General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

JSC-09159

NASA TECHNICAL MEMORANDUM

NASA TM X-58139
October 1974

N/S

SKYLAB FOOD SYSTEM

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS 77058

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
TM X-58139		

4. Title and Subtitle	5. Report Date
SKYLAB FOOD SYSTEM	October 1974
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Thomas R. Turner, JSC, and J. Dennis Sanford, Technology, Inc.	JSC-09159
	10. Work Unit No.
9. Performing Organization Name and Address	961-89-89-00-72
Lyndon B. Johnson Space Center Houston, Texas 77058	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Technical Memorandum
National Aeronautics and Space Administration Washington, D.C. 20546	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

A review of the Skylab food system requirements, package designs, and launch configurations is presented. In-flight anomalies are discussed, and between-mission changes in design are described. A discussion of support for Skylab 3 and Skylab 4 mission extensions and of new items launched on these missions is included.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
* Space-Flight Feeding * Provisioning * Nutrition * Diets * Food Containers * Food Packaging * Orbital Workshop * Weightlessness	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
Unclassified	Unclassified	44	

*For sale by the National Technical Information Service, Springfield, Virginia 22151

NASA — JSC

JSC Form 1424 (Rev Jul 74)

NASA TM X-58139

SKYLAB FOOD SYSTEM

Thomas R. Turner
Lyndon B. Johnson Space Center
Houston, Texas 77058

and

J. Dennis Sanford
Technology, Inc.
Houston, Texas 77058

CONTENTS

TABLES

FIGURES

SKYLAB FOOD SYSTEM

By Thomas R. Turner and J. Dennis Sanford*
Lyndon B. Johnson Space Center

SUMMARY

The Skylab Program food system was designed to provide three crewmen with nutritious, palatable food for 140 days and to meet the requirements of the M070 series of nutritional and musculoskeletal experiments. The food system included individual food items in protective packages, accessory items used in food preparation and consumption, and mineral supplements to ensure mineral balance. In an effort to provide variations in food taste, condiments were also launched on the Skylab 3 and Skylab 4 missions. Because of increases in allowable salt intake, a new dispenser system was designed and supplied for the Skylab 4 mission. A 3-day extension of the Skylab 3 mission was supported by using excess food from the orbital workshop. A 28-day extension of the Skylab 4 mission was supported by using excess food from the orbital workshop and by supplying high-caloric-density bars.

As a result of the excessive heat experienced during the first month after the orbital workshop launch, one item, catsup, had to be resupplied on the Skylab 3 and Skylab 4 missions. A few additional food system anomalies were reported, but none affected the mission as a whole. The failure rate for all food items was less than 0.1 percent.

INTRODUCTION

The Skylab food system was large and complex compared to systems used on previous space-flight missions. Approximately 17 000 individual food packages and support items weighing more than 1133 kg (2500 lb) were sent into space on board the orbital workshop (OWS) during the Skylab 1 Saturn V launch. In addition, some 2200 items having a total weight of approximately 159 kg (350 lb) were launched on the three manned Skylab missions. The food system provided the Skylab crewmen with nourishing food and beverages for 171 days and provided the accessory items needed for food preparation and consumption.

The purpose of the Skylab food system was to provide the crewmembers with a diet that optimally combined minimum weight and volume, ease of preparation, precise nutrient control, and palatability. These system functional design

---

*Technology, Inc.

requirements were divided into three categories: (1) nutritional and safety, (2) operational, and (3) experimental. The nutritional and safety requirements are basic to any food system. For the Skylab Program, the National Academy of Sciences Publication 1694 was generally followed to establish minimum dietary allowances of proteins, minerals, and electrolytes in the daily food intake. Special microbiological inspection and test requirements and a rigid quality control program were established to ensure food safety over long periods. All applicable Government and industry standards for processing, inspecting, and analyzing food were equaled or surpassed. The requirements for the M070 series of nutritional and musculoskeletal experiments established the range in which the daily mineral intake of each crewman was controlled. Crewman level within this range was based on individual need.

As an aid to the reader, where necessary the original units of measure have been converted to the equivalent value in the Système International d'Unités (SI). The SI units are written first, and the original units are written parenthetically thereafter.

FOOD SYSTEM DESCRIPTION

The Skylab Program food system was designed as a total system that included individual food items in protective packages, accessory items used in food preparation and consumption, mineral supplements to ensure mineral balance, fecal dye markers, and crew operational in-flight inventory control procedures. The experimental requirements for the M070 series of nutritional and musculoskeletal experiments were not a major constraint on the Skylab Program food system. The requirements did establish the daily mineral intake range summarized in table I; however, levels within this range were based on individual crewmember needs. To fulfill the nutritional, safety, and performance requirements of the Skylab food system, food items were initially identified as being desirable by the crewmembers and as being within the developmental capabilities of the Skylab Program.

Food Items

Rehydratable, thermostabilized, frozen, and natural-state foods were established as acceptable food types. Initial formulation specifications were developed, and processes were selected for manufacturing and packaging. Experience gained from previous space programs was used to the maximum extent. A list of Skylab Program foods follows.

Beverages requested by crewmen that could be developed for the Skylab food system were coffee; tea with lemon and sugar; cocoa; instant breakfast drink (chocolate flavored); lemonade; and orange, grape, strawberry, apple, grapefruit, and cherry flavored drinks. Foods that could be processed in wafer form included bacon, sliced dried beef, dried apricots, cheddar cheese crackers, biscuits (cracker type), dry roasted peanuts, butter cookies, vanilla wafers, mints, and hard candy. Foods that could be frozen were filet mignon,

prime rib of beef, pork loin with dressing and gravy, lobster Newburg, pre-buttered rolls, coffeecake, and vanilla ice cream. Thermostabilized foods included peanut butter, tuna sandwich spread, chili with meat, hotdogs with tomato sauce, turkey and gravy, white bread, stewed tomatoes, applesauce, peaches, pears, pineapple, butterscotch and lemon puddings, fruit jam, and catsup. Rehydratable foods used in the Skylab Program were crisp rice cereal; sugar-coated cornflakes; scrambled eggs; sausage patties; potato, turkey and rice, and pea soups; salmon salad; shrimp cocktail; beef hash; chicken and gravy; chicken and rice; pork and scalloped potatoes; veal and barbecue sauce; spaghetti and meat sauce; mashed potatoes; mashed sweet potatoes; German potato salad; macaroni and cheese; green beans; asparagus; cream style corn; creamed peas; strawberries; and peach ambrosia with pecans. Detailed nutritional information on each food item is provided in table II.

Protective Food Packages

All food items except beverages were packaged as individual items in large (401 by 105), small (208 by 105), or pudding size (208 by 203) cans. These are commercially available aluminum cans with full panel pullout lids.

The food was packed under a nitrogen purge at pressures between 32 and 55 kN/m^2 (4.7 and 8 psia). A thin plastic membrane was placed under the pull-tab lid, when necessary, to prevent food spills when the cans were opened in a weightless environment. The 208 by 105 wafer package contained ready-to-eat foods and snack items. See figure 1. The eight wafer container food items listed under "Other items" in table III had a preslit membrane under the pull-tab lid. When a portion was removed, the membrane held the remaining food product in the can. A plastic cushion and combination tab arrangement was included in the wafer package for biscuit and cracker items to provide vibration damping as well as a means of removing individual crackers under zero-g conditions. Bacon wafers and catsup were packed in individual wafer packages without the can membrane. A commercially available restaurant-sized package of fruit jam was packed in the wafer can using a formed plastic tub for vibration damping. Tuna sandwich spread and peanut butter are thermostabilized foods that were packed in the wafer can; no membrane was required for these items.

Butterscotch and lemon puddings are commercially available products that required no repackaging for the Skylab food system (fig. 1). Because of the difference in the diameter of the pudding and wafer cans, one cavity in the food tray was designated for use with pudding cans to prevent erosion of the inner liner of all four small-can tray cavities. The large 401 by 105 package was used for frozen, thermostabilized, and rehydratable foods (fig. 1). Both the frozen and the thermostabilized foods had intact membranes under the lids that were pierced at the time of preparation or consumption. Intermediate-moisture bread was packaged with polyethylene vibration dampers separating the slices.

The plastic membrane was not used on the rehydratable package. Rehydratable foods were packaged in a flexible container within the can. Two types of

rehydratable packages were designed. One of the packages had a zip-lock opening similar to that of the Apollo spoon-bowl package and was used for the more liquid items. The seven items packed in this spoon-bowl package are shown at the beginning of the rehydratable food list (under "Vegetables") in table III. All other rehydratable food items were packed in conical-topped packages (fig. 1).

Both package types had molded bottoms that fitted the cans and contained a rehydration valve that interfaced with the OWS hot and cold water dispensers. The dry products were vacuum sealed in the rehydratable package and then packaged in a 401 by 105 can using nitrogen at an internal can pressure of 32 kN/m^2 (4.7 psia).

The beverage package consisted of a polyethylene bellows body (fig. 1). A nylon valve that interfaced with both the hot and cold water dispensers was inserted in the neck of the bellows body and used for reconstitution. A nylon pontube for drinking was then inserted into the valve. The package in the vacuum-packed, stored state was compressed. The reconstituted beverage package extended in length to accommodate the water quantity required by the individual item. The package held a volume increase of as much as 0.000237 cubic meter (8 ounces).

Food Package Launch Configurations

All individual food packages were packed for launch according to package diameter and use sequence in either large or small sealed aluminum overcans, or canisters, 40.64 centimeters (16 inches) long. Special package retainers were provided for extracting the individual packages from the canisters in zero g. See figures 2 to 4. These canisters maintained a 34-kN/m^2 (5 psia) internal pressure and provided protection to the vacuum-packed individual packages through the launch portion of the mission.

All the overcans then were placed in restraint assemblies consisting of aluminum end plates separated by aluminum rods. These restraint assemblies provided support for the canisters during launch and served as an interface between the canisters and the stowage lockers. Frozen food was stowed 10 canisters per restraint assembly (fig. 5), whereas ambient food restraint assemblies each held 12 large canisters and 21 small canisters (fig. 6). The stowage sequence and the combinations of items in the small canisters were organized with respect to crew menus and physical constraints of the galley storage area. Each ambient restraint assembly contained an approximately 6-day complement of food.

The food for day 1 and return day meal B was packed for launch in Kel-F overwraps as individual meal packages (fig. 7). The food for days 2 to 4 was stowed in the command module (CM) left-hand equipment bay (LHEB) (fig. 8) for launch.

Accessory Hardware

Several food preparation and consumption accessory items were also provided as a basic part of the overall food system. The requirements for these items were minimized because the food was consumed directly from individual packages by using either the fingers or conventional utensils. A special serving tray was provided to hold the food packages and utensils while food was being eaten. Special disinfectant wet wipes were provided for utensil cleanup and general cleanup. Table IV includes detailed information on the items launched on the Skylab 1 OWS. A brief description of accessory items follows.

1. Three heating-serving trays were attached to the wardroom table and were functionally a part of it (fig. 9). Each tray had eight cavities, four large and four small, which retained individual food packages by friction fit. Three of the four large cavities contained heaters that were capable of heating food to 338 ± 3 K (149° ± 6° F). The eating surface of the tray contained magnets to retain the eating utensils. Each tray contained a timer capable of being preset in 15-minute intervals to a maximum of 12 hours. At the end of this preset time, power was applied to the selected heater cavities, and the timer green light was turned on. A cavity on the left side of the tray held a napkin. The tray operated from the vehicle 28-volt direct-current power source. The food trays, including the two provided as backup units, were used in calibration of the body mass measurement device of experiment M172.

2. Twelve sets (one set per crewman plus three spares) of standard, commercially available, three-quarter-size utensils - knives, forks, and spoons - were stored in the OWS wardroom (figs. 9 and 10). Three large spoons were carried in each command module and were transferred for use in the wardroom. The OWS utensils are comparable to those used on commercial airlines. The back edge of the knife was sharpened for use in cutting package membranes.

3. The canister lid-removal tool consisted of a two-part, tong-plier device (fig. 10). The tool was used to open food canister lids that could not be opened by hand. It opened canisters when one part of the tool was placed around the lid and the other part of the tool around the canister. Pressure was then applied by squeezing the handles, and the canister was opened by rotating the lid-removal tools in a counterclockwise direction. There were removal tools for both large and small canisters.

4. The wet wipe dispenser was a spring-loaded container that held 301 wet wipes (fig. 11). Each wet wipe was composed of an R-2 retort plastic laminated pouch that contained a flexible crepe paper saturated with benzalkonium chloride disinfectant solution. The wet wipes were used for cleaning utensils after each meal and for general cleanup. Nine of these dispensers were launched in the OWS.

5. The mineral supplement dispenser assembly contained five mineral supplement booklets (for use in standardizing daily mineral intake), five salt package dispensers, and one dye marker/temporary can cover booklet (fig. 12). The separate mineral supplement booklets were aluminum paged and contained 840 supplements each of potassium, calcium, phosphorus, sodium, and magnesium.

The salt package dispenser consisted of a spring-loaded, aluminum housing containing 251 individual salt packets (fig. 13). These individual salt packages were fabricated from R-2 retort plastic laminated pouches and contained a 0.5-milliliter solution of 25 percent sodium chloride (by weight) in distilled water. The dye markers (160 red and 160 blue) used in the M070 experiment and the temporary can covers (18 large size, 18 wafer size, and 6 pudding size) were stowed in a booklet like the mineral supplement booklets. These can covers were used for between-meal storage of unconsumed food (fig. 12).

The OWS contained 11 bulk storage lockers for ambient food (2 restraint assemblies per locker), 5 freezers for frozen food, 1 food chiller, 2 standard storage lockers for ambient food, and wardroom storage for accessory support items. To provide additional excess food, 120 large cans were stowed for launch in a frozen food restraint assembly in the chiller (fig. 5) and 12 small canisters were stowed for launch in the 2 standard lockers (fig. 14). The chiller, two freezers, two standard lockers, the food tray table, and a 6-day pantry were located in the wardroom. The balance of the food was stowed in the forward compartment and transferred to the wardroom as required.

