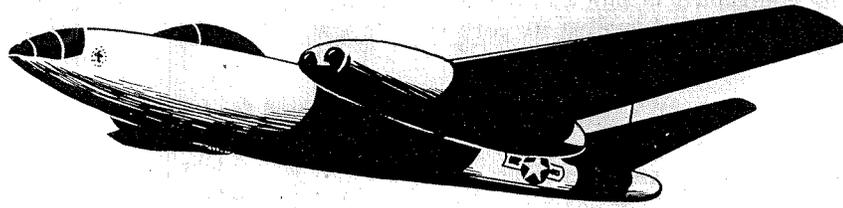


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## Food and Ration Problems of the U.S. AIR FORCE

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NATICK, MASS.

by Captain Thomas M. Davis, U.S.A.F. Liaison Officer  
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The problem of feeding the U. S. Air Forces has grown in complexity in proportion to the growth of the Air Force itself. Since the War Department first utilized airplanes for combat purposes in 1917, the Air Force has rapidly expanded to a potent and sizeable striking arm. The extent of that expansion can be realized in a measure by comparing the Air Force strength in 1917 and 1945. Early in World War I, the Army's air strength consisted of fewer than 100 officers, 1,120 enlisted men, and only a handful of training planes. By 1945 it had grown to a force of 2,000,000 officers and men, with thousands of airplanes, many of which were capable of striking anywhere on the globe.

The period between the two wars also saw radical changes in aerial tactics and types of missions, made possible largely through tremendous technological progress in the field of aeronautical engineering. In the early days of combat flight airplanes remained aloft for a relatively short time and flew at what would now be considered extremely low speeds. Missions progressed from reconnaissance and artillery observation to aerial duels to aerial bombardments. Flights were limited either to daylight hours or to clear evenings well illuminated by the moon.

Little or no thought was given to special feeding requirements of flight personnel, and indeed there may have been no such special requirements. Nevertheless, individual pilots and flight observers discovered that the tensions of flying could be relieved to some extent by chewing candy or even cigars. Although the ingestion of candy may have been intended simply to provide a psychological aid to the airman, it served also unintentionally, as a source of energy.

The subject of nutrition for flight personnel engaged in missions at high altitudes or for long periods of time remained virtually untouched as late as 1940. The conditions under which

## Activities Report

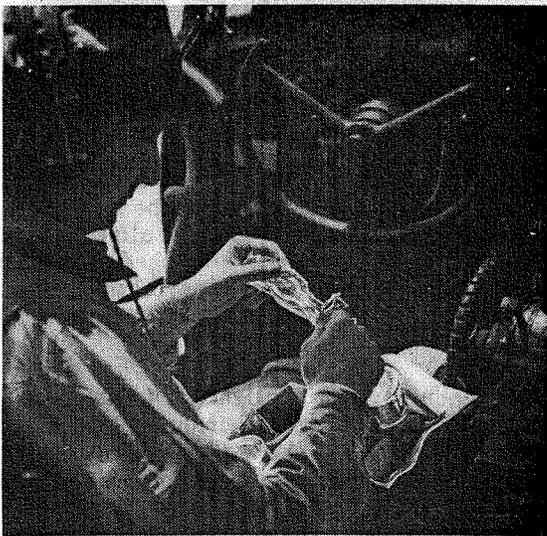
the second world war was fought, however, forcefully brought to the attention of the Air Force the problems of feeding its personnel in a wide variety of military situations which can be outlined as follows:

1. Ground feeding
2. Air feeding
  - a. Pre-flight
  - b. In-flight
  - c. Post-flight
3. Survival feeding

### Ground Feeding

Feeding of Air Force personnel on the ground, i.e., ground crews and supporting personnel, may be effectively accomplished by the utilization of some of the current standard rations used by other members of the Armed Forces as well. The Basic Ration, Field A, consisting of fresh, perishable foods, may be issued to Air Force units when kitchens and refrigeration facilities are available. When refrigeration is not available, or when it is not possible to supply perishable items because of inadequate refrigeration in transit, then the Ration, Operational B is issued to units with kitchen facilities. The latter ration consists of nonperishable items, canned or dehydrated, for the feeding of units of approximately 50 or more men.

