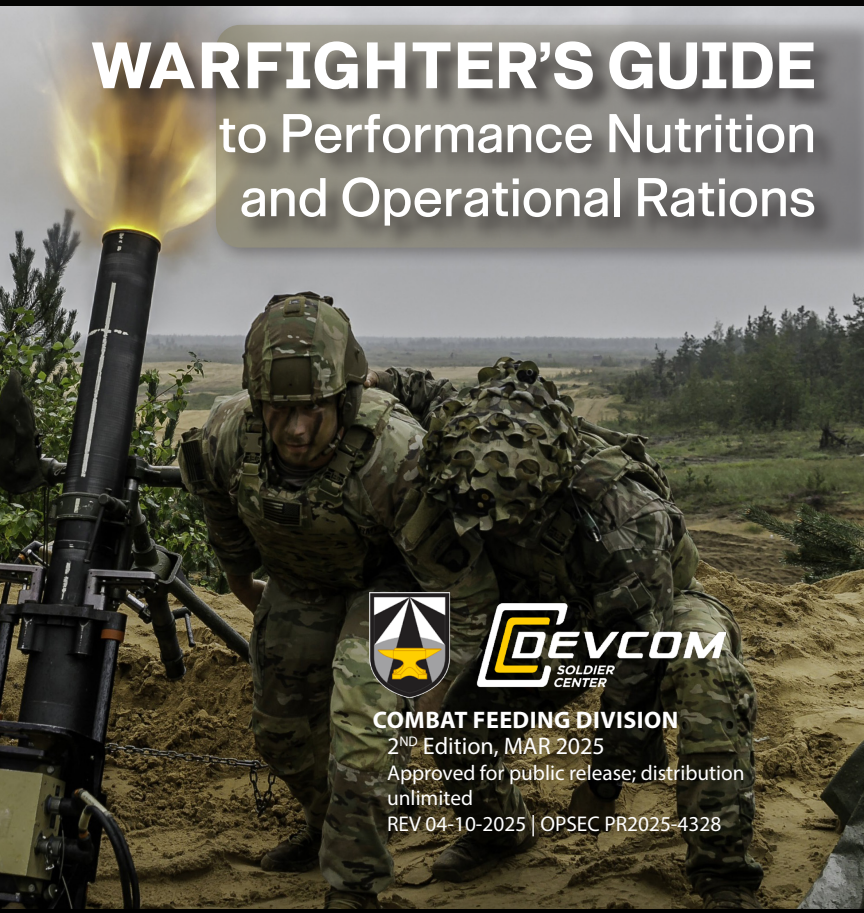
U.S. ARMY

WARFIGHTER'S GUIDE

to Performance Nutrition and Operational Rations



DEVCOM SOLDIER CENTER

COMBAT FEEDING DIVISION

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CONTENTS

Do you know how to get the maximum benefit from the foods you choose?

COMBAT FEEDING DIVISION (CFD)

THE GLOBAL LEADER AND TECHNOLOGY PROVIDER FOR MILITARY FIELD FEEDING

Mission

The mission of the Department of Defense Combat Feeding Research and Engineering Program is to provide an operationally relevant research and development base to deliver solutions for evolving field feeding challenges. CFD is responsible for the research, development, engineering, integration and technical support for the entire family of operational rations.

Collaborators

The program is driven by warfighter recommendations and feedback. This guide was created with input from the U.S. Army Research Institute of Environmental Medicine (USARIEM). USARIEM conducts nutritional research that provides a scientific basis for developing new rations, menus, policies and programs to enable the warfighter's health-readiness and optimal performance.

Purpose

The purpose of this guide is to provide an overview of performance nutrition, as it relates to operational rations designed to support combat readiness and resiliency during deployments, field operations and mission-specific scenarios.

This guide does not replace the need to consult with a physician and/or registered dietitian regarding diet and nutritional requirements for optimal individual performance.


