chewing gum, a can opener and one heating tablet constitutes a meal.

2. Summary of Tests:

a. The test item can be satisfactorily stowed in the breast pockets of the field jacket or fitted into the pockets of the bandoleer, and is preferable to the control item. The flat shape of the test item allows it to ride more smoothly against the body than does the control item. The individual can crawl or lie on his stomach and chest with much less discomfort when carrying the flat test item than when carrying the cylindrical control item.

b. The test item, leaving a larger area which can be exposed to a flame and with the opened lid providing a convenient handle, is more easily heated than the control item. Further, the contents of the test item can be more easily stirred while heating, thereby giving a more even spread to the heat. The control item container is filled to the brim, has a small bottom surface exposed to the heat, and is difficult to stir and heat uniformly. The above applies whether using heat tablets or squad burners.

c. Two heat tablets are required to prepare a hot meal of either the test or control type ration.

d. Considering the test and control rations as one of many menus available, the two types of meals (test or control) are adequate and suitable, except for items in the accessory packet.

e. Present items in the accessory packet are satisfactory but cigarettes, matches, and one additional heat tablet should be added for each meal.

f. One meal only should be carried by each man and this on the person rather than in the bandoleer.

g. The individual is more likely to retain the test item when tempted to throw away his rations due to their weight, bulk, and inconvenience to carry.

h. There is no tendency to throw away any entire unit of the meal. However, nearly every man threw away part of his "B" unit - some the coffee, some the biscuits, some the cereal.

3. Conclusions: The Board concludes that:

a. The test item is satisfactory for the purpose for which intended, i.e., a post assault meal.

b. One meal only should be carried and that it be carried on the person and not in the bandoleer.

c. The test item is adequate and suitable, except for lack of cigarettes, matches and one additional heat tablet in accessory pack.

d. The "M" unit should contain the same varieties as the "C" or "E" ration, provided the latter type ration is standardized.

4. Recommendations: The Board recommends that:

a. The test item, with the addition of a packet of four cigarettes, ten matches, and one heat tablet in the accessory packet is adequate and suitable as a post assault meal.

b. Only one meal be issued to each individual and that this be carried on the person.

c. The accessory packs be packed loosely.

5. Action to produce five hundred post assault meals has been held in abeyance. This action was taken in view of the following:

a. The Quartermaster General is developing an assault ration under Project RA-104 utilizing a cylindrical tin with a broad base and lessened height capable of being carried in the pocket of the Jacket, Field, M-1943. It is believed that this type of can (3½" diameter x 1½" height) will serve as a stop-gap until the optimum type of can is produced by the can industry. It is not intended that this developmental type ration should replace the Ration, Combat, Type "E" or the Ration 5-in-1.

b. The ration, which will contain six cans, should prove acceptable as a beachhead ration or for use under comparable situations. The caloric content of the proposed ration will be approximately 30% less than that of the Type "E" ration, but its use for very limited periods should not cause malnutrition. The cans are packed as follows:

3 cans meat items
1 can bread
1 can fruit

1 can confection and beverage
1 accessory packet containing 20 cigarettes, matches, plastic spoon, can opener, chewing gum, heat tablets and toilet paper

6. It is expected that samples of the Assault Ration in the wide based, short cans will be available in the near future for test.

ARMOR, BODY, PROTECTIVE

1. The Board is of the opinion that a definite requirement exists for body armor for infantry troops, especially for certain types of operations. A flexible, lightweight armor, covering the chest, abdomen, back and sides should be inestimable value both for the actual reduction in the number of casualties and for increasing the soldiers sense of security. Although it may not be practical, within the immediate predictable future, to produce a lightweight armor that will protect against direct hits by small arms firing high velocity bullets, it is believed that new discoveries and developments in the field of nylon, doron, spun glass and plastic, combined with lightweight metals such as aluminum, will afford appreciable protection against shell fragments and low velocity missiles.

b. The military characteristics of such body armor are as follows:

(1) Must be extremely lightweight, not to exceed eight (8) pounds.

(2) Must afford maximum protection against shell fragments and low velocity missiles.

(3) Must be flexible, so as not to interfere with freedom of movement.

(4) Must not aggravate the seriousness of wounds resulting from penetration of the armor by high velocity projectiles or bullets, by causing them to become distorted or deflected prior to entering the body.

(5) Must not appreciably increase soldier's body discomfort.

(6) Should be worn on the outside of the uniform and be capable of easy and quick removal.

2. Recommendations: The Board recommends that:

a. Research and development of body armor be continued.

b. Every consideration be given to the possibilities of new materials, such as plastics and spun glass, in order to obtain greatest ballistic resistance and lightest weight.

c. Pilot models of new designs, based generally on the Armor, Vest, T-62, (TIB Report 1815), be made and submitted to Army Ground Forces Board No. 3 for test.