When small detachments or supporting units are separated from kitchens they may be issued the Ration, Small Detachment, 5-In-1, which provides food for five men for one day. Since these may be eaten either hot or cold, no kitchen facilities are essential. Its use in the Air Force is generally limited to small advance detachments, radar detachments, crash crews, rescue squads, etc.



PILOT PREPARES TO EAT MEAL WHILE CO-PILOT TAKES OVER CONTROLS. THE IN-FLIGHT PACKET IS PROVIDED.



NAVIGATOR IN A-26 TAKES TIME OFF FOR LUNCH - THE IN-FLIGHT FOOD PACKET.

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The Ration, Individual, Combat, which provides food for one man for one day, has no important place in the Air Force feeding program since the airman is not often placed in a situation in which he must rely on this type of combat feeding.

### Air Feeding

Feeding airmen while aloft presents problems which are more complex than those encountered on the ground. The first of these - pre-flight feeding - could perhaps be considered a ground feeding problem; because it is so closely related to flight problems, however, it can be legitimately considered in the latter category.

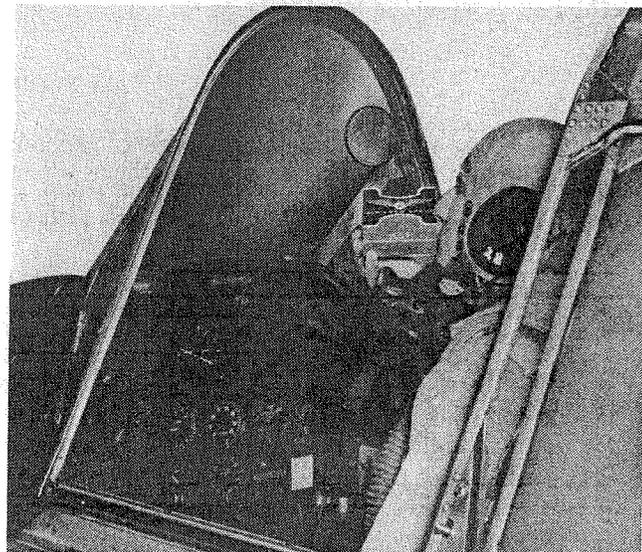
By pre-flight feeding is meant that food which will place the airman in a physical state which will enable him to perform his duties efficiently and maintain his health and morale. The basic rations required to accomplish this objective are the Ration, Field, A and the Ration, Operational, B. It is the opinion of the Department of the Air Force, supported by data obtained in actual flight operations, that for physiological reasons pilots and crew members require additional items not presently included in the existing operational rations for ground feeding. Pre-flight meals, for example, make mandatory the exclusion of foods that would cause gastric disturbances or would produce abnormal thirst or a tendency toward air sickness.

In-flight feeding represents the method, or methods, of feeding flight personnel while in the air. Experience in World War II demonstrated that heavy bombers - B-29's, B-50's, B-36's and their successors - were engaged in flights of relatively long duration spanning one or more meal periods. With the present improvements in heavy bombers it is anticipated that flights of 36 hours duration or more will not be unusual. These flights will almost invariably be conducted at high altitudes and personnel will be protected by pressurized and electrically heated cabins. The physiological and psychological stresses to which the men are subjected make it highly desirable that they be provided nutritious foods with a high level of palatability. The main components of such rations should be appetizingly hot at time of consumption.

PARATROOPERS EN ROUTE TO DROP ZONE EAT THE IN-FLIGHT MEAL. IN LARGE AIRCRAFT, IN THE FUTURE, ELECTRICALLY HEATED EQUIPMENT WILL WARM THE FOODS.



PILOT DEMONSTRATES USE OF AIR CREW LUNCH FOR FIGHTER TYPE OF AIRCRAFT. ONLY ONE HAND IS NEEDED TO OPERATE THE PACKET.