In addition to containing the three heating and serving food trays, the wardroom table also held hot and cold reconstitution water dispensers and individual drinking water dispensers. Wet wipes, mineral supplements, salt dispensers, and eating utensils were stowed in wardroom lockers.

Skylab 3 and Skylab 4 Additional Items

As a result of the excessive heat experienced during the first month after the OWS launch, one food item, catsup, became unusable. The flexible packaging leaked catsup. This item was resupplied on both the Skylab 3 mission (150 servings) and the Skylab 4 mission (50 servings) using a foil pouch similar to commercial, individually packaged servings. These pouches were packed in Kel-F overwraps for launch (fig. 15). To ensure vitamin intake levels, standard commercial multivitamins were also launched on the Skylab 3 and Skylab 4 missions (fig. 15). In an effort to provide variations in the taste of the food without affecting the M070 experiment, a condiment supply was launched on the Skylab 3 mission. The supply included liquid Tabasco sauce, granular pepper, onion powder, and garlic powder in commercially available packages overwrapped with Kel-F for launch.

Because of negative crew experiences with conventional shaker and bottle condiment dispensers, a squeeze dispenser with a collapsed inner bag was designed for use with liquid pepper, liquid garlic, and Tabasco sauce. In this design, the collapsed inner bag inflated with air as the liquid was expelled from the dispenser; this action prevented mixing of air with the liquid. Powdered horseradish was provided in an Apollo spoon-bowl package and was rehydrated for in-flight use (fig. 16). During the Skylab 3 mission, increases in allowed sodium consumption levels resulted in a greater than planned salt packet use rate. For the Skylab 4 mission, crystal salt was packaged in modified Apollo beverage packages for the required resupply. The salt was

rehydrated in flight, and syringes fitted with a special nozzle were used to dispense the liquid salt as required by the crew menus and the M070 experiment. See figure 17.

Skylab 4 Mission Extension Support

At the end of the Skylab 3 mission, an evaluation was made to determine the best method of supporting an extension of the Skylab 4 mission to 85 days. The quantity of available excess food in the OWS was determined. Because of launch weight and volume restrictions, new menus for the 28 extra days were designed to maximize the use of excess OWS food. Approximately one-half of the calorie intake on those extra days consisted of high-caloric-density bars (25 J/g (6 cal/g)). Launch stowage locations and quantities of each type of food launched to support this extension are shown in table V. The quantities listed as rehydratable spoon-bowl (RSB) packages were in Apollo spoon-bowl packages (fig. 18).

The food stowed on top of the lockers for launch was packed in fine-filament fiberglass bags and strapped to the lockers under the crew couches (figs. 19 and 20). To satisfy the 10-day rescue capability requirement at the end of the mission, 120 survival bars (251 400 joules (60 000 calories) total) were launched. These bars were 10 by 5 by 1 centimeters (4 by 2 by 0.5 inches) in size, and they provided an energy per unit mass of 30.5 J/g (7.3 cal/g). See figure 21. At the end of the Skylab 4 mission, the quantities of food shown in table VI were left on board the OWS.

RESULTS AND DISCUSSION

During the course of the Skylab Program, various anomalies in the food system were noted. Some of the anomalies can be attributed to food system design and manufacture, and some were the result of off-nominal conditions in the OWS.

Food System Design and Manufacturing Anomalies

A description of the reported anomalies follows. Detailed descriptions of Skylab food system problems can be obtained from the Skylab crew debriefing documents.

Rehydratable spoon-bowl package.- Anomalies noted on the RSB package were heat-seal seam separation on some of the corn packages, food item seepage through zipper closures, and one rehydration valve separation. The seam separation problem was attributed to the heat-seal temperature and to the amount of pressure applied during food package manufacture. Because quality control procedures and in-progress testing of the spoon-bowl packages did not allow time for the testing of each seam on each food package, a random seam separation could be expected. The food item seepage through the zipper closure

on the spoon-bowl package was considered an undesirable condition. This zipper closure method had been used successfully in the Apollo and Gemini Programs. The spoon-bowl package represents the state of the art in rehydratable package design; therefore, an effort to provide a better package design should be considered for future programs, such as the Space Shuttle Program. The rehydration valve separation was considered a random occurrence and was not attributed to package design.

Beverage package.- No anomalies were noted in the beverage package that rendered the package unusable. Nevertheless, several undesirable conditions were noted. One instant breakfast package had powder in the rehydration valve. A characteristic of the plastic bellows is that it tends to expand the package during use. This expansion introduced some gas into the beverages. Four coffee packages were mislabeled as coffee with sugar.

Other packages.- Undesirable conditions noted on the other food item packages were eight pull-tab separations and catsup package leakage.

Off-Nominal Mission Conditions

Several undesirable conditions were attributed to the high temperatures encountered during the early missions. These conditions were changes in food item palatability, unusable catsup packages, and rehydration difficulties caused by excessive gas in the spacecraft water system.

In-Flight Operational Procedures

Several undesirable conditions existed because of operational procedures required for food items in a zero-g environment. One problem was insufficient reconstitution time allowed on some food items. In addition, some thermostabilized items were messy when the lid membrane was cut before a meal. Neither of these conditions resulted in unconsumable foods.

Other conditions noted during the Skylab Program that may be attributed to operational procedures were changes in the taste of some foods, hard stems found in asparagus, unsatisfactory nature of powdered condiments for use in zero g, and difficulties in using some liquid condiments in zero g because of surface tension.

CONCLUDING REMARKS

The overall food system used in support of the Skylab Program was satisfactory in providing the required performance, which ensured a successful program. The few anomalies had minimal impact on overall food system mission support when compared to the approximately 17 000 food items launched for the Skylab Program. Nevertheless, all anomalies and undesirable conditions should

be considered in future space program food system design. In particular, state-of-the-art improvements in rehydratable spoon-bowl package and beverage package design should be accomplished for future missions.

Lyndon B. Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas, October 7, 1974
961-89-89-00-72

TABLE I.- REQUIREMENTS FOR M070 EXPERIMENT

Nutrient	Range, mg (a)	Tolerance, mg (b)
Potassium	[c]3945	--
Calcium	750 to 850	±16
Phosphorus	1500 to 1700	±120
Sodium	3000 to 6000	±500
Magnesium	300 to 400	±100
Protein	90 000 to 125 000	±10 000

[a]Individual crewman requirements were established within this range.

[b]Tolerances were applied to individually established requirements within the range.

[c]Minimum.

TABLE II.- SKYLAB FOOD SYSTEM NUTRITIONAL INFORMATION

Food item	Caloric content, J (cal)	Potassium, mg	Calcium, mg	Phosphorus, mg	Sodium, mg	Magnesium, mg	Protein, g	Nutritional water content, m^3 (oz)	Homogeneous	Reconstitution water		Reconstitution time, min
										Volume, m^3 (oz)	Type	
Vegetables												
Asparagus[a]	155 (37)	173	21	59	210	12	2.9	--	Yes	5.9×10^{-5} (2)	Hot	2 to 3
Green beans[a]	373 (89)	240	76	78	513	20	2.9	--	No	8.9 (3)	Hot	3 to 5
Mashed potatoes[a,b]	837 (200)	263	54	76	385	17	3.4	--	Yes	11.8 (4)	Hot	2 to 3
German potato salad[a]	737 (176)	211	19	69	638	17	6.8	--	No	8.9 (3)	Hot	5 to 20
Creamed peas[a]	645 (154)	197	56	111	802	22	5.6	--	No	10.4 (3.5)	Hot	10 to 20
Mashed sweet potatoes[a,b]	905 (216)	566	41	96	575	28	2.8	--	Yes	5.9 (2)	Hot	3 to 15
Stewed tomatoes[a,c]	272 (65)	443	80	35	568	23	1.8	16.9×10^{-5} (5.7)	No	--	--	--
Cream style corn[a]	666 (159)	252	4	89	418	32	3.4	--	No	13.3 (4.5)	Hot	10
Fruits and desserts												
Butterscotch pudding[d]	858 (205)	156	132	97	291	12	3.2	9.5×10^{-5} (3.2)	Yes	--	--	--
Lemon pudding[d]	837 (200)	75	8	1	150	1	0	10.7 (3.6)	Yes	--	--	--
Dried apricots	766 (183)	860	38	65	76	32	2.2	1.2 (.4)	Yes	--	--	--
Butter cookies	596 (144)	140	4	12	5	2	1.2	--	Yes	--	--	--
Strawberries[d]	398 (95)	160	22	21	3	14	.6	--	No	4.4×10^{-5} (1.5)	Cold	5 to 8
Vanilla wafers	477 (114)	21	4	26	31	4	1.5	--	Yes	--	--	--
Pineapple[d]	619 (148)	183	22	8	21	29	0	15.7 (5.3)	No	--	--	--
Applesauce[d]	644 (154)	139	6	12	10	5	0	15.1 (5.1)	Yes	--	--	--
Peaches[d]	681 (163)	208	7	26	27	12	0	15.4 (5.2)	No	--	--	--
Pears[d]	698 (167)	152	11	12	12	8	0	13 (4.4)	No	--	--	--
Peach ambrosia with pecans[d]	854 (204)	225	18	58	15	30	2.1	--	No	5.9 (2)	Cold	5 to 15
Beverages												
Lemonade[c,d]	352 (84)	5	12	5	29	0	0	--	Yes	22.2×10^{-5} (7.5)	Cold	1
Grape drink[c,d]	515 (123)	4	3	1	14	0	0	--	Yes	22.2 (7.5)	Cold	1
Cocoa[c]	1084 (259)	419	68	161	189	34	3.9	--	Yes	19.2 (6.5)	Hot	1
Orange drink[c,d]	515 (123)	85	79	131	87	1	0	--	Yes	22.2 (7.5)	Cold	1
Coffee[c]	46 (11)	103	5	9	4	11	.5	--	Yes	23.7 (8)	Hot	1
Tea with lemon and sugar[c,d]	335 (80)	49	1	2	7	2	0	--	Yes	22.2 (7.5)	Cold	1
Cherry drink[c,d]	598 (143)	1	2	1	12	1	0	--	Yes	22.2 (7.5)	Cold	1
Apple drink[c,d]	603 (144)	1	20	0	13	1	--	--	Yes	22.2 (7.5)	Cold	1
Strawberry drink[c,d]	527 (126)	92	64	77	89	1	0	--	Yes	22.2 (7.5)	Cold	1
Grapefruit drink[c,d]	711 (170)	410	95	125	125	2	0	--	Yes	22.2 (7.5)	Cold	1
Chocolate instant breakfast[c,d]	1000 (239)	797	456	406	246	139	14.8	0.3×10^{-5} (0.1)	Yes	17.7 (6)	Cold	1

[a] Could be heated after opening or after preparing.

[b] Required kneading.

[c] Could be prepared at previous meal.

[d] Could be chilled after opening or after preparing.

