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JOINT SERVICE MANUAL (JSM) FOR STORAGE AND MATERIALS HANDLING

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DEPARTMENTS OF THE ARMY, THE NAVY, THE AIR FORCE,
AND THE DEFENSE LOGISTICS AGENCY

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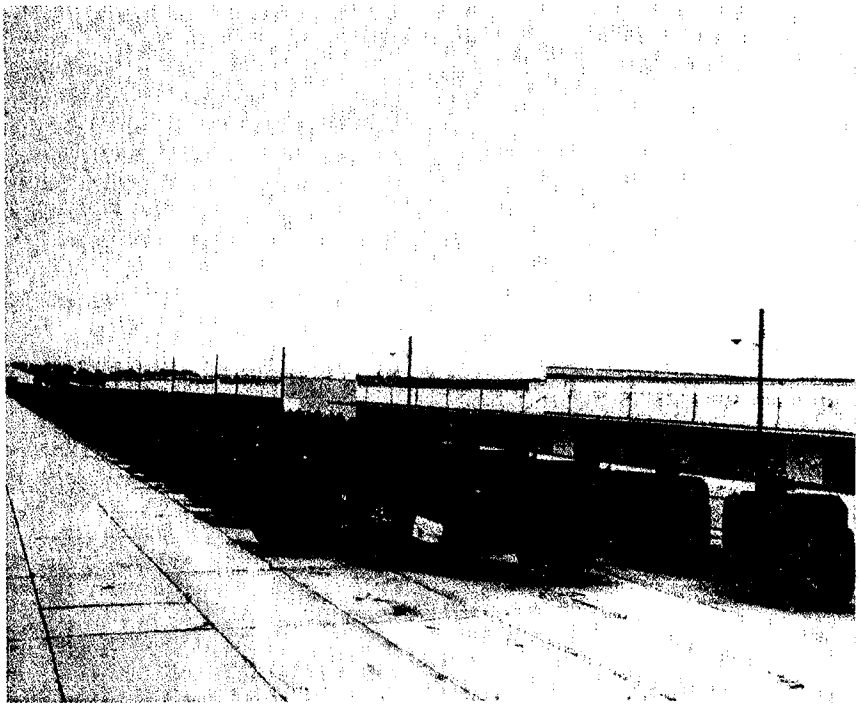

Figure 5-37 Modified back-to-back (herringbone) storage pattern

NOTE

This pattern allows items to be driven or maneuvered directly into their locations with minimal handling.

Section IV. Subsistence

5-17. Perishable Subsistence, Chill and Frozen Storage.

a. Prevention of deterioration.

(1) General. All chilled and frozen subsistence is highly perishable and subject to rapid deterioration when improperly stored. Storage at temperatures which are too high or too low, under unfavorable conditions of humidity, and in the absence of proper air circulation in unsanitary storerooms will result in rapid spoilage and eventual loss of the product. Most spoilage of chilled and frozen subsistence is caused by micro-organisms, particularly certain species of bacteria, yeast, and mold; the contamination spreads rapidly from the decayed items to the surrounding sound subsistence. Therefore, frequent inspection while in storage, followed by sorting and removal of the decayed items or portions thereof, is of basic importance in maintaining the products in top condition and in keeping losses and surveys to a minimum.

All shipments should be segregated and marked in such a manner as will assure that the oldest lots are issued first, except when it may become necessary to issue a lot quickly to avoid loss by spoilage or when another lot of the same commodity is in a better condition for continued storage. Old lots of chilled or frozen subsistence should not be allowed to accumulate in storage rooms, but should be issued promptly or surveyed if unfit for use. Frozen products will not be accepted in a partially thawed condition, nor will such products be refrozen after having been defrosted.

(2) Air circulation.

(*a*) *General.* Along with proper temperature and humidity, air circulation in a storage room is an important factor in the proper storage of chilled and frozen stored subsistence. This is facilitated by stacking the products on pallets in such a manner that will provide a 4-inch wall clearance, 2-foot ceiling clearance, and sufficient working aisleway.

(*b*) *Fruits and vegetables.* Containers should be raised off the floor by the use of pallets and individual lots should be stacked so as to permit free circulation of air. In some cases, the use of a fan or duct system may be desirable to maintain proper circulation in all parts of the room. The introduction of outside air into cold storage rooms housing fruits and vegetables is not necessary. However, when fresh fruits and vegetables are stored in tight compartments at temperatures of 40 °F. or higher, the concentration of carbon dioxide produced by respiration may reach such a danger point that a match or candle will be extinguished. While this condition is not considered harmful to most products, personnel should not work in such rooms until a supply of fresh air has been introduced.

(*c*) *Quick-frozen fruits and vegetables.* Quick-frozen fruits and vegetables are highly perishable unless properly stored. Correct handling and proper storage of such foods are imperative in utilizing frozen foods to the best advantage. Upon delivery, quick-frozen fruits and vegetables should be transferred promptly to a low temperature storage space. Temperature of the load should be checked upon arrival by taking temperature readings of cartons selected from top layers inside shipping cases. If the temperature of the product is higher than the freezer room temperature, shipping cases should be scattered loosely about the room on hand-trucks or upon pallets on the floor with adequate space between individual cases to permit rapid lowering of the product temperature to freezer room temperature. The use of a portable fan to create an air current over the product will hasten temperature equalization. When the temperature of the product has been lowered sufficiently, cases should be stacked compactly. If the product temperature upon delivery is the same as or below temperature of freezer room, the cases should be stacked compactly immediately.

(*d*) *Meat, meat products, and poultry.* A prime factor in keeping the temperature in all parts of meat storage spaces at the recommended level is proper circulation of the refrigerated air. Meat items will not be stored on the bare floor; pallets should be placed on the floor to allow free circulation of air under all items stored in the space. Generally, when the recommended temperature in all parts of the refrigerated space is uniform and is maintained within the stacks in the freezer space, the circulation of air may be considered to be adequate.

(*e*) *Dairy products and eggs.* To keep the air in a cold storage room fresh, the room must be kept clean and the air must circulate slowly. Ordinarily, adequate air circulation can be provided by the use of pallets on the floor and by proper stacking of the various lots. Egg cases should not be stacked more than five high to avoid pressure damage.

(*3*) *Transport and Storage Compatibility of Fresh Fruits and Vegetables.*

(*a*) *General.* Although it may be necessary to transport and store various fresh fruits and vegetables together, there are some products which should be separated whenever possible. Apples, pears, bananas, peaches, plums, cantaloupes, ripe honeydew melons, avocados, tomatoes, and other ethylene producing fruits or vegetables should not be stored with lettuce (causes russeting), carrots (become bitter), cucumbers, green peppers, acorn or Hubbard squash (loss of green color). Odors from apples and citrus fruits are readily absorbed by meat, eggs, and dairy products. Pears and apples acquire an unpleasant earthy taste and odor when stored with potatoes. Other combinations which should be avoided in storage rooms are apples or pears with celery, cabbage, or onions; celery with onions or carrots; green peppers with pineapples; and citrus fruits with any of the strongly scented vegetables. Green peppers can taint pineapples if the two are stored or shipped together. Onions, nuts, citrus fruits, and potatoes should each be stored separately whenever possible.

(*b*) *Perishable Subsistence Compatibility Groups.* For transport and storage, fresh fruits and vegetables have been divided into the following compatibility groups:

GROUP 1

Temperature: 32 °F. to 34 °F. (0 °C. to 1 °C.)

RH: 90 to 95 percent.

Atmosphere: Normally used in berries and cherries only—10 to 20 percent carbon dioxide (CO_2).

Ice: Never in contact with commodity.

Note. Most members of this group are not compatible with group 6a or 6b because ethylene production by group 1 can be high, and thus harmful to members of group 6*a* or 6*b*.

Apples (except those varieties listed in group 3)
Apricots
Berries (except cranberries)
Cherries
Figs (Not with apples, danger of odor transfer to figs; also see group 6*a*.)
Grapes (Not fumigated with sulfur dioxide (SO_2) in vehicle and no chemicals that release SO_2 should be included in packages.)
Peaches
Pears
Persimmons
Plums and prunes
Pomegranates
Quinces

GROUP 2

Temperature: 55 °F. to 65 °F. (13 °C. to 18 °C.).
RH: 85 to 95 percent.
Ice: Never in contact with commodity.
Avocados
Bananas
Eggplant (also see group 5)
Grapefruit [1]
Guava
Limes
Mangos
Muskmelons, other than cantaloupes
Casaba
Crenshaw
Honey Dew
Persian
Olive, fresh
Papayas
Pineapples (not with avocados, danger of avocados' odor absorption)
Tomatoes, green
Tomatoes, pink (also see group 4)
Watermelons (also see groups 4 and 5)

GROUP 3

Temperature: 36 °F. to 41 °F. (2 °C. to 5 °C.)
RH: 90 to 95 percent; cantaloupes about 95 percent.
Ice: In contact only with cantaloupes.
[1] Citrus fruits—Biphenyl fungicide may impart off odors to other commodities.
Apples (Grimes Golden and Jonathan (both, certain areas), Yellow Newton (California), and McIntosh.)
Cantaloupes
Cranberries
Lemons [1] (use 50 °F. to 55 °F. (10 °C. to 13 °C.) for more than a month)
Lychees (also see group 4)
Oranges [1] (Florida or Texas)
Tangerines

GROUP 4

Temperature: 40 °F. to 45 °F. (4 °C. to 7 °C.); beans 38 °F. to 42 °F. (3 °C. to 6 °C.).
RH: About 95 percent.
Ice: Never in contact with commodity.
Beans, snap
Lychees (also see group 3)
Okra
Oranges [1] (California or Arizona)
Peppers, green (not with beans)
Peppers, red (if with green peppers, temperature adjusted toward top of range)
Squash, summer
Tomatoes, pink (also see group 2)
Watermelons (also see groups 2 and 5)

GROUP 5

Temperature: 50 °F. to 55 °F. (10 °C. to 13 °C.); ginger not below 55 °F.
RH: 85 to 90 percent.
Ice: Never in contact with commodity.
Cucumbers
Eggplant (also see group 2)
Ginger (not with eggplant, also see group 7)
Potatoes (late crop)
Pumpkin and Squashes, winter
Watermelons (temperature adjusted for other members of group; also see groups 2 and 4).