The limited space in which Air Force technicians operate, together with the necessity for remaining at their stations, (e.g., the tail gunner in a place of difficult access, the fighter pilot, etc.) make it essential that the nourishment be available to them at their stations. Cognizance should also be given the fact that these men are greatly encumbered by flight clothing. When electrically heated suits are worn, the men cannot be expected to move away from their source of electricity for any appreciable length of time. Thus they will be unable to go to the food; on the contrary, the food must come to them.

In addition to the foregoing considerations, it should be emphasized that limited storage facilities aboard the aircraft make it necessary that the cubage and weight of in-flight rations be held to the absolute minimum.

At the present time the Food Packet, Individual, Combat, In-Flight (IF-2) may be considered a solution for this problem, except for the fighter pilot. The IF-2 consists of seven menus, each in a separate carton containing one can of meat, one of fruit, one dessert unit with cookies and confections, and one B-unit can with five round crackers. An accessory pack is also included and contains soluble coffee, tea, milk powder, chewing gum, salt and pepper, plastic spoons, paper towels, and a folding can opener. Twenty-one cartons are packed in a case which weighs 43 pounds and has a cubage of 1.2 cubic feet. The weight of each carton is approximately 2 pounds including packing and packaging materials. Each packet contains about 1200 calories, and the components may be eaten hot or cold. Although edible in unheated form, the food in the packet is far more acceptable when heated.

At the present time equipment for heating in-flight meals is not completely satisfactory. Work is being conducted at the Aero Medical Laboratories at Wright-Patterson Air Force Base in an effort to design small electrically heated ovens which will hold from 4 to 8 (and possibly 24) 6 ounce cans. It is intended that these ovens, when available, will be placed in various advantageous points within the aircraft, with one, in all probability, in the nose section and another in the waist section. In this manner all of the crew members would have facilities for warming their meals while in flight. Work is also being conducted on a two-gallon rectangular thermos container with an immersion type heater which can be used for making tea and coffee while in flight. This type of jug is also equipped with an ice well which makes it equally suitable for the preparation of iced drinks.

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Another project, at Carswell Air Force Base, is concerned with determining the suitability of precooked frozen meals for in-flight feeding. These meals have been subjected to field tests in B-36 aircraft, and recently obtained information indicates that their use may be extended in air feeding. Ovens to heat the precooked frozen meals are at present being procured and installed.

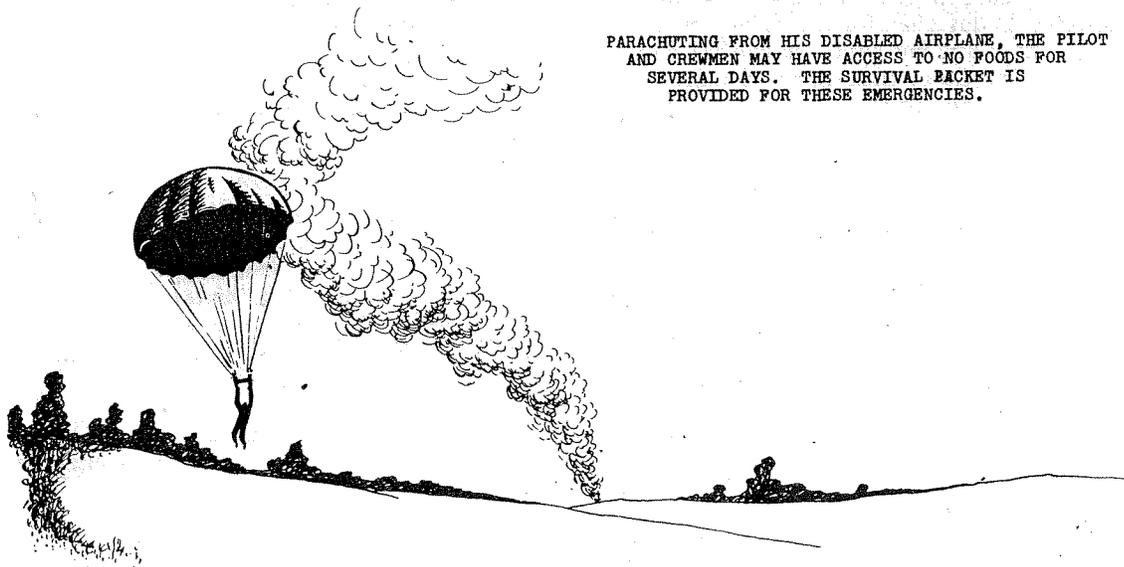
The ultimate solution to in-flight feeding problems may well be applied to the in-flight feeding of personnel other than pilots and crew members. Paratroopers and airborne infantry for example, may be provided with the in-flight food packet during air travel. Other passengers, including replacements, VIP's, or persons with special missions, will in all likelihood use the same type of meal. Precooked frozen meals, sandwiches, and hot beverages are also being used at present for passenger feeding.