TABLE II.- SKYLAB FOOD SYSTEM NUTRITIONAL INFORMATION - Concluded

Food item	Caloric content, J (cal)	Potassium, mg	Calcium, mg	Phosphorus, mg	Sodium, mg	Magnesium, mg	Protein, g	Nutritional water content, m^3 (oz)	Homogeneous	Reconstitution water: Volume, m^3 (oz)	Reconstitution water: Type	Reconstitution time, min
Breakfast entrees												
Sausage patties[a,b]	824 (197)	227	5	124	416	16	16.4	--	Yes	4.4×10^{-5} (1.5)	Hot	3 to 5
Scrambled eggs[a,b]	983 (235)	218	132	200	459	17	11.6	--	Yes	6.9 (3)	Hot	3 to 5
Bacon wafers	649 (155)	204	7	117	978	13	13.8	0.3×10^{-5} (0.1)	Yes	--	--	--
Crisp rice cereal[d]	607 (145)	213	136	137	265	22	5.3	--	No	10.4 (3.5)	Cold	--
Sugar-coated cornflakes[d]	703 (168)	191	122	108	300	14	4.9	--	No	8.9 (3)	Cold	--
Luncheon entrees												
Tuna salad spread[d]	613 (149)	175	22	85	562	14	9.7	5.9×10^{-5} (2.0)	No	--	--	--
Macaroni and cheese[a,b]	891 (213)	165	114	166	367	25	7.8	--	No	10.4×10^{-5} (3.5)	Hot	0 to 30
Salmon salad[b,d]	1305 (312)	307	51	211	646	22	23.5	--	No	10.4 (3.5)	Cold	2 to 5
Chili with meat[a,c]	1979 (473)	635	52	184	924	44	18.9	11.8 (4.0)	No	--	--	--
Shrimp cocktail[b,d]	389 (93)	182	65	103	166	32	12.7	--	No	5.9 (2)	Cold	15 to 20
Chicken and rice[a,b]	1000 (239)	265	30	240	952	25	17.3	.3 (.1)	No	11.8 (4)	Hot	10
Pork and scalloped potatoes[a,b]	782 (187)	345	53	149	257	24	13.4	--	No	13.3 (4.5)	Hot	5
Beef hash[a,b]	866 (207)	591	32	282	1362	37	27.0	--	No	13.3 (4.5)	Hot	5
Sliced dried beef	360 (86)	251	9	119	2488	14	13.4	2.7 (.9)	Yes	--	--	--
Spaghetti and meat sauce[a,b]	1308 (241)	349	26	178	599	32	21.6	.3 (.1)	No	14.8 (5)	Hot	25 to 30
Dinner entrees												
Turkey and gravy[a,c]	1163 (276)	620	13	54	1337	54	38.7	13.9×10^{-5} (4.7)	No	--	--	--
Hotdogs and tomato sauce[a,c]	2682 (641)	774	24	225	1820	40	25.7	11.2 (3.8)	No	--	--	--
Chicken and gravy[a,b]	695 (166)	213	28	222	1133	20	16.5	--	No	16.3×10^{-5} (5.5)	Hot	5
Veal and barbecue sauce[a,b]	979 (234)	582	23	243	589	34	30.5	--	No	14.8 (5)	Hot	5 to 18
Frozen items												
Vanilla ice cream[b,d]	1305 (312)	188	154	134	96	16	4.5	7.4×10^{-5} (2.5)	Yes	--	--	--
Filet mignon[c]	1494 (357)	586	8	363	126	44	37.1	11.5 (3.9)	No	--	--	--
Prebuttered roll[c]	920 (220)	51	36	58	335	10	4.2	1.5 (.5)	No	--	--	--
Pork loin with dressing[c]	2690 (404)	774	42	197	570	30	22.0	13.3 (4.5)	No	--	--	--
Coffeecake[b,c,d]	1017 (243)	99	43	67	253	13	5.0	1.2 (.4)	No	--	--	--
Lobster Newburg[c]	1180 (282)	348	241	358	891	43	23.2	15.1 (5.1)	No	--	--	--
Prime rib[c]	1594 (381)	484	11	343	248	37	41.7	11.2 (3.8)	No	--	--	--
Other items												
Mints	611 (146)	1	1	0	1	0	0	--	Yes	--	--	--
Catsup	80 (19)	102	3	15	223	4	0.3	1.2×10^{-5} (0.4)	Yes	--	--	--
Fruit jam[d]	343 (82)	20	4	3	13	3	0	.9 (.3)	No	--	--	--
Hard candy	1013 (242)	2	1	0	12	1	0	.3 (.1)	Yes	--	--	--
Peanut butter	1184 (283)	635	16	156	924	44	11.1	--	Yes	--	--	--
Dry roasted peanuts	1268 (303)	363	31	173	479	76	13.4	--	Yes	--	--	--
Pea soup[a,b]	1029 (246)	452	24	180	840	29	7.0	--	Yes	14.8×10^{-5} (5)	Hot	10 to 15
Potato soup[a,b]	967 (231)	522	12	138	498	18	2.9	.3 (.1)	Yes	13.3 (4.5)	Hot	10 to 15
Turkey and rice soup[a,b]	460 (110)	165	17	153	1041	13	10.7	--	No	13.3 (4.5)	Hot	5
Cheddar cheese crackers	883 (211)	63	107	96	477	9	6.2	--	Yes	--	--	--
Biscuit	226 (54)	14	2	11	93	2	1.0	--	Yes	--	--	--
White bread[a]	590 (141)	45	36	35	163	10	3.3	.9 (.3)	Yes	--	--	--

[a]Could be heated after opening or after preparing.

[b]Required kneading.

[c]Could be prepared at previous meal.

[d]Could be chilled after opening or after preparing.

TABLE III.- SKYLAB FOOD SYSTEM PACKAGING INFORMATION

Food item	Vendor (a)	Food or package type (b)	Can size, diameter	Membrane	Wafer membrane	Package weight,[c] dag (oz)	Serving size, g	Item number	Part number[d]	Process specification number[e]
Vegetables										
Asparagus	WPC	RSB	401	--	--	111.4 (39.3)	8.4	22	22-2	416
Green beans	WPC	RSB	401	--	--	111.4 (39.3)	20.5	73	29-2	475
Mashed potatoes	WPC	RSB	401	--	--	111.4 (39.3)	36.0	32	32-2	435
German potato salad	WPC	RSB	401	--	--	111.4 (39.3)	33.0	49	49-2	452
Creamed peas	WPC	RSB	401	--	--	111.4 (39.3)	34.0	56	56-2	459
Mashed sweet potatoes	WPC	RSB	401	--	--	111.4 (39.3)	48.0	61	61-2	464
Stewed tomatoes	SW	T	401	Yes	--	79.1 (27.9)	190.0	64	64-2	467
Cream style corn	WPC	RSB	401	--	--	119.9 (42.3)	37.5	65	65-2	404
Fruits and desserts										
Butterscotch pudding	HW	T	208	--	--	49.6 (17.5)	144.2	2	02-2	401
Lemon pudding	DM	T	208	--	--	50.7 (17.9)	152.3	4A	04-2	414
Dried apricots	M	W	208	--	Yes	45.4 (16.0)	62.0	7	07-2	408
Butter cookies	GFE	W	208	--	Yes[f]	51.0 (18.0)	27.0	76	78-2	519
Strawberries	WPC	R	401	--	--	111.4 (39.3)	23.4	27	27-2	418
Vanilla wafers	KE	W	208	--	Yes[f]	51.0 (18.0)	23.1	28	28-2	432
Pineapple	SW	T	401	Yes	--	78.8 (27.8)	200.0	38	38-2	441
Applesauce	SW	T	401	Yes	--	78.8 (27.8)	195.0	43	43-2	446
Peaches	SW	T	401	Yes	--	78.8 (27.8)	200.0	46	46-2	449
Pears	SW	T	401	Yes	--	78.8 (27.8)	200.0	47	47-2	450
Peach ambrosia with pecans	WPC	R	401	--	--	111.4 (39.3)	36.1	69	69-2	471
Beverages[g]										
Lemonade	W	B	Bev.	--	--	--	21.3	23	23-2	423
Grape drink	GF	B	Bev.	--	--	--	31.5	42	42-2	445
Cocoa	WPC	B	Bev.	--	--	--	54.6	58	58-2	461
Orange drink	GF	B	Bev.	--	--	--	31.5	60	60-2	463
Coffee	WPC	B	Bev.	--	--	--	2.4	62	62-2	465
Tea with lemon and sugar	NE	B	Bev.	--	--	--	20.0	66	66-2	468
Cherry drink	GFE	B	Bev.	--	--	--	36.85	78	77-2	518
Apple drink	GFE	B	Bev.	--	--	--	36.85	77	76-2	517
Strawberry drink	WPC	B	Bev.	--	--	--	31.5	80	80-2	478
Grapefruit drink	WPC	B	Bev.	--	--	--	33.9	79	79-2	477
Chocolate instant breakfast	NE	B	Bev.	--	--	--	55.8	50	50-2	453

[a]WPC = Whirlpool Corporation, SW = Swift, HW = Hunt Wesson, DM = Del Monte, M = Mariana, GFE = Government-furnished equipment, KE = Keebler, W = Wylers, GF = General Foods, NE = Nestles.

[b]RSB = rehydratable spoon-bowl package, T = thermostabilized, W = wafer, R = rehydratable, B = beverage.

[c]Includes weight of cans, lid panel, packaging, plastic lid, and three tissues.

[d]24-0222-XX-X.

[e]24-00XXX.

[f]Opened with wafer pull tab.

[g]All beverages could be reconstituted with hot water if they were consumed immediately or if they were placed in the chiller; all required shaking when reconstituted.

TABLE III.- SKYLAB FOOD SYSTEM PACKAGING INFORMATION - Concluded

Food item	Vendor (h)	Food or package type (i)	Can size, diameter	Membrane	Wafer membrane	Package weight,[c] dag (oz)	Serving size, g	Item number	Part number[d]	Process specification number[e]
Breakfast entrees										
Sausage patties	SW	R	401	--	--	111.4 (39.3)	30.0	13	13-2	419
Scrambled eggs	E	R	401	--	--	111.4 (39.3)	34.5	16	16-2	422
Bacon wafers	SW	W	208	--	--	59.5 (21.0)	28.8	17	17-2	420
Crisp rice cereal	WPC	R	401	--	--	119.9 (42.3)	34.0	54	54-2	457
Sugar-coated cornflakes	WPC	R	401	--	--	119.9 (42.3)	40.0	15	15-2	415
Luncheon entrees										
Tuna salad spread	SW	TW	208	--	--	44.5 (15.7)	85.0	3	03-2	402
Macaroni and cheese	WPC	R	401	--	--	111.4 (39.3)	44.0	74	74-2	474
Salmon salad	WPC	R	401	--	--	111.4 (39.3)	46.7	25	25-2	424
Chili with meat	SW	T	401	Yes	--	79.1 (27.9)	190.0	34	34-2	437
Shrimp cocktail	WPC	R	401	--	--	111.4 (39.3)	18.8	51	51-2	454
Chicken and rice	WPC	R	401	--	--	111.4 (39.3)	47.6	55	55-2	458
Pork and scalloped potatoes	WPC	R	401	--	--	111.4 (39.3)	36.8	59	59-2	462
Beef hash	SW	R	401	--	--	111.4 (39.3)	48.3	63	63-2	466
Sliced dried beef	SW	W	208	--	Yes	45.4 (16.0)	47.0	67	67-2	469
Spaghetti and meat sauce	WPC	R	401	--	--	111.4 (39.3)	50.0	72	72-2	473
Dinner entrees										
Turkey and gravy	SW	T	401	Yes	--	79.1 (27.9)	190.0	40	40-2	443
Hotdogs with tomato sauce	SW	T	401	Yes	--	79.1 (27.9)	200.0	44	44-2	447
Chicken and gravy	WPC	R	401	--	--	119.9 (42.3)	34.2	57	57-2	460
Veal and barbecue sauce	WPC	R	401	--	--	111.4 (39.3)	46.5	71	71-2	472
Frozen foods										
Vanilla ice cream	[illegible]	F	401	Yes	--	79.1 (27.9)	130.0	6	06-2	407
Filet mignon	SW	F	401	Yes	--	79.1 (27.9)	170.0	21	21-2	421
Prebuttered roll	PI	F	401	Yes	--	79.1 (27.9)	53.0	24	24-2	430
Pork loin with dressing	SW	F	401	Yes	--	79.1 (27.9)	200.0	26	26-2	431
Coffeecake	PI	F	401	Yes	--	79.1 (27.9)	64.0	31	31-2	434
Lobster Newburg	SW	F	401	Yes	--	79.1 (27.9)	200.0	39	39-2	442
Prime rib	SW	F	401	Yes	--	79.1 (27.9)	170.0	68	68-2	470
Other items										
Mints	RI	W	208	--	Yes	45.4 (16.0)	37.1	12	12-2	426
Catsup	PI	W	208	--	Yes	49.6 (17.5)	17.0	20	20-2	429
Fruit jam	WPC	W	208	--	Yes	58.7 (20.7)	30.0	36	36-2	439
Hard candy	BR	W	208	--	Yes	45.4 (16.0)	61.8	41	41-2	444
Peanut butter	SW	TW	208	--	Yes	44.5 (15.7)	40.0	33	33-2	436
Dry roasted peanuts	FL	W	208	--	Yes	45.4 (16.0)	45.0	5	05-2	406
Pea soup	WPC	R	401	--	--	119.9 (42.3)	49.0	37	37-2	440
Potato soup	WPC	R	401	--	--	119.9 (42.3)	48.0	45	45-2	448
Turkey and rice soup	WPC	R	401	--	--	119.9 (42.3)	25.1	53	53-2	456
Cheddar cheese crackers	WPC	W	208	--	Yes[f]	51.0 (18.0)	38.3	11	11-2	412
Biscuit	KE	W	208	--	Yes[f]	51.0 (18.0)	10.9	48	48-2	451
White bread	N	T	401	Yes	--	78.8 (27.8)	36.5	75	75-2	476

[c]Includes weight of cans, lid panel, packaging, plastic lid, and [illegible].

[d]84-0222-XX-X.

[e]84-00XXX.

[f]Opened with wafer pull tab.

[h]SW = Swift, E = Evansville Freeze-dried, WPC = Whirlpool Corporation, PI = Pillsbury, RI = Richardson, BR = Brach, FL = Franklin, KE = Keebler, N = Natick.

[i]R = rehydratable, W = wafer, TW = thermostabilized (wafer container), T = thermostabilized.

