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SHELF STABLE MEALS

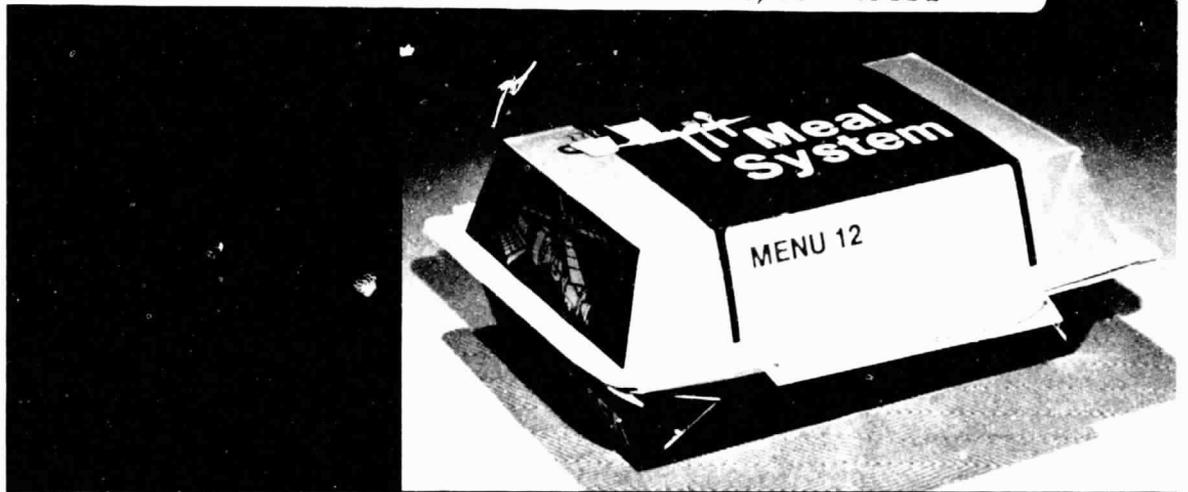
FOR PUBLIC SECTOR USES

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REPORT OF A CONFERENCE ON THE NASA MEAL SYSTEM

Lyndon B. Johnson School
of Public Affairs
The University of Texas at Austin



SHELF STABLE MEALS FOR PUBLIC SECTOR USES

Report of a Conference
co-sponsored by the
Lyndon B. Johnson Space Center, NASA
and the Lyndon B. Johnson School of Public Affairs
June 6-7, 1977
Washington, D.C.



Edited by Jurgen Schmandt

Lyndon B. Johnson School of Public Affairs
The University of Texas at Austin
1977

PREFACE

The NASA Meal System was developed with three simple concepts in mind: (1) nutritious, conventional foods are packaged in single-serving units and assembled into complete meals; (2) the meals have an extended shelf-life and can be transported and stored without need for refrigeration or freezing; (3) preparation of the meal by the consumer is an easy task which is accomplished in ten minutes or less.

The meal system was tested in 1975 and 1976 by different groups of elderly individuals, most of them poor, many of them living in rural or small communities with limited access to transportation and social services. The results were promising. Above all, it was shown that the meals can improve the nutrition of elderly individuals who have been unable to participate in congregate- or home-delivered meal programs. In addition, the meals are useful as a standby in case of inclement weather, sickness, or periods of temporarily impaired mobility. The meal system, combined with other services, has the potential to delay or prevent unwanted institutionalization, allowing elderly individuals to continue living in their familiar homes and neighborhoods.

The various organizations associated with the development and testing of the meal system, particularly the NASA Space Center in Houston, have done their part of the job. Further development of the system is now up to interested user groups, government agencies, and industry. As the final activity on their part, NASA

and the LBJ School of Public Affairs sponsored a national conference to report on the demonstration of the meal system for the elderly and to explore potential uses of the system for social services, institutional feeding programs, disaster relief, and international aid. What went on at this conference and how different groups assessed the potential of the meal system is reported in this volume of proceedings.

From here on, the NASA Meal System is on its own—either to join the ranks of stillborn innovations or to become a real-life tool in meeting nutritional needs in the public sector. Or, perhaps the system will come to life because of its commercial potential, which industry will not fail to examine.

I wish to thank the members of the staff responsible for preparing the conference: Nancy Brecht, Norman Linsky, Ruth Roth, and Peggy Wilson.

The volume is dedicated to Senator Hubert H. Humphrey, the key-note speaker at the conference, who has done so much to awaken us to the fact that nutrition and aging are closely interconnected, and that public policy has to face these problems which are largely of our own making.

Jurgen Schmandt
Conference Director

TABLE OF CONTENTS

PREFACE	<i>iii</i>
CHAPTER I: INTRODUCTION	1
Conference Aims	
Planning and Design	
CHAPTER II: REPORT ON THE 1976 DEMONSTRATION "MEALS FOR THE ELDERLY"	3
History, Design, and Production of the Meal System—Gary Primeaux; Ron Ritz	
Delivery Alternatives—Peggy Wilson	
Field Demonstration Results—Dr. Lodis Rhodes	
Health and Nutritional Assessment—William J. McGanity, M.D.	
The Economics of the Meal System—Dr. Jurgen Schmandt	
CHAPTER III: THE MEAL SYSTEM IN THE LARGER POLICY CONTEXT:	
MAJOR CONFERENCE ADDRESSES	21
Policy Priorities for the Aged—Senator Hubert H. Humphrey	
Nutrition, Aging, and Health—Donald M. Watkin, M.D.	
Nutritional Programs for the Elderly—Dr. Arthur Flemming	
Shelf Stable Meals and the Food Industry—Dr. Abner Salant	
CHAPTER IV: ASSESSMENT OF ALTERNATIVE USES OF THE MEAL SYSTEM	32
Social Services	
Institutional Feeding Programs—Background Paper and Conference Discussion	
Disaster Relief and International Aid—Background Paper and Conference Discussion	
The Role of Industry—Background Paper and Conference Discussion	
CHAPTER V: EXPLORING POSSIBLE ACTION	50
Future Demonstration Needs	
Funding for Future Programs	
A Grassroots Strategy: Formation of the Task Force	
CHAPTER VI: CONCLUDING REMARKS	54
Strategy for Innovation—Dr. Jurgen Schmandt	
ATTACHMENTS	57
A. Conference Proceedings	
B. Conference Participants	

CHAPTER I

INTRODUCTION

CONFERENCE AIMS

The NASA shelf-stable meal system was created to provide an alternative way of feeding elderly persons who could not participate in conventional feeding programs. (See *Meal System for the Elderly: Conventional Food in Novel Form*, 1976). From the onset of the project, it was recognized that the meal system might have wider applications beyond elderly feeding programs. Assessment of the policy implications of the meal system to meet these wider needs became an important goal of the project.

Following the completion of the field demonstration, project participants considered the best means to make public the demonstration findings, and to identify other public sector needs which the meal system might fill. The idea of regional workshops was entertained, but it was felt that a national effort would be more effective. Accordingly, a decision was made to hold a national conference on the meal system, jointly sponsored by NASA's Johnson Space Center and the LBJ School of Public Affairs.

Preliminary research indicated that there were other groups, both domestic and foreign, who saw uses for the meals. Such groups included social service agencies serving the handicapped, retarded, and indigent; nursing homes; hospitals and outpatient clinics; schools; and disaster and emergency relief organizations. One of the primary goals of the conference would be to explore in detail the potential uses of the meal system in these areas.

The interest of industry in producing single-serving, shelf-stable food units was noted as being of crucial importance to any future use of the meal system. It was hoped that the conference would provide an opportunity for food producers to discuss the problems and possibilities of economical meal production.

With these goals in mind, conference planners sought attendance from representatives of social service agencies, institutions, disaster and emergency relief agencies, as well as industrial producers of food and food packaging. Conference planners also felt it important to

invite local, state, and federal officials whose responsibilities were allied with future uses of the meal system. By bringing together the public and private sectors, it was hoped that the two would enter into an informed dialogue about the potential uses and marketability of the meal system.

PLANNING AND DESIGN

Planning for the conference reflected the two central aims of the undertaking—to report on the demonstration, and to explore the future of the meal system concept. To serve the first purpose, principal members of the research team would report on the development of the project, the demonstration results, the medical assessment of participants, and the costs of the meal system. The presentation would be comprehensive and would provide conference participants with a common base of information for subsequent discussion.

The sessions to follow were planned to consider the functional uses of the meals, further demonstration needs, shelf-stable meals and the food industry, and possible government–industry cooperation to produce and distribute shelf-stable meals to user groups. Persons with expertise in nutrition, aging, social services, disaster relief, institutional care, and industrial aspects of food production and delivery were asked to participate in these sessions as speakers, panel members, and workshop leaders. A mix of local, state, and federal government personnel were also invited to participate. The Washington, D.C. conference location was chosen to encourage participation by members of federal agencies involved in food acquisition, nutrition programs, and service delivery.

Exploring the future of the meal system concept necessitated extensive background research by members of the conference staff. Background papers detailing the potential of the meals to meet social service needs, disaster and emergency relief needs, and institutional needs were prepared prior to the conference and distributed to all participants. An additional background paper outlining industrial aspects of meal system production was also prepared.

Research was conducted primarily through letters of inquiry and personal interviews. Letters were sent to several hundred social service agencies, disaster and emergency relief agencies, institutions, and food producers requesting their reaction to the meal system. Approximately 30 personal interviews were held, many of them in Washington, D.C. Information gained in the return letters and interviews provided the core of data from which the background papers were prepared.

The research effort also stimulated interest in the forthcoming conference. Requests for conference information began to flow into the LBJ School and NASA. Additional promotion was effected through conference announcements printed in technical, trade, and social service journals.

Organizers of the conference were fortunate in assembling a group of persons with varied backgrounds to serve as speakers, panel members, and workshop leaders. Major conference addresses focused on policy priorities for the aged (Senator Hubert Humphrey), nutrition, health, and aging (Dr. Donald Watkin), nutritional programs for the elderly (Dr. Arthur Flemming), and shelf-stable meals and the food industry (Dr. Abner Salant). The complete conference program appears in Attachment A.

One hundred and twenty persons took part in the conference. Of this number, over a third were associated with aging programs, and almost a third were involved with industrial aspects of food and food packaging. The remainder represented other social service programs, disaster relief programs, and institutional settings. A complete list of participants can be found in Attachment B.

CHAPTER II

REPORT ON THE 1976 DEMONSTRATION "MEALS FOR THE ELDERLY"

HISTORY, DESIGN, AND PRODUCTION OF THE MEAL SYSTEM

Gary Primeaux

Director, NASA Meal System Project

Ron Ritz

Meal System Project, Martin Marietta Corporation

NASA established a Technology Utilization program in 1962 to assist government and industry in applying knowledge gained from space research advances in worthy uses on earth.

In 1974, Anne Kohler, then of the Governor's Committee on Aging, came to NASA and asked if there was any way, from the experience gained in feeding astronauts, to devise an alternate method of feeding elderly in Texas. It was decided that such a project fell within the bounds of the Technology Utilization program. The goal became to provide an alternate meal service for the elderly who could not participate in current meals programs, either congregate- or home-delivered, because of illness, immobility, or geographic location.

NASA scientists and engineers at the Johnson Space Center in Houston worked with the idea of shelf-stable meals, came up with a design, and then put together the team which subsequently worked on the project. The team included NASA, the Lyndon B. Johnson School of Public Affairs at The University of Texas at Austin, United Action for the Elderly Inc., Texas Research Institute of Mental Sciences (TRIMS), and The University of Texas Medical Branch at Galveston. NASA had overall program responsibility, designed and developed the meal system, and procured all the meals. United Action for the Elderly and the LBJ School of Public Affairs implemented the pilot demonstration and major demonstration of the meals, and the LBJ School of Public Affairs evaluated the results of the demonstration.

The initial stage of the project was devoted to the technical design of the meal system.

Using information from a "Food Preference and Attitude Survey" administered to 100 elderly by

TRIMS, NASA obtained 146 food items for testing. The meal components were procured from the U.S. Army Natick Development Center, from commercial food producers, and internally from NASA.

A technical taste test, again directed by TRIMS, was conducted on the 146 food items at NASA to ensure that only the most acceptable food items would be selected from those which were available. Ninety-six food items survived the technical taste test. These were then tested by 70 elderly citizens, who found only one item unacceptable. Thus, 95 food items were used in designing the menus to be used in the two-week and three-month demonstrations.

All meals were designed to meet one-third of the daily recommended dietary allowances for males 51 years and older and for people who could eat a regular diet. The types of packaging used were selected for ease of opening. Twenty-one menus were established. Each meal contained an entree, two side dishes, dessert, and a beverage. Fifteen of the 21 meals consisted primarily of canned items. The other six menus consisted of freeze-dried foods. The drinks were powdered and the soups were dehydrated.

A two-week pilot demonstration was conducted to test and evaluate the technical and social aspects of the meal system. The pilot demonstration ran from October 1-15, 1975. A seven-day meal cycle was used. Forty-one elderly were selected from small town and rural areas. Each person received a seven-day meal box at the beginning of each week from a delivery volunteer. Participants evaluated each food item from each menu and interviews were conducted with everyone at the end of the two weeks.

