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COMPARISON OF SOVIET AND U.S. SPACE FOOD AND NUTRITION PROGRAMS

Final Report

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ABSTRACT

This report compares the Soviet Space Food and Nutrition programs with those of the U.S. The Soviets established the first Space Food programs in 1961, when one of the Soviet Cosmonauts experienced eating in zero gravity.

A Soviet scientist recently developed "trophology" - the study of living systems which includes assimilation of nutrients. Trophology is expected to permit nutritional advances beyond the "Balanced Diet" concept of satisfying ongoing metabolic needs. The concept expands and enriches the old concepts with the new findings in space nutrition. The Soviet scientists have conducted a number of studies regarding the concepts of nutrition assimilation and increased nutritional needs in long duration missions.

U.S. Space Food and Nutrition programs have been developed over the past twenty-five years. From the early days of Mercury and Gemini to future Space Station requirements, the U.S. Space Food and Nutrition programs have progressively improved.

This study indicates that some major differences exist between the two space food and nutrition programs regarding dietary habits. The major differences are in recommended nutrient intake and dietary patterns between the cosmonauts and astronauts. The intake of protein, carbohydrates and fats are significantly higher in cosmonaut diets compared to astronauts. Certain mineral elements such as phosphorus, sodium and iron are also significantly higher in the cosmonauts' diets. Cosmonauts also experience intake of certain unconventional food and plant extract to resist stress and to increase stamina.

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COMPARISON OF SOVIET AND U.S. SPACE FOOD AND NUTRITION PROGRAMS

INTRODUCTION

The successful conquest of space was facilitated considerably by the creation of a life support system for cosmonauts and astronauts. One of the more important elements of life support is nourishment for the spacecraft crews. Collective efforts of technologists, nutritionists, engineers, physicians and microbiologists have developed a solution for these problems. Foods not only provide astronauts or cosmonauts nutrition for normal vital activities, but also provide psychological fulfillment.

For more than thirty years, Russian food industry technologists, scientists and specialists have studied and developed various forms, types and groups of food products. This resulted in a specialized food production industry to develop food for the cosmonauts. Nine food products with very limited storage lives were developed and tested for Yuriy Gagarin in 1961. One of the first tasks of the first man in space was to attempt eating in zero gravity. A food ration was then proposed for flights lasting from one to four days. The products were canned meats, the first dinner foods, and fruit juices in aluminum tubes, and bite-sized pieces of bread. All were considered to have very limited shelf lives. (20, 21)

The primary purpose of the U.S. Space Food and Nutrition Program is to provide nutritionally balanced diets to the astronauts during space flights and to gather physiological information and conduct nutritional studies designed to assess the effects of space flights on nutrient metabolism and its effects on crew performance. Over the past twenty-five years, the designs of food systems for spacecraft have been developed from the experience of past food systems. The foods used on U.S. space flights have been comprised of a wide variety of foods which have been specially processed and/or packaged to adapt them to zero gravity consumption. Mercury food was experimental and transient. Aluminum tubes were used for the semi-solid foods. The first manned flight of the Gemini program, Gemini 3, lasted less than five hours, but four experimental meals were aboard to test. The meals consisted of dehydrated foods in cubes, dry mix and freeze-dried products providing up to 2900 Kcal/crewmember. The Shuttle food system has over 150 items for astronauts to choose from when selecting a menu. The foods are classified by the method of preservation, namely, rehydratable, thermostabilized, natural form, and intermediate moisture. (19)

OBJECTIVES

- 1. To study the historical background and progression of Soviet Space Food and Nutrition programs.
- 2. To acquire knowledge about cosmonauts' daily dietary intake and nutritional supplements during longer duration missions.
- 3. To study their physiological information and nutritional research and assess the effects of space flight on nutrient metabolism on crew performance.
- 4. To compare the Soviet Food and Nutrition program to the U.S.

REVIEW OF THE LITERATURE

In the Soviet space programs, nutrition is given an important place in the life support systems for spacecraft crews. The "Soyuz-9" spacecraft, which was launched on July 1, 1970, with a crew of Andriyan Nikolayes and Vitaliy Sevastyanov, completed an 18-day flight. Their mission carried a device for heating food products in aluminum tubes. This made it possible to prepare hot foods onboard the spacecraft. In 1974, aboard the "Salyut-4" space station, a device was used to simultaneously heat products in aluminum tubes, and bread, which significantly improved the food intake of the spacecraft crews. (1, 20)

In the Salyut-6 missions, the food technologists, scientists, and other specialists expanded the variety of food products, increased their quality, and extended their shelf lives. A six-day ration was developed which provided a daily four-meal course (first and second breakfast, lunch and dinner). The Salyut-6 mission ration in 1977 had over 70 different products including twenty types of meat, fish, poultry, and cheese in 100gm cans, together with pureed first and second courses (10 types) in aluminum tubes. There were fourteen types of dehydrated (freeze dried) first and second courses and garnishes for the canned meats, which could be rapidly reconstituted by adding hot water, Bakery products, and desserts made from twelve types of semi-dehydrated fruits were also available. The drink selection included fruit juices, tea, coffee, milk, and fermented milk products.

In Soviet Space Food and Nutrition programs, the make-up of the diets are developed on the basis of the flight duration, the complexity of the program, the anticipated energy use, the storage, heating and dispensing equipment, the water reclamation systems, and other equipment. In long term⁻space flights, the relative monotony concerning diet does become annoying to some degree. In order to prevent the monotony of the diets and uplift the psychological aspects of life, some specially prepared fruits and vegetables were transported on an experimental basis. The shipment of fresh apples, onions, and garlic also was transported at the request of cosmonauts G. Crechko and Yu Romenenko during their Soyuz mission. The use of fresh fruits and vegetables was expanded. Oranges, lemons, melons, honey, cranberries, and even fresh cherries, were sent at the request of V. Ryumin during his Soyuz mission. The cargo spacecraft were used to send fresh fruits and vegetables to Vladmir Lyakhov and Aleksander Aleksandrov, who stayed three months in space during Soyuz T-9 mission in 1983.

The food service provisions aboard the Salyut-6 mission consisted of the following elements: Container for stowing and storing foods, tables to make meals, an electric warmer, place settings, a device to recycle, measure, and dispense hot and cold water, and containers for disposal of packages and left over foods. (15, 9)

TABLE I - MEN	U EXAMPLE (COSMONAUTS) (4)

MENU EXAMPLE (COSMONAUTS)

List of foods for a one-day menu on Salyut-6:

<u>First Breakfast:</u> Chicken with Prunes Bread Candy Coffee with Milk	100g 45g 50g 150g
<u>Lunch</u> : Cottage Cheese with Pureed Black Currants Honeycake Black Currant Juice with Pulp	165g 45g 50g
<u>Dinner</u> : Sauerkraut Soup Roast Beef with Mashed Potatoes Bread Prunes with Nuts Candied Fruit Coffee with Sugar	165g 57.5g 45g 60g 50g 24g
Supper: Chicken in Tomato Sauce Bread Cheese Tea with Sugar	165g 45g 100g 23g