TABLE IV.- FOOD SYSTEM HARDWARE UTILIZATION AND STOWAGE

Item	Quantity	Weight, kg (lb)	Dimensions, cm (in.)	Nominal use time	Assembly contents
Frozen food	1	27.9 (61.5)	33 by 43 by 41 (13 by 17 by 16) each	1 assembly per 28 days (approx)	10 large canisters per assembly
	1	28.3 (62.5)			
	1	28.6 (63.0)			
	1	27.7 (61.0)			
	1	27.9 (61.5)			
LHEB storage food assembly	3	17.9 (39.5)	--	N/A[a]	(b)
CM food container	3	1.9 (4.2)	--	1 per mission	(c)
Water sample bag	3	.05 (.1)	--	1 per mission	--
Food trays	5	11.2 (24.8)	41 by 34 by 11 (16 by 13.5 by 4.5)	N/A	(b)
CM food, day 1, meal B	3	1.8 (4.0)	--	1 meal for 3 crewmen	--
CM food, day 1, meal C	3	1.6 (3.5)	--	1 meal for 3 crewmen	--
CM food, return day	3	1.6 (3.5)	--	1 meal for 3 crewmen	--
Spoon	12	(d)	--	N/A	--
Knife	12	(d)	--	N/A	--
Fork	12	(d)	--	N/A	--
Unrefrigerated foods, workshop	1	41.7 (92.0)	56 by 51 by 41 (22 by 20 by 16) each	Each assembly contains approx 6 days of food; use dictated by menus	12 large, 21 small canisters per assembly
	1	41.5 (91.5)			
	1	41.5 (91.5)			
	1	40.8 (90.0)			
	1	40.6 (89.5)			
	1	41.0 (90.5)			
	1	41.5 (91.5)			
	1	40.6 (89.5)			
	1	[illegible]			
	1	40.6 (89.5)			
	1	41.0 (90.5)			
	1	41.0 (90.5)			
	1	41.[illegible] (90.5)			
	1	41.9 (92.5)			
	1	40.6 (89.5)			
	1	41.7 (92.0)			
	1	41.9 (92.5)			
	1	41.9 (92.5)			
	1	43.0 (95.0)			
	1	40.8 (90.0)			
	1	42.6 (94.0)			
	1	41.9 (92.5)			
	1	15.6 (34.5)	33 by 43 by 41 (13 by 17 by 16)	Overage used as needed	120 large cans of overage; 12 small overcans per locker, 301 per box
	1	12.7 (28.0)	29 by 25 by 41 (11.4 by 10 by 16)		
	1	12.9 (28.5)	29 by 25 by 41 (11.4 by 10 by 16)		
Dispenser, wet wipes	7	2.5 (5.6)	25 by 13 by 11 (9.71 by 5.15 by 4.46)	1 box per 28 days	--
Stowage module	1	12.0 (26.5)	39 by 28 by 24 (15.5 by 11.0 by 9.5)	N/A	--
Dispenser, salt packages	5	--	--	1 dispenser per 28 days	251 packages per dispenser
Dispenser, mineral supplements	5	--	--		840 capsules each
Dispenser, dye markers, and in-flight can covers	1	--	--	2/crewman/week, alternate colors (dye markers) or as needed (can covers)	160 red dye markers 160 blue dye markers 18 large can covers 18 wafer can covers 6 pudding can covers
Removal tool, canister lid, small	2	(e)	15 by 8 by 1 (6.0 by 3.0 by .5)	N/A	N/A
Removal tool, canister lid, large	2	(e)	18 by 11 by 1 (7.0 by 4.5 by .5)	N/A	N/A
Dispenser, wet wipes	2	5.1 (11.2)	25 by 13 by 11 (9.71 by 5.15 by 4.46)	Crew option	N/A
Package assembly straws	1	.5 (1.1)	22 by 7 by 12 (8.5 by 2.75 by 4.63)	Crew option	N/A

[a]N/A = not applicable.

[b]Included in CM food container.

[c]One CM food container for each mission.

[d]Total utensil weight: 1.13 kilograms (2.5 pounds).

[e]Total canister lid-removal tool weight: 1.09 kilograms (2.4 pounds).

TABLE V.- SKYLAB 4 FOOD SYSTEM LAUNCH CONFIGURATIONS

Food package	Location	Part number	Serial number	Weight, kg (lb)	Contents, amount
1	A7			10.57 (23.3) total	
		24-02032-03	6144	1.79 (3.94)	Day 1, meal B
		24-02033-03	6145	2.31 (5.1)	Day 1, meal C
		118-MFS-038	N/A	1.64 (3.61)	CM food (2A)
		SEb13100218-301	2001 2004 2005 2010	.28 (.61)	Food sticks
		SEC39108329-301	1010	.10 (.23)	Iodine tablets
		24-02035-01	N/A	.14 (.31)	Spoons
		14-02092	N/A	.05 (.10)	Water bag
		DE5-Food/1	N/A	.34 (.74)	Vitamins, 5 each
		TPS15320018	1002	.91 (2.01)	Salt kit
		SEC39109343-301	1004	.98 (2.15)	Catsup
		TPS15320021	1001	.14 (.31)	Taste kit
		TPS15320020	1001	1.17 (2.58)	Spice kit
				.64 (1.42)	M071/M073 bag
2	A9	GE-TPS-C-204	1002	15.06 (33.2)	Nominal command and service module day 2, 3, 4 High-density, day 2, meals B and C
3	A1	GE-TPS-C-204	1001	7.29 (16.08)	RSB spaghetti, 45 RSB mashed potatoes, 21 RSB veal and barbecue sauce, 15 RSB pork and potatoes, 21
4	A3	GE-TPS-C-204	1003	6.60 (14.55)	RSB chicken and rice, 18 RSB chicken and gravy, 63 RSB pork and potatoes, 22
5	A4	GE-TPS-C-205	1001	9.50 (20.94)	Veal and barbecue sauce, 11 Salmon salad, 5 Chicken and rice, 1 Pork and potatoes, 1 Sausage, 36 Mashed potatoes, 18 Apricots, 18 Grapefruit drink, 39
6	A5	GE-TPS-C-205	1002	22.60 (49.83)	High-density bars Flake - vanilla, 34 chocolate, 37 raspberry, 10 Crispy - vanilla, 60 chocolate, 61 raspberry, 14 Chocolate chip - vanilla, 72 chocolate, 72 raspberry, 18
7	A6	GE-TPS-C-205	1003	10.90 (24.02)	Spaghetti, 9 RSB spaghetti, 5 Chicken and gravy, 9 Sausage patties, 10 Mashed potatoes, 3 Beef hash, 4 Apollo cocoa, 34 Peanuts, 20 Apricots, 14 Peanut butter, 2 Bacon, 9 Salmon salad, 11 Veal and barbecue sauce, 1 Apollo grape punch, 9 Apollo grape drink, 18 Apollo grapefruit drink, 2
8	L3	24-02037-03	6146	1.95 (4.3)	Return meal A delta and return meal B
9	B1	TPS 118-MFS-053	N/A	3.74 (8.24)	Lemonade, 15 Jam, 5 Peanuts, 4 Apricots, 10 Grapefruit drink, 25 Orange drink, 3
10	A9	TPS 118-MFS-062	N/A	5.44 (12.0)	Lemonade, 27 Grape drink, 21 Tea, 28 Apple drink, 10 Cherry drink, 10
11	A7	T-41038	N/A	9.70 (21.39)	Survival bars, 120

TABLE VI.- ORBITAL WORKSHOP FINAL FOOD INVENTORY

Food item	Quantity
Applesauce	2
Asparagus	28
Beef hash	5
Biscuit	1
Bread	23
Butterscotch pudding	2
Catsup	22
Chicken and gravy	2
Coffee with sugar	18
Creamed peas	7
Cream style corn	24
German potato salad	2
Grape drink	10
Grapefruit drink	0
Green beans	12
Lemonade	16
Macaroni and cheese	1
Mashed sweet potatoes	3
Pea soup	1
Peach ambrosia	5
Peaches	1
Pears	1
Pineapple	1
Pork and scalloped potatoes	1
Potato soup	1
Crisp rice cereal	1
Scrambled eggs	1
Shrimp cocktail	11
Sliced dried beef	1
Spaghetti with meat sauce	3
Stewed tomatoes	2
Sugar-coated cornflakes	1
Tea with lemon and sugar	5
Tuna sandwich spread	13
Turkey and gravy	1
Turkey and rice soup	5
Veal and barbecue sauce	8
Grape drink (Apollo)	1
Survival bar	120

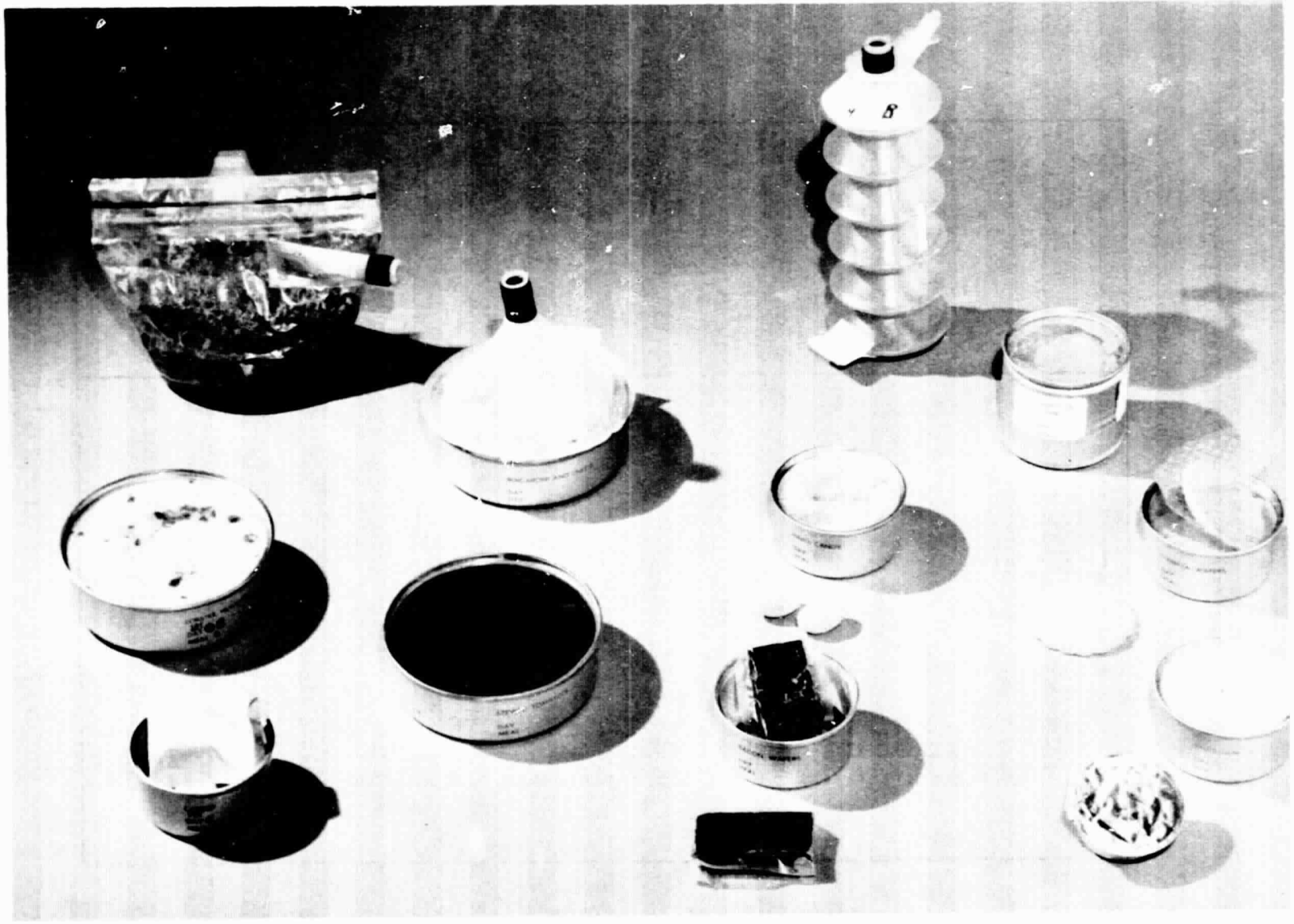

Figure 1.- Skylab food packages (S-73-23114).

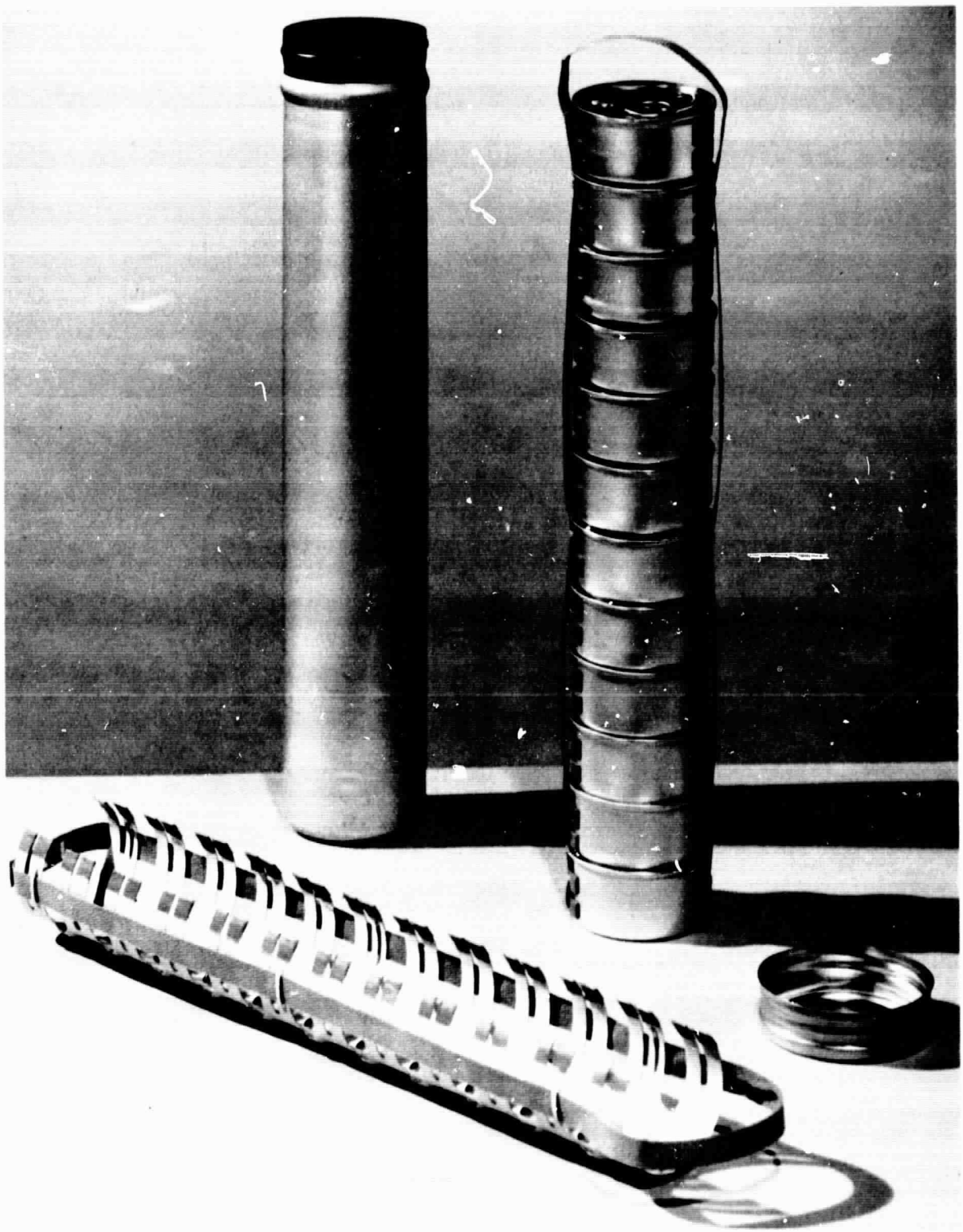

Figure 2.- Small canister/package retainer (S-72-53538).