The overall evaluation was very favorable. Several problems were identified: (1) a few food items got poor evaluations; (2) nuts were too difficult for some to chew; (3) about five participants found some of the packaging difficult to open; (4) a seven-day meal package gave several older women difficulty since it was bulky and relatively heavy.

Results from the two-week pre-test led to design changes. The meal tray was eliminated entirely, since few participants had used it during the pre-test. A

simplified color coding system was developed for the separate food items to indicate whether they were to be eaten hot or cold. Instructions and labels were printed in large black letters to make reading easier. The overall weight and bulk of the seven-day pack was reduced. Some food items were eliminated, which led to a partial rearrangement in the menu cycles. All changes were made to make the system more attractive and more useable by the elderly.

System Design

The full 21-day menu cycle was used for the full-scale demonstration. The foods were procured from commercial sources in accordance with food manufacturing specifications. Many were "off-the-shelf" products which were re-labeled in accordance with NASA's system design. A few commercial formulations were modified to meet nutritional requirements. Specifically, the powdered beverages and instant puddings—normally intended to be reconstituted with milk—were blended with non-fat dried milk so that they could be reconstituted with water without significant loss in nutrition. Some foods were specifically packaged for the project to meet single-serving requirements where such items (principally vegetables) were not commercially available.

Following the June, 1977 Conference the results of a nutritional analysis of the NASA meal system became available. The results are as follows:

The 21 meals used during the demonstration were procured commercially on the basis of detailed specifications established by NASA and reflecting nutritional data contained in Handbook #8, USDA. At NASA's request, nine randomly selected meals were subjected to a comprehensive nutritional analysis which was performed by a FDA-approved laboratory. The complete results of the analysis are available, on request, from the following address:

*National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058
Attention: Gary R. Primeaux/SD5*

Of the nine meals analyzed, seven provided more calories than 1/3 RDA; the remaining two meals provided slightly less. All other RDA requirements were met or surpassed in all meals except one. In the case of this particular meal, several requirements were not met. This suggests a deficiency with the meal or, possibly, a problem with the nutritional analysis. It is recognized that nutritional values contained in Handbook #8 are approximations and can differ substantially from results obtained through nutritional analysis. Although this one meal was nutritionally deficient, it is the average intake of nutrients over a period of time that is most important.

DELIVERY ALTERNATIVES

Peggy Wilson

Research Associate, LBJ School of Public Affairs

In planning delivery of the meals, two factors determined the methods used: the needs of the participants, and feasible delivery alternatives.

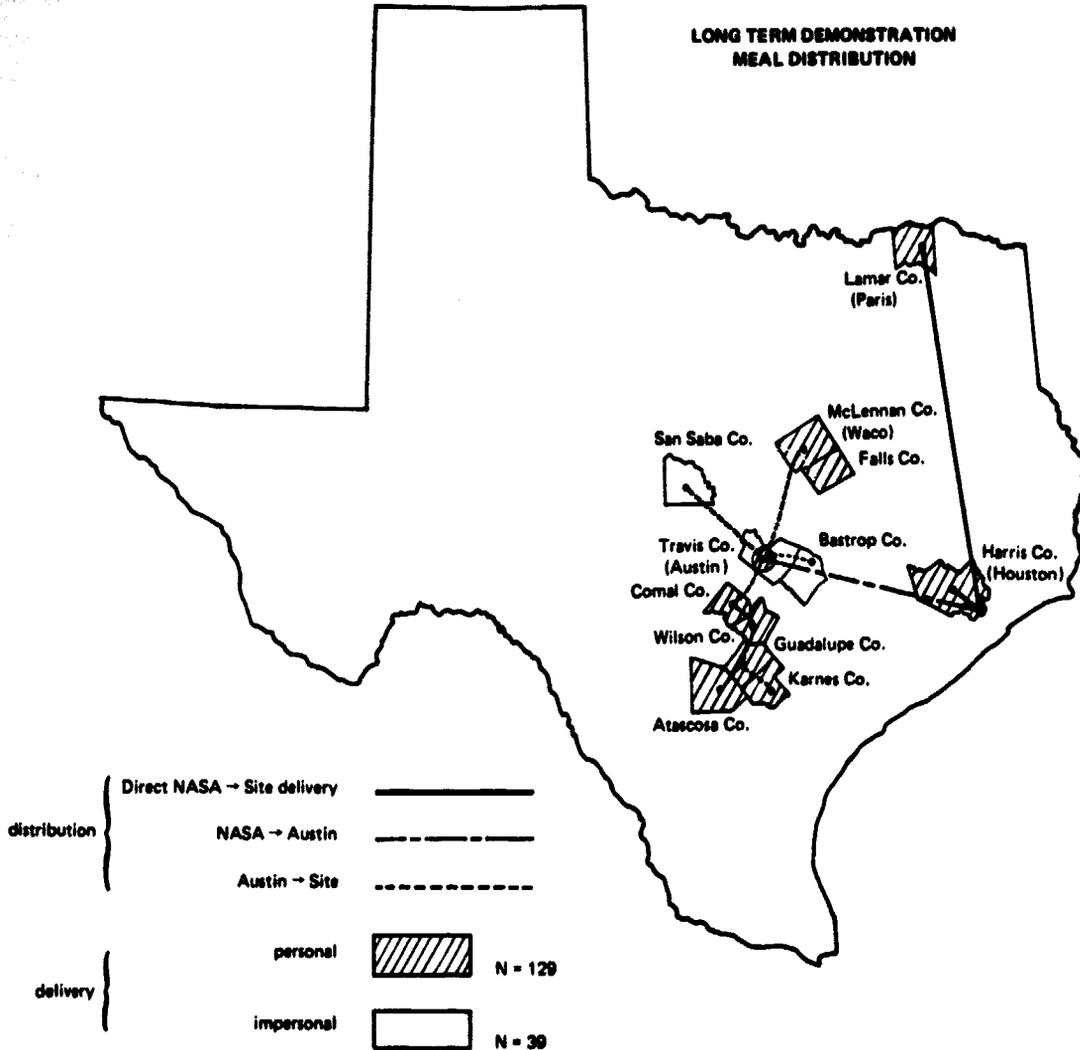
Some elderly are forced to enter nursing homes because they lack certain services, which, if provided, could be sufficient to allow them to remain in their homes. Having a balanced daily meal might be one of those services. Thus, the project was trying to reach homebound elderly who otherwise would not be receiving a meal service, primarily rural and small town elderly.

Many urban elderly are also isolated and homebound, so a small population of urban elderly was also included in the sample. Most congregate meal programs operate only five days a week, which creates a weekend feeding problem. The decision was made to include elderly who took part in congregate feeding programs in the weekend supplement phase of the project. Map A details the feeding sites, and also the distribution and delivery network.

Four delivery options were available. The project could tie into existing meal service systems, or could establish a new service network for home delivery. Participants could pick up their own meals, or meals could be mailed. In fact, all four methods were tried.

For purposes of evaluation, two home delivery systems were used, personal and impersonal. Most participants had their meals delivered to their homes by volunteers. The volunteer made an effort to establish a personal relationship with the meal recipient, and was available to answer any questions about the program that might arise. Some participants received their meals by impersonal delivery to control against the "halo effect", reactions based on personal attention instead of on the merit of the meal system. Use of impersonal delivery also provided an opportunity to test mail and van drop-off methods which, due to shortages of volunteers, would play an important role in any large-scale distribution of the NASA meals.

Deliveries for the weekend supplement participants were handled in two ways. A NASA packet consisting of two meals was distributed on Friday to those participating in congregate or day-care programs. Meals-on-Wheels participants received their NASA weekend meals on Friday at the time of their hot meal delivery. Deliveries to home health and alternate care participants were made by their service providers during regular visits to the home.



At the time of the initial delivery of NASA food to the participants, a volunteer gave each participant complete training in meal preparation, and answered any questions about the program. This personal orientation was given to all participants, regardless of their subsequent mode of delivery, whether personal or impersonal.

After the initial supply of meals had been delivered to each site, additional meals were delivered once a week or twice a month, depending on the storage capability of each site.

FIELD DEMONSTRATION RESULTS

Dr. Lodis Rhodes

Assistant Professor, LBJ School of Public Affairs

The field demonstration ran from late January to May, 1976. One hundred and sixty-eight elderly started the project. Their principal characteristics were:

	<i>Age</i>	<i>Ethnicity</i>	
60-70	32%	Anglo	54%
71-80	46%	Black	35%
Over 80	22%	Mexican-American	11%
	<i>Sex</i>	<i>Income Indicators*</i>	
Male	28%	Social Security (SSA)	48%
Female	72%	Supplemental Security	
		Income (SSI)	16%
		SSA + SSI	30%
		Food Stamps	31%
		Higher Income	4%**

* Does not add up to 100% because of program overlap.

** Above Title XX Social Security eligibility requirements.

Forty-one elderly received meals as a weekend supplement. The remaining 127 ate the meals on a daily basis. All received the meals for nine weeks. Meals were delivered to twenty-four elderly for an additional six weeks.

More than three-quarters of the elderly participants liked the NASA meals "very much" and wanted to continue receiving them, although not necessarily on a daily basis. The two most attractive features of the system, according to the participants, were the food itself, and the ease and convenience of food preparation.

Many participants realized that the NASA meals would be particularly useful to them should they become less mobile and less able to cook and shop for themselves. Several of the men in the sample said that if their wives became ill, they would like the meals on a daily basis due to their convenience and ease of preparation. In general, there was recognition among the elderly that receiving pre-packaged meals would aid them in remaining in their own homes.

Almost half the group felt each meal provided more than enough to eat. Many participants could not eat a single meal at one sitting, and routinely stretched each meal over the day to provide two meals, or one meal and several snacks. By preparing only a portion of the food items at any one time, and by saving leftovers for future

use, participants adapted the meal system to suit their own eating preferences and patterns.

All delivery systems used in the project worked well. Data obtained do not support any appreciable "halo effect". While those who received the meals from a volunteer enjoyed the social contact, they did not evaluate the program more positively than did those who received their meals via the impersonal delivery mode. More than 60 percent said that if they had their choice, they would prefer volunteer delivery over van drop-off or U.S. mail delivery. However, all 15 participants who received their meals by mail found that delivery system acceptable.

Since volunteer delivery might not be possible for an extended period of time, participants were asked if they could pick up their meals from a central location such as a church or community center. Fifty-four percent said such a pick-up would be impossible for them due to transportation problems or ill health. Thus, delivery to the home either by a volunteer, van, or U.S. mail is an important factor in the success of a long-term project.

Overall, the elderly who took part in the project did not become bored eating the NASA meals on a daily basis. Less than a third felt some food items had been repeated too frequently during the course of the program.

The majority of participants reported no difficulty either in opening the food packages or in preparing the individual food items. As previously mentioned, ease of food preparation was one of the most attractive features of the meal system for the elderly.

One-third of the participants questioned said their eating habits changed while they were participating in the NASA program. Most reported that they were eating both a greater variety and an increased amount of food than before. Other elderly noted that it was now easier to prepare meals, that they were eating more nutritious foods, and that they needed to eat less for other meals than they had before.

The majority of participants who received the NASA meals as a weekend supplement found the meals of similar or better quality than the meals provided by their hot meals programs during the week. All but one participant of this group wanted to continue receiving the meals for weekend use. The fact that almost 20 percent of the weekend participants did not frequently eat a hot meal on the weekend prior to this program suggests there is a service gap on weekends which the NASA meal system filled.

The ease of preparation of the NASA meals allowed some of the chronically ill and/or disabled alternate care participants to prepare the meals themselves. In addition, providers or homemakers who normally prepared

meals and/or shopped for alternate care participants reported a savings in time by using the NASA meals. On the other hand, some homemakers preferred to cook conventional meals.

Thus, the information available indicates that the simple preparation technology used in this program, the food, and the delivery systems were well accepted by the elderly participants. In fact, many participants expressed regret that the program would not continue.

HEALTH AND NUTRITIONAL ASSESSMENT

William J. McGanity, M.D.

University of Texas Medical Branch, Galveston

As part of the evaluation of the field trials of "Meals Systems for the Elderly," a small team of physicians, dietitians, and biochemists from the University of Texas Medical Branch--Galveston carried out serial health and nutritional assessments prior to starting and after completing both the 9- or 16-week feeding trial. On each occasion in February, March, and May, 1976 a medical evaluation (history, physical examination, and biochemical screen of 20 metabolic and physiologic items) and a nutritional assessment (dietary history, clinical examination, and nutritional biochemical assessment) were performed.

Participants were drawn from meal recipients in ten counties in central and south central Texas (Tables I and II). Two out of three were female; six out of ten were white; and almost all were over 65 years of age. Of the original 75 participants examined in late January or early February, 61 (81%) were re-assessed in late March, 18 of whom were continued on the feeding program an additional six weeks and re-evaluated for a third time in mid-May, 1976.

All persons enrolled in the study were in "good health" without contraindication to the use of the NASA dietary foods. For example, persons with known decompensated and treated cardiac, renal, and liver disease were excluded, as were a couple of individuals with gastro-intestinal problems and/or diversionary surgical procedures.