3. Standardization of Armor, Apron, T65 is contemplated for use with the Armored Vest, M12. The views of your Board regarding such standardization are desired.

4. The Infantry Board was directed to test several types of body armor for pattern only and in The Infantry Board Report No. 1815, Armor, Vest, T-62 was recommended as being the most acceptable from that viewpoint. The ballistic material in the T-62 Vest weighed 21 ounces per square foot, total weight of vest 6.75 pounds. Armored Vest M12 which was made on the same pattern as Armor, Vest, T-62, has ballistic material that weighs 40 ounces per square foot, total weight of vest 12.1 pounds - almost twice the weight of the original vest tested. Weight of the Armor, Apron, T-65 is 1.7 pounds which would bring the total weight of Armored Vest M12, w/apron, to 13.8 pounds.

5. Attention is invited to paragraph 1, in which this Board submitted recommendations for military characteristics of Body Armor. This Board adheres to its previous recommendation that weight of body armor should not exceed eight (8) pounds.

6. In view of the excessive weight of the existing standardized M12 Armored Vest (12.1 pounds), it is believed that further addition of weight is not advisable. It is therefore recommended that Armor, Apron, T-65, be not standardized in its present form.

7. It is further recommended that the usability and desirability of the design of the M12 Armored Vest and Apron, T-65 be tested thoroughly by subjecting it to extensive use by troops, and that development of body armor be continued to attain the characteristics set forth in paragraph 1.

MASK, GAS, COMBAT, SERVICE, E4&M11E15

1. The E4& faceblank and nosecup are molded from butyl synthetic rubber in order to secure the maximum flexibility with a resultant comfortable gas-tight fit at low temperatures. The nose-cup of the mask is shaped with a turned-in curl. The facepiece is equipped with laminated glass eyepieces secured by aluminum eye-rings. The deflector tube for the right eyepiece is molded into the nasal portion of the facepiece, producing a characteristic profile with a prominent "nose", distinguishing the mask from the standard M5 facepiece where the corresponding deflector tube passes through the chin of the mask.

2. The metal parts of the standard M11 canister are constructed of aluminum. The canister for the experimental mask and the standard M5-11-7 and the M8-11-10 gas masks are identical.

3. The experimental E15 carrier is constructed of two layers of dark green, mildew-proof, water-repellent duck with a coating of butyl rubber between the layers. The carrier has a roll-type closure secured by three (3) "Lift-the-Dot" fasteners. The shoulder strap, body strap and D-ring securing straps are permanently attached to the carrier by stitching. The design, shape and size of the carrier are similar to the standard M7 carrier. The E15 carrier was formerly designated as the MIT-E1OR43 carrier.

4. Weight of facepiece and canister: 1.6 pounds.
Weight of carrier: 1.6 pounds.
Total weight: 3.2 pounds.

5. Weight of accessory items:
Can of protective ointment: .5 pounds.
Envelope containing four (4) eyeshields, M1: .2 pounds.
Two (2) protective covers: 1.2 pounds.
Total: 1.9 pounds.

6. Maximum dimensions of carrier. Measurements made with the mask in carrier with the carrier slung, and do not include carrying straps:

Height: 13 inches.
Width: 10 inches.
Thickness: 5 inches.

ACF Board No. 3 Project No. 1958, 24 April 1946

FRONT LINE SLEEPING SUITS

1. Four types of front line sleeping suits have been developed. All four types contain the following general characteristics:

a. Outer layer is water repellant. The inner layer is made of down and feathers, with sufficient insulating quality to provide warmth in weather varying from moderate to low temperatures (40° F. to 0° F.). One zipper opens and closes both layers.

2. Individual characteristics of each type are as follows:

a. Type I. A sleeping suit not convertible to a sleeping bag. Sleeves are elbow length, without sleeve closure. Legs are closed trouser type without side zippers. The lower 12 to 14 inches of each leg are reinforced with canvas, to prevent excessive wear on the bottoms of the legs when the wearer walks in the suit.

b. Type II. A sleeping suit not convertible to a sleeping bag. Sleeves are full length with close-fit wool cuffs. Legs are closed trouser type without side zippers. The lower 12 to 14 inches of each leg are reinforced with canvas, to prevent excessive wear on the bottoms of the legs when the wearer walks in the suit. The leg terminates in a bear paw type foot, of material sufficiently durable to withstand wear when the wearer walks in the suit.

c. Type III. A sleeping suit not convertible to a sleeping bag. Sleeves are full length with close-fit wool cuffs. A vertical 12-inch zipper is placed on the inside of each leg at the bottom, the zipper to close from bottom to top, in such manner as to provide the wearer with an opening through which he may push his foot for walking. The lower 12 to 14 inches of each leg are reinforced with canvas, to prevent excessive wear on the bottoms of the legs when the wearer walks in the suit.

d. Type IV. The same as Type I except that sleeves of any length are eliminated, and that the armhole, width 23", is opened and closed by a durable zipper, operated from within the garment.