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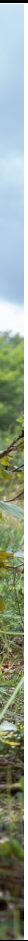


PERFORMANCE NUTRITION AND OPERATIONAL RATIONS

PROVIDING THE WARFIGHTER THE FUEL TO FIGHT

Food is your body's fuel. Do you know how to get the maximum benefit from the foods you choose? Do you know the role of macronutrients (carbohydrates, protein and fat) and micronutrients (vitamins and minerals)in fueling your body? Do you know how to eat before and during a mission, and how to refuel afterwards, to maximize your performance?

By providing your body with the proper nutrition, you can improve your alertness, strength and endurance. Operational rations are designed using scientific evidence to ensure warfighter nutritional needs are met in all environments.

ACTION PLAN

1. LEARN about the performance impact of nutrients.

2. DETERMINE your existing operational ration food choices and your mission requirements.

3. CREATE your own performance nutrition plan.

ENERGY BALANCE

PERFORMANCE IMPACT

- Balancing your energy intake (fuel) with energy needs (exercise, activity) is critical to optimize physical and mental performance.
- Operations in extreme environmental conditions (cold, high altitude, water immersion, and heat) along with heavier equipment loads and terrain variances, can increase your energy needs.

Not eating enough calories (kcal) leads to weight loss, muscle wasting, and decreased performance.

MILITARY DIETARY REFERENCE INTAKE[1]

ACTIVITY LEVEL	MEN (KCAL/D)	WOMEN (KCAL/D)
Light	3000	2100
Moderate	3400	2300
Heavy	3700	2700
Very Heavy	4700	3000

OPERATIONAL RATION SOURCES

OPERATIONAL RATION & ENHANCEMENTS	AVG KCAL
Meal, Ready to Eat (MRE)	1250/meal
First Strike Ration® (FSR) (24-hour ration)	2800/ration
Close Combat Assault Ration (CCAR) (24-hour ration)	2800/ration
Meal, Cold Weather (MCW)	1570/meal
Unitized Group Ration – A (UGR–A)	1570/meal
Unitized Group Ration – Express (UGR–E)	1300/meal
Unitized Group Ration – Heat & Serve (UGR–H&S)	1350/meal
Unitized Group Ration – Marine (UGR–M)	1350/meal
Modular Operational Ration Enhancement** (MORE). Type I - High Altitude/Cold Weather Type II – Hot Weather	1000/pack
Modular Operational Ration Enhancement** (MORE). Performance Pack	1340/pack

[1]AR 40–25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141, 3 January 2017

CARBOHYDRATES (CARBS)

PERFORMANCE IMPACT

- During moderate to very heavy activity levels, carbs are your body's main fuel source for muscle.
- During very heavy activity levels lasting >3 hours, your carb needs increase.
- You need adequate amounts of carbs for optimal endurance, concentration, coordination, and recovery.

MILITARY DIETARY REFERENCE INTAKE*

1.8 - 3.6 grams (g)/pound (lb.) of body weight [or approximately (approx.) 300-600 g of carbs/day for 165lb warfighter].

MRE EXAMPLES

Warfighter Weight	Approximate goal carbs (g) per day (3g/lb)	Approximate carbs (g)/Fueling Session (6 fueling sessions/day	Examples per fueling session
135 lbs	405 g	70 g	Beef Stew, Snack Bread, and Jelly
155 lbs	465 g	80 g	Spaghetti with Beef and Sauce, and Chocolate Protein Drink
185 lbs	555 g	95 g	Elbow Macaroni, Recovery Bar, and Carb-Electrolyte Beverage
205 lbs	615 g	105 g	Chicken Burrito Bowl, Toaster Pastry, & Recovery Trail Mix w/ Pretzels

[1]AR 40–25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141, 3 January 2017

PROTEIN (PRO)

PERFORMANCE IMPACT

- Essential for proper refueling after physical activity to promote recovery.
- Secondary source of energy for the body.
- Eating enough protein helps you to maintain muscle mass and recover from injuries and tough training sessions and missions.