V. P. Bychkov, et. al, 1986, researched the diets of three Salyut-7 prime crews. The Salyut-7 cosmonauts experienced the best nutritional systems of the Soviet Space Nutrition programs. The rations of the Salyut-7 crews had a caloric value of 3150 Kcalories and were well balanced, containing all the nutritional requirements. The food system included cosmonauts rations, containers for serving and storing food, a dining table, an electric food heater, utensils and dishes, devices for regenerating water and measuring hot and cold water to packages of freeze-dried food, containers for disposing of waste, and a refrigerator for storing fruit and vegetables. The food had equivalent food value of diets of Salyut-6, but consisted primarily (65%) of freeze-dried products, rehydrated with hot or cold water. (5, 17, 20)

In a study by V. P. Bychkov, et. al., 1981, concerning the adequacy of the protein supplied in the diet of crews of Salyut-6, it was found that the physical status of the cosmonauts and the parameters of nitrogen metabolism after the missions were indicative of adequate protein intake. Examination of nitrogen metabolism in the crew of the first main expedition aboard Salyut-6 (96-day mission) revealed that, in spite of individual fluctuations in the excretion of the end products of nitrogen metabolism in the post-flight period, their range was within the pre-flight levels. Urinary excretion of the total nitrogen was 11.1 gm per day post-flight and 11.6 gm per day pre-flight. On the 3rd and 4th post-flight days, it dropped to 9.0 gm per day, then reverted to the base level on the 5th and 7th days. (8)

In the second expedition aboard Salyut-6 (140-day mission), the postflight excretion of the end product of nitrogen metabolism was close to preflight levels. On the 3rd post-flight day, there was a 40% decrease in excretion of total nitrogen, 21% decrease for urea, and 44% decrease for ammonia, with retention of normal proportion. There was a tendency toward normalization of these changes on subsequent post-flight days. (8)

1. G. Popov, et. al, 1982, conducted a study to determine the effect of a 48-day flight on the blood amino acids content in the crew of Salyut-5. It was found that changes in essential and non-essential amino acids ratios, e.g., methionine and cysteine, are of major concern. They observed that the changes in amino acids metabolism could be due to several nutritional factors. The transition from the pre-flight diet to the inflight diet could lead to a reduction in the essential amino acids content. A decreased intake of dairy products, eggs, leguminous products, freshly prepared food, and an excess intake of foods which had gone through severe heat processing and drying. They suggested that this offsets the amount of amino acids in foods and their accessibility to digestion. They also suggested that changes in living conditions may change the synthesis of amino acids. Similar studies were conducted by I. G. Popov, et. al., 1983, to measure the amino acids levels in blood of cosmonauts during the 185-day Salyut-6 flight. It was found that appreciable decreases in the concentration of most amino acids occurred in both cosmonauts. The threonine and cysteine levels in blood plasma of both cosmonauts were below the bottom of the normal range cited in the Russian Medical Encyclopedia. Alanine and histidine for the commander, and methinine, isoleucine, and arginine for the flight engineer, were also below the normal range. The demonstrated changes in plasma amino acids were attributed to similar factors cited by Popov in 1982. Recommended countermeasures are also similar, such as organizing nutrition rehabilitation for cosmonauts by increasing all amino acid intake, particularly methionine, cysteine, valine, histidine, tyrosine, arginine, aspartic, and glutamic acids. (23, 24)

K. V. Smirnov, et. al., 1982, studied the state of the digestive system following long-term space flights. Those studies included: gastric, pancreatic and intestinal enzymes. These studies demonstrated consistent changes in the digestive system function. The depth and severity were related to duration and the condition of the space flights. It was found that weightlessness plays an effective role in these changes. There was a noticeable change of increased activity of gastric pepsinogen and pancreatic lipase after the first day of the 96-day mission. They were normalized by the 25th day of the readaptation period for the 96- and 140-day flights, and at the 43rd day after the 175-day space flights. They suggested inflight use of preventive measures and conditioning of cosmonauts to develop changes in enzyme secretion in the gastrointestinal tract during the readaptation period. The marked changes were not noted on the first day after the 185-day space flight, in comparison with the 175-day flight, due to the preventive measures of adeguate nutrition used during the readaptation period. (27) V. P. Bychkov, et. al., 1982, studied the effects of hypokinesia on man's nutritional status. They found that during and after the bed rest studies adequate nutrition and certain unidentified nutrients can serve as efficient countermeasures against metabolic changes, such as weight loss, negative nitrogen, phosphorus, potassium, and sodium balance. The nutrient rehabilitation led to a positive nitrogen balance, increase in the utilization of vitamin C, B1, B6, and faster termination of compensatory nitrogen retention, as compared to subjects in the control group. Physical exercise with adequate nutrition was found to be the most effective means of preventing changes observed under hypokinetic conditions. (3)

I.A. Radayeva, et. al., 1982, conducted research regarding the biological value and shelf life of cultured dairy products in the diet of cosmonauts. Freeze-dried cultured milk products, yogurt with sugar, and yogurt with fruits and berries were examined for shelf life. It was determined that the realistic shelf life was 12 months at $20^{\circ} \pm 5^{\circ}$ C and 18 months at $1-4^{\circ}$ C. They considered these foods to have a high biologic value with respect to their protein. The leucine/isolucine ratio is 2:1 for acidophilus paste, 2:3 for sweet-ened yogurt, 2:4 for fruit and berry yogurt. It was reported that freeze-dried cultured dairy products may be quite beneficial in the diet of cosmonauts and were recommended to be incorporated into space diets. (26)

N. G. Bogdanov, et. al., 1986, studied vitamin levels in cosmonauts during pre-flight training and after completion of short-term space flights. They reported a statistically significant decrease in the excretion of a number of vitamins during the post-flight period. They suggested that it was due to an increased vitamin metabolism which leads to an increased need for them during post-flight. (2)

DISCUSSION

Soviet specialists believe that both a regular meal schedule and carefully selected diet are important for the maintenance of overall conditioning in space. Nutrition is thought to have a synergestic effect with other countermeasures on the control of adaptive changes, such as musculoskeletal strength and mass losses. It has been observed that cosmonauts can actually gain weight in space if exercise is combined with vitamins, calcium supplements, appealing foods, and appetite stimulators, such as onions, garlic and spices. (4, 16)

USSR SPACE FOOD AND NUTRITION CONCEPTS

FOOD

In the 30th minute of the 1961 mission, Yuri Gagarin ate and drank. This became the first evidence of the possibility of eating, chewing, and swallowing liquid and solid food in weightlessness. Daily ration of the cosmonauts on Vostok and Vostok-2 contained about 2800 Kcal, including 100 gm of protein, 118 gm of fat and 308 gm of carbohydrates. Foods which were used in the flights were packaged in dispenser tubes and included soups, cottage cheese, as well as drinks: coffee, cocoa, juices. The rations had limited shelf lives without refrigeration (up to 5 to 6 days). Meat products in packets had to be prepared directly prior to flight. (20, 21) In the Soyuz missions, foods with long shelf life, such as bread, were baked in the form of small "one-bite" rolls to prevent crumbs. Meat products such as ham, steak, and veal, were also included in the diet. The daily dietary intake for cosmonauts in Soyuz had a 3-day menu cycle with four meals per day. The Soyuz mission also included dehydrated boiled meat, and Soyuz-9 cosmonauts were the first to heat meals at 60° to 70° C and drink from the dispenser tubes. (20)