Their past medical history revealed a significant incidence of chronic health problems (Table III). They also suffered from a variety of current health disabilities (Table IV). It is of note that almost one-half (46.7%) reported that they had no prior medical history of any of the 31 major health disorders about which they were questioned. However, only one percent were free of any of the 34 current medical symptoms about which they were queried.

A dietary food frequency history was obtained at each time of examination. The participants' dietary data (Table V) from the initial assessment provided a few surprises. Over one-third (34%) were ingesting a daily mineral vitamin supplement. Over one in two (55%) were drinking a glass or more of milk each day; 7% drank more than six cokes and/or cups of coffee each day, and one individual acknowledged being an alcoholic. From the dietary data in Table V, one might predict an adequate intake of most nutrients. Examina-

tion of those who "never" (inadequate < one serving/month) used a moderate or high food source of Vitamins A and C suggests the possibility of an "at risk" subgroup within our study group.

Meals used by the elderly in the feeding program provided one-third RDA for males 51 years of age and older. However, since 75 percent of the sample was female, the caloric and nutrient intake provided by the meals was greater than one-third RDA for the majority of participants. Table VI reflects the weighted RDA and percent RDA of the food packages.

Table VII shows selected non-nutritional clinical symptoms of elderly persons by duration of feeding trial. While these symptoms are to be expected with aging, it should be noted that five percent of the elderly showed evidence of edema when they started on the feeding program and seven percent after participating for nine weeks. While edema can result from various causes, it would be advisable to control salt intake in future medical tests of feeding programs, both by providing low sodium meals and by counseling participants not to add salt at home.

Table VIII shows that an increase in blood glucose was observed during the feeding trial. This increase may be due to the higher carbohydrate diet provided by the NASA meals. Renal function, as measured by blood urea nitrogen and serum creatinine, did not change significantly.

Table IX lists selected clinical symptoms which may be associated with insufficient nutrient intake.

At the time of entry into our study (February), there were subjects with biochemical nutritional problems, as evidence by

- 11 percent with low serum iron and 6 percent with low serum folate (Table X).
- 11 percent with low serum Vitamin E and 23 percent with elevated serum cholesterol (Table XI).
- 7 to 19 percent with decreased levels of serum Vitamin C and urinary riboflavin (Table XII).

During the feeding trial, the levels of the mean level of hemoglobin and serum iron decreased significantly (Table XIII), and the percent with low levels of hemoglobin and folate levels increased (Table X). While the calculated dietary intake of iron from the NASA meals was adequate, the biochemical data suggests that not all of it was available for use by the body.

Improvement was noted in the mean and "at risk" levels of Vitamin E and cholesterol (Tables XI and XIV) and Vitamin C and riboflavin (Tables XII and XV). While mean urinary niacin excretions did not alter significantly (Table XV), the percentage "at risk" with

low levels did increase over seven-fold.

Paired data from the 18 participants who were evaluated on all three occasions provides similar trends in their biochemical nutritional data. The mean levels and "at risk" percentage are presented in Table XVI to Table XVIII.

Taken as a whole, based on our data analysis, the NASA meals provide safe nutrition. Participants in the program showed improvements in some nutrition-related indicators, and deteriorated somewhat in other respects. We would recommend that the meals be subjected to longer and larger field trials to clarify the importance of trends we have identified. A longer assessment would allow for study of nutritional impact during a full food availability cycle, whereas our studies were carried out during only one season of the year (February-May, 1976).

TABLE I
HEALTH ASSESSMENT
CHARACTERISTICS OF ELDERLY SAMPLE BY SEX AND ETHNICITY
(February, 1976)

County	M	F	B	W	MA	Total
Comal	3	7	2	5	3	10
Guadalupe	3	5	4	3	1	8
Atascosa	2	5		5	2	7
Wilson	3	3	2	2	2	6
Karnes	2	2	2	2	—	4
Bastrop	2	2	3	1	—	4
Travis	3	3	2	1	3	6
McLennan	1	7	1	7	—	8
Falls	0	3	2	1	—	3
San Saba	4	15	0	18	1	19
Participants in Nutritional Assessment	n = 23	52	18	45	12	75
	% = 31	69	24	60	16	100

TABLE II
HEALTH ASSESSMENT
CHARACTERISTICS OF ELDERLY SAMPLE BY AGE
(February, 1976)

	M	F	Total
n =	23	52	75
Age/Years	Percentage		
60-64	13	2	5
65-69	30	23	25
70-74	22	27	25
75-79	17	25	23
80-84	13	17	16
85	4	6	5
Total	99	100	99

TABLE III
HEALTH ASSESSMENT
PERCENT ELDERLY PERSONS WITH POSITIVE PAST MEDICAL HISTORY
(February, 1976)
n = 75

<i>Prior Medical Disorder</i>	<i>Percent</i>
1. Major Respiratory	13.3
2. Major Cardiovascular	
- Coronary/Stroke	9.3
- Elevated Blood Pressure	28.0
3. Liver Trouble	6.7
4. Restricted Activity	9.3

TABLE IV

HEALTH ASSESSMENT

PERCENT ELDERLY PERSONS WITH CURRENT HEALTH PROBLEMS (February, 1976)
n = 75

<i>Current Medical Symptoms</i>	<i>Percent</i>
1. Weakness and/or Fatigue	16.0
2. Vision Alteration	45.3
3. Use Dentures	74.7
4. Short of Breath	22.7
5. Edema	29.3
6. Elevated Blood Pressure	37.3
7. Chronic Constipation	37.3
8. Nocturia	54.7

TABLE V

HEALTH ASSESSMENT

PERCENT FOOD USE BY ELDERLY PERSONS
n = 75

<i>Serving of Food Item Ingested</i>	<i>Daily</i>	<i>Never</i>
A. 1. Bread	91	3
2. Cereals	36	21
3. Noodles/Rice	11	45
B. 1. Milk	55	21
2. Eggs	33	21
3. Beef	16	13
4. Chicken	8	28
5. Cheese	8	48
6. Fish	1	73
7. Beans	1	45
C. 1. Fruit Juice	55	25
2. High Vitamin C	28	29
3. High Vitamin A & C	12	43
4. High Vitamin A	7	35
5. Moderate Vitamin A & C		28
D. 1. Sweets	23	11
2. Soda Water	12	63
3. Candy	9	67
4. Chips	8	63
5. Alcohol	3	92

TABLE VI
HEALTH ASSESSMENT
NUTRIENT CONTRIBUTION OF PRE-PACKAGED MEALS
21 MENU CYCLE

<i>Per Day</i>	<i>Weighted*</i> <i>RDA</i>	<i>Mean</i> <i>21 Menus</i>	<i>Percent</i> <i>Weighted RDA</i>
Calories: Kcal	2000	872	44
Protein: gm	50	45	90
Fat: gm	--	23	--
CHO: gm	--	122	--
Calcium: mg	800	500	62
Iron: mg	10	10	100
Vitamin A: iu	4200	4600	110
Vitamin C: mg	45	58	128
Thiamin: mg	1.1	0.6	57
Riboflavin: mg	1.2	1.0	83
Niacin: mg	15	12	80

*NRC Recommended Dietary Allowance for > 51-year old subjects of whom 75% female and 25% male.

TABLE VII
HEALTH ASSESSMENT
SELECTED CLINICAL SYMPTOMS ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	0	9	16
<i>n =</i>	75	61	19
Non-Nutritional Symptoms		Percent	
1. Abnormal Vision	3	3	5
2. Gross Dental Caries	9	7	5
3. Loss of Skin Elasticity	51	80	74
4. Abnormal Pulmonary Findings	7	---	---
5. Abnormal Cardiac Rate/Rythm	9	---	---
6. Absent Knee Jerks--Bilateral	9	10	---
7. Absent Ankle Jerks--Bilateral	27	10	---
8. Absent Vibratory Sense--Bilateral	13	8	5
9. Bilateral Edema	5	7	---

TABLE VIII
HEALTH ASSESSMENT
PERCENT HIGH BIOCHEMISTRY BY TIME

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	0	9	16
<i>n =</i>	75	61	18
Standard Used		Percent	
Blood Glucose 120 mg/dl	3	11	5
Blood Urea Nitrogen 30 mg/dl	8	11	5
Serum Creatinine 1.6 mg/dl	8	8	10

TABLE IX
HEALTH ASSESSMENT
SELECTED CLINICAL SYMPTOMS ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>75</i>	<i>61</i>	<i>19</i>
Nutrition-Related Symptoms		Percent	
1. Nasolabial Seborrhea	1	3	0
2. Filiform Papillary Atrophy	12	20	—
3. Swollen Red Papillae	1	0	0
4. Angular Lesions/Cheilosis	7	0	0
5. Follicular Hyperkeratosis	13	20	—
6. Enlarged Thyroid Gland	1	1	5

TABLE X
HEALTH ASSESSMENT
PERCENT LOW BIOCHEMISTRY BY TIME

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>75</i>	<i>61</i>	<i>18</i>
Standard Used		Percent	
Serum Albumin < 3.0 gm/dl	0	0	0
Hemoglobin < 13.0 gm/dl	0	10	11
Hematocrit < 37/41 %	3	7	6
MCHC < 30	0	0	0
Serum Iron < 40 mcg/dl	11	7	17
Serum Folate < 3 ng/dl	6	15	12
RBC Folate < 140 ng/dl	0	11	0
Serum B12 < 0.2 ng/dl	0	0	0

TABLE XI
HEALTH ASSESSMENT
PERCENT LOW OR HIGH BIOCHEMISTRY BY TIME

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	0	9	16
<i>n =</i>	75	61	18
Standard Used		Percent	
Serum Vitamin A < 30 mcg/dl	0	2	0
Serum Vitamin E < 700 mcg/dl	11	2	0
Serum Cholesterol > 300 mg/dl	23	5	6
Serum Triglycerides > 200 mg/dl	33	33	44

TABLE XII
HEALTH ASSESSMENT
PERCENT LOW BIOCHEMISTRY BY TIME

<i>Month</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	0	9	16
<i>n =</i>	75	61	18
Standard Used		Percent	
Serum Vitamin C < 0.2 mg/dl	7	3	5
Urinary Riboflavin < 79 mcg/gmCr	19	7	5
Urinary Niacin < 1.6 mcg/gmCr	3	14	21

TABLE XIII
HEALTH ASSESSMENT
MEAN BIOCHEMICAL DATA ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>74</i>	<i>59</i>	<i>18</i>
Serum Albumin gm/dl	4.4	4.3	4.2
Hemoglobin gm/dl	15.3	14.4	14.2
Hematocrit %	43.0	42.4	43.8
MCHC units	35.6	33.9	32.5
Serum Iron mcg/dl	95	91	90
Serum Folate ng/dl	7.6	7.8	10.2
RBC Folate ng/dl	354	317	329
Serum B12 ng/dl		All Elevated Levels	

B12 measurements were done on a limited group with low hemoglobin, iron, or folate levels.

TABLE XIV
HEALTH ASSESSMENT
MEAN BIOCHEMICAL DATA ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>74</i>	<i>59</i>	<i>18</i>
Serum Vitamin A mcg/dl	90	97	101
Serum Vitamin E mcg/dl	1122	1667	1157
Serum Cholesterol mg/dl	270	224	208
Serum Triglycerides mg/dl	179	191	209

TABLE XV
HEALTH ASSESSMENT
MEAN BIOCHEMICAL DATA ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>74</i>	<i>59</i>	<i>18</i>
Serum Vitamin C	1.1	1.1	0.7
Urinary Riboflavin mcg/gmCr	383	867	1395
Urinary Niacin mcg/gmCr	5.3	6.0	3.9
Serum Calcium mg/dl	9.8	9.9	9.5

TABLE XVI
HEALTH ASSESSMENT
MEAN PAIRED BIOCHEMICAL DATA ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>18</i>	<i>18</i>	<i>18</i>
Serum Albumin gm/dl	4.4	4.3	4.2
Hemoglobin gm/dl	15.2	14.6	14.2
Hematocrit %	43.2	42.8	43.6
MCHC units	35.2	34.1	32.6
Serum Iron mcg/dl	93	99	92
Serum Folate ng/dl	6.4	5.3	10.1
RBC Folate ng/dl			
Serum B12 ng/dl			

TABLE XVII
HEALTH ASSESSMENT
MEAN PAIRED BIOCHEMICAL DATA ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>18</i>	<i>18</i>	<i>18</i>
Serum Vitamin A mcg/dl	82	87	102
Serum Vitamin E mcg/dl	893	1663	1143
Serum Cholesterol mg/dl	238	211	203
Serum Triglycerides mg/dl	133	168	214

TABLE XVIII
HEALTH ASSESSMENT
MEAN PAIRED BIOCHEMICAL DATA ELDERLY PERSONS
BY DURATION OF FEEDING TRIAL

<i>Month (1976)</i>	<i>February</i>	<i>March</i>	<i>May</i>
<i>Duration in Weeks</i>	<i>0</i>	<i>9</i>	<i>16</i>
<i>n =</i>	<i>18</i>	<i>18</i>	<i>18</i>
Serum Vitamin C mg/dl	0.4	0.7	0.7
Urinary Riboflavin mg/gmCr	224	884	1459
Urinary Niacin mcg/gmCr	4.2	6.1	4.0
Serum Calcium mg/dl	9.8	9.7	9.5

THE ECONOMICS OF THE NASA MEAL SYSTEM

Dr. Jurgen Schmandt
Professor, LBJ School of Public Affairs

Cost considerations of the NASA meal system are essential to determine the viability of the concept. The figures available are partial, and are based upon a research and development type of project. We must leave it to industry to extrapolate from these figures what the costs would be under normal production conditions, and for different numbers of food units.