MILITARY DIETARY REFERENCE INTAKE[1]

Approximately 0.7 g/lb. of body weight.

When you eat enough calories to meet your body's needs, then you can likely meet your protein needs through foods/drinks alone without the need for supplements.

MRE EXAMPLES

Warfighter Weight	Approximate Goal PRO (g)/day	Approximate **PRO** (g)/Fueling Session (6 fueling sessions/day	Examples per fueling session
135 lbs	95 g	16 g	Chili Macaroni
155 lbs	110 g	18 g	Nut Raisin Mix with Chocolate Disks and Beef Stick, Teriyaki
185 lbs	130 g	20 g	Chocolate Protein Drink and Jalapeño Cashews
205 lbs	145 g	25 g	Lemon Pepper Tuna

[1]AR 40–25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141, 3 January 2017

FAT

PERFORMANCE IMPACT

- During prolonged, low intensity physical activity, your body uses stored fat as energy.
- Fat helps your body absorb certain vitamins (A, D, E, and K).
- Fat is the most energy dense nutrient and is essential for satiety.

MILITARY DIETARY REFERENCE INTAKE[1]

Approximately ≤30% of total calories (2500 calorie = 83 g of fat)

How to Calculate Fat Intake:

Example: 2500 calorie (kcal) diet

1. ≤30% of kcal should come from fat
2. 30%=30/100
3. 30/100 = x/2500kcal (x =kcal from fat)
4. 30 (2500) = 75,000
5. 75,000/100 = 750 kcal from fat
6. 1g of fat = 9 kcal
7. 1g/9kcal = x/750 kcal (x=g of fat)
8. 1g (750kcal) =750
9. 750/9kcal = 83g
10. **Fat Intake = ≤83g of fat**

MRE EXAMPLES

1-4.9 g FAT	Fruit (spiced apples) or Entrée (chicken chunks, elbow macaroni in tomato sauce) or Cracker or Beverage (chocolate protein drink)
5-10 g FAT	Entrée (chicken noodle/vegetable, beef stew) or Bread (snack bread, tortilla, filled bakery item)
Greater than 10 g FAT	Entrée(spaghetti w/beef and sauce, Italian style pork sausage w/peppers and onions in marinara sauce) or Snack (trail mix, cookie, pound cake) or Spread (peanut butter, cheese)

[1]AR 40–25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141, 3 January 2017

VITAMINS & MINERALS

PERFORMANCE IMPACT

- Vitamins and minerals don't provide your body with energy, but they are necessary for energy production and other cellular functions.
- Micronutrients are added to fortify certain ration items to prevent nutrient deficiencies and maximize performance.

MILITARY DIETARY REFERENCE INTAKE[1]

- Vitamin A: 3000 IU/day (men); 2333 IU/day (women)
- Vitamin C: 90 mg/day (men); 75 mg/day (women)
- Vitamin D: 15 µg/day (men and women)
- Calcium: 1000 mg/day (men and women)
- Iron: 8 mg/day (men); 18 mg/day (women)

See AR40-25 for complete list of military dietary reference intakes.

MAXIMIZE YOUR NUTRITION WITH MICRONUTRIENTS

- Many ration components are good sources of micronutrients.
- Eat a variety of components to obtain a balance of nutrients.
- If you can't eat your entire ration, then eat the entrée and fortified ration components first.

FORTIFIED COMPONENT	VITAMINS											MINERALS	
	A	B^1	B^2	B^3	B^6	B^{12}	C	D	E	Folic Acid	K	Calcium	Zinc
Chocolate Protein Drink							×	×					
Beverages/Pouched Fruit							×						
Beverages, Sugar Free							×					×	
Cheese Spread	×							×				×	
Peanut Butter	×	×			×		×						
Crackers/Snack Bread												×	
Pudding								×				×	
First Strike Bars		×	×	×	×	×	×	×	×	×	×		×

[1]AR 40–25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141, 3 January 2017

HYDRATION

PERFORMANCE IMPACT

- Balance fluid loss with fluid intake to stay hydrated and high performing.
- Your daily fluid needs may double with increased physical activity and in extreme environments like heat, humidity, cold, and high altitude due to increased energy needs, added sweat loss, and other factors.
- Dehydration in excess of 2-3% of body mass increases risk of injury, interferes with mental functions, and decreases mental and physical performance.
- Too few electrolytes may lead to muscle cramping and reduce your body's ability to function.