Cosmonauts P. Popvich and Yu Artyukhin on Salyut-3 were the first to test dehydrated products, rehydrated with recovered water. These experiments were continued in Salyut-4. Dehydrated products now comprise up to 20% of the food rations. The second crew of the Salyut-4 took additional food products of limited shelf life, as well as bread, coffee, and tea for the first time in the transport ship. The unmanned "Progress" transport ship is in widespread use to deliver fresh food rations to the orbital station. (20)

The water supply system on board the spacecraft functions in conjunction with the food systems. The supply of drinking water in the orbital station is produced at a rate of up to two liters per man per 24 hours. (17)

The most recent and satisfactory cosmonaut nutritional system on Soviet manned space flights was the one developed for Salyut-7. There is a buffet table on Salyut for eating food, as well as a set of table accessories, a food heater, facilities for sanitary cleaning of the table accessories, and bags for leftovers and packaging. The calorie content of the daily diet was increased up to 3200 Kcal to combat the negative consequences of weightlessness and physical training exercises during the missions. (5, 16)

NUTRITION

-Dr. Oleg Gazenko, 1987, in an address to the U. N. committee on the peaceful uses of outer space, discussed the concepts regarding digestive physiology. He described "a recently developed branch of medicine - trophology" as the study of general principles of fundamental vital processes of living systems, such as ingestion, processing, and assimilation of nutrients. Several discoveries in this area were outlined: New information regarding the immunological defense of the small intestine, importance of dietary fiber in digestive functioning and overall health, and microbiology of the digestive tract in medical support of long-term space flight. (12)

Dr. Gazenko suggests that trophology will advance the nutritionists' knowledge beyond the accepted concept of "Balanced Diet", which means satisfying on-going metabolic needs, to the new concepts of "Adequate Nutrition." The new concept does not really replace the previous concepts but expands and enriches them with new findings in the field of space nutrition. (12)

In research findings, decreases observed in essential amino acids in cosmonauts after the 211-day mission led researchers to the conclusion that the pre-flight diet should be supplemented with methionine and aspartic acid and inflight and post-flight diets with seven essential amino acids plus cysteine, arginine, proline, and aspartic acid. (6, 11)

Soviet scientists believe that increased exercise regimens require an additional intake of calories to maintain proper energy balance. They also believe that supplements consisting of vitamins, amino acids and minerals promote the retention of fluids and electrolytes. They have shown that pro-

per dietary combinations can also help to regulate the digestive and enzymatic changes associated with stresses of space flights. (22, 25)

The Soviet scientists also believe that the plant extract (Eleutherococcus), exercise and high calcium diet are three major ways by which reduction in calcium loss is possible in the spacecraft crews. They also use the plant extract to resist stress and to increase stamina among the cosmonauts. (10)

PACKAGING AND PRESERVATION

Snack products, bread products and appetizers, as well as sweet pastry products and fruits, were packaged for the Soviet space missions in film packets made of viscotene, a clear plastic film material similar to polyethylene. Some of them were vacuum packed. The ration of cosmonauts in the Soyuz ship included new shelf stable foods with a long shelf life, and pureed and liquid products in dispenser tubes. Meat products - ham, steak, and veal - were prepared in the form of meals preserved in metal cans. The sweet products included chocolate candy, prunes with nuts, and honey ginger bread, all in film packages. Some of the products, in the form of briquettes, were covered in edible film. The dehydrated boiled meat included in the menu was vacuum packed in a film. (9, 17, 20, 25)

U.S. SPACE FOOD AND NUTRITION CONCEPTS

The food systems planned for the U.S. Space Station are detailed in reference (28).

SUMMARY AND CONCLUSION

The research study shows that the successful conquest of space, either for astronauts or cosmonauts, depends on the collective efforts of technologists, engineers, physicians, microbiologists, nutritionists and psychologists.

According to the Congressional Research Service Report prepared by Hon. Ernest F. Hollings, May 1988, the Soviets have continued to make steady strides toward their goals of having a permanently occupied space station in Earth orbit. The Soviets hold a commanding lead in the operational use of crews. They have introduced two new launch vehicles and continue to develop a space shuttle and space plane. (13, 14)

A comparison time line of U.S. and Soviet space missions is shown in the Appendix.

Cosmonaut Romanenko, after his 326-day flight in space in 1987, stated that Mars is getting nearer and nearer to Earth. The Soviets also conducted a variety of studies dealing with new concepts regarding nutritional assimilation and increased needs in long duration missions. However, when comparing the research data, these reports are equivocal regarding countermeasures taken, the increased needs, and types of tests used in the analyses. (14)

The present research study indicates that food for U.S. space flight has improved steadily throughout the space programs. From the early days of Mercury and Gemini to future Space Station requirements, the U.S. Space Food and Nutrition program has progressively improved. The U.S. Space Food and Nutrition programs are more advanced in terms of their food packaging, preservation techniques and flexible menu patterns for long duration missions. (28) However, some major differences exist between the two space nutrition programs regarding the respective dietary habits. These differences are shown in Tables 2 and 3.

TABLE 2 - DIFFERENCES IN RECOMMENDED NUTRIENT INTAKE OF COSMONAUTS AND ASTRONAUTS

TABLE 3 - OTHER DIFFERENCES IN FOOD INTAKE OF COSMONAUTS AND ASTRONAUTS

FOOD Plant Extract (Eleu- therococcus) 500mg/ day or 1.00g every other day	COSMONAUTS Used to increase stamina to resist stress	ASTRONAUTS None
-Garlic	As food seasoning	None
Vodka	Small amount	None
Brandy	Small amount	None
Fresh Fruits and Vegetables	Supplied by Progress ship	Stored 16 hours before launch
Onion, Dill, Parsley	Cultivated in on- board vegetable garden (18)	None
Multivitamin	Supplementtwice/ day	Optional (Shuttle)
Undevit	Vitamintwice/day	None
Aerovit	Vitamintwice/day	None
Essential Amino Acids (Methionine)	Supplements/ increased amount	None
Glutamic Acid Decamerit	Supplement	None

The cosmonauts' nutrient intake is probably higher than the astronauts'. The mean daily inflight nutrient consumption per person during Shuttle STS-1 through STS-61C indicate higher intake of nutrients by the astornauts compared to the RDA (Appendix). The difficulty exists in estimating the nutrient intake since Shuttle crews are not required to maintain a food intake log. (29)

FUTURE RECOMMENDATIONS FOR U.S. SPACE NUTRITION PROGRAMS

- 1. Determine nutrient requirements for longer duration missions.
- 2. Understand the increased essential amino acids requirements during pre-flight, inflight, and post-flight diets.
- 3. Determine the effects of plant extract as a stimulant.
- 4. Determine the beneficial effects of alcohol for longer duration missions in space.
- 5. Study the regulatory effects of proper dietary combinations on digestive and enzymatic changes which are associated with stresses of long duration flights.
- 6. Study the accepted concept of "Balanced Diet", which means satisfying only ongoing metabolic needs, to the new concept of "Adequate Nutrition", which does not really replace the previous concepts, but expands and enriches them with new findings in the field of space nutrition.

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TIME LINE OF U.S. AND U.S.S.R. PILOTED SPACE MISSIONS



U.S.

TIME LINE OF U.S. AND U.S.S.R. PILOTED \$PACE MISSIONS (continued)



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TIME LINE OF U.S. AND U.S.S.R. PILOTED SPACE MISSIONS (continued)



U.S.

TIME LINE OF U.S. AND U.S.S.R. PILOTED SPACE MISSIONS (continued)



U.S.S.R.