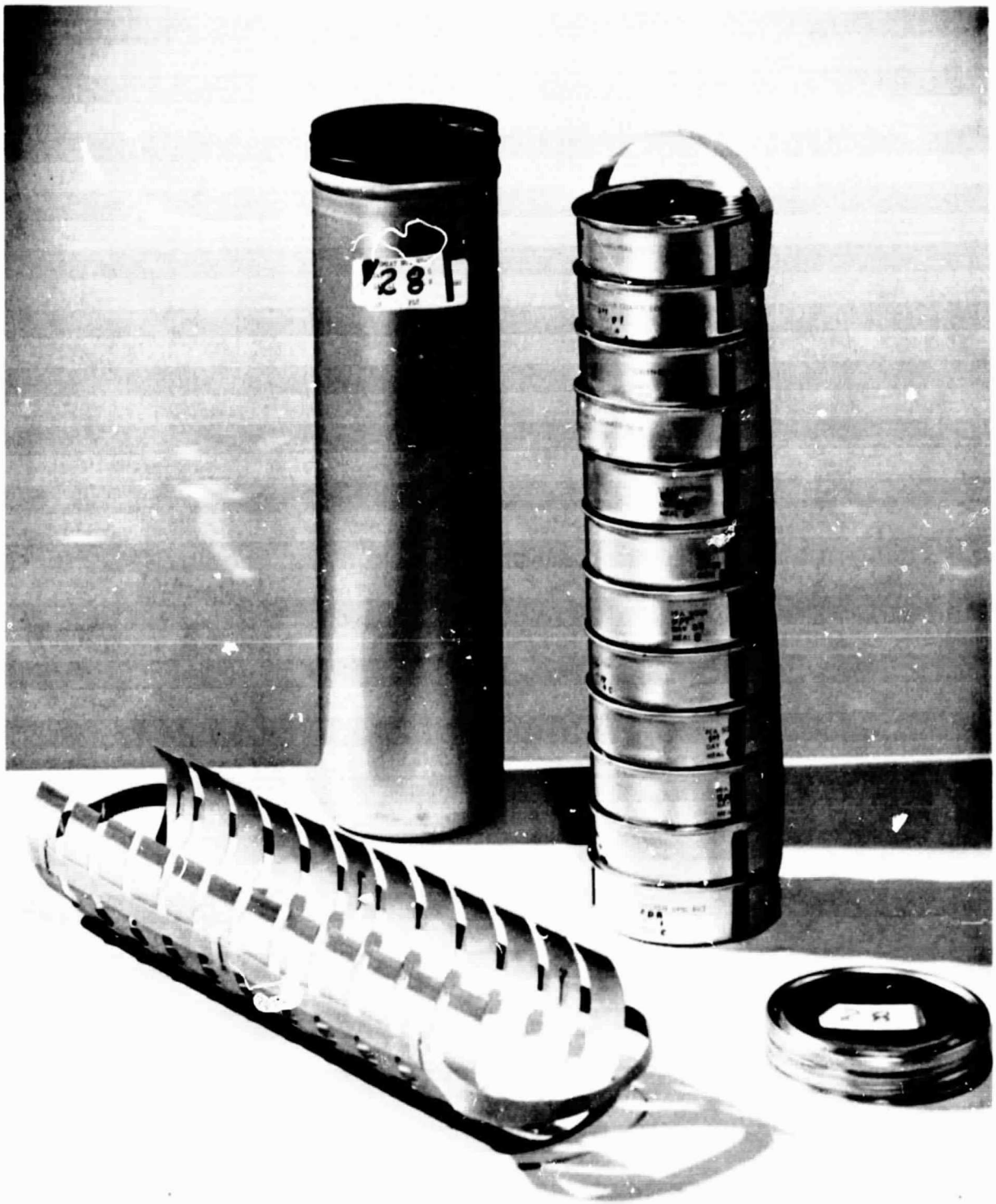

Figure 3.- Large canister/package retainer (S-72-53544).

Figure 4.- Small canister/beverage package retainer (S-72-53540).

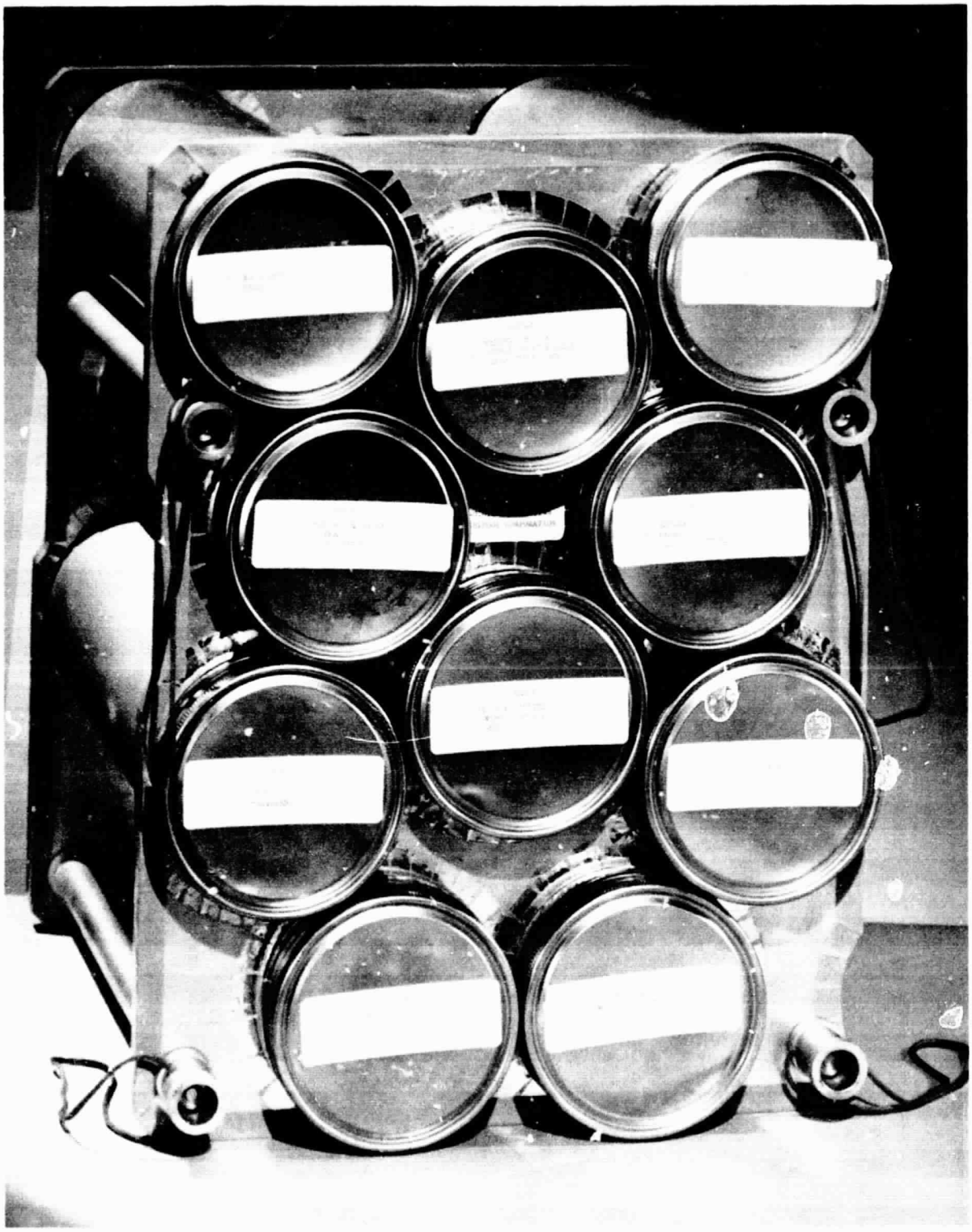

Figure 5.- Frozen food restraint assembly (S-73-22654).

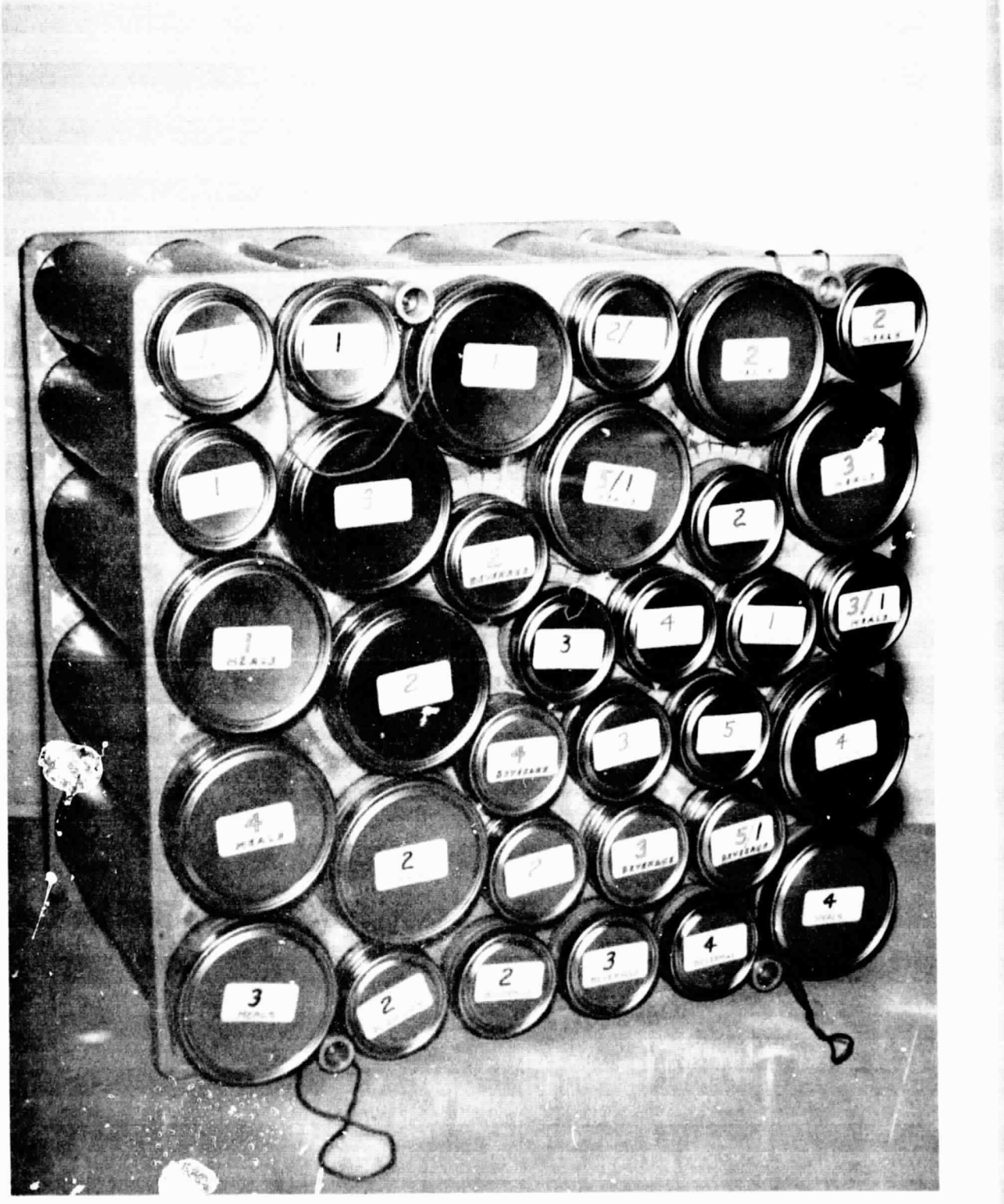

Figure 6.- Ambient food restraint assembly (S-72-43160).

Figure 7.- Day 1 and return day (meal B) launch configuration (S-73-22653).