MILITARY DIETARY REFERENCE INTAKE[1]

- Cooler (45-59ºF) Environments
  - *3-8 liters (L)) of fluid/day*
  - *2-4 g of sodium/day*
- Hot (>90ºF) Environments
  - *4-11.4 L of fluid/day*
  - *4-9 g sodium/day*

See figure on page 11.

OPERATIONAL RATION EXAMPLES

Carb-electrolyte beverages contain, 82-163mg sodium, 18-46mg potassium, and 12-24g carbs per 237ml (~8oz) for optimal hydration. You can usually meet your sodium needs by eating ration entrées and salty snacks (jerky, pretzels, corn nuts).

ELECTROLYTES

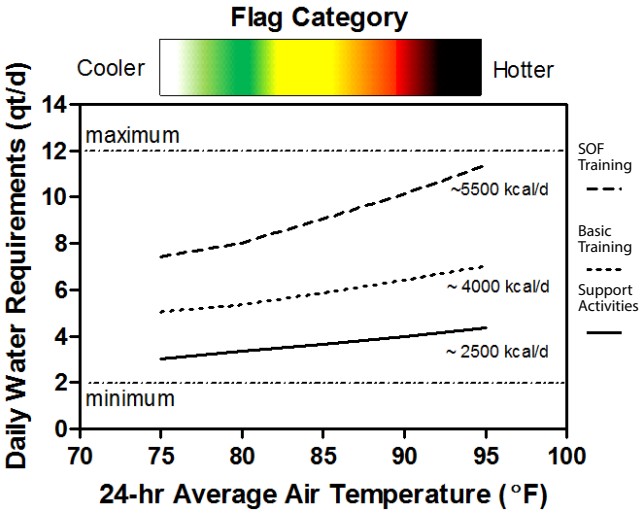
- Sodium
- Potassium
- Calcium
- Magnesium
- Phosphate
- Chloride

Electrolyte replacement is especially important with longer or more intense exercise and hot or humid weather.

[1]AR 40–25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141, 3 January 2017

HYDRATION

The graph below shows daily water requirements over a range of average daily air temperatures and the related heat stress flag categories.



EXAMPLE:
When the average air temperature is 75°F (24° C) and your activity level requires 4000 kcal, then your daily water requirement is approximately 5 quarts (4.7 L)/day.

NOTE:

- Individual fluid needs vary based on differences in sweat rate and sun exposure.
- Don't exceed 1.5 qt (1.4 L) of fluid per hour.

NUTRIENT TIMING and RECOVERY

PERFORMANCE IMPACT

- Eating regularly including before field operations, maximizes physical and mental performance.
- Improper fueling negatively impacts mission outcomes.
- Caffeine can temporarily improve performance, but isn't a substitute for sleep.

RECOMMENDATIONS

- Eat and drink ration items at regular intervals, every 3-4 hours of wakefulness.
- Eat and drink carbs and protein throughout for sustained energy and fueling.
- Consume up to 200 mg of caffeine at a time, and re-dose every 3-4 hours, only as needed. Don't exceed 800 mg of caffeine per day.

BEFORE FIELD OPERATIONS

(Approximately 1-4 hours)

- Pre-mission intake needs differ between individuals and depending on the upcoming activity (ex. field assaults).
- Eat a high carb (or carb focused) snack/small meal to maximize energy stores.
- Pay attention to your body, high protein, fat, or fiber foods may cause digestive upset. Adjust your intake as needed.
- If needed, 30-60 minutes before activity, use up to 200 mg of caffeine to boost your mental and physical performance.