FATIMATED MEAN DAILY INFLIGHT NUTRIENT CONSUMPTION PER PERSON DURING SHUTTLE STS-1 THROUGH STS 61-C

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5 4 1324 357 1957 75.7 52.1 281.1 787 1227 2825 188 2577 1.1 1.5 8 6 5 1445 378 2517 90.3 67.4 339.4 995 1841 3818 2597 1.5 1.4 1.1 1.5 8 7 1.445 378 2517 90.3 67.4 3597 1.2 1.3 1.4 11 1.5 8 1.4 11 2684 95. 3.13 333 332 1.8 3.7 1.9 1.9 10 10 10 10 10 10 10 10 10 10 10 10 10 10 12 1.4 11 10 11 </td <td>5 4 1324 357 1957 75.7 52.1 281.1 787 1227 2829 2226 18 227 1.1 1.5 8 6 4 11 903 291 1945 68.6 75.7 26.7 339.4 995 1841 3318 2567 20 339 2.6 2.4 11 9 6 5 1428 312 2517 90.3 6.1 76.1 339.4 995 1841 3318 2567 20 339 2.6 2.4 11 9 6 5 1428 311 2564 94.3 81.1 353.4 857 1140 3956 3532 18 355 4.2 3.2 13 8 5 166 382 2143 85.5 63.3 344.5 954 176 395 3532 18 355 4.2 3.2 13 6 5 1 166 382 2143 85.5 63.3 344.5 954 176 395 2549 19.5 73 3.2 27.3 13 345.5 856 156 382 2143 85.5 73.4 319.3 11003 1956 479 3512 19 382 4.7 3.4 13 8 5 2 2069 357 2994 103.9 92.1 397.4 1003 1956 479 3512 19 382 4.7 3.4 13 8 5 1 150 283 283 233 319.7 7 0.9 356.1 1003 1956 479 3512 19 382 4.7 3.4 13 3 5 1 137 34 3 333 195.7 7 349 357 234 801 103 357 244 181 3357 2548 13 273 2.9 2.7 11 3 3 5 1 137 348 220 0 87.6 395.2 2010 97.5 7 14 11 282 2219 72.6 74.3 288.6 891 1500 3433 2653 14 315 2.8 1.7 11 7 7 1 151 438 23219 72.6 74.3 288.6 891 1500 3433 2653 14 315 2.8 1.7 11 7 7 1 151 438 333 214 91.5 312 41.7 21.7 19 7 1 1751 430 353 2883 219 72.6 74.3 2893 395.1 801 170 944 2.1 2.7 19 7 7 1 1751 438 333 214.9 91.7 7 120 194 4.1 2.3 15 7 1 1751 430 353 2883 105.5 105.2 356.9 980 1779 464 244 278 4099 19 454 4.1 2.7 19 7 7 1 1751 431 2397 510.5 210 975 2010 779 409 19 454 4.1 2.7 19 7 7 1 1751 430 333 2863 314 491.1 1029 1944 424 278 309 12 401 4.1 2.3 15 7 7 1 1751 431 2303 91.4 91.1 7 361.2 9126 316 360 33.6 15 33.8 2.1 13 7 7 1 1751 431 2303 91.4 91.1 1029 1944 5589 3803 20 431 5.0 2.6 17 17 6 1 1137 301 2659 93.4 92.2 312.9 806 1484 424 278 539 16 362 3.2 2476 635 316 5.0 233 210 577 191 77 2 432 315 51 2.4 12 315 7 11 137 301 2659 93.4 99.2 312.9 806 1484 424 278 338 16 3.5 2.5 13 7 6 11 137 301 2659 93.4 92.2 312.9 806 1484 424 278 309 20 431 5.0 2.6 17 113 7 301 2659 93.2 936 3387 16 303 20 431 5.0 2.6 17 113 7 11 137 301 2659 93.7 191 1029 194 5589 3803 20 431 5.0 2.6 17 16 7 7 6 10 9275 10 920 312 18 346 3.5 2.5 13 15 7 11 1137 301 2659 93.7 191 11029 194 5589 3803 20 431 5.0 2.6 17 113 7 11 1137 301 2659 93.2 930 300 350 2.2 300 317 2.4 22 2.5 13 60</td> <td></td> <td>2</td> <td>4</td> <td>1378</td> <td>378</td> <td>2322</td> <td>73.2</td> <td>59.7</td> <td>338.0</td> <td>931</td> <td>1464</td> <td>3333</td> <td>2415</td> <td>22</td> <td>272</td> <td>2.6</td> <td>2.6</td> <td>6</td>	5 4 1324 357 1957 75.7 52.1 281.1 787 1227 2829 2226 18 227 1.1 1.5 8 6 4 11 903 291 1945 68.6 75.7 26.7 339.4 995 1841 3318 2567 20 339 2.6 2.4 11 9 6 5 1428 312 2517 90.3 6.1 76.1 339.4 995 1841 3318 2567 20 339 2.6 2.4 11 9 6 5 1428 311 2564 94.3 81.1 353.4 857 1140 3956 3532 18 355 4.2 3.2 13 8 5 166 382 2143 85.5 63.3 344.5 954 176 395 3532 18 355 4.2 3.2 13 6 5 1 166 382 2143 85.5 63.3 344.5 954 176 395 2549 19.5 73 3.2 27.3 13 345.5 856 156 382 2143 85.5 73.4 319.3 11003 1956 479 3512 19 382 4.7 3.4 13 8 5 2 2069 357 2994 103.9 92.1 397.4 1003 1956 479 3512 19 382 4.7 3.4 13 8 5 1 150 283 283 233 319.7 7 0.9 356.1 1003 1956 479 3512 19 382 4.7 3.4 13 3 5 1 137 34 3 333 195.7 7 349 357 234 801 103 357 244 181 3357 2548 13 273 2.9 2.7 11 3 3 5 1 137 348 220 0 87.6 395.2 2010 97.5 7 14 11 282 2219 72.6 74.3 288.6 891 1500 3433 2653 14 315 2.8 1.7 11 7 7 1 151 438 23219 72.6 74.3 288.6 891 1500 3433 2653 14 315 2.8 1.7 11 7 7 1 151 438 333 214 91.5 312 41.7 21.7 19 7 1 1751 430 353 2883 219 72.6 74.3 2893 395.1 801 170 944 2.1 2.7 19 7 7 1 1751 438 333 214.9 91.7 7 120 194 4.1 2.3 15 7 1 1751 430 353 2883 105.5 105.2 356.9 980 1779 464 244 278 4099 19 454 4.1 2.7 19 7 7 1 1751 431 2397 510.5 210 975 2010 779 409 19 454 4.1 2.7 19 7 7 1 1751 430 333 2863 314 491.1 1029 1944 424 278 309 12 401 4.1 2.3 15 7 7 1 1751 431 2303 91.4 91.1 7 361.2 9126 316 360 33.6 15 33.8 2.1 13 7 7 1 1751 431 2303 91.4 91.1 1029 1944 5589 3803 20 431 5.0 2.6 17 17 6 1 1137 301 2659 93.4 92.2 312.9 806 1484 424 278 539 16 362 3.2 2476 635 316 5.0 233 210 577 191 77 2 432 315 51 2.4 12 315 7 11 137 301 2659 93.4 99.2 312.9 806 1484 424 278 338 16 3.5 2.5 13 7 6 11 137 301 2659 93.4 92.2 312.9 806 1484 424 278 309 20 431 5.0 2.6 17 113 7 301 2659 93.2 936 3387 16 303 20 431 5.0 2.6 17 113 7 11 137 301 2659 93.7 191 1029 194 5589 3803 20 431 5.0 2.6 17 16 7 7 6 10 9275 10 920 312 18 346 3.5 2.5 13 15 7 11 1137 301 2659 93.7 191 11029 194 5589 3803 20 431 5.0 2.6 17 113 7 11 1137 301 2659 93.2 930 300 350 2.2 300 317 2.4 22 2.5 13 60		2	4	1378	378	2322	73.2	59.7	338.0	931	1464	3333	2415	22	272	2.6	2.6	6