The figures to be discussed reflect direct costs only: the food itself, food labeling, packaging, assembly, distribution, and partial delivery. Not included are the NASA and LBJ School administrative costs, nor the research costs incurred in the development of the system.

NASA expended \$38,950 for the 10,000 meals produced for the field demonstration. The following table summarizes the production costs:

<i>Items</i>	<i>Total \$</i>
Food and primary packaging	\$28,800
Labels	7,500
Secondary Package	300*
Multi-meal box	350*
Meal assembly	2,000
Total	\$38,950

* These figures are estimates of costs based on large production quantities. These items were provided to NASA by the manufacturer at no cost.

When considering the cost of the meals for the demonstration, it is important to remember that several factors contributed to unusually high expenditures. First, the single-serving cans used were particularly high in cost. For example, some of the cans cost \$1.46 per unit. These cans were produced in special runs especially for the meals program. According to NASA, use of the smaller cans increased the per-unit average cost from \$.25 for the standard size can to \$1.46 for the cans specifically produced for this project.

Secondly, only 10,000 meals were produced. Economies of scale in larger production runs would decrease the total costs.

Thirdly, the final assembly of the meals packages was done by "overqualified" NASA personnel. NASA reported that meal assembly could have been accomplished with less skilled personnel, thereby reducing the costs of that category.

The following tables itemize the highest and lowest cost meals:

<i>High Cost—Menu No. 19</i>	<i>Item Cost</i>
Corn	\$1.46
Beans w/tomato sauce	1.46
Chicken ala King	1.46
Applesauce	.50
Instant Vanilla Drink	.30
Labels	.40
Total	\$5.58

<i>Low Cost—Menu No. 6</i>	<i>Item Cost</i>
Beef and rice w/onions	\$.59
Creamed peas	.38
Cottage cheese	.45
Chocolate Crunch Bar	.20
Instant Vanilla Drink	.30
Labels	.41
Total	\$2.33

Menu 19 contained three special single-serving cans, all produced in special production runs. Their unit price of \$1.46 per can brings the total menu cost to a high \$5.58. Menu 6, on the other hand, contained mostly freeze-dry food items, and had a much lower total cost.

Delivery and distribution costs of the meal program were as follows:

<i>Distribution and Delivery</i>	<i>\$ per meal</i>
(a) From NASA to Distribution Center	.05
From Distribution Center to client (rural location)	.17
Total	.22
(b) Mail Delivery from NASA to client	.17

These costs are approximations. They are difficult to estimate since students and site volunteers spent considerable amounts of time delivering the meals. Not surprisingly, the cost of mail delivery is lower than the cost of personal delivery.

The next table shows the high, low, and average costs for food and primary packaging:

<i>Cost for Food and Primary Packaging</i>	
AVERAGE	\$2.88
HIGH	\$5.58
LOW	\$2.33

While the average cost per meal of \$2.88 was higher than the \$1.91 average Title VII meal costs in Texas, it is important to remember that the research nature of the NASA meal system increased the unit price substantially. As mentioned earlier, the cost of single-serving cans raised the average price. If adjustments can be made for the high cost of single-serving cans, the average cost per meal should drop to approximately \$1.60. This, of course, is dependent upon large-scale production which would allow economies of scale.

The direct dollar cost of the program does not tell the whole story. A cost analysis of the meal system needs also to take into account the reduction in nursing home payments by Medicare and Medicaid that might occur when elderly persons could remain in their own homes, receiving such home-based services as a meal system.

CHAPTER III

THE MEAL SYSTEM IN THE LARGER POLICY CONTEXT: MAJOR CONFERENCE ADDRESSES

The 1976 meal system demonstration project showed that shelf-stable, single-serving meals were accepted and enjoyed by one user group—the elderly. What are the ramifications of this successful demonstration on policy initiatives for the elderly and other potential users of the meals? How should nutrition considerations be related to general policies and programs for the elderly?

In his speech, "Policy Priorities for the Aged," Senator Hubert Humphrey indicated that the growing number of elderly Americans demands that an equitable portion of the budget be spent to address their needs. Policy priorities need to be established for the aging, and the cornerstone of the policy should be nutrition. At present, the nutritional health of the elderly is poor. Some programs are in operation, such as Title VII congregate feeding programs, Meals-on-Wheels programs, and Food Stamp services. Title XX also provides some funds for nutrition programs. But these efforts are not enough. More needs to be done. Research is necessary in order to design programs that are more responsive to the actual needs of the people. Good health demands a proper diet. By designing new nutrition programs, and by improving the ones that currently are in operation, we will be exercising economy in government.

POLICY PRIORITIES FOR THE AGED

Senator Hubert H. Humphrey

In developing public policy to help meet the needs of the elderly, Congress is faced with a challenge of monumental importance. As the post-World War II baby boom becomes the post-20th century senior citizen explosion, increasing amounts of government funds must be expended for care of the elderly.

We are very poor at looking ahead. We prefer to talk about yesterday, the good old days. And then a few people want to investigate today. But planning ahead seems to run contrary to our public nature. Most of us privately do plan ahead, particularly if you have children and a mortgage. But public policy planning is in short supply.

Our challenge is not simply to assure that an equitable percentage of the budget be spent on the elderly. Rather, our challenge is to establish a new order of priorities and a framework of services that allows government to respond to the changing demands of an aging society.

That's going to have an effect—on labor force, on employment, on the social security system and housing patterns. Many things are affected as you look at demographic trends for the next 20 years. We talk about demography, but then we don't do anything about it. Thank goodness you are here to do something about it.

A network of interlocking services must be designed to respond to the complications of aging—services that meet both the physiological and psychological needs of this population.

The principal foundation stone for this new approach should be nutrition. It is particularly difficult for senior citizens to achieve a balanced diet. Nutrition, in this country, is a subject mainly talked about for cats and dogs. On TV, they'll have a discussion of nutritional needs for puppies, for older dogs, or special food for kittens or cats. There is more information on TV about the diet of house pets than there is about children (and little or nothing about the elderly). As old age approaches, metabolic changes require a reduction of caloric intake, while the necessary levels for protein, vitamins, and minerals remain constant.

The facts on the state of the nutritional health of our elderly are shocking:

- 67 percent of women and 46 percent of men are overweight;
- 26 percent of the elderly are undernourished; and
- 25 percent are anemic.

These facts are pretty well known, but there is no concerted program of information and communication through the process of saturation to bring the message to the American people and to find solutions.

Improving the nutritional well-being of our nation's aged will not be an easy task. Yet, we as individuals must commit ourselves to this purpose. After all, every one of

Shelf-Stable Meals for Public Sector Uses

us will be the beneficiary of such a policy sooner or later.

Two troublesome trends confront policymakers. The first trend is that the number of persons over the age of 65 is increasing sharply. The second trend is that the cost of health care is rising at an alarming rate—165 billion last year or 9 percent of the GNP.

There are 30 million persons aged 60 and above. This number will increase by 40 percent by the year 2000.

Our spending for health is rising at a rate of 12 percent each year. In 1966, we spent \$42.1 billion on health. That figure could reach \$230 billion by 1980. A large percentage of this money is devoted to the elderly. We don't give people health care; we give them sickness care. As long as we delude ourselves by saying we have health insurance, we aren't going to get at the question of health care.

I have come to the conclusion, partly as a result of personal experience and partly as a result of overwhelming evidence, that the United States must adopt a strong policy of preventive health care. At that point, we must talk nutrition, and diet, and exercise.

Such a policy should not be directed at just the elderly, but the entire population.

I can tell you this. I was on the phone this morning with an eminent physician. He was asking me how I was feeling, because I have to get some chemotherapy tomorrow. I was telling him my symptoms. I said, "I want to see a top-grade nutritionist to talk about my diet." He said, "They are hard to find." They're not really considered a part of the total health care system (unless you are a dog). Such a policy should be viewed as an investment in the future, because it is just that.

The importance of the relationship of diet to health is emphasized by hard statistics. Six of the ten leading causes of death in the U.S. are related to nutrition. Half of the cancers in women and 30 percent in men are caused by poor nutrition.

Clearly, improving the nutrition of the nation will help us to attack these diseases at their root. And yet, the medical schools of this country, until the last five or six years, have had no program in nutrition for their doctors.

Earlier, I said that good nutrition is an investment in the future. In fact, some nutrition programs begin to save money as soon as they are active. An example is the Meals-on-Wheels program.

The Senate Select Committee on Nutrition and Human Needs has estimated that an investment of \$80 million in this program would save the Federal Government at least \$200 million.

This savings would be due to the decrease in dependency that our elderly would have on institutionalized care.

Our discussion of this subject should not overlook the contributions of non-governmental sources. A number of non-government groups and individuals have played a valiant role in assisting the nation's aged.

While these efforts are both courageous and generous, they still leave us with a cry in the darkness. The simple truth is that we must do more.

The Federal Government helps senior citizens through the Older Americans and Social Security Acts, as well as through Food Stamps. Even with these essential policies and programs, we still lack a comprehensive approach to the problem I have outlined. Each one of these programs runs its own course, as if they were in separate continents.

Let us review these Federal efforts. Over \$600 million in food stamp benefits go to households with an elderly person.

Food stamps are one of the most important nutrition programs this nation has. But the primary problem with food stamps—from the point of view of the elderly—is that they are intended for the poor. It is a fact that many elderly are poor, but not all of them.

Nutritional problems of the elderly stem from many causes, only one of which is poverty. This poverty orientation prevents the food stamp program from reaching many households which desperately need assistance.

The Social Security Act is another well-intentioned legislative effort that falls short of being a comprehensive approach.

Title XX of this Act provides nutrition services. But only 38 states currently use Title XX funds because of a highly resented means test for elderly recipients and because of a restrictive matching requirement.

Title VII of the Older Americans Act is the most comprehensive effort to date to resolve the nutritional deficiencies of the elderly. In 1972, Congress established the authority for nutrition projects under this Title.

The response has been impressive. We now have 6,700 sites in every state of the union, serving about 435,000 meals per day.

But what about the other 29 million elderly? What about the elderly of our center cities? Of our rural areas? By conservative estimates, at least 1.5 million home-bound elderly need significant food assistance.

Existing programs are flawed, inadequately funded, and very small. While local volunteer, non-profit Meals-on-Wheels groups have—mostly on their own—managed to provide service to an additional 40,000 home-bound elderly, the U.S. Government has failed to address this serious situation.

In the immediate future, we have the opportunity to make progress. The Senate recently passed legislation to

reform the Food Stamp program, including the termination of the "purchase requirement".

In addition, an important bill has been introduced to make a significant expansion in the Title VII program. This legislation, which I joined in sponsoring, would appropriate \$80 million in fiscal year 1978 to establish a home-delivered meals program. This amount of money would triple the number of persons now receiving home-delivered meals. S. 519 has the support of 33 senators and should be acted upon soon by the Committee on Human Resources, and then by the Congress.

We need to make several improvements in Title VII, particularly in its impact on rural areas. Congress, when this provision is reviewed next year, should examine the level of benefits flowing into rural areas. Special provisions for the rural aged may be the only way to guarantee services for this segment of our population.

But much more can and must be done. We need more research in order to design programs that are more responsive to the actual needs of our people. We need to be ingenious in this business. In World War II, we found out how to put together packages of C-rations. We found out at NASA new ways of having nutritious food for astronauts. There are a lot of things we can do if we make up our mind to do it.

I have co-sponsored legislation with Senators McGovern, Percy, Dole, and Bellmon that provides for a national preventive medicine health maintenance and health promotion initiative.

Right now at Baylor University, there is a nutritional institute. At Tufts, Dr. Mayer has requested funds for a nutrition institute. We need a half dozen or so across the country to study nutrition and its application to the human diet. And we also need to study ways and means to deliver highly nutritional foods.

This legislation would create a Bureau of Human Resources within the National Institutes of Health to coordinate the activities of four institutes, including the National Institute on Aging.

If the Bureau is created, the National Institute on Aging would be directed to include nutrition research in its research priorities. By coordinating this research effort with similar research on all age groups, I believe that we will develop the type of information that is vital to understanding the relationship between nutrition and disease.

Data collected from nutrition research would lay the groundwork for formulating a nutrition education program for the elderly.

There is, at present, no rational basis for making nutritional recommendations for the elderly. We need fundamental information regarding the nutritional needs

of the elderly if we are to plan effective nutrition programs and use diet as one element in combating the serious health problems of so many older Americans.

We grow old. But we're born young. I am author of the WIC program. Those first few years for mother and child are basic and fundamental to continuing health. We have Medicare for Grandma and Grandpa, but we need kiddy care, and maternal and child care. That's the way to cut down health costs. We can cut our health bill by 25 percent or more, by proper diet and nutrition early in life, and by early diagnosis and treatment of children in those formative years. While I know you are primarily concerned with the elderly, remember, you aren't born 65 years old. You're just born. Before that birth, the diet of the mother is critically important.

