

to provide water on the necessary scale in emergency rations. Its loss can, however, be reduced by the provision of shade and by avoiding any exertion, and the new inflatable rubber raft with a tent covering has revolutionized the outlook for survivors. In hot climates it provides shade, and if men lie quietly and keep their clothing wet with sea water during the day their water requirements should not exceed the physiological minimum. In cold climates such rafts provide shelter, and in them the occupants generate enough heat to keep themselves warm, and therefore alive.

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Army Operational Rations

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Under normal conditions the soldier is fed according to a standard ration scale based on normal civilian feeding habits. Items of fresh food, such as bread, frozen meat, vegetables and fruit, are provided, and all the necessary cooking equipment is available for preparing the meals. When, however, supply conditions become difficult, as during wartime when troops are situated far from their home bases, tinned equivalents of the fresh items are brought into issue. Such substitution

may be applied to part or to the whole of the ration, and it is continued until fresh items again become available through the development of local resources and the arrival of ships with frozen meat and other foods.

While troops are congregated in one area in large units and formations, the method of feeding from a central supply depot is possible, but it fails when units are widely dispersed in independent groups, or when the conditions for distributing supplies have become too difficult for breaking up bulk stocks as, for instance, during landing operations. The problem is solved by the issue of composite ration packs, each of which contains a definite number of complete, balanced rations. Thus, the somewhat complicated and lengthy process of issuing multiple quantities of all the items on the ration scale is resolved into the simple task of handing out the appropriate number of composite ration cases from a single stack. These operational rations are the only food the soldier can expect to get as long as the same conditions last, so that they must be adequate to keep him in good bodily health and provide the necessary energy for his activities. At one time the soldier was content, or had to be content, with a tin of bully beef and a packet of biscuits for the day's ration, but the present-day army demands a full and varied diet. The modern practice, therefore, is to design rations of such a nature that, in any circumstances, however difficult the problem of supply, the soldier receives food as similar as possible in character and quality to that which he normally receives at his base camp. The importance of food to his morale is recognized, and efforts are made to provide him with a full and varied diet.

The conditions which operational rations should satisfy may be summarized briefly as follows: (1) The ration should be nutritively adequate, attractive, and sufficiently varied in composition to ensure general acceptability when consumed over a fair period of time. (2) The items in the ration should be such that appetizing meals can be prepared by the soldiers themselves, who are probably unskilled in the art of cooking, without the aid of normal cooking equipment. (3) The ration should be in a compact and convenient form, suitable for rapid distribution and use during special operations such as assault landings, or on long-range patrols. (4) The packaging should be adequate to withstand very rough handling without damage to the contents, and the weight of packing should be reduced to a minimum consistent with efficiency. (5) The ration packs must withstand long storage in any climatic conditions without chemical or microbial deterioration.

During the last war, many different operational ration packs were produced for use in varying circumstances. They included various composite rations, special Pacific packs, jungle ration, AFV (armoured fighting vehicle) ration and mountain (Arctic) ration. The production and assembly of so many different rations involved an immense amount of labour and organization in this country at a most difficult time. As a result of experience and of the administrative difficulties of getting the right ration to the right place for consumption, it was decided that standardization was essential. The need for standardization has governed the design of the present-day operational ration packs which are now few in number and capable of almost universal application.

The types are as follows: ten-men composite ration; five-men composite ration; twenty-four hour ration, G.S; twenty-four hour snow ration.

In addition to the above, but in a class of its own, is the emergency ration. Except for it all the rations provide food for three meals, breakfast, main meal and tea or snack meal. A brief description of each ration follows.

The ten-men composite ration is the main pack used for operational purposes; it contains food for ten men for 1 day, or for five men for 2 days. It is formulated in four different menus in order to prevent monotony, and the number will be increased to seven during the next packing phase. All items are contained in hermetically sealed cans, mostly of size no. 1 tall, containing from 15 to 16 oz. Thirty such cans (or smaller ones) are contained in a weatherproof fibreboard case divided up by interlocking partitions, and fitted with an external sleeve. The weight of the case is 42 lb. The pack does not contain biscuits which are provided separately in tins holding ten or twenty packets, each containing 9 oz. Bread is, of course, preferred to biscuits, and is issued if possible.