6 41 1983 281 2535 86.7 76.1 339.4 995 1841 3818 2567 20 336 4.2 3.4 12 9 5 1043 291 1945 65.7 257.7 833 1026 1729 3995 356 354 357 237 129 10 17 10 15 19 19 19 19 19 19 19 19 11 11 10 19 19 10	6 4 1 1983 281 2535 86.7 76.1 339.4 995 1841 3818 2567 20 336 4.2 3.4 12 6 5 1045 378 2517 90.3 67.4 359.3 1026 1729 3697 282 20 309 2.6 2.4 11 9 6 1083 291 1945 65 55.7 26.7 857 1740 3956 3532 18 355 4.2 3.2 13 7 5 1687 382 2143 85.5 63.0 275.8 88.3 3784 3256 16 399 4.0 3.2 13 8 5 1428 411 2684 94.3 81.1 353.4 857 1740 3956 3532 18 355 4.2 3.2 13 8 5 1487 334 2673 91.5 83.3 374.5 994 1766 3784 355 4.7 3.4 13 8 5 1 1502 283 2383 83.5 73.4 319.8 974 1661 3367 2549 13 273 2.9 2.7 11 8 4 1 1502 283 2383 83.5 73.4 319.8 974 1661 3367 2548 13 273 2.9 2.7 11 7 1 1511 4282 2219 72.6 74.3 295.1 1201 5003 3433 2653 14 315 2.8 1.7 11 7 1 1551 438 2862 90.0 87.6 395.2 968 1761 3698 3668 20 356 3.1 2.4 14 7 1 1751 438 2862 90.0 87.6 395.2 968 1761 3698 3658 12 3367 1.1 2.7 19 7 1 1761 431 282 2219 72.6 139.7 16.1 3698 3658 12 3367 14 3.9 2.1 13 7 1 1751 418 281 2010 87.6 395.2 968 1761 3698 3658 16 363 3.4 12 2.3 15 7 1 177 1 1751 418 281 10.5 1055 1050 3733 653 14 315 2.4 14 7 1 1751 418 287 114.5 116.1 118.8 411.1 1029 1944 2547 3630 17 404 4.1 2.3 15 7 1 1771 483 2367 116.1 118.8 411.1 1029 1944 5248 2785 15 327 3.6 1.9 15 7 1 1772 482 2367 116.1 118.8 411.1 1029 1944 5248 2785 15 327 3.6 1.9 15 7 1 1771 483 2367 116.1 118.8 411.1 1029 1944 5248 2785 15 327 3.6 1.9 15 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5248 2785 15 327 3.6 1.9 15 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5248 2785 15 327 3.6 1.9 15 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5248 2785 15 327 3.6 1.9 15 7 1 1771 482 774 310 2659 93.4 92.3 779 424 2785 15 37 3.6 1.9 15 7 1 1772 482 704 310.5 742 598 3603 270 2.6 17 7 1 1751 418 233 10.5 744 578 16 54.4 570 8 0 8 00 3450 2773 17 3 16 3.1 2.4 12 8 6aydration Levels 6564 97.7 340.9 377 18 306 273 17 306 2.5 13 8 6aydration devels 7 4.4 544 278 8 6aydration devels 7 4.4 544 278 8 6aydration devels 7 4.4 544 278 8 6aydration devels 7 4.4 544 544 278 8 60 800 3450 273 17 310 2.6 17 330 2.6 17 330 2.7 14 2.2 15 8 64 600 3345 600 3345 600 345 67.7 800 8664 30 846 6		ۍ	4	1324	357	1957	75.7	52.1	281.1	787	1227	2829	2226	18	227	1.1	1.5	æ
6 5 1445 378 2517 90.3 67.4 359.3 1026 1729 3697 2822 20 309 2.6 2.4 11 8 5 1445 378 2517 90.3 67.4 359.3 31382 3128 3128 31382 31382 31382 31382 31382 31382 31382 31382 313 312 312 312 312 312 312 312 312 312 312 312 312 312 312 312 312 314 312 314 315 314 317 314 315 314 317 314 317 314 317 314 317 314 317 314 317 314	6 5 1445 378 2517 90.3 67.4 359.3 1026 1729 3697 2822 20 309 2.6 2.4 11 7 5 1687 364 2673 91.5 83.3 334.5 954 1766 3784 3226 16 369 4.0 3.2 13 7 5 1687 364 2673 91.5 83.3 334.5 954 1766 3784 3226 16 369 4.0 3.2 13 8 5 2 2069 367 2934 103.9 92.1 3931 1003 1956 4379 351 19 382 4.7 3.4 13 8 41 1502 283 283 81.5 73.1 310.8 1956 4379 3512 19 382 4.7 3.4 13 8 41 1502 283 283 81.5 7.4 330.8 991 1500 3433 2563 14 315 2.8 11 7 1 1551 438 2825 2919 72.6 74.3 288.6 891 1500 3433 2563 14 315 2.8 1.7 11 7 1 1551 438 2825 2910 78.6 396.2 956 1051 3698 3663 14 315 2.8 1.7 11 7 1 1785 481 335 7783 91.4 91.7 361.2 905 1692 3975 3387 16 365 3.1 2.4 14 7 7 1 1785 481 353 7783 91.4 91.7 361.2 905 1692 3975 3387 16 365 3.1 2.4 14 7 7 1 1781 414 282 2219 72.6 74.3 288.6 891 1500 3433 2563 14 315 2.8 1.7 11 7 1 1785 481 331 0.7.7 126.1 397.6 1092 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1781 418 387 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.1 1029 1944 5589 3887 16 362 3.4 2.1 13 7 7 1 1751 418 3287 114.1 1029 1944 5589 3803 15 64 2.1 13 7 7 1 1751 418 3287 116.1 118.8 411.1 1029 1944 5589 3803 2.0 431 5.0 2.6 17 7 7 1 1751 418 3287 116.1 118.8 411.1 1029 1944 5589 3803 2.0 431 5.0 2.6 17 7 7 1 1751 418 3287 116.1 118.8 411.1 1029 1944 5589 3803 2.0 431 5.0 2.6 17 8 10 0005)10 1491 355 247 88 346.2 957 1715 403 3136 15 9 352 3.5 13 7 1 1751 418 327.1 911 1665 3673 2213 773 18 346 3.5 2.5 13 8 10 0055)10 1491 355 247 88 346.2 957 1715 403 3132 18 346 3.5 2.5 13 8 10 0055)10 1491 355 247 88 346.2 957 1715 403 3132 18 346 3.5 2.5 13 8 10 0055)10 1491 355 247 88 346.2 957 171 1666 3673 2913 17 316 312 2.6 17 8 10 0055)10 1491 355 247 88 346.2 957 1715 403 3301 12 406 365 3.1 24 42 8 10 0055)10 1491 355 247 88 346.2 957 1715 403 3301 270 246 17 8 10 00000 1491 0560 001.7 7854 990 0800 3450 2773 18 346 3.5 2.5 13 8 10 0556 140 0560 001.7 7854 990 340.2 2731 18 346 3.5 2.5 13 8 10 048 9564 607 31.0 485 946 700 31.0 481 9504 733 132 18 346 3.5 2.5 13 8 11 000 481 9707 480 31.0		9	41	1983	281	2535	86.7	76.1	339.4	995	1841	3818	2567	20	336	4.2	3.4	12