What we are talking about is the health of the American people. We are addressing ourselves here to the end of the spectrum—the elderly. But I want you to tie it in to the beginning of the spectrum. It's all one totality.

My dad was a pharmacist. Dad told me, "Son, these pills are to sell, not to take." We never had time to be ill. When I was a boy and I would say to my Dad that I didn't feel good, he would say, "That is all in your head. We don't have time for sickness around here; we got prescriptions to fill." I was brought up to believe you shouldn't be sick. Also, we didn't have money for it, or time for it.

We didn't know too much about diet, but fortunately in those days, we had the home garden. Mother did all the canning. We didn't add chemicals and additives to everything. We had good, clean water that wasn't filled with chlorine. We had a lot of things that were wholesome. We didn't have air pollution. We were lucky.

But those days are gone. Now we have to think about the times in which we live, and what it's going to be like 20 years from now. For example, what's the effect of the incredible intake of sugar by the youth of this country—it's a serious medical problem. The U.S. per capita consumption of sugar is three times larger than anywhere else in the world, and those attitudes formed early in life develop the taste buds. Even baby food is loaded with things that are not good for health, because mothers like the taste and Mother was brought up the same way.

Now we come to Grandma and Grandpa. They have serious problems because of what time does to the whole physiological, psychological make-up of the individual. We have to look not only at the quality of food, but what you're looking at—how do you get it to them. There have been improvements since 1972. The school lunch program is opening up to the elderly. Churches are also serving food to the elderly, but like many programs,

people don't know about it; it's the outreach that's important.

In the final analysis, action to address these problems is really a business decision that we have to make. If we invest now, then we will enjoy a return in the future. If we fail to invest, then we have no one to blame but ourselves.

I don't know of any better way of exercising economy in government than improving the health of the American people, and protecting that health. One of the best ways to do it is the intake—the water that we drink, the food that we eat, the air that we breathe, and the environment in which we live. This is what makes for good health.

Dr. Donald M. Watkin, Office of State and Community Programs, Administration on Aging, addressed the conference on "Nutrition and Health." Dr. Watkin outlined some of the problems typically associated with nutrition and disease among Americans. Malnutrition in North America is always associated with disease and often compounds the effects of disease. However, if population groups practice appropriate lifestyles throughout life, they can significantly decrease the prevalence of disease and increase their average age at death. The lives of individuals are literally in their own hands. Proper nutrition and appropriate health care are vital parts of this regimen. Proper nutrition leads to better health; proper health care improves nutritional status. Both must be tailored to meet the needs of individuals at their respective ages. The nutrition-health-aging triad is inseparable.

NUTRITION, AGING, AND HEALTH

Donald M. Watkin, M.D.

The mutual relationships among nutrition, health, and aging are such that the three together form an inseparable triad.

Some major issues facing scientists are the doubling of the death rate every 8 years from age 60 onward; the decrease with age in the number of people able to function at 50 percent or more of their potential in early maturity; and the decrement in immune responses after reaching maturity.

The prevalence of disease rises with age. Disease is the prime cause of disability and death. In 1971, the average American male died at 61. This is not the often-quoted life expectancy figure. Life expectancy for an average American male born in 1977 is now well over 70, but the average age at death today is far younger. Preventable diseases and accidents are the major causes. Among the former are cardiovascular diseases and neoplasias, problems which are avoidable causes of death among many elderly. Depression and mental illness, also common diseases among the aged, can be effectively treated with modern drugs. Good nutrition itself may make the difference between an institutionalized psychotic and a person able to live independently.

Triage is the military system of determining priorities in the commitment of life-saving measures. With ever-increasing numbers of elderly who are diseased and nonproductive, triage or the lifeboat ethic may become reality unless disease and disability can be deferred and productivity sustained to older ages than is now the case.

Even today, the problems associated with the diseases of aging are soluble. First, health maintenance is

possible. In 1972, Alexander Leaf studied the world's oldest people. He observed two factors associated with their long lives—vigorous physical activity and good nutrition. These factors are directly under man's control. If appropriate life styles are practiced throughout life, good health can be prolonged. These life styles comprise obeying the following instructions:

1. avoid gluttony
2. avoid alcoholism
3. avoid tobacco
4. perform vigorous physical activity daily
5. get adequate sleep daily
6. get some recreation daily
7. distribute food intake throughout the day.

Five of these life styles are related to nutrition. According to Belloc and Breslow, following these life styles gives a low "redit" (relative to an identified distribution), an index of health status. The average person has a "redit" of 0.50. High "redits" indicate poor health; low "redits", good. Persons of 80 who have practiced all 7 lifestyles throughout life have the same "redits" as persons of 35 who practiced from 0 to 2. Thirty years can be added to life if these life styles are followed from infancy onward; 11 years, if begun at 45.

Animal studies suggest that anticipated decrements in immunological activity may be deferred by appropriate nutrition.

The Nutrition Program for Older Americans (NPOA) is an example of the application of present knowledge. It applies what is known about the nutrition-health-aging triad for persons 60 and over. The components of the triad are inseparable. The integral triad must be applied, not its Balkanized parts. Dining together serves as a center of gravity drawing older Americans to sites where they have opportunities to receive health services, education and counseling, and to participate in recreational activities and to enjoy socialization.

Most infectious diseases have been conquered. Degenerative diseases have not. In the future, it may be possible to push the technical life span of man up to 140 years. This will require application of knowledge not yet available. However, life style changes and improved availability of health care can be applied now. Nutrition is an integral component of health care and should be made a medical benefit under all health care plans. Applying the principles of the nutrition-health-aging triad now will help to keep many elderly out of institutions by keeping their functional capacity above the 50 percent mark. Present-day elderly have many unmet needs. Applying the principles of the nutrition-health-aging triad will better serve them and will prevent among future elderly persons many problems prevalent among the aged of today.

The Commissioner of the Administration on Aging, Dr. Arthur Flemming, addressed the conference on the subject of "Nutritional Programs for the Elderly." Dr. Flemming outlined the history of Title VII nutrition programs, and stressed their "bottoms-up" organization. He also brought out that while the legislative history of Title VII puts emphasis upon congregate meal programs, there is no restriction on the number of home-delivered meals that can be served by Title VII projects. Currently, about 13 to 14 percent of meals are home-delivered. Dr. Flemming also commented favorably on the potential of shelf-stable meals to meet some of the food needs of homebound elderly, and weekend needs of congregate meal participants. He also saw a potential for use in situations of natural disaster.

NUTRITIONAL PROGRAMS FOR THE ELDERLY

Dr. Arthur Flemming

I am delighted to have the chance to participate in what is certainly a unique conference, and one that I believe will be a very significant conference. We talk a lot about cooperation between the public and private sectors, and between agencies within the public sector. This conference is a good illustration of not only talking about it, but doing something about it.

The issues that you are looking at in connection with this conference are issues which have been of deep concern to the Administration on Aging, particularly since the passage of Title III and Title VII of the Older Americans Act, and also since the passage of the 1973 amendments to that Act. When you put those titles of the Older Americans Act together, you have laid the foundation for a very significant series of developments in the field of aging.

We now have, throughout the nation, over 500 area agencies on aging, and we have crossed the 800 line as far as nutrition projects are concerned. Those nutrition projects operate 7,000 to 7,500 sites and deliver 400,000 meals five days a week.

Under the Older Americans Act, the state agency on aging has the management responsibility for both Title III and Title VII. The state agency develops a state plan for the consideration of the governor. In developing that plan, the state agency follows the guidelines that are issued by AOA. But above everything else, it takes into consideration presentations that are made to it by area aging agencies, and by nutrition project personnel. Before a governor can submit a plan to AOA, the state agency must make sure that the plan has been considered by the state advisory committee, and that public hearings have been held.

Once AOA has approved a plan, certain sums of money under both Title III and Title VII are available to the state. The amount of money is determined by a formula which relates to the annual appropriation for Title III and Title VII. A little over 4½ years ago, the amount of money that the Administration on Aging had available to help states and communities develop services for older persons was about \$40 million. This year, we are operating under a budget of about \$403 million. Both the Senate and the House appropriation committees have marked up our bill for 1978 slightly in excess of half a billion dollars.

When the state receives its money, it does not just automatically make funds available at the local level. The area agencies and the nutrition project agencies must develop a plan and a budget. The plans must be considered by the appropriate advisory bodies, and there must be public hearings. The state agencies have the final word on those plans and budgets. As a federal government, we do not get involved in the passage of those plans and budgets. This is the concept that the Congress has enacted into law over the years, and I find it to be a most satisfactory concept. I think the fact that essentially this is a "bottoms-up" planning is what puts the concept on a good, solid foundation.

Now I'll turn to the field of nutrition, with particular emphasis upon Title VII, although Title III can also be used for nutrition under certain circumstances. Let me share with you my feelings as to where we are in the evolution of what I regard as one of the most exciting and important programs that the Federal Government has ever been involved with in the field of aging.

I have already given you some of the overall statistics. Close to 400,000 meals are being served five days a week. Of that number, approximately 13 to 14 percent are home-delivered meals. Under Title VII, nutrition project agencies have the right to use their funds for home-delivered meals. There is absolutely no restriction on home-delivered meals under the law. We do recognize that in the beginning of Title VII, the Congress had built a legislative history indicating a desire to put emphasis upon congregate meals. The discussion which took place on the floor of both the House and the Senate made it clear that the Congress felt there were some spin-offs from congregate meals that were very important. Thus, in the early days of Title VII, we suggested as a guideline that the number of home-delivered meals should be approximately 10 percent. We soon discovered that what we regarded as a guideline was being interpreted as a regulation, and that in one situation after another, the number of home-delivered meals was being cut back. Consequently, we withdrew that guideline, and did not substitute another in its place. We simply called atten-

tion to the legislative history. As I have indicated, now about 13 to 14 percent of the meals are home-delivered.

We have recognized from the beginning that home-delivered meals was a very important area. There is no doubt that we have several million older persons in this country who are not able to participate in congregate meal programs. We also recognize that even those who participate in congregate programs five days a week find it difficult to obtain a nutritious meal on the weekend. I want to make it clear that we have not at any time resisted the idea of stepping up the number of persons who would be, or could be, on the receiving end of home-delivered meals. But, we have put emphasis upon congregate meals because in doing so, we felt we were properly interpreting the intent of the Congress. Personally, I welcome the attention that some leaders in the Congress have been giving to the possibility of expanding the resources that would be available for home-delivered meals.

In discussing home-delivered meals, I want to acknowledge the great debt that is owed to the private sector. Long before there was a Title VII, long before there was a Title III, non-profit groups all over the country marshalled their resources to meet the needs of the elderly for home-delivered meals. I feel that our nation will always be deeply in debt to those in the private sector who not only recognized the need, but who substituted action for words. I also appreciate the initiatives that they have taken in pressing for home-delivered meals legislation on Capitol Hill.

Just a few weeks ago, I appeared before Senator Eagleton and Senator Chafee, relative to the two principle bills that have been introduced on the Senate side to deal with the home-delivered meals situation. Personally, I hope the bills move. The main point that I have made in connection with my comments on those bills has been that I believe that home-delivered meals legislation should be part of Title VII, and that the congregate meals programs and the home-delivered program should always be coordinated with one another.

Thinking in terms of the project you have been looking at at this conference, I think the shelf-stable meal concept could be very meaningful in the lives of older persons. It could become very meaningful not only in relation to home-delivered programs, but also in relation to congregate meal programs. We recognize that services ought to be delivered seven days a week, but then we turn our backs on the importance of delivery of services on the sixth and seventh day. When it comes to the delivery of services for older persons, we have no right to settle for a five-day week. The shelf-stable meal concept could make a significant contribution to meeting weekend needs of the elderly.

I also see a possible use for the meals in dealing with natural disasters. One of the exciting things about the development of the aging network has been the way that network has been able to relate to natural disasters. One of the most effective ways this has been done is through Title VII. There have been a number of situations in recent months that those operating Title VII programs have been able to provide food more quickly than any other institution in our society. We are tied in closely with the Department of Housing and Urban Development in connection with their disaster administration. We have set aside funds for use over and above the normal allocation to the states. We know that in addition to meeting the needs of the general public in times of disaster, that older persons have some rather unique needs during those times. Those who are part of the network are also responding to those needs.

I'd like to make two additional comments in connection with the whole nutrition program. Taken as a whole, there are 125,000 volunteers participating in these programs, and 60 to 65 percent of them are 65 years of age or older. In other words, here is a program designed to meet the needs of older persons in the area of nutrition, and it is also dealing with the need of older persons to be involved in life in a meaningful and systematic manner.

As we move in the direction of having additional funds available for home-delivered meals, I hope that the public sector and the private sector working together can make sure that the public funds do not replace investments on the part of the private sector. We want to be sure that we at least maintain the efforts on the part of the private sector. I believe that the private sector will not withdraw in any way, but will be inspired by the fact that the public sector is ready and willing to make additional funds available.

We are engaged in a very exciting enterprise. I do not know of any development that has made so significant a contribution to the lives of older persons as the developments that have taken place under Title VII.