Almost all the food items are already cooked, and only require heating in water before consumption. As it occurs very rarely that the soldier cannot manage to 'brew-up', he can usually contrive to heat his rations. The empty biscuit tin is fitted with a handle to make a dixie, and individual meals can be prepared in the soldier's mess-tin. Examples of two of the menus are shown in Table 1.

Table 1. *Two examples of menus provided by a ten-men composite ration*

Menu	Breakfast	Main meal	Tea
Type C	Oatmeal blocks Ham and eggs Biscuit or bread Jam	Steak and kidney pudding Peas, diced mixed vegetables, mashed potatoes Rice pudding Biscuit or bread	Hamburgers Biscuit or bread Cheese Margarine Jam
Type F	Oatmeal blocks Bacon and sausage Biscuit or bread Marmalade	Casserole steak and onions Beans, carrots, mashed potatoes Tinned fruit Biscuit or bread	Luncheon meat Cheese Biscuit or bread Margarine Jam

It will be seen that a conventional meat dish is provided for breakfast, two courses consisting of meat and vegetables followed by a pudding for the main meal, and meat and cheese for tea. Whether or not the main meal is consumed at mid-day or in the evening, will depend on the immediate circumstances; it might not be possible to spend time in cooking at mid-day.

In addition to the items shown in Table 1, the packs contain tea, sugar, milk, sweets and such sundries as matches, soap, a can-opener and water-sterilizing outfits.

The average calorific value of the rations is 4100 Cal. per man daily.

The five-men composite ration provides sufficient food for five men for 1 day, and

is specially designed for use by tank crews. The size and shape of the case are dictated by the restricted space which can be allotted in a tank for carrying food.

In composition and general make-up the five-men composite ration is similar to that for ten men. The weight of the pack is 21 lb., and the average calorific value is 4100 Cal. per man daily.

The twenty-four hour ration G.S. contains food for one man for 1 day; it is intended for use by soldiers in special circumstances where each man has to be independent and carry his own food. The ration weighs $3\frac{1}{2}$ lb., and has a calorific value of 3000 Cal. It is issued in three different menus, and each ration is divided into three separate meal packets for breakfast, main meal and snack. Each packet contains sufficient biscuit for the particular meal. In addition, there is a pouch containing a tube of condensed milk, salt, matches, a can-opener and other sundries. A meat dish is provided for breakfast, and meat with vegetables followed by a pudding for the main meal. The snack packet contains biscuits, and various items of confectionery which are intended to be consumed periodically on the march throughout the day. All the items of the pack are contained in small cans or in foil-laminated pouches as a protection from water vapour. The twenty-four-hour ration, G.S. is of somewhat elaborate construction, and is intended for consumption for a few days only at any one time.

The twenty-four-hour snow ration is still in the stage of development; it is a version of the twenty-four-hour ration, G.S. specially adapted for use in cold weather conditions. It was designed specifically as a sledging ration for the use of mobile ski-troops, for which purpose it was essential that the weight and bulk of the ration should be kept to a minimum; the present ration weighs only 2 lb. 8 oz., and measures $5 \times 4\frac{1}{2} \times 5$ in. The calorific value is 4250 Cal.

The main item in the pack is a bar of dehydrated meat weighing 5 oz., prepared from equal parts of beef and pork, and containing 40% fat. It may be consumed cold as a 'munch', or made into a hot stew and mixed with other items in the pack. Breakfast consists of porridge followed by chopped bacon; items of confectionery are included for consumption on the march. With the exception of the can for the bacon, the use of tins has been avoided, the other items being contained in heat-sealable vacuum pouches.

The emergency ration was carried during the last war by each soldier in action for consumption only under conditions when no other food was available. It consists of chocolate. Careful consideration has been given to the composition of the chocolate, and several different types have been tested for suitability for the purpose. The conclusion reached up to the present is that the old type of ration, with slight adjustments to make it more palatable, is the most acceptable from the point of view of compactness, weight, edibility, calorific value and storage life. The ration consists of four slabs of chocolate, each $1\frac{1}{2}$ oz. in weight, contained in a vacuum-packed flat tin measuring $4\frac{1}{2} \times 3\frac{1}{2} \times 1$ in. Such a container fits conveniently into a pocket of the battle-dress. The calorific value is 860 Cal.

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