OPERATIONAL RATION EXAMPLES ≥ 30 g Carbs

- Fruit (spiced apples, carb-enhanced applesauce).
- Bread (snack bread, tortilla, filled bakery item).
- Pasta entrées (elbow macaroni, cheese tortellini)
- Snacks (cookie, candy)
- Beverage (carb-fortified)

NUTRIENT TIMING and RECOVERY

DURING FIELD OPERATIONS

- Snack when you can to meet energy needs (every 1-2 hours if possible).
- Focus on your carb intake; 60-90g/hour when events last >3 hours. Ensure adequate PRO in events lasting ≥3 hours.
- Drink enough fluid to prevent excessive dehydration (0.5 - 1.0 L per hour).

OPERATIONAL RATION EXAMPLES ≥30 g Carbs

- Fruit (spiced apples, carb-enhanced applesauce, dried fruit)
- Snacks (filled bakery item, candy)
- Carb-fortified beverage

AFTER FIELD OPERATIONS

(within 30-60 minutes after heavy physical activity)

- Consume 80-120 g carbs and 15-25 g PRO to kick start recovery and refueling.
- Drink to relieve thirst and promote urination.

OPERATIONAL RATION EXAMPLES

- Recovery trail mix and toasted corn kernels: 95 g carbs + 15 g PRO
- Chocolate PRO drink, peanut butter, and crackers: 90 g carbs + 25 g PRO
- Meatballs in marinara sauce, Italian bread sticks, and carb-fortified beverage: 85 g carbs + 23 g PRO


Choose foods to meet
your performance
nutrition needs.

FOOD LABELS

The nutrition facts label provides the operationally relevant nutrition information a warfighter may need. For more information on energy and nutrient levels of operational rations, search the Combat Rations Database (ComRaD) by visiting https://www.hprc-online.org/nutrition/comrad

Are you consuming enough energy (kcal) to meet your performance needs?

Are you consuming enough carbs to meet your performance and recovery needs?

Are you consuming enough protein to maintain muscle mass and promote recovery?

Are you consuming enough vitamins and minerals to maximize performance?