Dr. Abner Salant, Director of the Food Engineering Laboratories, U.S. Army Natick Development Center, dealt with the topic of "Shelf-Stable Meals and the Food Industry." He first outlined the available technologies in support of the shelf-stable meal concept, including familiar technologies such as canned, freeze-dried, and dehydrated to newer technologies such as the retort pouch, tray pack, and dehydrated/reversibly compressed foods and irradiated foods. Dr. Salant then submitted that there were recognized needs for specialized feeding outside normal distribution channels and food service systems for which shelf-stable meals represent part of the solution. However, before industry will get involved, problems and questions concerning possible uses of the system must be answered. Dr. Salant called for the formation of a task force, to define a realistic plan of action to carry the shelf-stable meal system forward.

SHELF-STABLE MEALS AND THE FOOD INDUSTRY

Dr. Abner Salant

I have been asked to address the topic of shelf-stable meals and the food industry. This assignment reflects the concern over how to overcome the problems of cost, availability, and distribution encountered in the 1976 demonstration of meals for the elderly, and how to integrate other potential applications with this program.

The need to involve and commit the food industry has been recognized, but how to justify their investment remains an unanswered question at this point in time.

Not having been charged with the responsibility for coming up with answers, I propose to pose questions whose answers could furnish the basis for a viable program. I also believe we have some assets available to us, and therefore, need to place greater emphasis in those areas where deficiencies exist.

I feel that I've been given an opportunity to expound on one of my favorite themes—a business-like approach to filling human needs, or study less and act more. Hopefully, some of the concepts will make sense to you and help provide direction as to dealing with the issues which this conference has set out to address.

Before going any further, I would like to define the ideal shelf-stable food:

1. It must be stable at ambient temperatures, without refrigeration for periods ranging up to two years.
2. Quality—palatability, wholesomeness, nutrition—should be comparable to fresh counterparts.
3. Should be of minimum weight and volume.
4. Require no unusual utensils or equipment for preparation.
5. Cost competitive on a final use basis.

6. Capable of production and distribution through familiar systems.
7. Be energy-conserving in production, distribution, and preparation.
8. Present no unusual environmental or ecological threat.

Let me begin with the easy part—the technology available in support of the shelf-stable meal concept. There is no shortage of technical solutions—some of them well-tested by prolonged use, some more recent but no less applicable, and new approaches on the horizon. The combination offers ready solutions to providing appealing, wholesome, and nutritious meals to feed the elderly, disaster victims, residents in institutions, or other recipients of social services.

The most familiar shelf-stable meal forms are canned items. They have served us well for more than 150 years and will continue to do so for some period into the future. However, we have come to recognize certain limitations to canned foods or the availability of more preferred alternatives. The nature of the heat process used in canning makes it difficult to produce many food items without significant impairment of their palatability and/or nutritional value. Furthermore, there are inherent inefficiencies in the process and overall canned food system—including distribution—that are becoming more important as the impact of energy limitations becomes a source of ever-growing concern. In too many cases, we find that the amount of energy required to make a can and process the contents far exceeds the caloric value of the food. This situation is further aggravated by energy required to ship the weight and bulk involved.

Major quality improvements were achieved with the introduction of frozen foods, but these do not meet the criteria for ideal shelf-stable foods, nor do they offer potential for energy savings.

Many of the disadvantages of canned or frozen foods can be overcome by dehydration. Dried foods, such as dates, figs, prunes, raisins, onions, celery, meats, and fish have been used for hundreds of years. With the introduction of freeze-drying, the potential for attaining high quality with a wide variety of items was created. With proper packaging, they are inherently more shelf-stable than either frozen or canned foods, and have the advantage that they weigh only a fraction of the original raw product. Market acceptance, however, has been limited by relatively high cost due to the capital intensive nature and relative inefficiency of the freeze-drying process. Moreover, even with the major reduction in weight, dehydrated foods tend to be just as bulky as their fresh, canned or frozen counterparts, and also very fragile—highly susceptible to breakage and attrition.

The product systems described provide partial solutions to the problem, but each has major short-falls when measured against our criteria for optimal shelf-stable foods. But, there are a number of developments, including some virtually in-hand, that have real promise for bringing us close to our ultimate goal.

1. *Retort pouch*. The first of these is a flexible pouch that replaces the old tin can. It requires less heat to process so that superior product quality can be achieved, is lighter in weight, and overall, requires less energy. Extensive testing has indicated that it provides at least equivalent shelf-life and resistance to rough handling during shipment and storage. The technology is well-established and is being utilized on a large scale in Japan, Europe, and Canada. With the recent approval of pouch materials by the FDA, we are now in a position to begin moving in the United States as well.
2. *Tray-Pack*. A derivative of the retort pouch concept is the tray-pack, which is a tin can in the form of a tray. The initial version in test market is designed to provide multi-serving quantities in a half-size steam table tray for institutional use. Food is processed, shipped, stored, reheated, and dispensed from the same container. Characteristics similar to those of the retort pouch provide quality, energy savings, and convenience advantages over the conventional can. Future developments of polymeric trays and additional sizes and configurations should provide further benefits and flexibility for new applications.
3. *Dehydrated/reversibly compressed foods*. Along with advancements in packaging technology, there are major breakthroughs in food preservation and product forms. Significant progress is being made in overcoming the liabilities of dehydrated foods to an extent where we can anticipate greater availability and wider distribution of these products.
 - a. Refinement and modification of the process technology has improved quality of existing items to the point where they can compare favorably with fresh frozen food. In addition, products such as salad vegetables, which could not be dehydrated without serious texture and quality penalties, could become available commercially in the near future.
 - b. Major reduction in bulk—ranging from 3:1 to 20:1—has been achieved by the reversible compression process. These products rehydrate readily in water to yield foods which are virtually indistinguishable in flavor, texture color, and appearance from fresh frozen. Initial

use was by the military, and they are now becoming available commercially. A wide variety of vegetable and meat products has been developed, and many more will be coming.

c. High capital costs and inefficiencies in the freeze-drying process are both related to low throughput rates. We now have identified a highly promising approach that could triple the productivity of existing equipment with corresponding cost savings. Additional opportunities for further cost reductions are actively being sought.

4. *Irradiated foods.* The application of ionizing radiation to the preservation of foods and shelf-life extension of perishable commodities has been the subject of intensive research for over 20 years, both here and abroad. We are now at a point where we can anticipate having another alternative 5 to 10 years downstream.

a. The major effort in radiation preservation has been in the United States—specifically at NARADCOM. The Army was asked to carry out the mission as part of the Atoms for Peace Program. Extensive wholesomeness studies, including animal feeding tests and chemical, microbiological, physical, and engineering research are underway on beef, pork, ham, and chicken. At this moment, petitions to the FDA are being prepared to obtain clearance on irradiated beef.

The irradiation process provides another means for preparing shelf-stable meal items of high quality, including some which could not be adequately handled by other means. The wholesomeness of irradiated foods has been subjected to intense scrutiny, and the subject of voluminous studies, without precedent with any other food material. This work has generated data which confirm, in my opinion, their wholesomeness in terms of nutrition and safety for human consumption.

The process is inherently simple and familiar. The basic steps are the same as used in the food industry today, except for the final irradiation to preserve the products. It offers cost and energy savings over conventional technology and utilizes waste radioactive materials for its energy source.

b. Shelf-life extension of perishables, such as fresh fruits and vegetables, meat, fish, poultry, and cereal and grain products, is receiving increased attention world-wide. Low doses of radiation are capable of destroying insects and bacteria

that have caused major losses and limited the shelf-life of these commodities. A wide variety of foods treated with low dose radiation has been cleared for human consumption throughout the world. These include raw meat, chicken, shrimp, mushrooms, asparagus, strawberries, papaya, spices and condiments, potatoes, onions, wheat, and flour.

From this brief overview, you can see that technology of shelf-stable meals should not be the major factor in determining whether the system is a go. The real concerns arise from defining the objective—do we have a solution, the shelf-stable system, in search of a problem, or are there recognized needs for specialized feeding outside the normal distribution channels and food service systems for which shelf-stable meals represent part of the solution? I submit for your consideration that it is the latter.

The first demonstration of shelf-stable meals for the elderly was conducted in Texas in 1976, and the results were presented in the Monday morning session. The plenary session yesterday afternoon explored a national demonstration plus other potential applications—social services, institutions, disaster relief, and international aid. A moment's reflection quickly tells us that we are talking about five different markets as a minimum, each with its own requirements for specific products, packaging, distribution, funding, organization, and management.

Furthermore, while the driving forces are problems with filling human needs—non-commercial in nature, the program requires industry participation if it is to succeed. There appears to be a widespread interest among federal, state, and local governments to try out the concept of utilizing shelf-stable meals in coping with some of the needs, but we must look to industry for their capabilities and expertise in the production and distribution of food.

These considerations define the problems and questions which must be dealt with.

1. What is the program? Meals for the Elderly was the original project, but the 1976 demonstration surfaced the problems of distribution and source of supply on a continuing basis because of low volume, large number of individual items, and complexity of the system overall. Expansion beyond the original project to the national level and to other potential uses could lead to a collective market large enough to justify industry investment and secure a reliable procurement/distribution base. However, the answer to one question raises many more.

2. Can the program confine itself to shelf-stable

meals or meal distribution, or must we take a broader perspective? It can be argued that what we are talking about is a total life support system of which food service is one part. Therefore, each of the five or more markets must be examined individually from this point of view.

3. What are the markets that the program will be addressing? How big are they and what is their composition? How do these demographics affect their needs, distribution problems, and collectively provide a predictable volume requirement that can be satisfied at reasonable cost? To exemplify the differences, consider two cases:

a. Meals for the Elderly represents a continuous feeding system with schedules and volumes being reasonably predictable. However, the 1976 demonstration suggests that more work is needed with the menu—including supplementation with fresh items, and also with a practical solution to the distribution problem. Moreover, the demonstration was confined to rural Texas, and we have yet to determine what the requirements and problems would be on a national scale.

b. Disaster relief, on the other hand, is relatively unpredictable as to when, how much, or what will be needed. Moreover, it involves survival for a limited period of time until normal services can be restored. All of this dictates an entirely different approach to planning and response. When compared to Meals for the Elderly, menu, variety, and supplements become less critical. The emphasis is placed on maintaining contingency stocks with a capability to deliver from these stocks sufficient quantities quickly.

4. A key question that must be answered is who is going to be the customer? That is, who will be responsible for procurement and planning and ultimately, paying the bills? Industry has demonstrated many times its willingness and ability to respond to national emergencies and needs. It has also shown its capability to seek out and develop new markets and business opportunities to meet its obligations to its shareholders. I believe that the situations we are dealing with have a middle ground where the public and private sectors need to work together for their mutual benefit. Industrial organizations have the expertise in market research, production, and distribution, while public agencies have the information on the nature of the needs, the population to be served, and the environment in which that service is to be provided.

We have set forth a formidable task for ourselves, and if we are to succeed in accomplishing it, there are a number of critical actions to be taken:

1. It is essential to organize and provide leadership for the program. Not another committee or study group, but a task force capable of and committed to action.
2. Specific, well-defined goals and objectives must be established. What is the nature and scope of the program, and what is it designed to accomplish?
3. Industry participation, which is vital to ultimate success, dictates that justification for investment of its shareholders' assets has to be identified. Industry involvement in establishing this justification can reasonably be sought if the task force is constituted and realistic targets are defined.
4. The several potential concepts for the meal system and/or life support systems must be reduced to hard facts and figures, to individual and collective market profiles. This includes definition of key factors, such as:
 - a. How many people are equivalent to how much product?
 - b. What types of product?
 - c. How is the product to be distributed and inventoried?
 - d. Assessment of available technology versus needs, and determination of how any gaps can be filled.
 - e. Production capabilities needed. Again, how does need match up with what is available and what will have to be added?
 - f. What are the costs involved, including both new investment and operating capital?
 - g. What are the sources for required capital, and are these financial requirements affordable?
 - h. How is the program to be managed? What should be appropriate roles for the various government agencies and private industry in the program?
5. The product of this task force should be a plan of action that is
 - a. definitive and specific;
 - b. realistic and feasible;
 - c. substantially meeting the stated needs; and
 - d. supported enthusiastically by both the public and private sectors.

The question raised and the type of analysis which I have outlined should provide the answers needed and the directions to be taken.

1. We can determine if the basis exists for an integrated, truly national effort as opposed to local community action programs with more limited national coordination.

2. The feasibility and desirability of constructing a unified plan and managing the five potential applications—or markets—as a single program would become more amenable to definitive evaluation and decision making.
3. A better definition, not only of the resources required, but also the nature and extent of the management, technical, and distribution problems, should evolve.

I believe that from the outset we all realize that we are confronted with a monumental, highly complex undertaking. The magnitude of the task, coupled with the issues involved, not only presents major challenges, but also entails significant political implications. Rather than be overwhelmed by all these factors, we must recognize that many, if not most, of the necessary assets are potentially available. The essential and critical first steps then become:

1. Identification of a central focal point that will provide leadership for the program.
2. Securing the commitment to participate in and support the effort to define the program by all actively or potentially interested parties.

We are dealing with important, well-recognized human needs that are fully deserving of our best effort and complete dedication to their fulfillment.