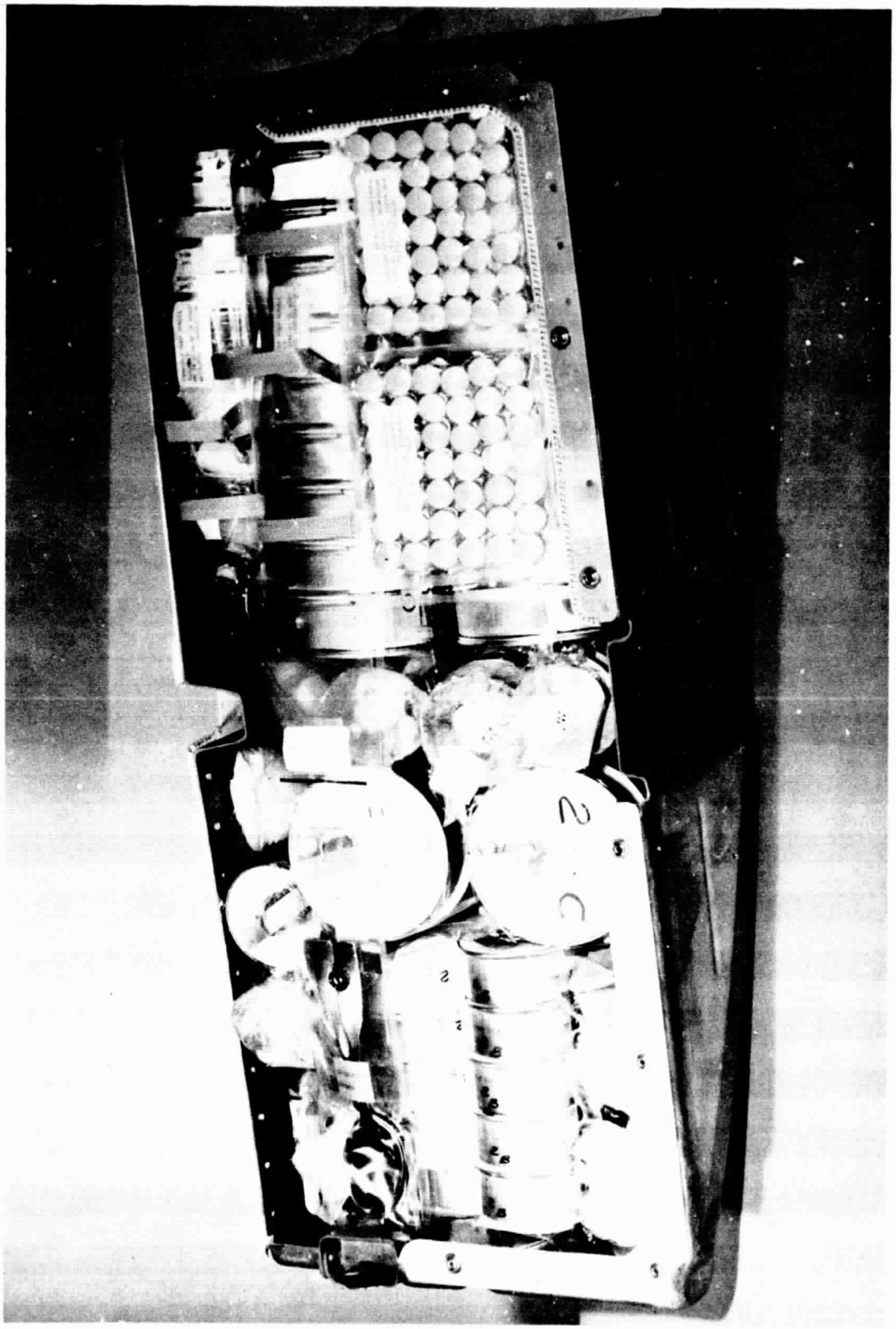

Figure 8.- Left-hand equipment bay/day 2 to 4 launch configuration (S-73-22652).

Figure 9.- Food heating and serving tray (S-73-23112).

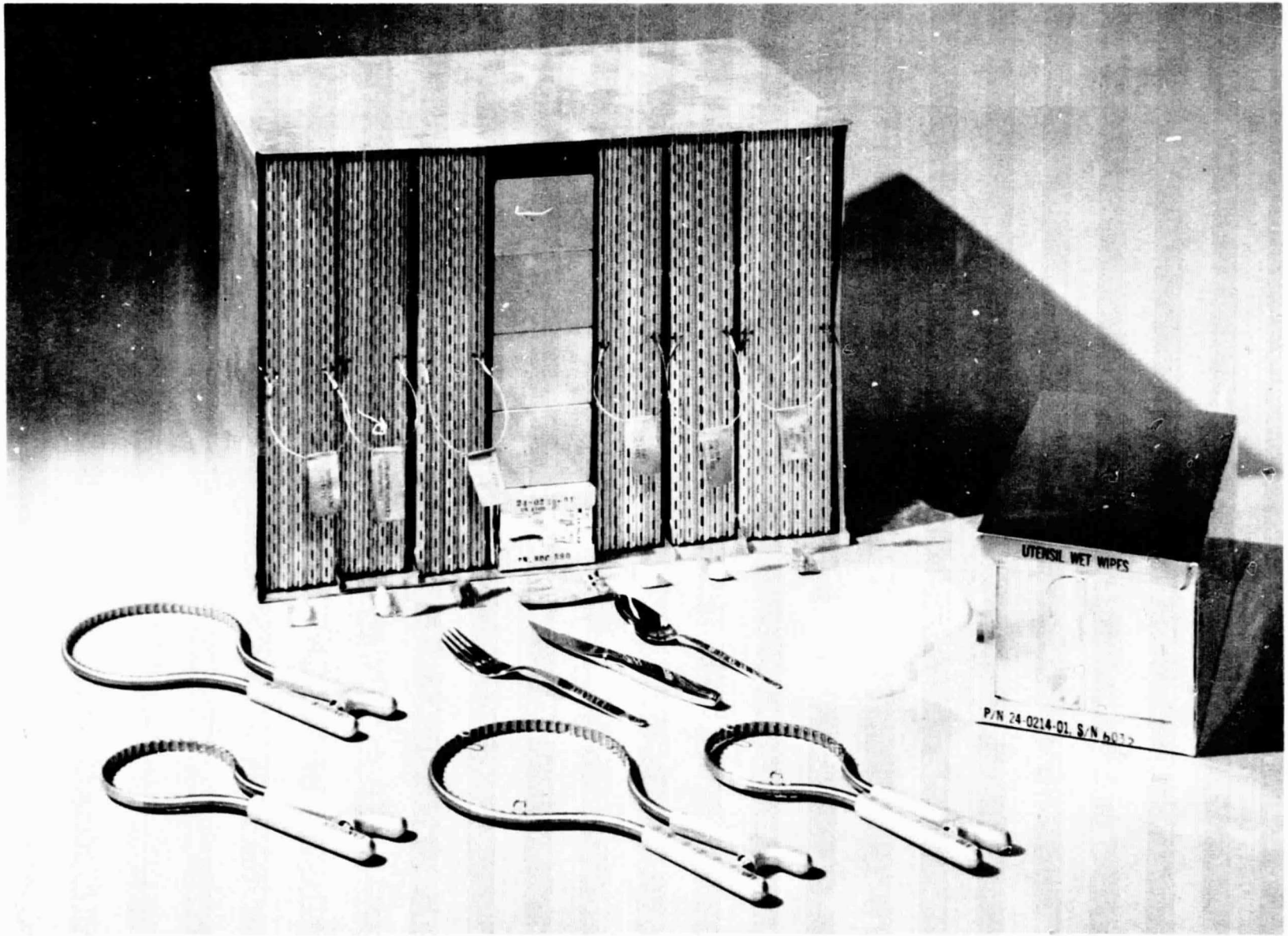

Figure 10.- Accessory food hardware (S-73-23119).

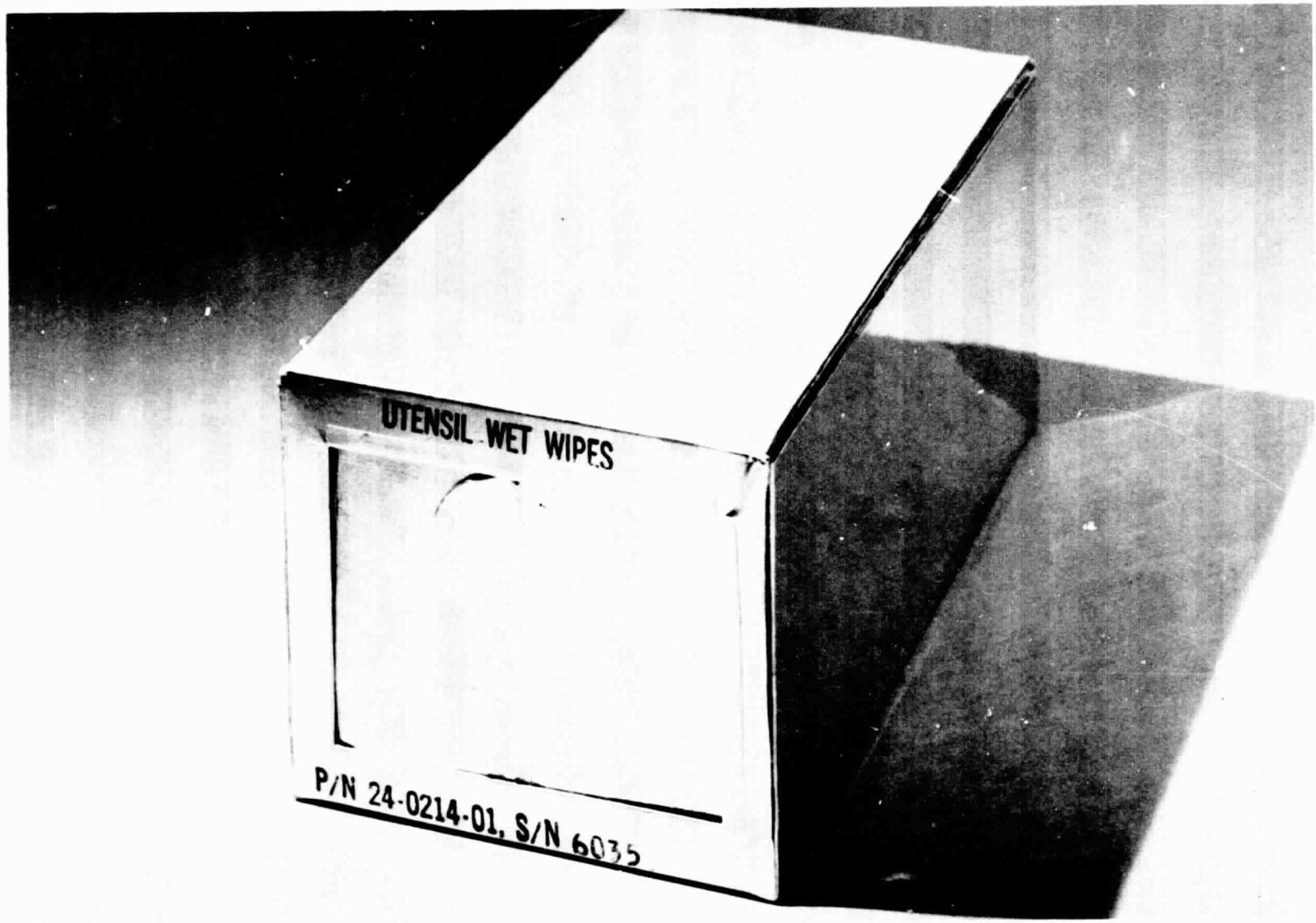

Figure 11.- Wet wipe dispenser (S-73-23115).

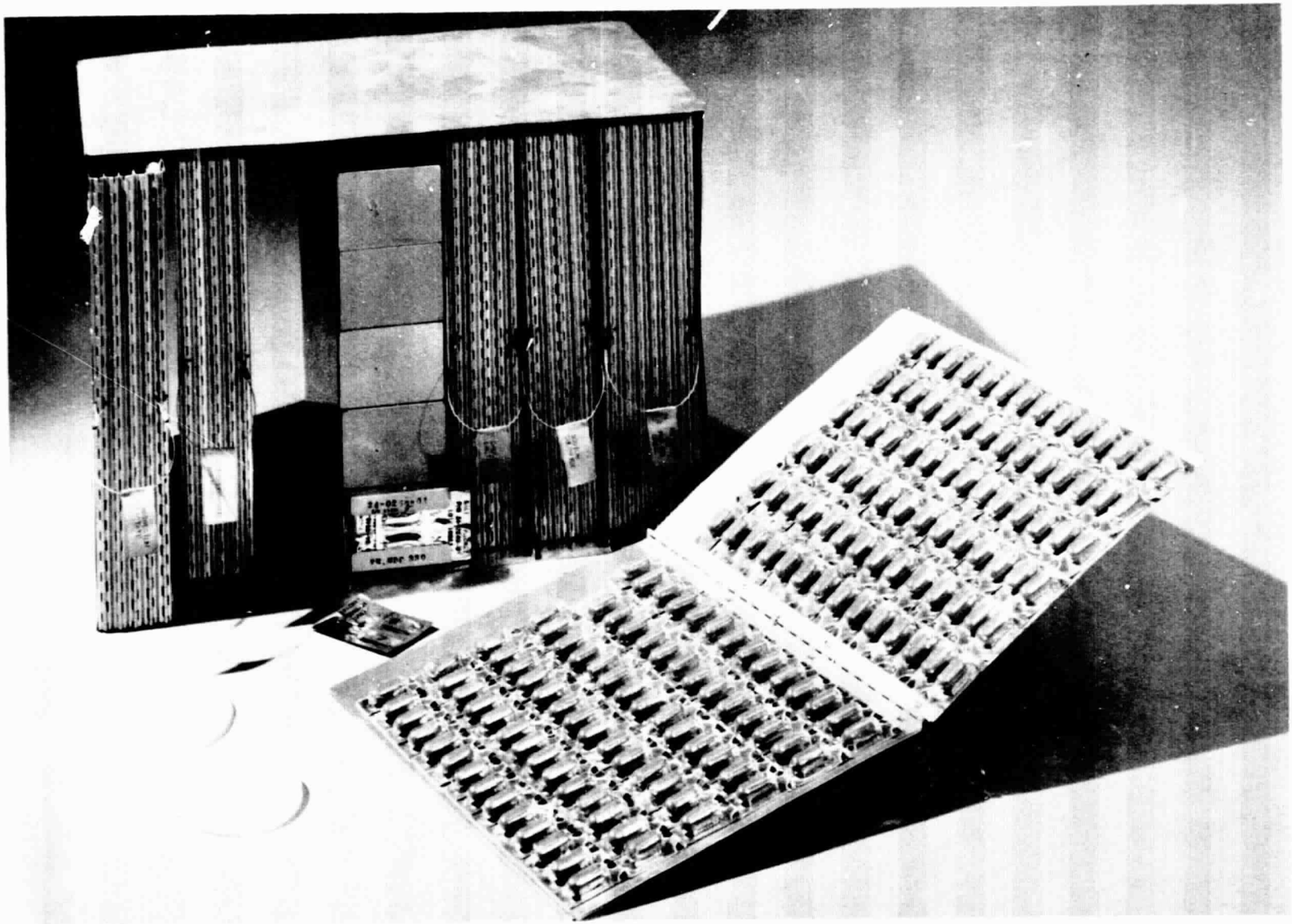

Figure 12.- Dispenser module (S-73-23116).