9 6 1083 291 1945 66.6 55.7 267.7 833 1382 3138 2393 15 212 1.9 1.9 10 7 5 1687 364 94.3 81.1 353.4 857 1740 3956 3552 2549 15 365 4.2 3.2 13 8 5 1686 362 203 31.5 83.3 344.5 954 1766 376 3552 549 15 303 2.9 2.8 11 8 5 2 2069 367 2994 103.9 92.1 393.1 1003 1956 4379 3512 19 382 4.7 3.4 13 8 4 1 1502 283 2383 83.5 73.4 319.8 974 1681 3367 2548 13 273 2.9 2.7 11 8 4 1 1502 283 2383 83.5 73.4 319.8 974 1681 3367 2548 13 273 2.9 2.7 11 7 1 1414 282 2219 72.6 74.3 288.6 891 1500 3498 3664 20 356 3.1 2.4 14 7 7 1 1751 438 2862 90.0 87.6 395.2 905 1692 3975 348 20 356 3.1 2.4 14 7 7 1 1751 438 2862 90.0 87.6 392.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 418 363 273 91.4 91.7 351.2 905 1692 3975 3387 16 362 3.9 2.1 13 7 7 1 1751 418 3287 107.7 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 418 3287 107.7 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 418 3287 114.5 116.8 401.7 366.3 336 16 363 3.3 2 10 2.1 13 7 7 1 1751 418 3287 114.5 116.8 401.7 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1772 482 337 114.5 116.8 401.7 366.3 336 16 363 3.3 6 15 327 3.6 1.9 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 2.3 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 8 7 1177 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 8 7 10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 315 2.5 13 8 7 10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 315 2.4 12 8 m Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 315 2.5 13 8 d Minimum Levels 6 f Minimum Levels 6 f Minimum Levels 6 f Galories: 14.65 Prot 31.05 f A4 C40 6 1800 3450 2737 18 350 2737 18 350 6 13.0 2737 18 350 6 13.0 2737 18 550 6 10 1401 21.0 21.0 2100 2450 2737 18 350 6 10 165 6 6 1484 208 6 207 2737 18 160 6 3673 2913 17 20 6 10 160 6 3673 2913 17 20 6 10 160 6 3673 2913 17 20 6 10 140 6 365 7 10 140 6 365 7 10 140 6 365 7 10 7 10 7 10 7 10 7 10 7 10 7 10 7 10	9 6 1083 291 1945 68.6 55.7 267.7 833 1382 3138 2393 15 212 1.9 10 7 5 1428 411 2684 94.3 91.1 353.4 857 1740 3956 3552 18 355 4.2 3.2 13 6 51 1666 382 2143 85.5 63.0 275.8 886 1658 3565 2549 15 303 2.9 2.8 11 8 52 2069 367 2994 103.9 92.1 393.1 1003 1956 4379 3512 19 382 4.7 3.4 13 8 4 1 1502 283 2383 83.5 73.4 319.8 974 1681 3367 2549 15 303 2.9 2.8 11 8 52 2059 367 2994 103.9 92.1 393.1 1003 1956 4379 3512 19 382 4.7 3.4 13 7 61 1414 282 2319 72.6 74.3 286.6 991 1500 3433 2553 14 315 2.4 14 7 7 11551 438 2862 90.0 87.6 395.2 968 1761 3698 3684 20 356 3.1 2.4 14 7 7 1 1551 438 2862 90.0 87.6 395.2 968 1761 3698 3684 20 355 3.1 2.4 14 7 7 1 1751 431 2958 105.7 126.1 399.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 413 2958 105.5 105.2 306 179 4947 3563 14 2.3 15 7 7 1 1751 418 333 10.7 126.1 397.6 1025 2010 4728 409 31 7 404 4.1 2.7 19 7 7 1 1751 418 3287 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 177 482 2317 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 177 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 177 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 177 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 1137 301 2659 99.4 99.2 312.9 806 1484 4244 2785 15 327 3.6 129 15 6 1 1137 301 2659 99.4 99.2 312.9 106 4567 3317 20 431 5.0 2.6 17 7 1 1137 301 2659 91.4 91.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 1137 301 2659 91.4 91.2 110.2 1944 5589 3803 20 431 5.0 2.6 17 7 1 1137 301 2659 91.4 90.2 312.9 106 6 367 2737 18 346 3.5 2.5 13 6 Man Days)10 1491 355 2476 87.2 800 800 3450 2737 18 346 3.5 2.5 13 6 Man Days)10 1491 355 2476 87.2 800 800 3450 2737 18 346 3.5 2.5 13 6 Man Days)10 1491 355 2476 87.2 800 800 3450 2737 18 346 3.5 2.5 13 6 Man Days)10 1491 355 2476 87.4 M00 8 Galories: 14.6 % Prot 31.0 % Fat 54.4 % CHO 6 Rehydration Water ² NH_2 ⁰ = Moisture in Food ³ M = Males F = Females Rehydration Water ² NH_2 ⁰ = Moisture in Food ³ M = Males F = Females 19ht, food was p		9	S	1445	378	2517	90.3	67.4	359.3	1026	1729	3697	2822	20	309	2.6	2.4	11
8 5 1428 411 2684 94.3 81.1 353.4 857 1740 3956 3532 18 355 4.2 3.2 13 7 5 1686 382 2143 85.5 63.0 275.8 886 1658 3565 2549 15 333 2.9 2.8 11 8 5 2 2069 357 2143 85.5 63.0 275.8 886 1658 3565 2549 15 333 2.9 2.8 11 8 5 2 2069 357 2383 83.5 73.4 313.8 974 1681 3367 2548 13 273 2.9 2.7 11 8 5 1 1950 283 2383 83.5 73.4 313.8 974 1681 3367 2548 13 273 2.9 2.7 11 8 5 1 1950 283 2383 83.5 73.4 313.8 681 1500 3433 2653 14 315 2.8 1.7 11 7 7 1 1551 438 2862 90.0 87.6 396.2 968 1761 3699 3684 20 356 3.1 2.4 14 7 7 1 1755 438 357 2549 13 273 2.9 2.7 13 7 7 1 1765 437 323 1077 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1765 431 353 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 418 282 21077 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.3 15 7 7 1 1751 418 283 91.4 91.7 261 397.6 1025 2010 4728 409 19 454 4.1 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 800 800 3450 2737 18 350 20.6 17 800 800 3450 2737 18 350 2137 18 350 2.5 13 800 800 3450 2737 18 350 2137 18 3.1 2.4 12 6 Minimum Levels 6 faltories: 14.6% Prot 31.0% fat 54.4% CHO	8 5 1128 411 2684 94.3 81.1 353.4 857 1740 3956 3532 18 355 4.2 3.2 13 7 5 1667 364 2673 91.5 63.0 2.34.5 954 1766 3784 226 15 369 4.0 3.2 13 8 5 2 2069 367 2994 103.9 92.1 393.1 1003 1956 4379 3512 19 382 4.7 3.4 13 8 4 1 1502 283 2383 83.5 73.4 319.8 974 1681 3367 2548 13 273 2.9 2.8 11 7 6 1 1551 438 2822 197 74.3 285.1 1201 5503 5132 4127 23 544 6.1 2.7 19 7 7 1 1551 438 2822 90.0 87.6 395.2 968 1761 3698 3684 20 355 3.1 2.4 14 7 7 1 1551 438 2822 90.0 87.6 395.2 968 1761 