CHAPTER IV

ASSESSMENT OF ALTERNATIVE USES OF THE MEAL SYSTEM

One of the key goals of the conference was to assess critically the potential of the meal system to meet the needs of other user groups. In preparation for the conference, background research about potential uses was undertaken at the LBJ School of Public Affairs, The University of Texas at Austin. In the process, many private and public organizations, active in a variety of food-related activities, were contacted. They were briefed about the development of the NASA meal system and were asked to comment about potential uses to meet a variety of needs. Background papers were written which summarized the findings of this research effort and were included in the registration packet for all conference participants.

In the sections which follow, alternative uses of the meal system to meet the needs of social service programs, domestic, and foreign international relief operations, and institutional feeding programs will be discussed. Under each heading, the background paper prepared for the conference will be presented, followed by summaries of the corresponding conference workshop, panel, and general session discussion. The final section will deal with industry's interest in producing the meal system.

SOCIAL SERVICES—BACKGROUND PAPER

The Meals for the Elderly demonstration project was carried out with a specific client population—the elderly. Most of the participants could not join current meals programs—either home-delivered or congregate—because they were temporarily ill, handicapped, immobile, or lived in areas where no meals programs existed.

But the problems experienced by the aged in obtaining food services are experienced by other segments of the population, too. For example, they characterize the lives of the handicapped and disabled whose physical condition makes shopping and traditional food preparation difficult, they characterize, as well, the lives of low-income families in many parts of America whose lack of access to transportation makes it difficult to

purchase and pick up food stamps at a central location, as well as to shop.

In the belief that the NASA meals could meet some nutritional needs of homebound individuals, researchers at the LBJ School, University of Texas, have been in contact for several months with public and private social service agencies. Agencies contacted include state welfare and human resource departments, state community action or economic opportunity agencies, state rehabilitation agencies, and state aging agencies and commissions. Federal agencies and divisions concerned with either food and nutrition, or social service delivery were also queried. In the private sector, organizations concerned with provision of services for children, families, the aged, and the disabled were contacted.

This section of the paper will discuss the potential for use of the NASA meal system by three groups: (1) the aged, (2) the disabled, and (3) low-income persons of all ages. Under each sub-topic, specific reactions of agencies and organizations will be given. In this way, the paper will provide participants with a common base of information for workshop discussion.

The Aged

The NASA meal system was originally designed for use by the many aged who cannot participate in current meals programs. While it is not possible to determine the precise number of elderly persons who fall into this group, figures are available on the wider population of elderly from which users of the meal system would come.

Current Meals Programs

Title VII, OAA, Congregate—300,000/day

Meals-on-Wheels (Title VII and Private)—80,000/day

Over 65	20 million
Over 65 in nursing homes	1 million
Over 65, living alone	5 million
Over 65, rural	5½ million
Over 65, homebound	3-4 million

In 1970, there were 20 million persons over 65 in the United States. According to Census Bureau, the number of aged rises about 3 to 4 million every decade, so that by 1980, the total figure of those over 65 will be between 23 and 24 million.

Of the present number, approximately 1 million are living in institutions, primarily in nursing homes or other long-term care facilities. It is estimated that 10 to 40 percent of the elderly who live in institutions do not really require this type of total care, and could remain in their own homes if home-based social, medical, and nutritional services were made available to them.

Over 5 million of the nation's elderly live alone. Elderly who live alone often lack the incentive to plan and prepare nourishing meals for themselves. Delivery of a shelf-stable meal which is easy to prepare would encourage many of these solitary elderly to consume nutritious meals.

Another 5½ million of the aged live in areas designated by the Bureau of the Census as rural. It is the rural elderly who are most often outside the scope of traditional meal services, since few rural areas operate either congregate or meals-on-wheels programs. In addition, those in rural areas often lack ready access to transportation for food shopping, which compounds the difficulty of obtaining adequate meals. A shelf-stable meal package which could be mailed, shipped, or delivered by volunteers to rural elderly would provide this segment of the population with a meal service option not presently available.

The plight of the homebound elderly, unable to participate in congregate meals programs because of illness, handicap, or social isolation, has been well documented in hearings conducted by the Senate Select Committee on Nutrition and Human Needs. Between 3 and 4 million of the nation's elderly fall into this group. A home-based nutrition program is the only way most of these elderly will receive meals. But the current number of home-delivered meals is only 80,000 a day, which leaves the vast majority of homebound elderly with no meal service at all.

Title VII, Older Americans Act congregate meal programs are serving approximately 300,000 meals per day. Many elderly participate in congregate programs only 2 to 3 days a week. Even for those who receive 5 congregate meals a week, weekend meals are still a problem. A shelf-stable meal system can serve as a useful supplement to congregate meal programs by guaranteeing that the elderly have access to healthful food on those days, and for those meals when their congregate program does not operate.

In general, aging agencies contacted saw the system as particularly valuable in rural and isolated areas of their

states where no meals programs currently existed, or where conventional delivery of meals was difficult, particularly during winter months. For example, the nutrition consultant for the State of Vermont noted that "since we serve a rural population in the State, the concept of shelf-stable foods that can be delivered by the week and are easy to prepare at home seems very promising." Similarly, the Director of Social Services in Washington State noted that the greatest need for the NASA meals would probably be among "people living in rural areas who have no access to transportation . . ."

Agencies contacted also saw the NASA system as a good means of providing supplementary meals to elderly persons participating in congregate meals or home-delivered meal programs. The National Council for Homemaker-Home Health Aide Services commented that "a major advantage of the shelf-stable meal system might be for weekend or emergency (snowstorm or other circumstance preventing travel) use to supplement person-to-person assistance."

In the same vein, the Commissioner of Social Services of South Carolina saw the NASA meal system as a useful weekend supplement to elderly persons participating in either congregate or home-delivered hot meals programs during the week.

The Director of a large Meals-on-Wheels program in Maryland suggested some additional ways in which the system could supplement existing meal services. For example, the NASA meals could be provided to current Meals-on-Wheels clients as their second meal of the day. The meals could also be provided to newly discharged patients from hospitals or nursing homes for immediate use in aiding their convalescence at home.

The daily, volunteer delivery of prepared hot meals is the backbone of existing meals-on-wheels programs. However, the energy crisis is driving the cost of gasoline upward, and it may soon become infeasible to continue daily volunteer deliveries. The NASA meal system, or other shelf-stable systems that may be developed, can be used by the elderly on those days when volunteer deliveries cannot be made. In this way, the two types of food service can work in tandem to provide the elderly with a comprehensive nutrition program.

Certain characteristics of the NASA meal system were particularly attractive to agencies and organizations concerned with the aged. First, the shelf stability of the meals meant that they could be mailed to elderly living in rural, isolated areas, who could not regularly or easily leave their home to purchase food. Shelf stability also meant that the meals could be stored for occasional or supplemental use by those elderly who participated in other meals programs.

The second favorable characteristic of the meals as

seen by agencies dealing with the aged was their nutritional balance. Because each meal contained 1/3 RDA, the elderly would be assured of at least one nutritionally sound meal per day. Ease and convenience of preparation was also seen as important, as the elderly often do not (or cannot because of their physical condition) devote considerable time to meal preparation.

Questions for Discussion:

1. Concern was voiced by some aging specialists that freeze-dried foods might be unacceptable to the elderly. Some aging specialists also see the need to modify meal items to meet the ethnic and regional food tastes of the elderly. To maximize the acceptance of the food by the elderly, what kinds of food item changes do you think will be necessary?
2. What is the preferred service mix between congregate meals, home-delivered hot meals, and shelf-stable meals, such as those developed by NASA? Under what conditions would the shelf-stable meal system work successfully in the absence of other meal programs?
3. Can the delivery of shelf-stable meals be integrated into the delivery systems of other home-based care services—such as home health care or homemaker care?
4. Many elderly persons require special diets for health conditions, such as high blood pressure or diabetes. The meals, as currently structured, are limited to those who can tolerate a normal diet. What would the cost of providing special diet meals be relative to the probable size of the market?
5. Certain uses of the meals have been suggested in this paper. Do you see other ways that the meals can be used to meet the needs of the elderly?

The Disabled and Handicapped

The features of the NASA meal system which make it useful to the elderly also make it potentially useful to disabled and handicapped persons of all ages who are homebound, and/or cannot easily shop or prepare meals for themselves.

Like the elderly, there are no exact figures on the number of handicapped persons who could benefit from this service. We do have figures, however, on numbers of persons receiving disability benefits from governmental sources. It is from this larger group of disabled that probable users of the meal system would come.

Social Security Disability Benefits	2,670,000	(1976)
SSI—disabled	2,011,876	(1976)
SSI—blind	76,366	(1976)
VA Disability Benefits	3,226,701	(1975)

Over 2½ million persons are currently receiving Social Security disabled worker benefits. These persons are suffering from physical or mental impairment that can be expected to last for a continuous period of not less than 12 months, and are unable to engage in gainful activity. The leading causes of worker disability are chronic ischemic heart, osteoarthritis, rheumatoid arthritis, and slipped disc.

Disabled and blind persons with limited incomes receive Supplemental Security Income benefits through the Social Security Administration. Over 2 million disabled and over 75,000 blind qualified and received this aid in 1976. For those on SSI, the problems of physical disability are compounded by problems of limited income. The two together often lead to inadequate nutrition, due to difficulties in shopping and preparing food, as well as the inability to afford a varied diet.

For the fiscal year ending June 30, 1975, over 3¼ million disabled veterans received monthly payments from the VA. The degree of impairment ranged from 10 percent to 100 percent; certainly the entire number of disabled veterans drawing benefits would not require, nor benefit from a shelf-stable meal system, but a substantial number would.

Rehabilitation specialists felt that the NASA meal system could be used most appropriately by the homebound and severely disabled, and by those suffering temporary disability due to recent illness or hospitalization. These persons often have mobility impairments and cannot easily leave their homes to shop for food. In addition, many are unable to prepare meals for themselves by ordinary means. The Director of Vocational Rehabilitation of the State of North Dakota commented that "the system appears to be a most appropriate alternative to providing adequate nutrition to those who find ordinary means of meal preparation difficult or impossible."

The ease of food preparation of the NASA meals means that many disabled persons could prepare meals for themselves, thus retaining a sense of personal independence. In this regard, the Veterans Administration is considering use of the meals for homebound veterans. The VA is also interested in using the meals in VA centers as part of the rehabilitation training process. Learning to prepare these meals would be one step in the

attainment of personal independence and self-care.

Other rehabilitation specialists expressed interest in the program. The Director of Vocational Rehabilitation of the State of Florida felt the system could be useful to handicapped homebound individuals, served by his agency, and to many severely disabled individuals who were currently not receiving rehabilitation services, but who needed meal service. He felt as well that the system could be used in conjunction with other services such as home health care, homemaker services and social services.

Similarly positive comments were made by a California Department of Rehabilitation program consultant who felt the agency "would be interested (in its advocacy role) of making the service available to all homebound disabled regardless of age or employment potential."

The meal system could also be used in rehabilitation programs for the blind. One rehabilitation specialist felt that if the instructions were clear and properly labeled so that the blind could prepare and use the food, "there could be considerable use of the service for this segment of our clients."

Occasional use of the meal system by the disabled should also be considered for those situations when other meal options are not available, for example, on the days when homemakers do not come to prepare meals, and on the days when pain or discomfort is great enough to prevent other types of meal preparation.

Future use of the meals by the disabled does, however, raise certain fundamental problems, first of which is ease in opening the seven-day meal boxes. The individual food packages and the cans with pull tabs must be re-examined in the light of severe strength and dexterity impairment suffered by quadriplegics, stroke victims, and arthritics. If the food packages cannot be opened easily by such persons, the system would be impractical. The Director of the Virginia Department of Vocational Rehabilitation suggested that sample packages should be sent to an occupational therapist in a rehabilitation center setting for evaluation of its use by the severely physically handicapped.

Secondly, modifications in labeling and preparation instructions would be necessary if the meal system were to be used by the blind. Use of raised symbols on the food items might be considered.

Whatever modifications prove necessary for the disabled could be incorporated into the general system. Greater ease of opening, and simplified preparation techniques can also serve to make the meals even more convenient for general use.

Most of the comments made thus far center on the potential for use of the NASA meals by those suffering from physical disabilities. However, the system also has

advantages for those suffering from mental disabilities, such as retardation or mental illness.

Like the aged, many retarded and mentally ill persons are institutionalized because there are not sufficient home-based services available for them. Obtaining nutritious food in the home can often be a problem both for the retarded and the mentally ill. The retarded may lack the skills necessary for shopping and traditional food preparation while the mentally ill may temporarily lack the interest. By making these meals available to the retarded and the mentally ill, many should be able to prepare nutritious meals for themselves in their own homes.

Persons newly discharged from institutions for the retarded and the mentally ill sometimes take up residence in half-way houses to ease their reentry into a non-institutional environment. Use of a prepackaged meal system, such as the one developed by NASA, could be useful to half-way house residents who are learning how to prepare their own meals after a period of culinary inactivity.

Questions for Discussion:

1. What segments of the disabled population could make most effective use of a shelf-stable meal system?
2. What modifications in opening procedures and preparation techniques would be necessary to facilitate use of the meal system by the disabled?
3. What would the cost of these modifications be relative to the probable size of the market among the disabled?
4. What are some alternatives for delivery of the meal system to the disabled?