Another use for which the in-flight food packet is intended is the feeding of pilots, crew members, and passengers of the Military Air Transport Service (MATS).

The IF-2 is designed for consumption by men who may use both hands for opening cans and feeding themselves. It is impracticable for fighter pilots or fighter crews who are restricted to a limited space, such as a cockpit, and must maintain constant control of the craft. Missions in which fighter craft are engaged may span meal periods, and some feeding method is necessary for personnel manning such planes. The current solution is the Lunch, Air Crew, a packet designed to permit consumption with the use of only one hand, either gloved or ungloved. The container is intentionally designed to fit conveniently in the flyer's jacket pocket. It contains confection items such as pan coated candies, nuts, chocolate bars, and chewing gum totaling approximately 400 calories. The packet itself may be contained in a laminated foil bag which keeps the confection items fresh. The bag or an outer container can be removed by personnel prior to the take-off.

A second device which may be applicable in the feeding of pilots in long range fighter and reconnaissance aircraft is an electrically heated receptacle capable of warming the IF-2 meat item, canned soup, liquid cocoa, or coffee. This receptacle is currently under development, but should be ready for field tests soon. The heating device will be of the plug-in type which can be installed in the cockpit or gunner's station.

Still another solution which has recently been entertained is the use of the self-heating can which, under certain conditions, will heat the contained food item by means of a chemical reaction taking place with the mixture of water and calcium oxide. The "hotcan" was used by



PARACHUTING FROM HIS DISABLED AIRPLANE, THE PILOT AND CREWMEN MAY HAVE ACCESS TO NO FOODS FOR SEVERAL DAYS. THE SURVIVAL PACKET IS PROVIDED FOR THESE EMERGENCIES.

## *Activities Report*

the crew of the Lucky Lady, the B-50 which recently completed a non-stop globe circling flight. According to reports of the crew members, the "hotcan" ready-to-serve soup item was particularly acceptable.

A somewhat specialized type of in-flight feeding is required for sick or wounded personnel being evacuated to other areas by air. Two ration supplements are currently available for the feeding of such evacuees, and are intended for use in conjunction with normal subsistence issues. The first of these is the Ration Supplement, Special Items Pack, Hospital. This supplement contains an assortment of nutritious, easily digested foods and beverages such as processed fruits, fruit juices, soups, compressed cereals, and beverage ingredients. Some of the components require heating prior to consumption. The second item is the Ration Supplement, Special Items Pack, Aid Station. It consists of ingredients for coffee, tea, and cocoa and is administered in conjunction with treatment for shock. The various aspects involved in serving precooked frozen meals to air evacuees is currently being investigated. Efforts are being made to develop a hospital ration which may be adaptable to the feeding of air evacuees.

Post-flight feeding problems are similar in many ways to those encountered in pre-flight feeding. It is necessary that flight personnel be provided with highly acceptably and nutritious foods which will maintain their good physical status and thus enable them to engage in subsequent flights. Such rations as the Ration, Field, A or the Ration, Operational, B (where indicated) will be consumed. In addition, it is deemed desirable that these rations be supplemented with foods of high protein content in order to increase visual acuity, altitude tolerance, cold tolerance, motor functions, and resistance to bends.