3698 3684 20 355 3.1 2.4 14 7 7 1 1751 418 322 2197 72.6 73.0 25.6 905 1692 3937 16 356 3.1 2.4 14 7 7 1 1751 431 2958 105.5 10.2 52010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1777 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1777 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1777 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 6 1 1137 301 2659 92.4 87.8 $0.0 300 3450 2737 18 356 3.1 2.4 12 8 dM 1000mL Levels 5 5 2476 87.7 0.0 345 27.1 911 666 3573 2913 17 316 316 3.1 2.4 12 6 Calories: 14.6 F prot 31.0 F f at 54.4 F H0 8 Rehydration Water 2NH20 = Moisture in Food 3M = Males F = Females 6 calories: 14.6 F prot 31.0 F f at 54.4 F H0 8 Rehydration Water 2NH20 = Moisture food only. Trash given to Air Force and not ingute, food was packed for 7 days but they etermed after only 3 days. Trash given to Air Force and not ingute.$		6	9	1083	291	1945	68.6	55.7	267.7	833	1382	3138	2393	15	212	1.9	1.9	10
7 5 1687 364 2673 91.5 88.3 344.5 954 1766 3784 3226 16 369 4.0 3.2 13 6 5 1 1666 382 2143 85.5 63.0 275.8 886 1658 3565 2549 15 303 2.9 2.8 11 8 4 1 1502 283 2393 119.7 170.9 395.1 1201 2503 5123 4127 23 543 6.1 3.9 17 7 6 1 1414 282 2219 72.6 74.3 288.6 891 1500 3433 2653 14 315 2.8 1.7 11 7 7 1 1551 438 2862 90.0 87.6 395.2 968 1761 3698 3664 20 356 3.1 2.4 14 7 7 1 1785 487 363 01.7 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1785 487 363 01.7 7 126.1 397.6 1025 2010 4728 4099 19 454 4.1 2.7 19 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 208 1662 3336 16 363 3.9 2.1 13 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 61 1137 301 2659 93.4 99.2 312.9 806 1484 4244 2785 15 327 3.6 1.9 15 7 7 1 1751 418 3287 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 8 00 3450 159 372 201 312 246 255 135 2.5 13 8 346 3.5 2.5 13 9 63 3.4 2.4 2.2 13 9 63 3.4 2.4 2.2 13 9 7 10 1491 355 2.47 800 800 3450 2737 18 316 3.1 2.4 12 9 64 Minimu Levels 6 6 Minimu Levels 6 6 6 6 7 7 800 800 3450 2737 18 350 2.6 13 6 6 10 10.6 2673 2737 18 350 2.6 13 7 6 10 100 1499 355 247 400 8 00 0 800 3450 2737 18 350 2.5 13 16 7 12 17 15	7 5 1687 364 2673 91.5 83.3 344.5 954 1/66 3784 3226 15 559 4.0 3.2 13 6 5 1 1666 382 2143 85.5 63.0 275.8 886 1658 3565 2549 15 303 2.9 2.8 11 8 4 1 1502 283 2383 83.5 73.4 319.8 974 1681 3367 2548 13 273 2.9 2.7 11 3 5 1937 348 3838 119.7 170.9 395.1 1201 2503 5123 4127 23 543 6.1 3.9 17 7 7 1 1551 438 2862 90.0 87.6 396.5 968 1761 3698 364 20 356 3.1 2.4 14 7 7 7 1 1551 438 2862 90.0 87.6 396.5 1201 2503 3133 2653 14 315 2.8 1.7 11 7 7 7 1 1551 438 2862 90.0 87.6 396.5 1052 2003 433 2653 14 315 2.8 1.7 11 7 7 7 1 1840 363 2783 91.4 91.7 361.2 905 1692 3975 3387 16 362 3.9 2.1 13 7 7 1 1751 440 363 2783 91.4 91.7 361.2 905 1692 3975 3387 16 362 3.9 2.1 13 7 7 1 1751 440 549 2839 95.4 92.3 378.4 942 1671 3860 3336 16 363 3.1 2.4 12 7 7 1 1751 418 288 105.5 105.2 356.9 980 1779 4547 3530 17 404 4.1 2.3 15 7 7 1 1751 418 287 114.5 116.8 401.5 124 2008 5554 3517 20 422 4.2 2.3 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 6 11 1377 01 2559 99.4 02.5 370.0 3773 3132 18 346 3.5 2.5 13 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 6 11 1177 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 6 d Minimum Levels 5 6 31.2 476 85.7 78.0 327.1 901 3659 2737 18 346 3.5 2.5 13 8 f Calories: 14.6% Prot 31.0% Fat 54.4% CHO 7 6 d Not levels 7 800 800 3450 2773 18 340 350 2.5 13 8 f Calories: 14.6% Prot 31.0% Fat 54.4% CHO 8 eRehydration Water 2NH20 = Moisture in Food $3M = Males F = Females$ 8 food was packed for 7 days but they returned after only 3 days. Trash given to Airs parked foor 7 days but they returned after only 3 days. Trash given to Airs packed for 7 days but they returned after only 3 days. Trash given to Ai		œ	പ	1428	411	2684	94.3	81.1	353.4	857	1740	3956	3532	18	355	4 . 2	3°5	13
			~ '	، د ک	1687	364	2673	91.5	83 . 3	344.5	954	1/66	3784	3226	16	369	4.0	2.0	13
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7 7 7 1 1840 363 2783 91.4 91.7 361.2 905 1692 3975 3387 16 362 3.9 2.1 13 7 5 1841 431 2958 105.5 105.2 356.9 980 1779 4547 3630 17 404 4.1 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 6 1 1137 301 2652 92.8 87.8 346.2 957 1715 4037 3132 18 346 3.5 2.5 13 7 8 man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Minimum Levels 56 7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 6 Minimum Levels 56 7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 d Minimum Levels 56 7 78.0 600 800 800 3450 2737 18 350 15 7 Calories: 14.6% Prot 31.0% Fat 54.4% CHO	7 7 7 1840 363 2783 91.4 91.7 361.2 905 1692 3975 3387 16 362 3.9 2.1 13 7 5 1841 431 2958 105.5 105.2 356.9 980 1779 4547 3630 17 404 4.1 2.3 15 3 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 6 1 1137 301 2659 93.4 99.2 312.9 806 1484 4244 2785 15 327 3.6 1.9 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 8 7 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 8 7 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 7 6 1 1137 301 2659 92.8 87.8 346.2 957 1715 4037 3132 18 346 3.5 2.5 13 7 8 7 0 00 3450 2737 18 350 1.0 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 9 6 Minimum Levels 56 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 6 Calories: 14.6% Prot 31.0% Fat 54.4% CHO = Rehydration Water 2 CNH ₂ O = Moisture in Food 3 M = Males F = Females ated from returned food only. Trash given to Ames and not inventoried. 1 ight, food was packed for 7 days but they returned after only 3 days. Trash given to Air Force and not inventoried.		7	61	1785	487	3423	107.7	126.1	397.6	1025	2010	4728	4099	19	454	4.1	2.7	19