GROUP 6a

This group, except for figs, grapes, and mushrooms, is compatible with group 6*b*.
[1] Citrus fruits—Biphenyl fungicide may impart off odors to other commodities.
Temperature: 32 °F. to 34 °F. (0 °C. to 1 °C.).
RH: 95 to 100 percent.
Ice: Never in contact with asparagus, figs, grapes, and mushrooms.
Artichokes
Asparagus
Beets, red
Carrots
Endive and escarole
Figs (also see group 1)

Grapes (Not fumigated with SO_2 in vehicle and no chemicals that release SO_2 should be included in packages.)
Greens
Leek (not with figs or grapes)
Lettuce
Mushrooms
Parsley
Parsnips
Peas
Rhubarb
Salsify
Spinach
Sweet Corn
Watercress

GROUP 6b

This group is compatible with group 6*a*, except for figs, grapes, and mushrooms.
Temperature: 32 °F. to 34 °F. (0 °C. to 1 °C.)
RH: 95 to 100 percent.
Ice: Contact acceptable for all.
Broccoli
Brussels sprouts
Cabbage
Cauliflower
Celeriac
Celery
Horseradish
Kohlrabi
Onions, green (not with rhubarb, figs, or grapes; probably not with mushrooms or sweet corn).
Radishes
Rutabagas
Turnips

GROUP 7

Temperature: 55 °F. to 65 °F. (13 °C. to 18 °C.)
RH: 85 to 90 percent.
Ice: Never in contact with commodity.
Ginger (also see group 5)
Potatoes, early crop (temperatures adjusted for others)
Sweetpotatoes

GROUP 8

Temperature: 32 °F. to 34 °F. (0 °C. to 1 °C.)
RH: 65 to 70 percent.
Ice: Never in contact with commodity.
Garlic
Onions, dry

The above information was extracted from Lipton, W.J. and J.M. Harvey, Compatibility of Fruits and Vegetables During Transport in Mixed Loads, U.S. Department of Agriculture, Agricultural Research Service, ARs 51-48 (September, 1972).

(c) Chill injuries to certain products. Although the shelf lives of many fruits and vegetables are significantly extended by storage at 32 °F., there are some fruits and vegetables which are subject to chill injury when stored at low but nonfreezing temperatures.

Commodity	Approximate lowest safe temperature F°	Character of injury when stored between 32 °F and safe temperature
Apples: Grimes Golden (certain areas) Jonathan (certain areas), Yellow Newton (certain areas), McIntosh	36–38	Internal browning, brown core, soggy breakdown, soft scald
Asparagus	36	Chill damage
Avocados	40–55	Grayish-brown discoloration of flesh
Bananas, green or ripe	53–56	Dull color when ripened
Beans (snap)	45	Pitting and russeting
Cranberries	36	Rubbery texture, red flesh
Cucumbers	45	Pitting, water-soaked spots, decay
Eggplants	45	Surface scald, alternaria rot
Grapefruit	50	Scald, pitting, watery breakdown
Lemons	52	Pitting, membranous staining, red blotch
Limes	45–48	Pitting
Mangos	50–55	Grayish scaldlike discoloration of skin, uneven ripening.
Melons		
Cantaloupes	36	Pitting, surface decay
Honey Dew	45–50	Pitting, surface decay, failure to ripen
Casaba	45–50	Pitting, surface decay, failure to ripen
Crenshaw and Persian	45–50	Pitting, surface decay, failure to ripen
Watermelons	40	Pitting, objectionable flavor
Okra	45	Discoloration, water-soaked areas, pitting, decay
Olives, fresh	45	Internal browning
Oranges, California and Arizona	38	Pitting, brown stain
Papayas	45	Pitting, failure to ripen, off flavor, decay
Peppers, sweet	45	Sheet pitting, alternaria rot on pods and calyxes

Commodity	Approximate lowest safe temperature F°	Character of injury when stored between 32 °F and safe temperature
Pineapples	45–50	Dull-green when ripened
Potatoes	38	Mahogany browning (Chippewa and Segao), sweetening
Pumpkins and hardshell squashes.	50	Decay, especially alternaria rot
Sweetpotatoes	55	Decay, pitting, internal discoloration
Tomatoes, ripe	45–50	Watersoaking and softening, decay
Mature-green	55	Poor color when ripe, alternaria rot

(4) Recommended average storage period for frozen perishable subsistence.

(a) Temperature. Storage temperature for all frozen subsistence items shall not exceed 0 °F. During shipment, the temperature shall not be higher than 10 °F. For ice cream, the recommended temperature is −10 °F. and in no case should the temperature exceed 0 °F.

(b) Condition. The recommended average storage periods listed for frozen items are based on the assumption that products delivered to the Government were processed and procured in accordance with current specifications and were in good condition at time of delivery. Condition should be the deciding factor when determining if an item is suitable for shipment to an overseas area. Exception to this rule is listed in *(f)* below. In no case should a product received in a thawed state be refrozen for storage. Thawing will reduce the average storage life of most frozen subsistence items below the desired economical storage period.

(c) Packaging. The nature and condition of the packages are important factors which influence storage life expectancy. Example: packaging materials permeable to water vapor or which are defective will permit dehydration by sublimation (freezer burn) or other defects and materially detract from the quality and appearance of the stored product. A program should be established to reseal or repackage all damaged frozen cargo before it is stored or transshipped.

(d) Detection of deterioration. Deterioration due to time in storage and/or variations in temperatures can be detected by organoleptic inspection for such defects as dehydration (freezer burn), undue softness or mealy texture, discoloration, off odor, evidence of weeping and evidence of rancidity, and/or mold.

(e) Initial quality or grade. The initial quality of a product at time of receipt by the Government is an important factor which influences storage life expectancy. Initial quality of the product is determined by method of processing and handling as well as the grade of the ingredients.

(f) Limitations. Frozen subsistence items with a recommended average storage life of 3 months or less should not be stored for shipment to overseas areas. Such items will have exceeded the recommended storage life prior to issue in overseas areas. Prior to shipping frozen subsistence items with a recommended average life of less than 6 months, a careful inspection by veterinary personnel should be made with a view toward assuring that there is sufficient storage life remaining to enable routine issue within the overseas command.

(g) Approximate storage life. Storage life is the total elapsed time from date of pack to date of issue for immediate consumption. The approximate storage life given in tables below is the best estimate of expected life, based upon experience gained through subsistence procured and stored in accordance with the applicable specifications and regulations. Specific lots of subsistence may be expected to show signs of quality loss within +20 percent of the time listed. Therefore, procedures shall be established to provide surveillance from time of receipt until the subsistence is issued and consumed. The frequency of inspection should be established through actual experience with various products and as prescribed in pertinent military publications.

Table 5–1 Storage Life of Frozen Subsistence
(0 °F. or Below)
See footnotes at the end of the table.

	Approximate storage life (months)
Apples	18
Apple juice, concentrated	30
Asparagus	12
Bacon [2,3]	
slab, vacuum packed	12
sliced, nonvacuum pack	2
sliced, vacuum pack	6

Table 5-1 Storage Life of Frozen Subsistence **(Continued)**
(0 °F or Below)
See footnotes at the end of the table

	Approximate storage life (months)
Canadian	9
Beans	
green	12
lima	14
wax	12
Beef[2]	
boneless, fabricated	12
carcass, wholesale cuts	12
corned	12
diced	12
dried, sliced	9
ground, bulk	12
ground, patties	9
liver, whole or portion cut	6
tongue	6
Blackberries	18
Blueberries	18
Bologna[2,3]	6
Boysenberries, dewberries, loganberries, youngberries	8
Bread dough[2]	6
Bread yeast raised (and rolls fresh)	6
Broccoli	14
Brussels sprouts	12
Burritos	9
Butter prints and patties[2]	48
Cakes, coffee, layer, loaf, cheese	12
Carrots	12
Cauliflower	14
Cervelat[2,3]	
dry	12
soft (thuringer)	6
Cherries, RTP and dark, sweet, pitted	24
Cheese, pizza blend, shredded	12
Chicken	12
Chitterlings	
raw	3
precooked	12
Clams, shucked[2]	9
Corn	24
Corn on the cob	9
Crabs	9
Cranberry juice cocktail	24
Dates	12
Duck[2]	12
Egg roll	6
Eggs	
whole (including table grade)[2]	12
whites[2]	12
yolks, sugar or salt added	12
Enchiladas	9
Fish	
fish fillets, steaks[2]	
fatty (mackerel, salmon)	3
moderately fatty (halibut, perch, rockfish)	6
lean (cod, haddock, flounder)	9
fish sticks and portions	12
Frankfurters[2,3]	
carton	3
flexible package	9
Giblets, chicken/turkey, hearts and gizzards	12
Grape juice, concentrated	24

Table 5-1. Storage Life of Frozen Subsistence **(Continued)**
(0 °F. or Below)
See footnotes at the end of the table.