Nutrition Facts

8 servings per container

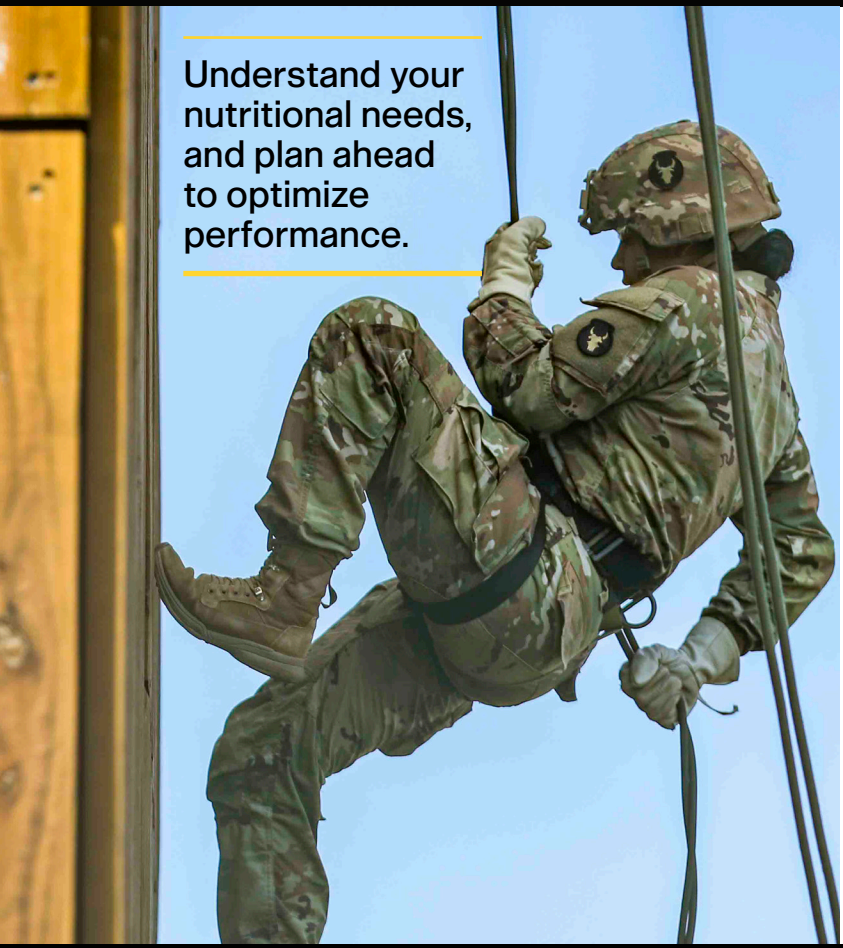
Serving size **2/3 cup (55g)**

Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 240mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.


Understand your nutritional needs, and plan ahead to optimize performance.

PLAN AHEAD

A fueling plan contributes to mission success. Use the following table to help you plan your energy and fluid intake before, during and after missions.

BODY WEIGHT (LBS)	TIMING		
	PRE-MISSION	DURING[2]	POST-MISSION
<145-165	80-300 g Carb drink to thirst	30-60 g Carb/hr 0.5-1.0 qt (0.5-1.0 L)/hr	80-120 g Carb, 15-25 g PRO drink to relieve thirst and promote urine production[1]
165-185	90-350 g Carb drink to thirst	30-60 g Carb/hr 0.5-1.0 qt (0.5-1.0 L)/hr	80-120 g Carb, 15-25 g PRO drink to relieve thirst and promote urine production[1]
> 185	100-400 g Carb drink to thirst	30-60 g Carb/hr 0.5-1.0 qt (0.5-1.0 L)/hr	80-120 g Carb, 15-25 g PRO drink to relieve thirst and promote urine production[1]

- Know your calorie needs (see calorie needs by sex and activity table on page 5) and eat at regular intervals to maintain consistent intake of energy.
- During multiple hours of heavy to very heavy physical activity, snack regularly with goal to consume 60-90 g carbs/hour.
- Listen to your own body tolerances; practice fueling strategies during training and before actual missions.
- If needed, 30-60 minutes before activity, use up to 200 mg of caffeine. Stop caffeine use at least 6 hours before sleep periods.

[1] fluid needs vary by individual, do not exceed 1.5 qt (1.4 L)/hr (1500 ml/hr) • [2] cold weather or high altitude increases needs to 50-75 g Carb/hour

PLAN AHEAD: **VIGNETTE 1**

You are part of an Infantry Platoon deployed in support of combat operations in a hot climate. Your mission is to conduct dismounted zone reconnaissance patrols throughout the Area of Responsibility. At 0730 you are dropped off by helicopter 5 kilometers away from the objective. At 1530 you are scheduled to be picked up by vehicles upon completion of the mission. The patrol requires travel over varied terrain and significant elevation changes. As the platoon moves towards the extraction point, you receive contact and are stuck on the objective for an additional 5 hours.

PLAN AHEAD: **VIGNETTE 1**

Example using a 185 LB MAN or a 150 LB WOMAN:

What is your activity level? Heavy activity

What is your environment? Extreme heat

What are your estimated energy needs?

Approximately 3700 kcal (man) or 2700 kcal (woman).

Caloric needs can vary based on individual differences in height, weight, age, and gender.

Which ration(s) meet your needs?

CCAR + MORE Type II

When will you use the ration items?

Before: (100-400 grams carbs)

- Toaster Pastry + Dried Fruit + Carbohydrate Electrolyte Beverage + Maple Pecan Sea Salt Bar (114 g carbs)
- Eat and drink additional ration items, as needed to your individual needs.