### **Survival Feeding**

Survival feeding is intended to provide for situations in which air personnel are forced to bail out, ditch their craft, or make forced landings in areas remote from sources of supply. Existence under such conditions will depend on the availability of food as well as on many other factors. The required solution to this feeding problem must be packaged processed foods which will maintain health and morale until rescue can be effected. It is anticipated that such survival situations will occur mainly in arctic or tropical areas, and for that reason two types of survival packets are under development, one for cold weather zones - Food Packet, Individual, Survival (SA-1), and the other Food Packet, Individual, Survival (ST-1).

The current experimental SA-1 packet, developed at the Quartermaster Food and Container Institute, is designed for air crews operating over arctic areas. It consists of compressed cereal, fruit and nut bars, starch jelly bars, cigarettes, bouillon, tea, coffee, and halazone tablets. The case, containing 24 individual packets, has a cubage of 0.6 cubic feet and weighs 42 pounds. Each packet weighs 1-3/4 pounds including packaging materials. It provides approximately 1800 calories, and the water requirements, when using this packet, may be limited to about one quart per day.

The ST-1 packet, thus far only experimental, is intended for air crews operating over tropical areas. It is pure carbohydrate in content and consists primarily of starch jelly bars, cigarettes, tea, coffee, sugar, and halazone tablets. Physiologically speaking, the pure carbohydrate diet is beneficial under tropical survival conditions because of its water-sparing characteristics and also under all survival conditions, because it provides a substance other than stored fat on which the body can draw for energy. The ST-1 is a 3-in-1 packet, i.e., it provides food for one man for three days or for three men for one day.

Neither the SA-1 nor the ST-1 is the ideal solution for survival feeding, and efforts are continuing to develop an all-purpose survival packet which will fulfill the military requirements regardless of climatic conditions or environment.

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Another ration which has been issued in the past for survival situations is the Ration, Parachute, Emergency designated specifically for flyers who are forced to bail out of disabled aircraft. Its packet construction is such that it fits neatly into a pocket or emergency vest. Components include hard candy, chocolate bars, cheese and cracker bar, coffee, sugar, gum, bouillon cubes, halazone tablets, a can opener, and a laminated cellophane bag for carrying unused portions of the ration after the can has been opened. Although the Ration, Parachute, Emergency is listed as a standard ration, it is anticipated that improved food packets designed for survival will replace it.

### Conclusion

Because military tactics, equipment, and logistics are constantly changing, ration development must keep pace in order that Armed Forces personnel may be provided with nutritious, acceptable foods under all military conditions, whether in peace or war. Ration development, therefore, is an unending task. Existing rations and ration components must be everlastingly improved to insure the highest possible level of feeding for United States troops. Also, new rations must be developed to meet altered requirements based on changes in available equipment and in tactics and supply.

Typical of the improvements currently considered for the rations and packets are the following:

1. Improvement of the Lunch, Air Crew by substituting more suitable confection items, redesigning the package, and adding a suitable overwrap to prolong the freshness of the components.
2. Improvement of the Food Packet, Individual, Combat, In-Flight (IF-2) by continuing research and development based on service tests.
3. Improvement of Food Packets, Survival, SA-1 and ST-1 by increasing acceptability of various components, decreasing thirst-provoking qualities, and at the same time endeavoring to develop from these packets a single packet which will be suitable for all types of survival conditions.
4. Development of an edible calcium pectinate coating for Food Packet or ration bars. One of the principal objectives of such a coating is the elimination of paper or other types of overwraps which are difficult to remove with gloved fingers.
5. Improving the stability of various ration bars and components.
6. Design of an all carbohydrate ration for survival use based on the concept that 100 grams of pure carbohydrate is essential for survival purposes.