THE COMBAT "E" RATION

1. Description, General:

a. One ration consists of seven cans, one accessory packet, and one packet of cigarettes. The seven cans contained in a ration are composed of three meat units, one fruit unit, two biscuit units, and one breat unit. Each ration contains 3900 calories and weighs 5 1/2 pounds.

b. One meal consists of:

(1) One of the meat units or the fruit unit and

(2) One of the biscuit units or the bread unit.

c. The ration is packed eight to the box, a box of eight rations weighing 48 pounds.

2. Details of contents:

a. The biscuit units are designated B-1 and B-2. Their contents are as follows:

(1) The B-1 unit contains:

Item	Unit	Net Weight
Sugar, compressed disc	1	1.66 ozs.
Cocoa, " "	1	2.00 "
Cereal, " premixed	1	2.00 "
Coffee, soluble	1	5 grams
Cookie, butterscotch sandwich	1	0.8 ozs.
Jam, can	1	1.5 "

(2) The B-2 unit contains:

Item	Unit	Net Weight
Biscuit, Type V round (Sultanas)	3	1.0 ozs.
Fudge, disc vanilla or		
Fudge, disc chocolate	1	2.0 "
Coffee, product soluble	3	5 grams

Item	Unit	Net Weight
Sugar, compressed disc	1	1.66 ozs.
Orange or Grape beverage powder	1	7 grams

b. The bread unit contains 4 ounces of canned white bread.

c. The fruit unit contains one of the following four varieties of fruit:

Peaches, halves or slices, canned	12 ozs.
Pineapple, slices or chunks, canned	12 "
Apricots, canned	11 3/4 ozs.
Fruit cocktail, canned	11 3/4 ozs.

d. The meat units are divided into two groups. Their contents are as follows:

(1) Group I contains:

Chicken and Vegetable	12 ozs.
Hamburgers	11 "
Pork and Rice	12 "
Ham and Lima Beans	12 "
Beef Stew	12 "

(2) Group II contains:

Pork and Beans	12 ozs.
Meat and Beans	12 "
Frankfurters and Beans	12 "
Meat and Noodles	12 "
Ground Meat and Spaghetti	12 "

e. The accessory packet contains:

Gum, chewing, candy coated tablets	2 tablets in 1 packet
Opener, can, small	2 per case of rations
Salt, granulated	½ ounce

Salt tablets	4 tablets
Spoons, wooden	3 spoons
Tablets, heat (hexamethylene tetramine)	3 tablets

f. The cigarette packet contains 9 cigarettes and a book of 10 matches.

SHELTER, SQUAD, PORTABLE

DESCRIPTION: The Shelter, Squad, Portable, devised in the Research and Development Branch, Military Planning Division of the Quartermaster Corps, holds the promise of being one of the most satisfactory and popular portable shelters that has yet been designed. It has started new trends of thinking regarding tentage and is being considered as a substitute for the squad tent.

The necessity of finding substitutions for tentage materials in order to alleviate the critical shortage of cotton duck led to studies to determine all possible substitute materials. It was evident that the best tentage materials which have been used in roofs for tents tend in time to deteriorate, and that canvas, being made of vegetable matter, is subject to deterioration much more rapidly than is metal. This is true particularly in respect to its water resistant qualities. Other objections to canvas for tentage, are that the normal strain on canvas in roofs tends to open the interstices in the roof, and that the best fire resistant treatment that can be placed upon canvas is not permanent and is not as effective as it should be for fireproofing. It was therefore necessary to develop a roof material which is superior to canvas.

The proposals to investigate the practicability of steel or aluminum for a portable squad shelter proved to be sound. Of the quantity now under procurement some have aluminum roofs and vents, and some have plywood roofs and vents. The frame consists of steel sections which fold and nest together. The floor area is the same as the squad tent, but the shelter has more usable space since there are no poles. It was necessary that the side wall be designed and the end materials so adapted as to accommodate extremely varied climatic conditions. For that reason the upper portions of the side and end walls are hinged outward for ventilation and protection from the rain. The remainder of the sidewalls are canvas. The weight of the entire item is 1,180 pounds, and the net cubage when packed is 22 cubic feet as compared with 18 cubic feet for the squad tent including pins and poles. The shelter can be erected by average troops in 6 man hours and has no loose parts such as bolts, screws and nails.

The portable squad shelter was primarily designed for temperate climates, but a liner has been developed that will insulate it against the cold and confine the heat within. The liner has complete sides, ends and roof.