	Approximate storage life (months)
Grapefruit juice, concentrated	24
Grapefruit-orange juice, concentrated	24
Grapefruit sections	12
Greens, leafy	14
Hams [2]	12
Ice cream, sherbets or ices	6
Ice cream, novelties	9
Lamb [2]	
carcass, wholesale cuts	12
cutlets, boneless (restructured)	10
slices, chops	10
telescoped	12
Lard	12
Lemon juice, concentrated	24
Lemonade, concentrated	24
Lime juice, concentrated	24
Lime juice, single strength	24
Lobster tail [2]	9
Lobster, whole [2]	9
Luncheon loaf [2,3]	6
Manicotti	6
Margarine, prints and patties [2,3]	48
Meal, precooked (TV dinners, pot pies, etc) [1,6]	6
Milk fat anhydrous [2]	12
Milk, pasteurized, homogenized [2]	3
Milk, whole, concentrated [2,4]	3
Okra	18
Onion rings, french fried and raw	14
Orange juice, concentrated	24
Oysters [2]	12
Pastrami	12
Peaches	18
Peas	
black eye	12
dehydrofrozen	14
green	14
Peas and carrots	14
Pepperoni	12
Peppers	14
Pies, fruit, baked and unbaked [2]	
cream filled	6
fruit filled	12
Pineapple	12
Pineapple juice, concentrated	24
Pizza	6
Pizza shells [2]	6
Pork [2]	
bulk	6
links, patties	3
barbecued	12
cutlets, boneless (restructured)	9
diced and sliced (restructured)	9
hocks, fresh	12
hocks, smoked	12
loin, boneless, fabricated	12
slices, chops	12
wholesale cuts	12
Potatoes	
white, french fried, precooked rounds	12
white, hash brown	12
Rabbit [2]	

Table 5-1 Storage Life of Frozen Subsistence **(Continued)**
(0 °F. or Below)
See footnotes at the end of the table.

	Approximate storage life (months)
ready-to-cook	12
ready-to-cook, cut up	12
Raspberries	18
Rhubarb	18
Ravioli	6
Salami[2,3]	
cooked	6
dry	6
Sausage[2,3]	9
liver	9
New England style	6
pork, bulk style	6
pork patties	3
pork, precooked, Polish, Italian	9
pork and beef, precooked	9
Scallops[2]	9
Scrapple	6
Shrimp[2,7]	
raw, peeled/unpeeled	9
raw, breaded, molded	9
Soups[5]	12
Spinach	12
Spinach, chopped	12
Squash, summer and fall, cooked	12
Strawberries	18
Succotash	12
Sweet goods, yeast raised[2]	6
Tamales	9
Topping, dessert	24
Tortillas, corn or wheat	12
Turkey[2]	
boneless, cooked	6
boneless, raw	6
whole, ready-to-cook	9
Veal	12
Vegetables, mixed	12
Waffles	12

[1] Any evidence that meal has been thawed is reason for discarding.
[2] Many of the products listed herein are also storable under chill conditions (above 32 °F.). See 5-17*a*(4).
[3] These products suffer deteriorative changes as a result of freezing. If frozen storage is necessary, storage times indicated will tend to minimize rancidity development
[4] Storage life above 0 °F. is 4 months
[5] Cream-style soups which have broken down during freezing will be satisfactory when heated.
[6] These meals may be used for their intended purpose up to 9 months after date of pack provided surveillance inspections, performed at least every 30 days subsequent to the 6-month period, result in the product being accepted for consumption.
[7] The quality of frozen shrimp will deteriorate within 30 days if held between 14 °F. and 18 °F

(5) *Chill storage of perishable subsistence freezing point, storage temperature, RH, and storage life.* The following table (table 5-2) is for the guidance of personnel in computing the storage life of subsistence held in chilled storage. Many of the considerations mentioned in paragraph *a*(1), section D, above are applicable to chilled storage. The storage periods given are applicable only to products processed and procured in accordance with specifications.

(*a*) *Temperature.* Chill storage is generally within a temperature range of 32 °F. to 35 °F. For some items, better quality is maintained at temperatures higher or lower than these are shown as accepted storage temperature. Some items are damaged by slow freezing; for these, the average freezing points are given.

(*b*) *Humidity.* Preferred RHs shown in the table are those which best inhibit the gain or loss of moisture in the item. Storage at higher RHs may allow water to condense on or be absorbed in the item, while at lower RHs, the item may dry and shrink.

Table 5-2. Storage Life of Perishable Subsistence
See footnotes at the end of the table

Item	Freezing point °F	Optimum RH (%)	Approximate storage life (days)			Remarks
			32–35 °F	35–45 °F	45–55 °F	
Artichokes						
Globe	30	90–95	14–30			
Jerusalem	28	90–95	150			
Apples						
Red Delicious, Washington (other varieties, see footnote 1).	30	90	120–150			
Apricots	30	90–95	7–21			
Asparagus [2,3]	31	95+	14–21			Stalks continue growing above 36 °F
Avocados [2]						
Lula, Both varieties [4]	31	85–90		14–30		Best storage at 40–45 °F.
West Indian varieties	31	85–90			12–14	Chill injury below 50 °F.
Bacon [5]						
Slabs		90	60			
Sliced		90	60			
Bananas						
Green	30	90–95				7–10 days at 56–58 °F.
Ripe	30	85				3–4 days at 56–58 °F. (temp below causes chill injury) Alternate Storage temp 56–70 °F.
Beans						
Green or Waxed	31	95+		10	7	Chill injury below 40 °F.
Limas, Shelled	31	95	7–14			
Beef						
Carcass, whole sale cuts		85–90	6			
Corned		85–90	45			
Cryovaced		85–90	21	14		
Dried, Sliced			45			
Ground		85–90	1–4			
Tongue, Fresh		85–90	7–10			
Tongue, Smoked		85–90	35–42			
Beets						
Bunched	31	95–100	10–14			
Topped	30	95–100	120–180			
Berries						
Strawberries	31	90–95	5–7			
Blueberries	30	90–95	7–15			
Elderberries	30	90–95	7–14			
Huckleberries	29	90–95	7–15			
Gooseberries	30	85–90	14–28			
All others	31	90–95	2–3			
Bologna [5]						
Lebanon		85–90	60			
50% Beef		85–90	30			
Broccoli [2]	31	95+	14–21			
Brussels Sprouts	30	90–95	21–35			

Table 5-2. Storage Life of Perishable Subsistence **(Continued)**
See footnotes at the end of the table

Item	Freezing point °F	Optimum RH (%)	Approximate storage life (days)			
			32–35 °F	35–45 °F	45–55 °F	Remarks
Butter	.....	80–85	60	60	.....	−10 °F and and below=365 days
Cabbage, early	30	90–95	21–42			
Cabbage, late	30	90–95	90–120			
Cantalopue						
Hard ripe[7]	30	90–95	.....	7–14		
Full Slip	30	90–95	5–14			
Carrots[6,8]						
Mature, topped	30	98–100	120–150			
Immature, topped	30	98–100	28–42			
Bunched	30	95–98	10–14			
Casaba melon	30	90–95	.....	.....	28–42	
Catsup[9]						
Boat, Envelopes	.....	80–90	.....	180	135	
Cup, Foil Pouch	.....	.....	.....	365	270	
Cauliflower[6]	31	95+	14–28			
Celeriac	30	95+	90–120			
Celery	31	95	60–90			
Cervelat[5]						
Dry[10]	.....	75–80	60			
Soft (Thuringer)	.....	85–90	15			
Cherries						
Sweet[2,11]	29	90–95	14–21			
Chicory	30	85–98	10	14		
Chives, Potted	30	90–98	.....	14		
Cheese						
Blue—Nat	.....	70	90–180			
Cheddar—Nat	25	70	.....	365		
Cheddar—Shredded	25	65–70	180			
Cottage	30	70	.....	10–15		
Cream (hot pack)	.....	70	.....	60		
Cream Cheese	.....	70–75	.....	120		
Mozzarella, Nat	.....	70	.....	30		
Process American:						
Swiss Loaf	25	70	.....	180–300		
Sliced	.....	70	.....	180		
Parmesan, Nat	.....	70	.....	300–720		
Pizza Blend	.....	70	.....	180		
Provolone, Nat	.....	70	.....	90–360		
Romano, Nat	.....	70	.....	300–720		
Swiss, Nat	25	70	.....	240–360		
Chocolate Drink	29	.....	12	7		
Clams, Shucked	.....	.....	4			
Cookie Dough	.....	.....	60–90	14–21		
Corn-on-the-Cob[2]	31	95	4–8			
Cranberries						

Table 5-2. Storage Life of Perishable Subsistence **(Continued)**
See footnotes at the end of the table

Item	Freezing point °F	Optimum RH (%)	Approximate storage life (days)			
			32–35 °F	35–45 °F	45–55 °F	Remarks
Fresh	30	95+		60–120		
Sauce, Cup[9]					180	
Creams						
Half and Half	31		10			
Sour, Cultured	31		20			
Table, including filled	31		10			
Whipping	31		10			
Whipping, UP[12]	31		28			
Crenshaw Melon	30	90–95			14	
Cucumbers	31	90–95			10–14	
Currants	30	90–95	7–14			
Casheens (Taro Root)	30	98–100			60–120	
Dates, Pitted, Cured	1–5	70	180			
Eggnog	28		14–21			
Eggnog (UP)	28		28–35			
Eggs, Shelled						
Fresh	27	80–85	30			Best Storage 29–31 °F
Oil Processed	27	70–80	60			Best Storage 29–31 °F.
Egg Plant[2,7]	31	90–95			7–14	
Fennel	30	90–98	60–120			
Figs, Fresh	27	85–90	7–10			
Frankfurters						
Carton		85–90	15			
Flex Pkg		85–90	30			
French Dressing	31	50–60			90	
Fruitcake, Fresh		50–60	360	300		
Fruits, Dry	22–26	50–60	360	270	180	
Garlic, Dry	31	65–70	180–210			
Grapefruit[13]	30	85–90			28–42	
Grapes						
American[14]	30	80–85	15			
European	28	90–95	90–180			
Greens						
Endive, Escarole[6]	32	95+	14–21			
Collard, Kale, Beet, others	31	95	10–14			
Ham[5]						
Cured, Canned		60–65	270			
Bnls, Ckd		85–90	30			
Smoked[10]		85–90	30			
Honeydew/Honeyball Melon	31	90–95			14–21	
Horseradish, Prepared	30		90			
Horseradish, Root	29	95–100	300–365			
Jams, Jellies, Preserves:						
Boat, cup[9]		80–90		180		
Foil pouch[9]				365		

Table 5-2. Storage Life of Perishable Subsistence **(Continued)**
See footnotes at the end of the table