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	7 5 1841 431 2958 105.5 105.2 356.9 980 1779 4547 3630 17 404 4.1 2.3 15 3 4 5 1240 549 2839 95.4 92.3 378.4 942 1671 3860 3336 16 363 3.8 2.1 13 7 7 1 1751 418 3287 114.5 116.8 401.5 1224 2008 5654 3517 20 422 4.2 2.3 15 7 6 1 1137 301 2659 93.4 99.2 312.9 806 1484 4244 2785 15 327 3.6 1.9 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 8 Man Days)10 1491 355 2476 85.7 78.0 1000 800 800 800 800 800 800 800 800 8		7	1	1840	363	2783	91.4	91.7	361.2	905	1692	3975	3387	16	362	3.9	2.1	13
$(4 \ 5 \ 1240 \ 549 \ 2839 \ 95.4 \ 92.3 \ 378.4 \ 942 \ 1671 \ 3860 \ 3336 \ 16 \ 363 \ 3.8 \ 2.1 \ 13 \ 7 \ 1 \ 1751 \ 418 \ 3287 \ 114.5 \ 116.8 \ 401.5 \ 1224 \ 2008 \ 5654 \ 3517 \ 20 \ 422 \ 4.2 \ 2.3 \ 15 \ 5 \ 7 \ 327 \ 3.6 \ 1.9 \ 15 \ 5 \ 7 \ 1137 \ 301 \ 2659 \ 93.4 \ 99.2 \ 312.9 \ 806 \ 1484 \ 4244 \ 2785 \ 15 \ 327 \ 3.6 \ 1.9 \ 15 \ 12 \ 12 \ 12 \ 12 \ 12 \ 1772 \ 482 \ 327 \ 3.6 \ 1.9 \ 15 \ 327 \ 3.6 \ 1.9 \ 15 \ 12 \ 12 \ 12 \ 1137 \ 313 \ 20 \ 431 \ 5.0 \ 2.6 \ 17 \ 17 \ 10 \ 191 \ 1029 \ 1944 \ 5589 \ 3803 \ 20 \ 431 \ 5.0 \ 2.6 \ 17 \ 17 \ 17 \ 10 \ 191 \ 1029 \ 1944 \ 5589 \ 3803 \ 20 \ 431 \ 5.0 \ 2.6 \ 17 \ 17 \ 17 \ 10 \ 1312 \ 13 \ 18 \ 346 \ 3.5 \ 2.5 \ 13 \ 18 \ 346 \ 3.5 \ 2.5 \ 13 \ 18 \ 346 \ 3.5 \ 2.5 \ 13 \ 13 \ 16 \ 12 \ 12 \ 10 \ 1491 \ 355 \ 2476 \ 85.7 \ 78. \ 346.2 \ 357.1 \ 911 \ 1606 \ 3673 \ 2913 \ 17 \ 316 \ 3.1 \ 2.4 \ 12 \ 12 \ 13 \ 18 \ 346 \ 3.5 \ 2.5 \ 13 \ 18 \ 346 \ 3.5 \ 2.5 \ 13 \ 13 \ 18 \ 346 \ 3.5 \ 2.5 \ 13 \ 13 \ 13 \ 16 \ 12 \ 12 \ 12 \ 12 \ 12 \ 12 \ 12$	3451240549283995.492.3378.4942167138603336163633.82.11377117514183287114.5116.8401.51224200856543517204224.22.3157611137301265993.499.2312.9806148442442785153273.61.915757117724823367116.1118.8411.11029194455893803204315.02.617757117724823367116.1118.8411.11029194455893803204315.02.617887816.1118.8411.11029194455893803204315.02.6138878346.2957171540373132183463.52.4128814160636732913173163.12.412886637.1911160636702737183463.52.415876160636702737183602737183502.415866	~ (7	പ	1841	431	2958	105.5	105.2	356.9	980	1779	4547	3630	17	404	4.1	2,3	15
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7 61 1137 301 2659 93.4 99.2 312.9 806 1484 4244 2785 15 327 3.6 1.9 15 7 5 7 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 Flights) ⁹ 1589 374 2692 92.8 87.8 346.2 957 1715 4037 3132 18 346 3.5 2.5 13 Man Days) ¹⁰ 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 ed Minimum Levels 56 56 7 100 800 3450 2737 18 350 15 f Calories: 14.6% Prot 31.0% Fat 54.4% CHO	7 61 1137 301 2659 93.4 99.2 312.9 806 1484 4244 2785 15 327 3.6 1.9 15 7 7 1 1772 482 3367 116.1 118.8 411.1 1029 1944 5589 3803 20 431 5.0 2.6 17 Flights) ⁹ 1589 374 2692 92.8 87.8 346.2 957 1715 4037 3132 18 346 3.5 2.5 13 Man Days)10 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 ad Minimum Levels 56 f Calories: 14.6% Prot 31.0% Fat 54.4% CHO = Rehydration Water 2 NH20 = Moisture in Food 3 M = Males F = Females ted from returned food only. Trash given to Ames and not inventoried. Ight, food was packed for 7 days but they returned after only 3 days. Trash given to Air Force and not	n		-	1751	418	3287	114.5	116.8	401.5	1224	2008	5654	3517	20	422	4.2	2°3	15
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Flights) ⁹ 1589 374 2692 92.8 87.8 346.2 957 1715 4037 3132 18 346 3.5 2.5 13 Man Days) ¹⁰ 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 ed Minimum Levels 56 800 800 800 3450 2737 18 350 15 f Calories: 14.6% 81.0% Fat 54.4% CHO 15	<pre>Flights)⁹ 1589 374 2692 92.8 87.8 346.2 957 1715 4037 3132 18 346 3.5 2.5 13 Man Days)¹⁰ 1491 355 2476 85.7 78.0 327.1 911 1606 3673 2913 17 316 3.1 2.4 12 ad Minimum Levels f Calories: 14.6% Prot 31.0% Fat 54.4% CHO</pre>	-	5	2	1772	482	3367	116.1	118.8	411.1	1029	1944	5589	3803	20	431	5.0	2.6	17
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ed Minimum Levels 56 800 800 3450 2737 18 350 15 f Calories: 14.6% Prot 31.0% Fat 54.4% CHO	ed Minimum Levels 56 56 800 800 3450 2737 18 350 15 f Calories: 14.6% Prot 31.0% Fat 54.4% CHO = Rehydration Water ² NH ₂ O = Moisture in Food ³ M = Males F = Females ated from returned food only. Trash given to Ames and not inventoried. light, food was packed for 7 days but they returned after only 3 days. Trash given to Air Force and not		Man Di	iys) ¹	0 1491	355	2476	85.7	78.0	327.1	911	1606	3673	2913	17	316	3.1	2.4	12
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