Screening is being developed which makes the squad shelter practical for tropical areas. The windows only may be screened, leaving the canvas below, or screening may entirely replace the canvas sidewalls. This last named type of screening makes the squad shelter especially good for hospitals since it is cooler than a tent and also provides excellent ventilation.

The Shelter, Squad, Portable, is contemplated for use in many types of terrain; rocky soil, sand, snow, ice, rock, tundra, jungle, and beach. It is to be used in altitudes up to 10,000 feet, and it can weather equally rigorous winter gales, desert dust storms, and torrential rains.

The Infantry Board Project No. 1890, 30 Sep 1945

PORTABLE FLAME THROWER UNIT E3R1

1. Description of Material:

a. The subject E3R1 Flame Thrower tank unit was designed to decrease the silhouette of the M2-2 type and to embody desirable Flame Thrower features developed since the standardization of the M2-2 Flame Thrower.

b. The subject unit consists of the M2-2 Flame Thrower tank unit with the following modifications and additional features:

(1) Relocation of the pressure tank from a vertical position between the two fuel tanks to a horizontal position located below the fuel tanks.

(2) Elimination of the flexible shaft for the opening and closing of the pressure tank valve.

(3) New design and relocation of the pressure tank container clamp.

(4) Relocation of the fuel outlet manifold so as to obtain a more complete emptying of the fuel from the fuel tanks when the unit is fired at positions other than vertical.

(5) A more heavily reinforced carrier frame.

(6) Relocation of the safety head to a position on the diffusion pipes in order to decrease the fire hazard to the operator should a safety disc rupture.

(7) Substitution of a larger diffusion pipe.

(8) Larger fuel tank filling holes and a fuel plug capable of being removed by hand.

(9) Addition of a safety relief valve to prevent the rupture of the disc in the safety head.

2. The subject E3R1 Flame Thrower tank unit represents a highly successful phase in needed improvements over the standard (M2-2) Flame Thrower. However, in accomplishing the desirable modifications, the weight of the unit has been increased approximately 7-1/2 lbs. This brings the weight of the subject unit loaded with 4 gallons of thin fuel to approximately 66-1/2 lbs. plus the weight of the gun (9.25 lbs.), or approximately 75 lbs.

It is not possible for an operator to carry such a heavy load and obtain any degree of mobility for tactical operations. Therefore, it appears that the subject unit has been given little consideration as to weight reduction. Possibly the only method of accomplishing reduction of the weight would be to use a lighter weight metal alloy, preferably aluminum, in the construction of the fuel and pressure tanks.

3. Conclusions. The Infantry Board concludes:

a. That the E3R1 Flame Thrower in its present form is unsatisfactory for Infantry use due to its excessive weight.

b. That all the additional features and modifications on the E3R1 Flame Thrower are highly desirable and satisfactory.

c. That when the subject E3R1 fuel unit can be decreased in weight to a figure no greater than the M2-2 Type it will be satisfactory for Infantry use.

4. Recommendations. The Infantry Board recommends:

a. That the E3R1 Flame Thrower be reduced in weight to a figure no greater than the weight of the M2-2.

b. That when the reduction in weight is effected as mentioned in the above paragraph, the E3R1 Flame Thrower tank unit be standardized in lieu of the M2-2 Flame Thrower tank unit.

The Infantry Board Project No. 1683A, 30 Sep 45

TENT, KITCHEN, FLYPROOF

1. Kitchen, Tent, Type II is a 17' x 10' wall type tent with a stack at one end which rises 2½' above the tent proper. Nylon screens attached by lift-the-dot fasteners extend the entire length of both sides and across the front of the tent. The front screen has a serving window which is secured by zippers. The canvas front and side walls may be rolled up or staked out as canopies. Nylon screened ventilators, with a canvas covering flap are provided at the upper front of the tent and on the front and back sides of the stack and along the lower part of the back wall of the tent. The covering flaps on the stack have stiffeners along the lower edges and may be opened and closed by the use of ropes from the inside of the tent. A coated fabric curtain may be attached to separate the stack from the remainder of the tent. The tent is erected using two ridge poles, three uprights, four shorter uprights on each side, ropes and guy lines.

2. Conclusions:

That the Type II kitchen tent is superior to all other types tested, and, when modified, meets all the requirements of a fireproof kitchen shelter.

3. Recommendations:

That the Type II kitchen tent be modified and when so modified be considered suitable and satisfactory as a fly-proof kitchen shelter, for general use by all units provided with field kitchens.

Army Ground Forces
Board No. 3

Report No._____

_____

FORT BENNING, GEORGIA

_____

11676 FT. BENNING, GA. 24 SEP 45 2,000