During: (30-60 g carbs/hour)

- Snack (Filled Pretzels, Toaster Pastry, Energy Gel, Recovery Trail Mix), and/or Carbohydrate Electrolyte Beverage
- Fluids 0.5-1.0 L/hr

After: (80-120 g carbs, 15-25 g PRO)

- Spaghetti with Beef and Sauce + Chocolate Protein Drink + Energy Gel (112g carb + 28 g PRO)
- Fluids - drink to relieve thirst and promote urination.

The above listed Operational Ration components are only examples — other options may also meet nutrition requirements (check the food labels and ComRaD Database)

PLAN AHEAD: **VIGNETTE 2**

You are part of an Infantry Platoon conducting a training mission in a moderate climate. Your mission is to emplace surveillance devices on the objective area. Reaching the designated objective area involves a 7-kilometer dismounted movement from the Company area. Your unit will leave the line of departure at 0730. Your uniform includes your individual weapon, body armor, advanced combat helmet, camelback with water, and pack. Time on target will require a sustained moderate activity level for patrolling, infiltration of the objective and device installment. Movement back to the Company area is scheduled to start around 1300 and follow the same 7-kilometer route.

PLAN AHEAD: **VIGNETTE 2**

Example using a 187 LB MAN or a 152 LB WOMAN:

What is your activity level? Heavy activity

What is your environment? Moderate, but heavy equipment

What are your estimated energy needs?

Approximately 3400 - 3700 kcal (man) or 2300 - 2700 kcal (woman).

Caloric needs can vary based on individual differences in height, weight, age, and gender.

Which ration(s) meet your needs?

3 MREs or substitute one MRE for a UGR meal if provided.

When will you use the ration items?

Before: (100-400 grams carb)

- [MRE] Muffin Top + Granola with Milk and Blueberries + Snack Bread + Carb Beverage Base (137 g carb) or [UGR H & S, Breakfast] Oatmeal + Milk + Harvest Cake + Grape Juice (125 g carb)
- Eat and drink additional ration items as needed to meet your individual needs.

During: (30-60 g carb/hour)

- [MRE] Snacks – Recovery Bar, Toaster Pastry, Crackers, Pound Cake
- Beverages – Carb Beverage Base
- Fluids - 0.5-1.0 L/hr

After: (within 30-60 minutes) 80-120 g carb, 15-25 g PRO)

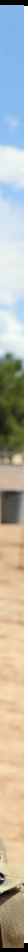
- [MRE] Chili Mac Entrée + Cheese Spread + Fruit Flavored Discs) (80 g carb + 22 g PRO)
- Fluids - drink to relieve thirst and promote urination.

After: (several hours):

- [MRE or UGR H&S, Dinner] Consume items to balance daily intake and meet individual post-mission needs.
- Fluids - drink to relieve thirst and promote urination.

The listed Operational Ration components are only examples — other options may also meet nutrition requirements (check the food labels and ComRaD Database).


OLD IRONSIDES



- Combat Ration Database(ComRad): HPRC (hprc-online.org)
- Nutrition and Menu Standards for Human Performance Optimization: AR 40-25 / OPNAVINST 10110.1 / MCO 10110.49 / AFI 44–141
- Warfighter Nutrition Guide | HPRC: hprc-online.org/nutrition/warfighter-nutrition-guide
- Heat Stress Control and Heat Casualty Management: TB MED 507/AFPAM 48-152
- Fluid and electrolyte replacement guidance: https://usariem.health.mil/assets/docs/partnering/tbmed507.pdf
- Academy of Nutrition and Dietetics (AND), Dietitians of Canada (DC), and American College of Sports Medicine (ACSM) performance nutrition guidelines: http://journals.lww.com/acsm-msse/Fulltext/2016/03000/ Nutrition_and_Athletic_Perrformance.25.aspx

YOUR NOTES

U.S. ARMY
COMBAT CAPABILITIES DEVELPOMENT COMMAND — SOLDIER CENTER
COMBAT FEEDING DIVISION

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