Item	Freezing point °F	Optimum RH (%)	Approximate storage life (days)			
			32–35 °F	35–45 °F	45–55 °F	Remarks
Kohlrabi[2]	30	95+	14–28			
Kumquats	29	85–90	60–120			
Lamb Carcass[5]		85	7–10			
Lard, Service Style		90–95		120–240		
Leeks	31	95+	30–90			
Lettuce, Iceberg						
Wrapped	31.7	95–100	21–42			
Naked	31.7	95–100	14–21			
Table-ready	31.7	95–100	5–7			
Lettuce, Romaine	31.3	95–100	5–8			
Lobster, Live						32–50 °F —Check daily.
Lemons[15]	28	85–95			14–21	(30–120 days at 55–58 °F.)
Lemon Juice	30				125	
Limes	29	85–90			42–56	
Luncheon Loaf		85–90	14			
Mangos	30	85–90				14–21 days at 50–55 F Chill injury below 50 °F
Margarine[16]		40–60	90	60		
Milk:						
Buttermilk	31		14			
Choc. Flavored			10			
Choc. Flavored UP[12]	29		28–35			
Concentrated	29		10			
Fluid, Past.	30		7–10			
Fluid, Homo (UP)[12]	31		28			
Ice or Shake Mix, Fresh	31		10			
Mushrooms	30	90–95	3–5			
Mustard[9]						
Boat, Envelope	30	80–90			90	
Cup, Foil Pouch	30				270	
Nectarines	30	90	14–30			
Okra	31	85–95			14	
Olives	29	85–90	28	14		
Onions						
Bermuda	30	65–70	30–60			
Glove	30	65–70	180–240			
Green, Iced Top	30	95	10–28			
Spanish	30	65–70	90–180			
Peeled or Green	31	65–70	5–7			
Oranges						
CA, AZ[17]	30	85–90		21–56		
FL, TX	30	85–90	56–84			
Temple, Tangelos	30	90–95		14–28		
Sections Pasteurized				540		
Orange Juice	30		21			
Oysters on Ice			4			

Table 5-2. Storage Life of Perishable Subsistence **(Continued)**
See footnotes at the end of the table

Item	Freezing point °F	Optimum RH (%)	Approximate storage life (days)			
			32–35 °F	35–45 °F	45–55 °F	Remarks
Papaya	30	85–90	.....	.....	7–12	
Parsley	30	95	30–60			
Parsnips	30	98–100	60–180			
Peaches[2]	30	90–95	14–30			
Peanut Butter:						
Boat, Envelope	.....	50	180	120	90	
Cup, Foil Pouch	.....	50	365	270	180	
Pears[2,18,4]	29	90–95	60–240			
Peas, Unshelled	31	95	7–14			
Peppers, Sweet	31	92–95	.....	.....	14–21	
Peppers, Dry, Chili	.....	60–70	180	180	180	
Pepperoni, Dry[5]	.....	75–80	45			
Persian Melons	31	90–95	.....	.....	14	
Persimmons	28	90	90–120			
Pies						
Fruit, Fresh	.....	80–85	3			
Fried, Fresh	.....	80–90	5			
Pineapple						
Mature, Green[7]	30	85–90	.....	.....	14–28	
Ripe[2]	30	85–90	.....	.....	14	
Plums	30	90–95	21–35			
Pomegranates	27	90	60–120			
Pork						
Whsle, Cut[5]	.....	85–90	5			
Cryovac	.....	85–90	14			
Poultry	27	95–100	12–18	6–12	2–4	
Potatoes						
Sweet[2,7]	30	85–90	.....	.....	.....	Chill injury below 50 °F. 90–120 days at 50–60 °F.
Potatoes, White[19]						
Early, Uncured	31	95	.....	.....	60–90	
Early, Cured	31	95	.....	120–150		
Late Crop	31	95	.....	150–240		
Peeled, Table Ready	31	95	5–9			
Prunes, Ital.	30	90–95	14–28			
Pumpkins	31	60–70	.....	.....	30–180	
Quinces	28	90	60–90			
Radishes						
Spring, Topped, Poly-bag	31	95+	21–30			
Spring, Table Ready	31	95+	10–12			
Winter, Topped	28	95+	90–120			
Rhubarb	30	95	14–30			
Rolls, Brown and Serve	.....	80–85	21			
Rutabagas	30	95+	120–180			
Salad Dressing, All[9]	.....	80–90	180	120	90	
Salmon Stks	.....	85–90	12			

Table 5-2. Storage Life of Perishable Subsistence **(Continued)**
See footnotes at the end of the table

Item	Freezing point °F	Optimum RH (%)	Approximate storage life (days)			
			32–35 °F	35–45 °F	45–55 °F	Remarks
Salami[5,10]						
Dry		75–80	45			
Cooked		85–90	15			
Salsify	29	95–98	60–120			
Sausage[5]						
Liver		85–90	14			
New England Style		85–90	10			
Scallops		85–90	4			
Shallots	32	95	10–28			Freeze injury below 32 °F
Shortening Compound		55	1,800	1,800	1,800	
Shrimp, Unpeeled, Iced			10–12			
Syrup, Imitation Maple, etc.[9]		80–90			365	
Spinach[2]	31	95	7–14			
Squash						
Fall, Winter, Hubbard	30	70–75			180	Cold sensitive below 50 °F
Acorn	31	70–75			35–56	
Butternut	30	50			60–90	
Summer	31	90–95	4–5	4–5	10–14	
Swiss Chard[2]	31	95	10–14			
Tangerines	30	85–90	14–28			
Tomatoes						
Mature Green[2,7]	31	85–90				14–21 days storage 55–60 °F
Pink	31	85–90			7–10	
Firm, Ripe	31	85–90			4–7	
Full Color	31	85–90	21			
Turnips	30	95	120–150			
Veal and Calf[5]		85	6			
Watercress	31	90–95	7			
Watermelon[2]	31	85–90	14–21			
Yeast, Bakers						
Active, Dry		60–70	365	548		
Compressed Cake		80–90	30–40			
Yogurt, Plain or Fruit Flavored	30		30			

Table 5-2. Storage Life of Perishable Subsistence

Variety	Storage period (months)	
	Normal	Maximum
Baldwin	4 to 6	7
Cortland	3 to 4	5
Delicious	4 to 5	8*
Golden Delicious	4 to 6	8*
Gravenstein	0 to 2	3
Grimes Golden (some areas 34-36 °F)	2 to 3	4
Johnathan (some areas 35-36 °F.)	2 to 3	4
McIntosh (some areas 38 °F.)	2 to 4	5
Northern Spy	4 to 5	8
Rhode Island		
Greening	3 to 4	6
Rome Beauty	4 to 5	7
Stayman Winesap	4 to 5	6
Wealthy	0 to 2	3
Winesap	5 to 7	8
Yellow Newton (CA 38 48 °F.)	5 to 6	8
York Imperial	4 to 5	6

*Stored in polyethylene bag liners (unsealed)

Storage of pear varieties at 30 °F to 31 °F	Length of storage period (months)
Stored immediately after harvest at 30 °F to 31 °F	
Anjou	4 to 6*+
Bartlett, Comice, Hardy, and Kieffer	2 to 3
Bosc and Seckel	3 to 4*+
Packam	5 to 6
Winter Nelis	6 to 7

*Stored in polyethylene bag liners (unsealed).

+The storage live of Anjou, Bartlett, Bosc, and Comice pears may be extended for an additional 1-2 months by packaging in polyethelene liners

[1]The length of time apples can be held successfully in cold storage at 32 °F, unless otherwise specified, will vary with the variety and with the district where grown as well as with their condition when harvested. Controlled atmosphere can extend storage life an additional 2 to 4 months.

[2]Commodities not recommended for export, but which are suitable for immediate use by shore activities and by ships in port or shortly after sailing

[3]Asparagus held too long at 32 °F. is subject to chill injury The butts of asparagus should be placed in absorbent material during storage

[4]Pears—Length of safe storage for certain varieties of pears

[5]Carcasses and cuts: Quarters, carcasses, and cuts of beef, lamb, and veal should be hung or placed on racks when in chill space. If such items are in a solid frozen condition when received, stow as compactly as possible in the freezer space Frozen boneless beef should be stacked compactly Veal carcasses or cuts, particularly of the lighter weights and lower grades, are subject to rapid deterioration Holding time of such items in the chill space should be a minimum. Fresh chilled pork cuts should be treated as highly perishable

Variety meats and sausage: Such items are highly perishable Hold storage time to a minimum.

Cured and smoked meat: The keeping qualities of cured and smoked meats depend upon the type of cure, the length of the smoking period, and the method of packaging. The storage life of such items is further influenced by the condition of the storeroom with regard to humidity, temperature, and sanitation.

Growth of mold and development of rancidity in hams and bacon can be retarded by stowing such items in the chill space for current consumption and in freezer space for seasonal stocks Since the growth of mold on cured and smoked meats is favored by the presence of condensed water, excessive humidity should be avoided. If the RH is higher than recommended, it is essential that good circulation of air be maintained.

Hams and bacon which have been individually wrapped in one or more layers of paper have a tendency to retain, upon the surface of the meat, any moisture which may have come from the product after wrapping. This moisture, in a measure, stimulates mold and bacterial growth. If hams so wrapped are held in temperatures of 45 °F. or above for a considerable length of time, mold and slime will form on the surface of the meat Surface slime and mold make the ham unattractive and unpleasant to handle, but do not necessarily indicate spoilage. Accordingly, such products should be carefully inspected to determine how far the mold has penetrated. In most cases, where only the surface is affected, the mold can be removed from the meat by brushing with a stiff-bristled brush, wiping with a clean cloth moistened with a vinegar or salt-water solution, and allowing to air dry When the mold growth is heavy, it may be trimmed away. If the ham does not have deep cracks or abrasions, the meat underneath the surface usually is found to be perfectly sound and wholesome When mold growth or spoilage is evidenced deeply between the muscles and around the bone, a survey is usually necessary

[6]This item keeps better unwashed.