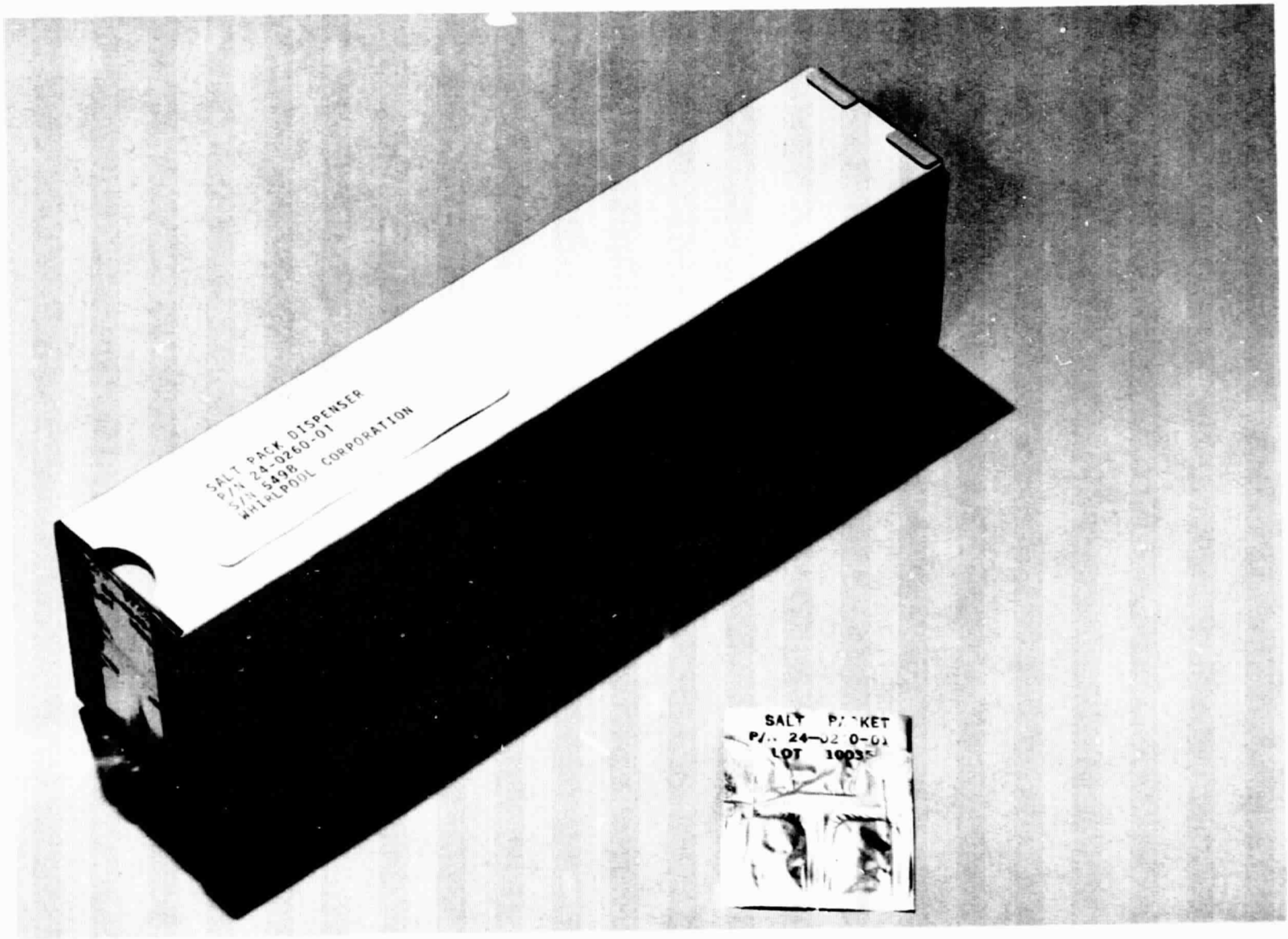

Figure 13.- Salt pack dispenser (S-72-53548).

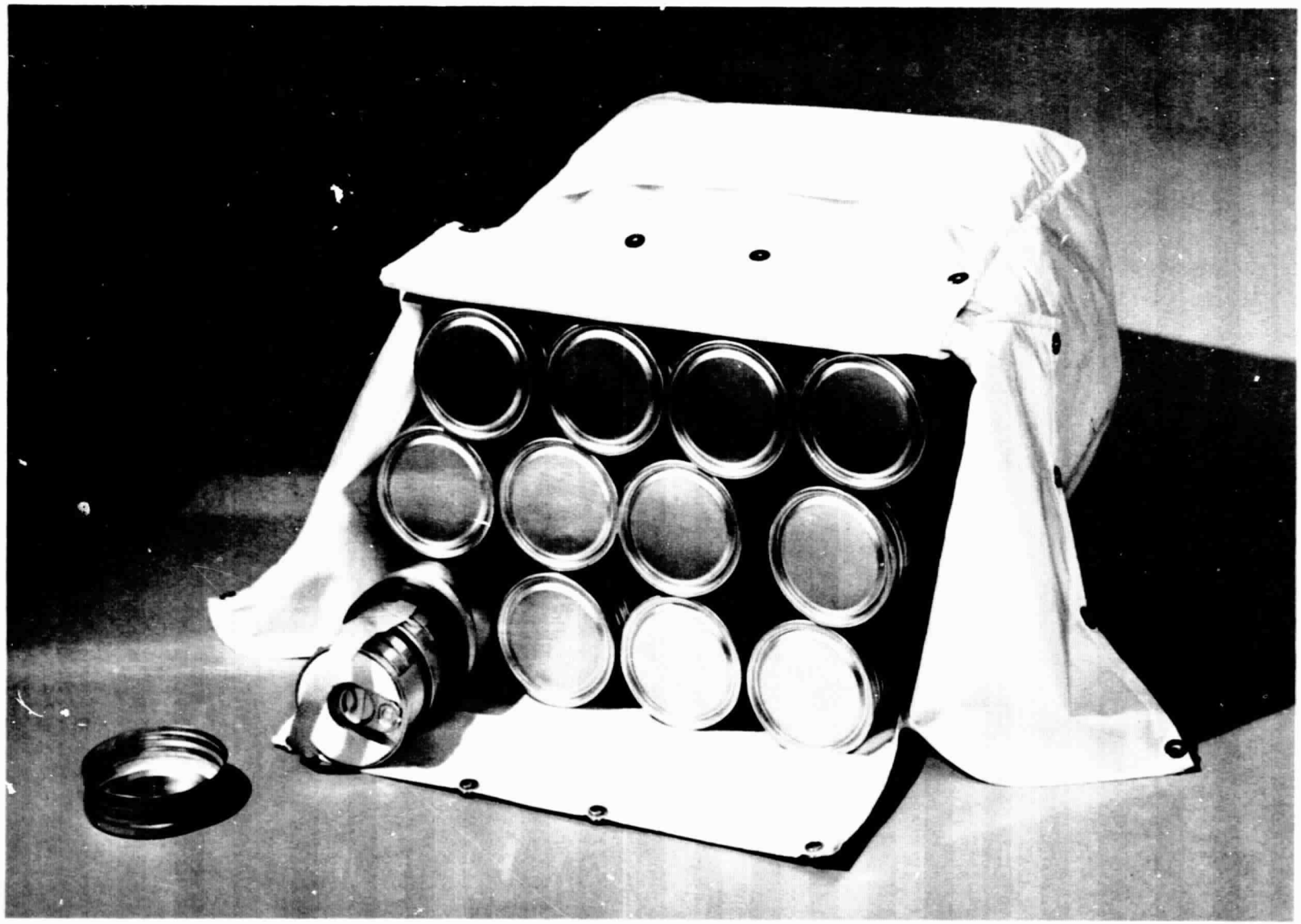

Figure 14.- Standard locker stowage assembly (S-73-23118).

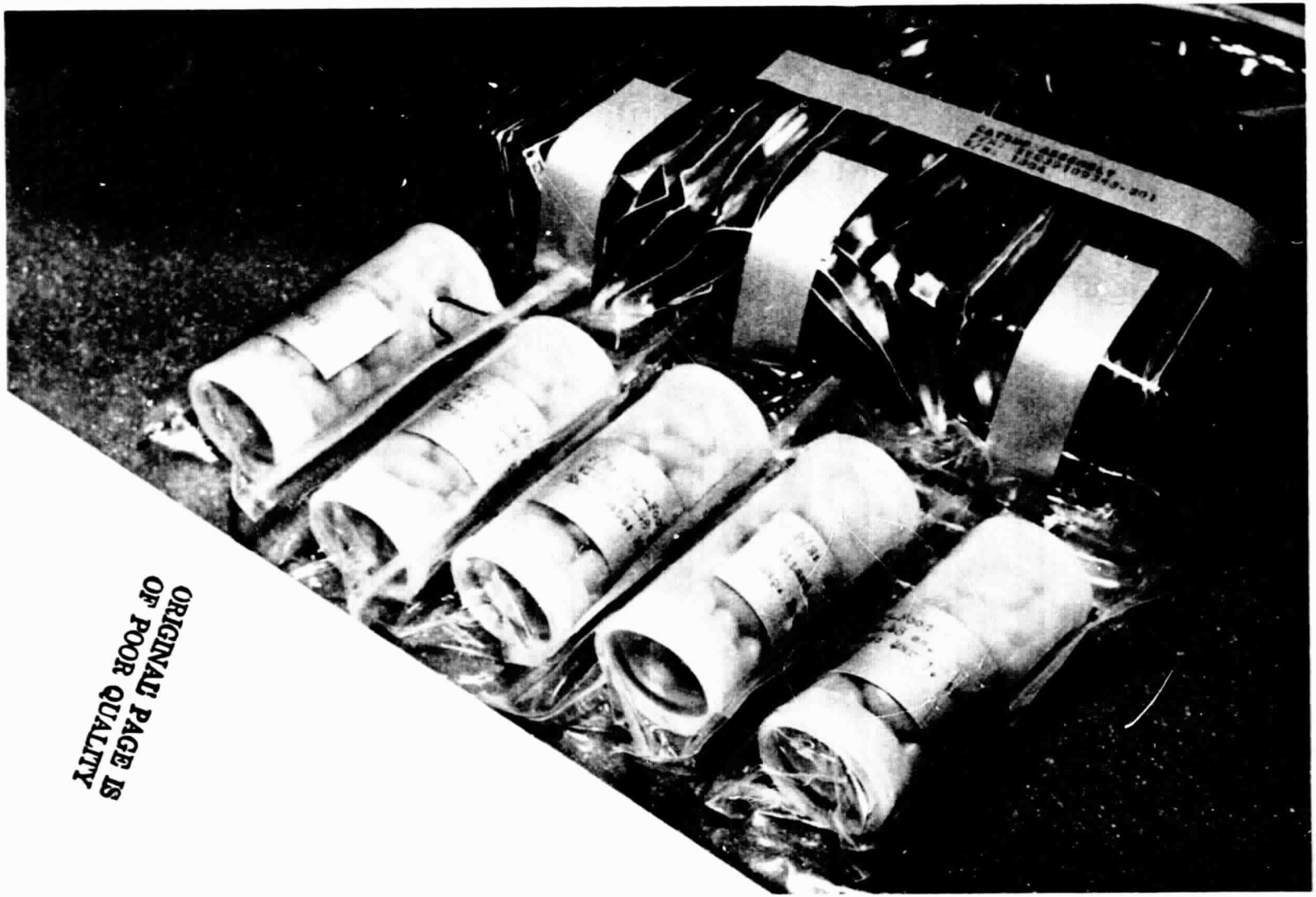

Figure 15.- Launch configuration for vitamin packs and catsup assembly (S-74-20376).