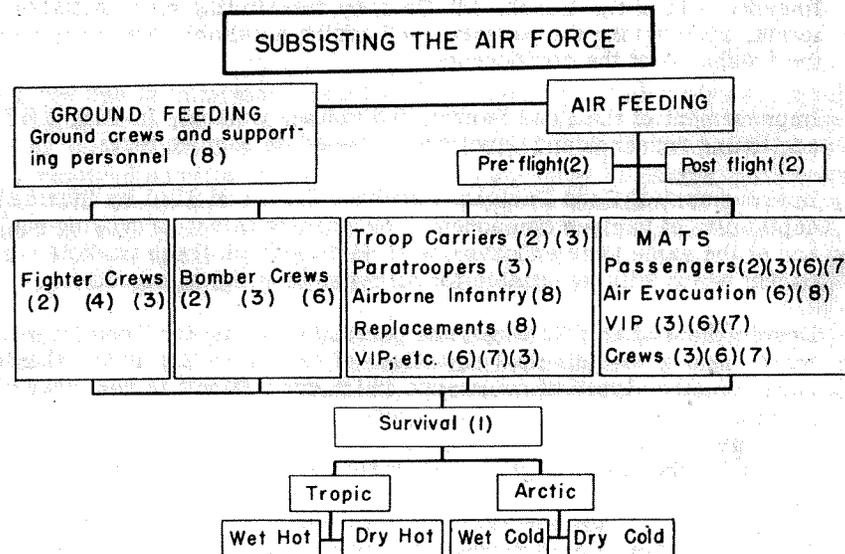
The foregoing are only a few of the feeding problems presently confronting the Quartermaster Corps and the Air Forces. Other problems depend for their solution on the joint enterprise of agencies other than those concerned with ration development. For example, it is necessary that consideration be given the design of military aircraft in order to provide suitable and adequate facilities for the storage and preparation of subsistence for the personnel who man them. Although it is fully realized that weight and space must be held to an absolute minimum in making these aircraft as battleworthy as possible, the tremendous effect on the morale of the airmen whose aircraft are equipped with properly designed feeding equipment cannot be overestimated.

## Activities Report

Present equipment for feeding in aircraft is clumsy and generally inefficient and is often superimposed on the aircraft after it comes off the assembly line. If equipment of this type were engineered into the aircraft at the time it is designed much more efficient and space-saving equipment could be made available. If food is considered an essential weapon in warfare, then the provision of facilities of this type is of equal importance to the building in of bomb-bays and machine guns.

The Air Forces have recognized this deficiency by designing specially built-in stainless steel galleys which will form an integral part of the fittings of some of the newer aircraft. These galleys are now being installed by the factory in some of the new large transport planes of the Constellation type.

The increased complexity of air operations has likewise increased the difficulty of feeding Air Force personnel before, during and after flight. The problem is further complicated by the necessity for feeding divisions of armies of airborne troops, as well as for evacuating by air patients from the various theaters of operations, and maintaining at the same time conformance with the minimum weight and volume requirements for air transportability of all food, equipment, and material. Partial solution of some of these problems has been achieved, though it will be necessary to continue intensive research and development in the field of foods, ration containers, and container materials in order to provide Air Force personnel and airborne troops with the necessary food to maintain them at the peak of highest fighting efficiency, health, and morale. Every effort should be made to develop rations to such a state of perfection that the air crews are fed meals equal to those that are made available to ground personnel.



- (1) Survival-Ration ST-1 and SA-1 to be used for this situation. Also Water, Canned Emergency being improved. Development of All Purpose Survival projected.
- (2) Pre-Flight and Post Flight Feeding - a common problem. Selection of proper foods must be considered.
- (3) Packet Food Individual Combat IF-2, suitable for Bomber Crews, Passengers, Paratroopers and Air Borne Infantry. Also Ration, Parachute, Emergency.
- (4) Lunch Air Crew designed for use by Fighter Pilot(s).
- (5) Special Item Pack Hospital or Beverage Pack Aid Station. (Operational rations utilized when possible).
- (6) Precooked frozen meals when available.
- (7) Sandwich-beverage meal.
- (8) Subsisted on same operational rations as other members of the Armed Forces.
  - a. Basic Field Ration "A"
  - b. Ration Operational "B"
  - c. Ration Small Detachment (5-In-1)
  - d. Ration Individual (C-4)
  - e. Ration Supplement, Sundries Pack
  - f. Ration Supplement, Spice Pack, Kitchen
  - g. Ration Supplement, Special Items Pack, Aid Station
  - h. Ration Supplement, Special Items Pack, Hospital