[7] Damage will result if item is stored at lower temperature than indicated.
[8] Carrots may become bitter if stored with fruits which give off ethylene such as apples and pears. If carrots are bitter, they should be stored in a room temperature for several days before use.
[9] Keeping time in uncontrolled storage (dry space) is less than 3 months because of desiccation and because of swelling due to microbial activity.
[10] Very susceptible to mold growth on surface. Inspect and wipe often.
[11] Sweet cherries packed in sealed polyethylene bag liners can be stored for up to 21 days.
[12] Imperfect seals will reduce shelf life.
[13] The refrigerated storage of Florida grapefruit is not recommended for more than a limited period and, then, only if the fruit is inspected at intervals Grapefruit is very susceptible to rind pitting and aging at comparatively low temperatures, especially around 38 °F. At higher temperature such as 50 °F., the rapid development of decay is troublesome.
[14] Not recommended for export since the European type of grape from California with better keeping quality is available during the same period.
[15] Foothill grown lemons store better than coastal grown lemons, especially late picked; at Receiving Markets, only "Strong" lots of lemons should be stored and frequently inspected.
[16] Soybean oil margarine is considered by some authorities to be less stable than cottonseed oil margarine.
[17] California and Arizona varieties are more susceptible to low temperature rind disorders
[18] For best ripening, pears should be held at about 65 °F. for 2 to 3 days prior to serving
[19] Early and intermediate crop potatoes may possess better or poorer keeping qualities than potatoes show on the table. Many lots of early potatoes are too immature for export, and some intermediate crop potatoes are not suitable for export because of poor quality and condition Extreme care must be exercised in the selection of potatoes for export from the middle of May to the middle of August. The quality and condition of available supplies must govern the final choice between old and new crop stock for export during the first part of this period, and such factors also must govern the choice of stocks of new crop potatoes for export later in this period.

(c) *Approximate storage life.* Storage life is the total elapsed time from date of pack to date of issue for immediate consumption. The approximate storage life given in table 5–2 is the best estimate of expected life based upon experience for subsistence procured and stored in accordance with applicable specifications and regulations. Specific lots of subsistence may be expected to show signs of major quality loss within +20 percent of the time listed. Therefore, procedures shall be established to provide surveillance from time of receipt until the subsistence is issued and consumed. The frequency of inspection should be established through actual experience with various products and as prescribed in pertinent military publications. Storage life will be somewhat lessened depending on the extent of deviation from the ideal storage temperature and RH conditions cited in (*a*) Lutz, J.M., and Hardenburg, R.E., U.S. DA Agriculture Handbook, No. 66 (1977), the Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks and (*b*) the Refrigeration Research Foundation, Commodity Storage Manual, 1982.

5–18. Semiperishable Subsistence in Dry Storage.

a. The product. The term semiperishable subsistence refers to food items that are canned, dried, dehydrated, or otherwise processed to the extent that such items may, under normal conditions, be stored in nonrefrigerated spaces. Semiperishable subsistence too often is regarded as nonperishable commodities which do not require care or protection in storage. While semiperishable subsistence is not nearly as susceptible to spoilage as perishable subsistence, spoilage can and will occur if the products are mishandled, improperly stored, or stored for excessive periods of time. It is important to remember that the length of storage should be based on the date of packing and not on the date of receipt.

b. Storage. Careful, correct storage methods prevent damage to items in storage and assure speed and efficiency in the receipt, handling, and issue of such items. Shipments should be segregated and clearly marked so that the oldest lots, as packed and not as received, are issued first, unless the newer lots show evidence of deterioration or spoilage. The particular method used for storing each item depends on the nature of the container, the nature of the commodity, and the breaking strength of the bottom layers. For example, items packed in glass containers with cork stoppers should be inverted to prevent the drying out of the cork.

(1) *Storage precautions.* Care should be taken that items are not stacked so high as to cause a bursting or crushing of the bottom layers; nor should items be stacked so high that the top layer is subject to the higher temperature more prevalent near the ceiling or overhead. Stacking in close proximity to steam or other heated pipes shall be avoided. Use pallets to raise subsistence off the floor and pile individual lots to permit the circulation of air around the lots. Bagged items and those requiring fumigation and insect control should not be stored in large masses in corners of the storeroom or directly against the walls; such storage leaves insufficient room for cleaning and inspecting. Palletized storage is used as this facilitates handling of the stores and reduces losses by breakage in handling. All items should be properly cross stacked to keep the stack solid and prevent it from toppling.

(2) *Storage periods (keeping time).* The safe storage period for dry subsistence items varies greatly, depending on such elements as tempera-

ture, humidity, care in handling, protection from weather, quality of the food when received, and the packing. Safe storage periods become very uncertain at extremes of temperature and under combat conditions. The fact that subsistence has been on hand up to the limit of the "safe" storage period does not mean that the subsistence should be surveyed but should be consumed as soon as practicable. Subsistence which has been on hand beyond the safe storage period should be inspected carefully for spillage, leakage, or other damage and, if still good, issued as soon as possible; such items will be given priority of issue over newer stocks.

c. Causes of spoilage.

(1) *Age.* All foodstuffs are subject to varying degrees of natural deterioration; this deterioration is inherent in the food itself. It should not, however, be confused with the action of micro-organisms, chemical agents, or other outside agents. Such facts compel an observance of the basic principle of storage that the oldest lots of the item always should be used first, except under conditions indicated in *a*(1) above.

(2) *Insects (roaches, flies, weevils, and moths).* Insects can cause great damage to stored food, attacking both natural and manufactured food. Food stored at temperatures between 60° F. and 90° F. is especially attractive to insects. Infested supplies must be segregated and if not too heavily infested, may be "reconditioned" for use. Cornmeal, especially, is susceptible to insect infestation and rancidity. Insect repellents should be used carefully so as not to contaminate the foods or cause damage by the absorption, by the food, of the fumigant or insecticide flavor. Roaches and flies not only contaminate the foods, but may spread disease. (See chap 3, sec IV for information on pest management.)

(3) *Rodents (rats and mice).* Rodents not only physically destroy food by feeding, chewing, and cutting the bags for nests or nesting material, but also contaminate food with their excreta and hairs. Rodents are carriers of filth and disease; the importance of controlling these pests is evident. The most effective method of control is to prevent entry of these animals.

(4) *Physical environmental factors.*

(a) Freezing. Dry products such as grains, flour, sugar, starch, cereals, and dehydrated foods, ordinarily are not injured by freezing. If foods containing relatively large amounts of water such as canned products are frozen, the usefulness and palatability of such products have not been harmed. However, the physical appearance may suffer due to change in consistency and texture (softening). Emulsions such as canned cheese and butter, prepared mustard, and mayonnaise may be broken (separated) by freezing although the food is not spoiled.

(b) Heat (high temperatures). A high temperature over long periods of time is very detrimental to the keeping of almost all food products. High storage temperature encourages bacterial growth, mold growth, and insect infestation and is particularly dangerous when accompanied by high humidity. Chemical action is accelerated, causing rancidity in many items; action of the food acids naturally present within the cans is accelerated, resulting in pinholing, blackening of the interior, and hydrogen swells. High temperature is the chief cause of accelerated spoilage in canned foods and should be controlled when possible by providing adequate ventilation.

Flour and associated products (barley, cereals, cornmeal, cornstarch, cracker and biscuit, hominy, noodles, oats, rice, spaghetti and macaroni, tapioca, and uncooked wheat) are subject to insect infestation, particularly at high temperatures. Flour and cereals will absorb odors and should be kept away from subsistence or materials giving off distinctive odors. Cocoa will keep years under cool, dry storage conditions. The formation of white "bloom" (described as a "whitening" or "graying" due to storage under fluctuating temperatures) has little or no effect on the flavor of cocoa. Long periods of storage at higher temperatures may cause mustiness or rancidity. Cocoa does absorb moisture and odors; therefore, cans should be kept tightly closed. Roasted, ground coffee rapidly develops a weak and stale flavor. If coffee is not hermetically sealed, it will absorb odors affecting the flavor.

(c) Moisture (humidity). High humidity is detrimental to stored subsistence in many respects (i.e., accelerating the growth of bacteria and molds promoting insect infestation and causing mustiness in flour, rice, and similar foods). High humidity causes products which readily absorb moisture such as sugar and salt to cake and become hard. Tea will absorb odors and high humidity causes it to become musty and sour. It should be emphasized that dehydrated products are perishable and should not be handled or stored carelessly. Such products are subject to moisture absorption, insect infestation, and mold. A loss of flavor and discoloration (darkening) will occur with age; this action is progressive and is accelerated at high temperatures. Dried vegetables and fruits are subject to insect infestation and molding (particularly fruits) and should be inspected at frequent intervals.

(d) Ventilation. Where sharply fluctuating temperatures and high humidity prevail, the lack of proper ventilation may cause excessively high temperatures. Proper ventilation is one of the most important factors in protecting foods, particularly in tropical areas. In extreme cases, it may be necessary to open doors and use fans to induce circulation.

(e) Light. Damage from light is restricted to products that are packed in glass or transparent containers. Exposure causes color changes and may affect the flavor of foods containing or composed of edible oils and fats.

d. Physical factors for canned products.

(1) *Subject to spoilage.* Canned products such as meats, fish, poultry, vegetables, fruits, and juices are subject to several physical environmental factors causing spoilage.

(2) *Spoilage factors.*

(a) Rust. Rust, unless it actually penetrates the can causing leakage, will not injure the contents or render them inedible.

(b) Dents. Dents, unless so severe as to cause leakage, do not indicate that the contents are in an unsatisfactory condition.

(c) *High temperature.* High temperatures are detrimental to all canned provisions and reduce the storage life to a considerable degree.

(d) Freezing. Freezing causes loss in palatability and may cause breakdown of the texture. Alternate freezing and thawing may cause delamination of the protective enamel.

(3) *Major defects.*

(a) Quality change. Fading of color, loss of flavor, or softening of contents is due to chemical action and the natural aging process.

(b) Discoloration. Discoloration of contents on the inside of a can because of chemical action is found usually in products containing sulphur compounds (i.e., corn, peas, and meat products).

(c) Swells. Swells, springers, and flippers are caused either by chemical or bacterial action or by overfilling. Regardless of the primary cause, cans exhibiting such defects should be discarded or referred to a medical or veterinary officer for recommendation as to disposition.