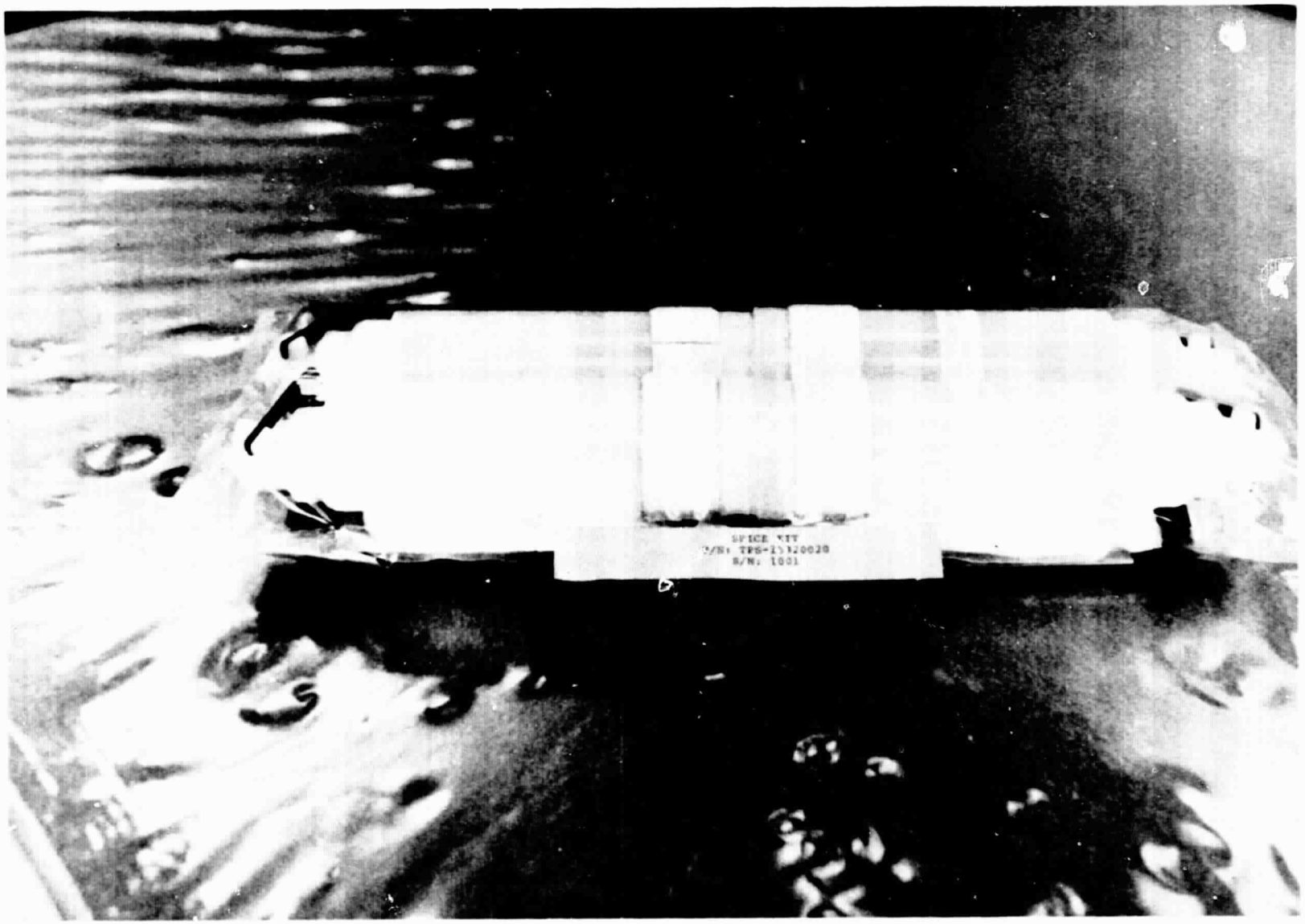

Figure 16.- Skylab 4 spice kit (S-74-20375).

Figure 17.- Skylab 4 salt dispenser kit (S-74-20377).

Figure 18.- Apollo rehydratable spoon-bowl package (S-71-21761).

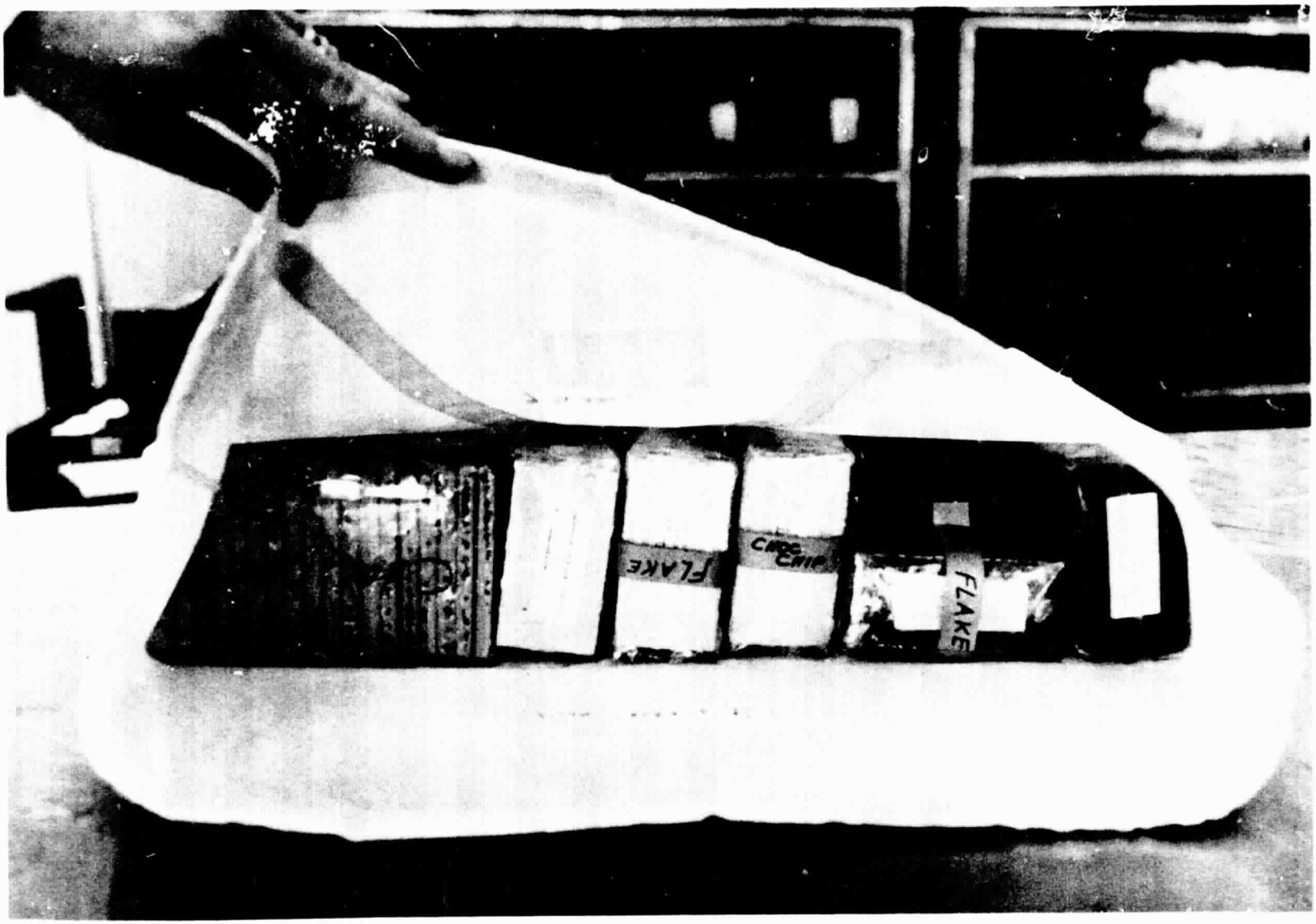

Figure 19.- High-density-bar launch configuration (S-74-20372).

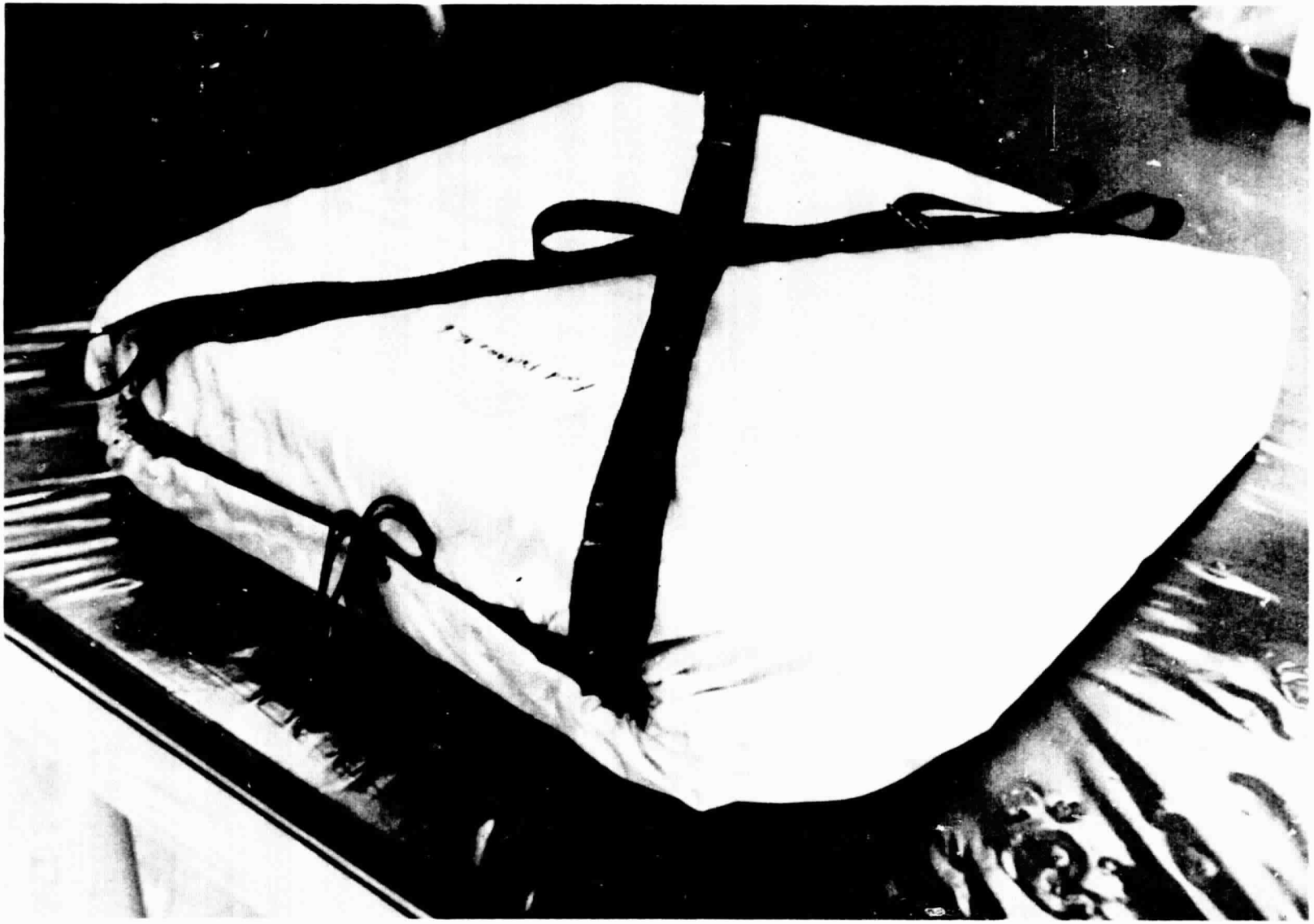

Figure 20.- Skylab 4 extension-food launch configuration (S-74-20374).

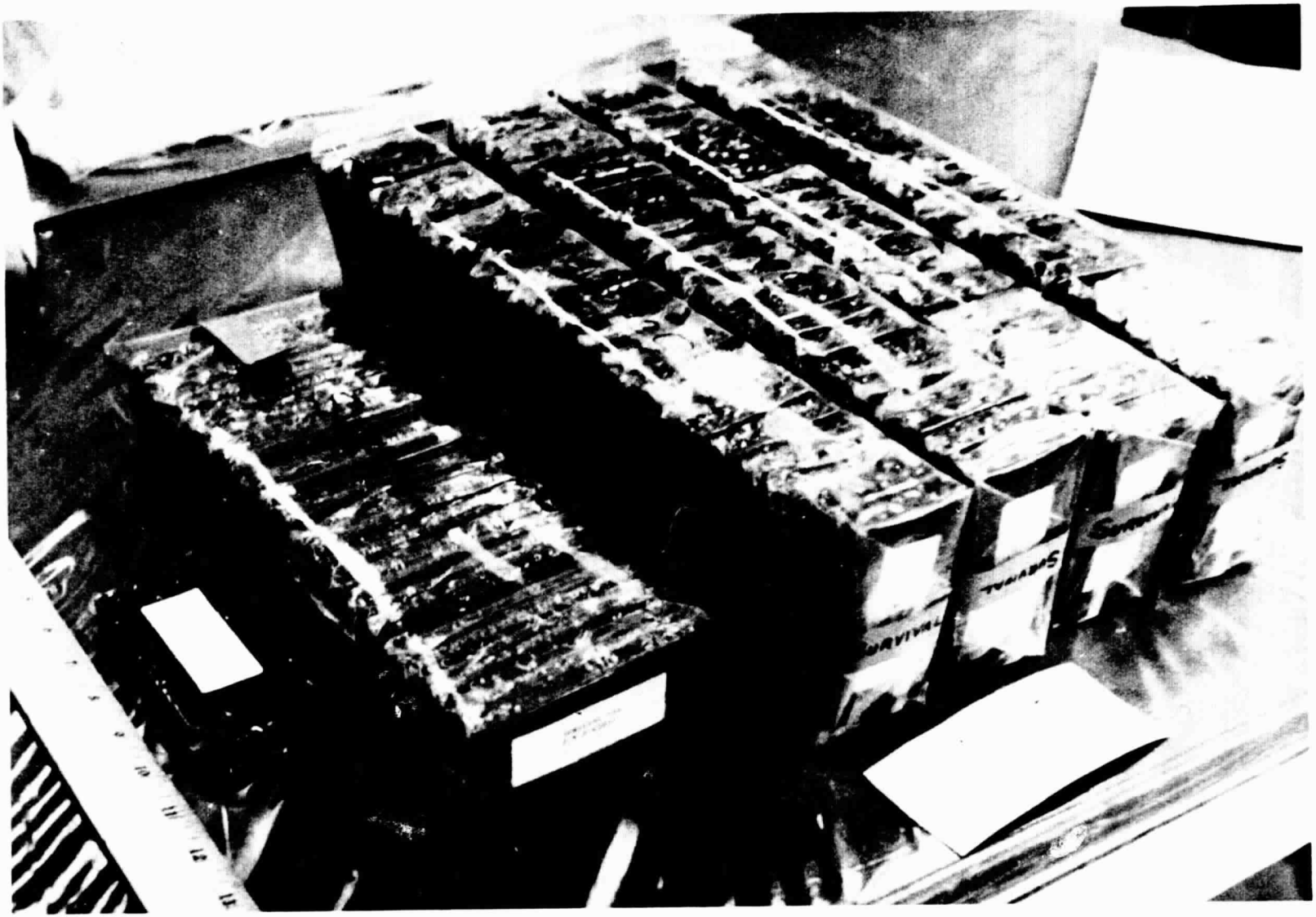

Figure 21.- Skylab 4 survival food bars (S-74-20373).