(d) Pinholing. Pinholing is due to the chemical action of the food acids on the tin. Pinholing is more often found in enamel-lined cans, brine- or vinegar-packed items, and in waterpacked fruits.

(e) Flat sours. Flat sours are caused by bacterial action, causing changes in odor, color, or turbidity of the product, but not accompanied by gas production which would cause swelling of the can.

e. Exterior can coating.

(1) *Purpose.* Exterior can coatings are applied to protect the tin plate from external conditions promoting rusting and, depending on the coating specified, to camouflage the bright can surface.

(2) *Types of coating.* Three types of exterior coatings are used. Specification TT–C–495, Coatings, Exterior, for Tinned Food Cans, lists these as follows:

(a) Type I. Precoated camouflage (O.D. colored coating applied to tin plate before can fabrication). Precoated cans do not have the side seam area coated as manufactured. Depending on contract requirements, the side seam may or may not be striped with O.D. lacquer following filling and sealing.

(b) Type II. Post-coated camouflage (O.D. colored coating applied to the cans sometime following filling and sealing).

(c) Type III. Precoated unpigmented (clear lacquer applied before can fabrication—commonly called "gold coat").

(3) *Labeling of coated cans.* Precoated cans will normally have completed label information lithographed on the body or one end of the cans. Post-coated cans will usually show only the name of the product or an abbreviation thereof since these cans have to be labeled after coating, and equipment for complete labeling is impractical for the packer to maintain. While it is intended that most post-coated cans will have as near as possible the full name stamped on the side or one end, there is the possibility that some cans will be embossed or impressed on the end only with an abbreviated legend (see MIL–L–1497).

f. Storage periods.

(1) *General.* Table 5–3 "Dry Storage of Semiperishable Subsistence" should be used only as a guide. This table is based on the optimum rather than the maximum storage life.

(2) *Overaged stock.* Activities receiving a pack older than that indicated on the storage life table should not on this basis alone consider the product as unfit or undesirable. Subsistence stored for periods in excess of the storage life shown in the table, but at temperature lower than those listed therein, should not be automatically considered as overage stock.

(3) *Containers.* Since the container is one of the factors in the overall keeping period of an item, the container should be considered if it markedly differs (i.e., flour in bags vs. cans, coffee in bags vs. coffee in vacuumpacked tins). Thus, supply officers should be guided by the appearance, odor, color, and condition of the item.

(4) *Subsistence, table of safe keeping time for dry storage* (see note) *of semiperishable subsistence.*

NOTE

These products are not always subject to the same spoilage as are other foods. Their desirable properties of flavor, odor, and taste often depend upon very unstable or volatile components, and deterioration may result from a breakdown or loss of these constituents. However, excessive heat and moisture, contamination by insects, rodents, and micro-organisms, dirt and dust, and inadequate packaging and packing can be major factors contributing to deterioration.

g. Sanitation. All storage areas containing infestible material shall be maintained in such a manner as to assure that a high degree of sanitation is achieved. Spilled food, waste package/packing material, lumber, or other debris will be cleaned up and disposed of prior to the end of each workday. In no case, shall such spills or trash be allowed to exist within a storage area in excess of 24 hours.

h. Stock Location. All infestible material will be stored in the following manner:

(1) In a single section or isolated to the maximum extent possible to allow for the concentration of pest management procedures.

(2) Stacked away from all walls a minimum of 24 inches with inspection/control aisles of not less than 24 inches maintained between each three stacks/rows of infestible stock items. No three stack grouping will combine items produced under different contracts. These spaces are essential for the proper inspection of the materials for infestation and inplace fumigations.

Table 5-3. Storage Life of Semiperishable Subsistence
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Almond paste	Can	36	9	3
Apples				
Regular pack	Can	48	24	12
Pie style, dehydrated	Can	48	36	18
Butter	Can/jar	36	18	9
Sauce	Can	48	24	12
Baby food, strained	Jar	36	18	9
Dehydrated (instant)	Can	48	24	12
Dietetic pack	Can	48	24	12
Junior food	Jar	36	18	9
Juice.				
Dehydrated [8]	Can	72	36	18
Single strength	Can	36	18	9
Spiced, rings	Can	36	18	9
Apricots				
Regular pack	Can	48	24	12
Baby food, strained	Jar	36	18	9
Dietary pack	Can	36	18	9
Dried	Carton	24	3	1
Apricot nectar				
Regular pack	Can	48	24	12
Freeze dehydrated	Can	48	36	18
Asparagus	Can	36	18	9
Baby formula preparation	Can	24	12	6
Bacon				
Sliced	Can	48	18	9
Sliced, prefried	Can/flex pkg	48	36	12
Bakery mixes, extended shelf life (except biscuit, cheese cake, cookie, corn bread or pie crust mix, see specific item)	Can	72	36	9
Bakery mixes, commercial	Bag/carton	12	6	3
Bakery mixes, commercial angel food	Bag/carton	24	12	6

Table 5-3. Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Baking powder	Can	24	12	6
Baking soda	Carton	Indef.	Indef.	Indef.
Barley, pearl	Bag/carton	60	48	24
Banana, baby food, strained	Jar	24	12	6
Beans				
Dry[12]	Bag/carton	24	12	9
Green, baby food, strained	Jar	36	18	9
Green, regular	Can (plain body)	36	18	9
Green, junior food	Jar	36	18	9
Green, dehydrated	Can	120	60	24
Green, dehydrated, compressed	Can	120	60	24
Kidney	Can	72	36	18
Lima	Can	72	36	18
Pinto	Can	72	36	18
Lima, dehydrated	Can	72	36	18
Salad, 3-bean	Jar	48	24	12
Sprouts	Can	48	24	12
Wax	Can (plain body)	36	18	9
	Can (enameled)	48	24	12
White, dehydrated	Can	48	24	6
White, with pork in sweet sauce	Can	72	36	18
White, with pork in tomato sauce	Can	48	24	12
Beans refried	Can	72	36	18
Beef, liver, pork, or veal				
Baby food, strained	Jar	36	18	9
Junior food	Jar	36	18	9
Beef				
Broth, baby food, strained	Jar	36	18	9
Chunks with natural juices	Can	60	36	18
Corned	Can	60	36	18
Diced, raw, dehydrated	Can	72	48	24
Flakes and shaped, raw, dehydrated	Can	72	48	24
With gravy	Can	72	36	18
Patties, dehydrated	Can	72	48	24
w/spiced sauce	Can	60	24	12
Beef steak, raw, dehydrated	Can	72	48	24
Beets				
Baby food, strained	Jar	24	12	6
Junior food	Jar	24	12	6
Regular pack, Gulf states	Can	36	18	9
except Gulf states	Can	48	24	12
Berries, black, etc.	Can	36	18	9
Beverage base				
Cocoa, powder	Can	72	36	12
Imitation, liquid	Bottle	24	12	6
Powder	Envelope	72	36	18
Beverage, base, liquid for post mix				
Cola pepper	Can	2	1	½
Fruit punch, lemon-lime, orange, root beer, ginger ale, grape.	Can	18	8	3
Biscuit, mix	Can	56	28	8
Blueberries	Can	60	36	18
Bouillon cubes, beef or chicken	Can	48	24	12
Bread crumbs	Bag	8	4	2
Brownie mix	Can	56	28	8
Cabbage				
Red, sweet, sour	Can	72	36	18
Raw, diced, dehydrated and dehydrated compressed	Can	72	36	18
Cake, fresh				
Layer, coffee			(2 days)	
Loaf			(4 days)	

Table 5-3. Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Candy				
Caramel	Box	12	9	4
Coated (bridge mix)	Box	24	12	4
	Can	72	36	18
Hard	Can	72	36	18
Starch jelly	Box	24	12	6
Bars	Flex pkg	24	NR	NR
Carrots				
Baby food, strained	Jar	48	24	12
Junior food	Jar	48	24	12
Puree	Can	60	30	15
Regular pack	Can	60	30	15
Dehydrated, compressed N_2 pack	Can	48	36	12
Catsup				
Regular pack	Bottle	24	12	6
	Can	36	18	9
Dehydrated	Envelope/can	72	36	12
Cereal				
Baby food, strained, barley	Container	24	12	6
Quick cooking	Carton	24	12	6
	Can	48	24	12
Ready-to-eat, rolled oats	Pkg	24	12	6
Sugar, coated	Pkg	24	12	6
Chalupa shells, corn	Container	12	6	3
Cheese				
Cheddar, processed	Can	48	24	12
Cheddar, shredded	Pkg	3 to 4		
Cottage, dehydrated	Can	48	36	12
Grated	Container	18	6	3
Processed, American, dehydrated	Can	48	24	12
Cheese cake mix	Bag	12	6	3
Cherries				
Dehydrated	Can	60	36	18
Dietetic pack	Can	36	18	9
Maraschino	Jar	36	18	9
RTP (Red tart pitted)	Can	36	18	9
Sweet, dark	Can	36	18	9
Sweet, light	Can	36	18	9
Whole, red, glace	Plastic Tub	24	12	6
Chewing gum	Carton	9	4	2
Chicken				
Dehydrated, reg. pack	Can	72	48	24
Baby food, strained	Jar	36	18	9
Chili con carne				
Without beans	Can	60	36	18
Dehydrated, with beans	Can	72	36	24
Chili sauce	Bottle	48	24	12
Chives, dehydrated	Can	24	12	6
Chocolate, cooking				
Semisweet chips[16]	Pkg	36	18	6
Unsweetened[16]	Carton	48	24	12
Chocolate syrup, beverage	Can	72	36	18
Chutney sauce	Jar	48	24	12
Clams	Can	72	36	18
Cocoa, natural	Carton	36	18	9
	Can	72	36	18
Coconut, prepared				
Sweetened	Can	36	18	6
	Container	24	6	1
Unsweetened	Bag	24	6	1

Table 5-3 Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Coffee				
Instant	Envelope	36	18	9
	Jar	72	36	18
Roasted and ground	Pouch	9	2	1
	Can	18	12	5
Cookie mix, chocolate and sugar	Can	36	18	9
Cookies	Carton	6	4	2
Corn bread mix	Can	56	28	8
Corn, cream, and whole grain styles	Can	72	36	18
Corn, dehydrated, uncooked, comp	Can	72	36	24
Corn, chips	Pkg	1	½	¼
Corn flake crumbs	Carton	24	12	6
Corn meal	Pkg	24	12	6
	Can	48	24	12
Crabapples, spiced	Can	24	12	6
Crab	Can	72	36	18
Crackers				
Graham	Carton	4	2	1
Other than graham	Carton	12	6	3
Crumbs	Bag	12	6	3
Cranberry sauce	Can	36	18	9
Cranberry juice cocktail	Can	30	12	3
Cream				
Coffee type, aseptically processed and packaged [19]	Bottle	60	12	3
Whipping, aseptically processed and packaged [7 19]	Can	12	6	1
Substitute	Can/envelope	48	24	12
Whipping, dry	Can	8	6	4
Cream of tartar	Container	Indef	Indef	Indef
Cup, ice cream, edible	Box	24	12	6
Currants, dried	Carton	24	12	6
Custard pudding, baby food strained	Jar	24	12	6
Dessert powder				
Gelatin, base, all flavors [14]	Can	72	36	18
	Container/pkg	36	18	9
Starch base, all flavors [14]	Container/pkg	36	18	9
Instant, all flavors [14]	Can	48	24	12
	Carton	36	18	9
Doughnuts				
Cake	Pkg		(5 days)	
Yeast	Pkg		(3 days)	
Eggnog (APP) [19]	Can	12	6	1
Egg mix, dehydrated	Can	72	36	18
Eggs, whole, dry	Can	72	36	18
Emulsifier, bread & rolls	Bag/can	24	12	6
Enchiladas	Can	48	24	12
Figs	Can	48	24	12
Fish, dehydrated, squares	Can	60	36	18
Flavoring				
Imitation maple or vanilla	Bottle	Indef	Indef.	Indef
Other flavors	Bottle	24	18	6
Rye	Fiber drum	12	6	3
Tablet, imitation maple or vanilla	Bottle	Indef	Indef	Indef
Flour				
Rye [18]	Bag	24	12	6
Wheat, bread or general purpose	Can	54	27	12
	Bag	24	12	6
Food coloring, liquid	Bottle	Indef	Indef	Indef
Food coloring, paste	Jar	48	24	12
Frankfurters	Can	72	36	18
Fruitcake	Can	64	32	16
	Box	12	6	1
Fruit, candied	Jar	12	6	3

Table 5-3 Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Fruit cocktail	Can	48	24	12
Fruit mix, freeze dehydrated	Can	36	18	9
Fruit puree	Can	48	24	12
Fry mix, breading	Bag	36	18	9
Garlic				
Dehydrated	Can	48	24	12
Dry	Box	5	4	3
Gelatin, plain, edible	Container	72	36	18
Grape juice				
Dehydrated [11]	Can	72	36	18
Single strength	Can	24	12	6
Grapefruit				
Regular pack	Can	48	24	12
Juice, dehydrated (instant) [11]	Can	72	36	18
Juice, single-strength	Can	48	24	12
Grapefruit-orange juice blend				
Single-strength	Can	48	24	12
Grapefruit-pineapple juice blend				
Single strength	Can	48	24	12
Ham chunks	Can	72	36	18
Hamburgers, without gravy	Can	72	36	18
Hash, corned beef or roast beef	Can	72	36	18
Hominy				
Grits	Container	24	12	6
Whole	Can	72	36	18
Honey, extracted	Jar	48	24	12
Horseradish, dehydrated	Bottle	48	24	12
Ice cream mix and ice milk mix				
Powder	Can	36	18	6
Icing mix	Can	72	36	18
Inhibitor, mold, bread, and rolls [14]	Bag	18	9	5
Jam, fruit	Can/jar	36	18	9
	Pkg	24	12	6
Jelly, fruit	Can/jar	36	18	9
	Pkg	24	12	6
Lard, service style	Carton	12	6	3
Lemon juice, dehydrated [11]	Can	72	36	18
Lime juice, single strength	Can	24	12	6
Luncheon meat	Can	72	36	18
Macaroni [14]	Carton	72	36	18
Malted cereal syrup	Can	48	24	12
Margarine	Can	36	18	9
Marmalade	Jar	36	18	9
Marshmallow	Container	12	9	1
Mayonnaise	Can/jar	12	6	3
Meal, Combat, Individual	Case	See table 5-4		
Meal, Ready-to-Eat	Case	See table 5-4		
Meat, spread	Can	36	18	9
Meringue powder	Can	48	24	1
Milk				
Chocolate (cocoa flavored), dry	Envelope (vacuum)	40	20	10
	Envelope (no vacuum)	24	12	6
Chocolate, aseptically processed and packaged	Can/box	12	6	3
Dry, nonfat	Can	32	16	8
	Drum/bag/carton	24	12	3
Evaporated [8]	Can	24	12	6
Filled dry, including chocolate	Can	24	12	6
Ice and milk shake mix, dehydrated	Can	24	12	6
Malted, dry	Can	48	24	9
Whole, dry	Can (zero oxygen pouch)	6	3	1
Whole, aseptically processed and packaged [19]	Can	12	6	1

Table 5-3. Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Mincemeat	Can	48	24	12
Molasses	Can	48	24	12
Monosodium glutamate	Container	Indef.	Indef.	Indef.
Mustard, prepared	Can/jar	36	18	9
Mushrooms	Can	48	24	12
Noodles				
Chow mein	Can	8	4	2
Egg [14]	Carton	72	36	18
Nuts				
Shelled, roasted	Can	60	24	12
Unshelled	Bag	24	12	6
Okra	Can	48	24	12
Olives				
Green	Jar	48	24	12
Ripe	Can	48	24	12
Olive oil	Can	18	6	4
Onion ring mix	Can	24	12	6
Onions, dehydrated and dehydrated compressed	Can	60	24	12
Onions, whole, acidified	Can	36	18	9
Orange juice				
Dehydrated (instant) [11]	Can	72	36	18
Single strength	Can	48	24	12
Parsley, dehydrated	Can	48	24	12
Peaches				
Baby food, strained	Jar	36	18	9
Dietetic pack	Can	48	24	12
Regular pack	Can	48	24	12
Slices (freeze dehydrated)	Can	36	18	9
Peanut butter	Can/jar	36	18	9
Pears				
Baby food, strained	Jar	40	20	10
Dietetic pack	Can	36	18	9
Freeze dehydrated	Can	36	18	9
Regular pack	Can	36	18	9
Peas				
Baby food, strained	Jar	40	20	10
Blackeye	Can	72	36	18
Dehydrated compressed	Can	120	60	24
Dried [12]	Bag/carton	24	12	9
Green	Can	72	36	18
Peas and carrots	Can	60	30	15
Peppers, green dehydrated	Can	72	36	18
Peppers, pickled, cherry	Jar	36	18	9
Peppers, jalapeno	Can	24	12	6
Peppers, red sweet	Can	48	24	12
Pickles				
Cucumber, cured	Jar	48	24	12
	Can	24	12	6
Cucumber, fresh pack	Jar	36	18	9
	Can	18	9	4
Mixed	Jar	48	24	12
	Can	24	12	6
Relish	Jar	48	24	12
	Can	24	12	6
Pie crust mix	Can	36	18	6
Pie filling, prepared fruit apple, blueberry, cherry, peach, lemon [15]	Can	60	36	18
Pie shell, graham cracker	Container	8	4	2
Pimentos	Can	48	24	12
Pineapple				
Slices, glace natural	Plastic tub	24	12	6
Dietetic pack	Can	48	24	12

Table 5-3. Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Freeze dehydrated	Can	36	18	9
Juice, dehydrated [11]	Can	72	36	18
Juice, single strength	Can	48	24	12
Regular pack	Can	48	24	12
Sliced, glazed	Plastic tub	24	12	6
Plums				
Dietetic pack, red	Can	36	18	9
Dietetic pack, green	Can	48	24	12
Regular pack, red	Can	36	18	9
Regular pack, green	Can	48	24	12
Popcorn, unpopped	Can	72	36	18
	Cello bag	24	3	1
Pork chops, raw, dehydrated	Can	72	48	24
Potato				
Chips	Pkg	1	½	¼
	Can, air	4	2	1
	Can, nitrogen	24	12	6
	Can vacuum	12	6	3
Sticks	Can	48	24	12
Sweet	Can	48	24	12
Sweet, instant, dehydrated	Can	60	36	18
White	Can	60	30	15
White, dehydrated, granules	Can	60	36	18
White, dehydrated, granules—8% H_2O	Can	24	12	6
White, dehydrated, slices	Can	60	36	18
White, dehydrated, slices—8% H_2O	Poly bag	24	18	6
White, dehydrated, slices—8% H_2O	Kraft bag	12	6	3
Mix, dehydrated for french fries	Can	18	9	5
	Bag	12	6	3
Prunes				
Baby food, strained	Jar	18	9	5
Dehydrated/pitted (low moisture)	Can	36	18	9
Dried	Can	36	18	9
Dried	Carton	18	9	5
Dried, soaked	Can	36	18	9
Pumpkin	Can	48	24	12
Raisins, dried	Can	36	18	9
	Carton	18	9	5
Ration, supplement aid station	Case	72	36	18
Ravioli w/meat sauce	Can	48	24	12
Rice				
Instant [14]	Carton	36	18	9
Milled [14]	Bag	48	24	12
Parboiled [14]	Container/bag	30	20	10
Rolls, fresh				
Bagel	Pkg	(1 day)		
Sweet or finger	Pkg	(2 days)		
English muffin	Pkg	(7 days)		
Salad dressing, spoonable [4]	Can/jar	8	5	2
Salad dressing, pourable [4]	Bottle	7	5	2
Salad oil [9]	Can	24	12	6
Salmon	Can	72	36	18
Salt				
Celery, garlic, onion	Container	72	36	18
Substitute	Envelope	Indef	Indef.	Indef.
Table [5]	Bag/envelope	Indef.	Indef	Indef
Sauces, Hot, Kitchen, Meat, Soy, or Worcestershire	Bottle	60	30	15
Sauerkraut	Can	36	18	9
Sardines	Can	72	36	18
Sardines in tomato sauce	Can	30	15	8
Sauce mix, brown gravy, spaghetti, taco seasoning	Can	36	18	9
Sausage, pork, link	Can	60	36	18

Table 5-3. Storage Life of Semiperishable Subsistence **(Continued)**
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Shortening compound [10]				
Bakery type [9]	Can/cube	48	24	12
Deep fry, cooking type, fluid	Can	48	24	12
Deep fry, cooking type, plastic	Can	48	24	12
General purpose, regular	Can/cube	48	24	12
General purposes, high stability	Can/cube	60	30	15
Shrimp	Can	72	36	18
Shrimp, dehydrated	Can	72	36	18
Syrup				
Blended	Can	72	36	18
Maple syrup, imitation	Bottle/can	72	36	18
Soup				
Baby food, chicken, strained	Jar	36	18	9
Beef, instant, hydrated	Pkg	24	12	6
Beef, noodle, dehydrated	Pkg	48	36	12
Beef, vegetable, noodle, dehydrated	Can	48	36	12
Chicken, chunk, dehydrated	Pkg	48	36	12
Chicken or chicken flavored instant, dehydrated	Pkg	48	36	12
Chicken noodle, dehydrated	Can	60	30	15
	Pkg	24	12	6
Condensed [13]	Can	72	36	18
Cream of onion, instant, dehydrated	Pkg	36	18	9
Cream of potato, instant, dehydrated	Pkg	36	18	9
Green pea, simmer type, dehydrated	Can	60	24	12
	Pkg	24	12	6
Onion, dehydrated	Can	60	30	12
	Pkg	36	18	9
Onion, instant, dehydrated	Pkg	36	18	9
Ready-to-serve	Can	48	24	12
Tomato-vegetable w/noodle, dehydrated	Can	48	24	9
Vegetable, dehydrated	Pkg	24	12	6
Soup and gravy base				
Beef flavored	Can/jar	60	30	15
	envelope	24	12	6
Chicken flavored	Can/jar	60	30	15
	envelope	24	12	6
Ham flavored	Can/jar	60	30	15
	envelope	24	12	6
Sour cream sauce mix	Can	24	12	4
Spaghetti [14]	Carton	72	36	18
Spices, seasoning, herbs [6]	Can	48	24	12
	Container	36	18	3
	Bottle	36	18	9
Spinach				
Baby food, strained	Jar	36	18	9
Dehydrated, compressed	Can	60	36	12
Junior food	Jar	36	18	9
Regular pack	Can	48	24	12
Puree	Can	48	24	12
Starch				
Corn, edible	Carton	96	48	24
Pregelatinized, edible [14]	Can/bag	96	48	24
Sugar				
Brown [17]	Carton/bag	36	18	4
Confectioners [17]	Carton/bag	36	18	6
Refined, granulated [17]	Can/bag/envelope	Indef	Indef	Indef.
Sugar, substitute	Envelope	Indef.	Indef	Indef
Tamales	Can	48	24	12
Tapioca [14]	Carton	96	48	24
Taco shells, corn	Container	12	6	3

Table 5-3 Storage Life of Semiperishable Subsistence (Continued)
See footnotes at end of table

Item	Packaging	Approximate storage life (months)		
		40 °F	70 °F	90 °F
Tea				
Black, bags or loose	Can/carton	36	18	9
Instant	Envelope	36	18	9
Tomato				
Juice, concentrated 3+1	Can	36	18	9
Juice, single strength	Can (plain body)	36	18	9
	Can (enameled)	48	24	12
Paste, instant, dehydrated	Can	72	36	18
Paste, regular pack	Can	36	18	9
Puree	Can	48	24	12
Regular pack	Can	48	24	12
Tomatoes and okra	Can	48	24	12
Topping, dessert				
Prepared, ice cream, non-acid syrup	Can	72	36	18
Prepared, ice cream, fruit, acid syrup	Can	36	18	9
Dehydrated	Can	36	24	6
Tortillas, corn	Can	36	18	9
Tuna				
Oil pack	Can	72	36	18
Turkey				
Regular pack	Can	72	36	18
Loaf	Can	72	36	18
Vegetable				
Baby food, mixed, strained	Jar	36	18	9
Juice, single strength	Can	36	18	9
Mixed, dehydrated, compressed	Can	48	36	12
Vinegar				
Liquid	Bottle	60	30	15
Synthetic, dry	Flexible bag	72	36	18
Wheat base[2,14]	Bag	48	36	12
Yeast, bakers, active dry	Can	6	1	¼
Yeast food	Bag	48	24	12

[1] In general, RH 50–55 percent. Metal cans are susceptible to rust and most boxed or bagged food to mustiness or molding above RH 60 percent.
[2] Flour should be stored under cool, dry conditions The major problem is protection against dampness, insects, and rodents Low temperatures, 32 °F.–40 °F., protect against insects; RH greater than 70 percent leads to mustiness Best storage conditions are at temperatures below 50 °F and approximately 60 percent RH.
[3] Footnote not used.
[4] Separates at high temperatures or after freezing
[5] Humidity above 90 percent will cause caking "Caked" salt is usable
[6] Above 100 °F. there is complete loss of flavor in less than 6 months "Whole" spices keep longer than "ground" spices
[7] Guaranteed to whip only if stored below 50 °F
[8] Cases should be turned every 30 to 60 days to prevent separation of butterfat. Separated or grainy milk can be used for cooking.
[9] When held below 32 °F , may show solid material which will disappear on warming.
[10] If held above 90 °F , changes may occur in texture unfavorable to normal creaming properties
[11] Store at cool temperatures below 75 °F. during the first 3 months.
[12] High temperatures harden; high humidity causes molding.
[13] Cream style soups break down on freezing, but are not spoiled
[14] Highly susceptible to damage by moisture.
[15] Freezing alters appearance of starch thickening. Baking restores desirable appearance.
[16] Do not store near other material capable of imparting odor to chocolate
[17] Keeping time based on RH not more than 60 percent For storage longer than 1 month, sugar should be covered with tarpaulins and not stored on damp or concrete floors or near cold walls.
[18] Rye flour loses its most delicate flavor after 2 months at 40 °F., 1 month at 70 °F., or 1 week at 90 °F After this time, further flavor change is very slow It is said that only experts can detect this first, subtle flavor change.
[19] These items should be stored at temperatures below 72 °F. For long holding, chill storage is recommended. Do not freeze

Table 5-4 Operational Rations
a Ration and Packets Other than MRE; Meal, Combat, Individual (MCI); and Meal, Flight Feeding (MFF)

Item	Estimated Optimum Storage Life (Months)		
	40 °F	70 °F.	90 °F.
Food Packet:			
Assault (FPA)	84	48	24
In-Flight	48	24	12
Long-Range Patrol (LRP)	120+	120	36
Survival, Abandon Ship, Aircraft, Liferaft	84	84	72
Survival, General Purpose	60	48	24
MCI	60	24	12
MFF	(See table 5-4B)		
MRE	(See table 5-4B)		
Ration, Cold Weather	84	48	24
Ration, Supplement Aid Station.	72	36	18
Tray Pack, Canned	60	36	18
Water, Canned	120	60	30

b. *Estimated Serviceable (Maximum) Storage Life for MRE and MFF.* Persons using this table as an aid in planning storage facility utilization must be aware that using average environmental temperatures to enter the table will often result in inaccurate and misleading guidance. The use of maximum temperatures encountered will generally provide more useful guidance. Few nonrefrigerated storage facilities offer nonfluctuating and moderate temperatures; therefore, controlled temperature storage of MRE and MFF stock is generally recommended. In order to optimize quality of stocks shipped to using agencies, wholesale stocks should be stored at not more than 40 °F.

Sustained Storage Temperature (°F)	Estimated Serviceable Life (Months)
120	1
110	5
100	18
90	30
80	48
70	66
60	84
<50	96

When using this table, it must be remembered that effects of time and temperature are cumulative. For example, if rations are received 9 months after their DOP, and you determine that they have been held in a hot environment, say 100 °F., you can estimate that one-half of their serviceable life is gone (9/18=0.5). If they are to be stored at 70 °F. in your facility, you could expect a remaining serviceable shelf life of 33 months, not 66 months (66 × 0.5=33). See table 5-4.C for estimating remaining shelf life after initial refrigerated storage.

Fluctuating temperatures around the freezing point of foods (approximately 25 °F. to 30 °F.) should be avoided due to the potential for reduced product quality from repeated freezing and thawing. Frozen storage below 0 °F. is not recommended as rough handling of frozen MREs and MFFs will result in packaging failures.

Table 5-5 Estimated Serviceable (Maximum) Storage Life for MRE and MFF After Refrigerated Storage

Storage (Years)[1]	Estimated Remaining Storage Life (Months) (0 °F.)							
	<50	60	70	80	90	100	110	120
0	96	84	66	48	30	18	5	1
1	84	74	58	42	26	16	4 5	1
2	72	63	50	36	22	14	3 8	0 8
3	60	52	41	30	19	11	3	0.5
4	48	42	33	24	15	9	2.5	0.5
5	36	32	25	18	11	7	2	0
6	24	21	16	12	8	4	1	0
7	12	10	8	6	4	2	0 5	0
8	0	0	0	0	0	0	0	0

[1] Held after acquisition from production under controlled refrigerated storage at 30 °F +1 °F and 50+5 percent RH.

Section V. Miscellaneous Commodities

5-19. General.

This section includes some of the more common miscellaneous commodities stored in military installations but is not intended as a complete list. Also, it prescribes the approved methods and practices for storing and handling the listed materials. Storage and handling methods that are to be observed with respect to other commodities will be in accordance with the principles and practices included in the other sections and parts of this manual or as may be prescribed by the appropriate military service.