Low Income Population

Persons of all ages share a common need for adequate nutrition. But according to a Nutrition and Health Report, prepared by the Select Committee on Nutrition and Human Needs (1976), the under-consumption of nutrients is widespread, especially among persons below the poverty level. This section discusses the feasibility of using a shelf-stable meal system for low-income persons, either alone, or in coordination with other food programs.

At present, low-income households receive their primary food assistance through the Federal Food Stamp Program. In 1976, 18.6 million Americans participated in the program. The Commodity Program, once the mainstay of food aid for the needy, has been basically phased out. Only 50,000 persons a month are still participating, and most reside either on Indian reservations, or in the Pacific Trust Islands.

The Food Stamp program has been the subject of

controversy for many years. Complaints are made that the system does not work well for the old, the disabled, and those who live in rural areas. The purchase requirement also means that many of the very poor cannot accumulate sufficient cash to buy the stamps.

According to a Children's Foundation Report, "the rural poor often have trouble making the long trip to and from the county welfare offices which administer the food stamp program. In addition, rural grocery stores in many places are not authorized to accept food stamps, or are not located near food stamp users."

Similar problems arise for the elderly and disabled, both in urban and rural areas due to lack of transportation to both pick up food stamps, and to shop. Some urban elderly are within walking distance of stores, but fear to venture out of their homes. If meals and food are not brought to them, many go hungry before they will brave the streets.

Delivery of shelf-stable meals to low-income persons of all ages who have difficulty using the food stamp program would be one way of meeting their nutritional needs. The demand would probably be greatest in rural areas, but would also have merit in urban areas for those who had difficulties leaving their homes. The meals can also be made available for purchase at grocery stores, or through the mail, for food stamp recipients who desire convenient, prepackaged meals for occasional, or general use. Families receiving food stamps might also want to keep a supply of the meals available for use during periods of illness, or bad weather.

Some also criticize the food stamp program, because it does not guarantee that recipients will buy food items that contribute to a balanced diet. Such a criticism might be quelled if a balanced, nutritious meal such as that developed by NASA were available for use by food stamp participants. As a matter of interest, most of the elderly in the demonstration project who received food stamps expressed willingness to use them to purchase the NASA meals, provided they would cost roughly the same as meals prepared from conventionally bought items.

Currently, special supplemental foods are available through the USDA's Women, Infant, Children (WIC) program for low-income pregnant and nursing women, babies, and children under five. WIC provides milk, eggs, cheese, juice, cereal, and infant formula each month.

In 1975, the total authorized WIC caseload throughout the nation was 611,577. However, the Children's Foundation, on the basis of poverty data prepared by the U.S. Bureau of the Census, estimated that over 4½ million children and pregnant women were eligible for the program.

The most common delivery system adopted by states

for the WIC program is non-negotiable vouchers redeemable for the specified food items at grocery stores. Home delivery is practiced in a few areas of the country.

While purchase or delivery of fresh food products is in most cases the preferred option, there are situations where delivery of a shelf-stable meal package would be the only means of getting the food to the recipients. For example, mothers and children residing in isolated sections of the country often have no regular access to transportation which would allow them to purchase food items at a store. Similarly, service providers often lack the transportation necessary to bring the food to rural and isolated areas. A meal package, designed to meet the specific nutritional needs of pregnant and nursing women, and one designed to meet the dietary needs of young children, could be mailed or shipped to eligible WIC participants when other delivery options were not available.

Shelf-stable meal packages designed for women and children would also be useful as a standby when illness or bad weather prevented WIC participants from going to the grocery store to purchase food.

LBJ researchers received few responses from state community affairs and economic opportunity offices. However, those that did reply felt that the NASA shelf-stable meal was an innovative way to feed the poor, and could be effectively incorporated into the delivery system of Community Action Agencies at the local and regional levels. In particular, they felt the system had merit for individuals in rural areas whose location made it difficult for them to participate in other food programs.

Questions for discussion:

1. Under what conditions could a prepackaged meal system be used by low-income persons and families?
2. How could the system be used in conjunction with other programs, such as the Food Stamp program and the WIC program?
3. What delivery options would be available for low-income persons?
4. Would the system be stigmatized if it became used by the "welfare" population?

Delivery of Meals Within the Social Service Context

During the Meals for the Elderly demonstration project, two delivery modes were used: for participants who received seven meals per week—a personal delivery system in which the meals were brought to the elderly by a volunteer, and a less personal delivery system in

which the meals were either dropped off by a van, or delivered through the mail. Those persons who participated in the weekend supplement phase of the program either picked up their meals at the congregate meal site, or had the meals delivered to them at the time of their Meals-on-Wheels delivery. For those participants who were receiving alternate care services, meals were delivered by their social workers; for those participants receiving home health care, meals were delivered by their service provider at the time of their normal visit.

As the above description suggests, various delivery systems can be used for getting the meals to the clients. In fact, flexibility in delivery is one of the key features of the shelf-stable meal system. Unlike a hot, home-delivered meal, the NASA meals do not have to be delivered within a certain time to maintain proper temperature. Unlike a hot, home-delivered meal, the NASA meals do not have to be delivered one or two per day, but can be delivered in multiple units of any reasonable size to participants.

In those cases where the meals would be an additional home-based service, delivery could be incorporated into the existing service network of home health care, visiting nurses, meals-on-wheels, etc. In those cases where participants were receiving no other home-based service, meals could be mailed, or delivered through a volunteer system designed for that purpose. In rural areas where home delivery by volunteer would be impractical, mail delivery would be a viable alternative.

It is likely that no one delivery system will work equally well for all groups. Various systems will need to be tried. However, the advantage of the NASA meal system is that because it is shelf-stable, many kinds of delivery systems can be used. Flexibility is built into the system.

SOCIAL SERVICES—CONFERENCE DISCUSSION

The majority of participants felt that the greatest potential of the meal system within a social service context remained with the elderly. In part, this was a consequence of the professional orientation of many participants: over a third of those attending the conference worked for agencies or programs concerned with services for the aging.

Discussion focused on what role a shelf-stable meal system could play for the aging, and in what situations would the provision of this type of meal service be an appropriate service alternative for the aging.

There was general agreement that the system would be a viable meal service for those elderly who were homebound, and had no other meal services available. "Homebound" can encompass many types of persons, ranging from those who are physically unable to leave

their homes, those that are emotionally unable to leave their homes, those that live in isolated, rural areas and have no access to food programs, to those that live in center city areas and are fearful of venturing out on the streets.

Providing this type of meal system to those elderly unable to participate in other programs would have decided merit. Those elderly who currently are eating inadequate diets would be aided in their health maintenance efforts by receiving one or more balanced meals per day. The link between proper nutrition and health is well-known.

The system has the potential for use as a weekend supplement to five-day congregate and meals-on-wheels programs. The food needs of the elderly are seven-day needs, yet most meals programs only operate for five or fewer days.

The biggest area of concern focused on ability of a shelf-stable food system to incorporate the special diets, and cultural food preferences of many elderly. Can low-sodium, and low-sugar menus be provided, as well as diets that would be acceptable to different ethnic and geographic groups?

There also is a need for greater varieties of food items. The question of using commodity food items available through USDA was raised. Many felt some fresh fruits should also be included, even though the shelf-stability of the food package would be significantly reduced as a result.

Is it appropriate to provide only meals to the elderly without other services as well? Title VII directors indicated that by law, they had to provide auxiliary social, I&R services to all elderly who participated in congregate programs. Some felt the meal by itself was secondary in importance to the social elements present in Title VII programs.

While many questions remained, there was general agreement that the system had potential for use for the elderly. Social service and nutrition project representatives indicated they would like to see the program implemented, particularly on a weekend supplement basis.

The system would also be useful to the elderly as emergency standby meals. One meals-on-wheels director indicated that he was presently using such a concept in his home state—packaging three canned meals for program participants for use when severe weather prevented hot meal deliveries.

Other Groups

The potential of the meals to meet the needs of other groups within the social service context was also discussed, although not in such detail.

The handicapped could benefit from such a program, provided the meals could be adapted to take into account their sometimes severe strength and dexterity restrictions.

Other less obvious populations in need of meals of this kind were also mentioned: migrant workers, Chicanos, Puerto Ricans, Indians, immigrants, Mormons. If the meal system were to be used for any of these groups, it would be important that the system be modified to fit their cultural food and packaging preferences.

The meal system also could be made available to apartment house owners, and to low-income housing projects for distribution to those residents who were temporarily ill. It was suggested that such a distribution program could be administered through HUD.

Food aid has been a traditional church activity, and churches might consider keeping a supply of shelf-stable meals on hand. Keeping a stock of meals at church sites would guarantee that needy persons would have immediate, and ready access to nutritious food. For example, St. Mary's Church in Oakland, California has used a similar system for homebound elderly who have very limited cooking facilities, usually only water and a hot plate. They report the program has been quite successful.

The Meal System as an Outreach Tool

The meal system would be useful as an outreach tool to reach persons who were currently outside the bounds of social service programs. This applied to obvious populations, such as elderly who were receiving few if any services, but also applied to less obvious populations, such as school children who were developing health habits for the future. The meals could be used to draw persons into the social service network. The appeal of food is strong, and universal. Once a service relationship was established through delivery of the meal system, other social service needs could be addressed.

Innovative delivery systems should be devised to make the meals part of a life-long learning system. Schools, and science and health museums were suggested for this purpose. By making the meals available in this way, a strong nutrition education component would be incorporated into the program. The need for nutrition education for all groups who would use the meals was stressed.

INSTITUTIONAL FEEDING PROGRAMS— BACKGROUND PAPER

Introduction

The organizations contacted were from a wide variety of institutions, representing hospitals, schools, nursing homes, prisons, and other facilities. Those groups were asked to comment as to how the meals system might apply to their needs. Of particular interest to the LBJ researchers were three questions: what advantages did the organizations feel the meals system might have, what disadvantages might exist regarding the meals in their present form, and what modifications might make the system more useful?

The NASA system has a number of characteristics that may usefully serve occasional institutional needs. No formal field-testing or research has been conducted on the subject, however. Consequently, opinions vary widely. This paper will present those opinions in two sections.

First, several characteristics of the NASA meal system will be discussed, along with the reactions of various agencies. Second, several possible uses for the meal system, plus agency reactions, will be outlined.

Characteristics of the System

The meal system was developed to meet the needs of the rural elderly. Delivery, storage, packaging, preparation, and nutritive characteristics of the meals could be adapted to meet other groups' needs, and should demand warrant. This section will describe agency reactions to the system's present characteristics. Of particular concern to us is how institutional feeding needs are currently met, and how the NASA meal system would fit into current systems.

Institutional food services vary in some respects. Some, like most schools and colleges, utilize central dining facilities, with limited hours of operation. Others (hospitals, for example) prepare meals centrally and distribute them throughout the facility. Still other institutions (prisons, mental hospitals and schools, and nursing homes) provide both central and dispersed dining. All these facilities have common characteristics: all are mass-feeding situations with the prime considerations being cost, appeal, and nutrition.

Delivery

The NASA meal system, unlike some foods used by institutions, requires no refrigeration and has a relatively low bulk. While several disaster relief organizations felt this would be useful, institutional food services generally believed these characteristics were less advantageous.

The U.S. Department of Agriculture's Food and Nutrition Service, for example, supplies much of the food used by public school lunch programs. Most of these foods are already packaged in shelf-stable form, usually in large (#10) containers.

The NASA freeze-dried foods have a low bulk, since most water is removed prior to shipment. Social services agencies find this useful, especially when using the U.S. mails to deliver small shipments to individuals. International relief agencies also find the meals' low weight attractive, since this could perhaps lower long-distance shipping costs.

For domestic institutions, this is less significant. Procurement by hospitals, schools, prisons, and other institutions is almost always done locally. Shipping costs are consequently less a factor than is the case with international use of mail delivery. The National Bureau of Prisons, in fact, supplies a small portion of its food needs with goods raised within its institutions. Other institutions (Veterans' Administration and most other hospitals are an example) obtain foods from local wholesalers either on a lowest bidder or comparison purchase basis.

Public schools also rely, according to USDA/FNS, on local wholesale purchases. In addition, FNS distribution of bulk surplus commodities (in canned or perishable form) is an important part of most school lunch programs. FNS distributes food through three existing programs (school lunch, price support, and surplus food removal). Transport mechanisms used to collect and deliver these foods usually are by the freight-car load. FNS believes the smaller portions used by the NASA meal system would not fit into this transport system.

Storage

According to institutional users, extended storage is important to them. The American Hospital Association commented that a stockpile of shelf-stable meals

could probably be one of the most effective disaster supply plans for an institution, because the NASA products require less storage space, have a good shelf-life, and are nutritionally adequate. Their use would, however, hinge on a planned water supply.

Humana, Inc. (a private hospital chain) noted that the *Accreditation Manual for Hospitals* published by the Joint Commission on Accreditation of Hospitals in April, 1976 "clearly delineates the responsibilities of hospitals to prepare for the eventuality of external disaster." The Commission interprets the *Manual* as mandating that hospitals maintain a minimum of one week's supply of food. According to Humana, such an

accreditation requirement is relatively new, and NASA-type meals may have considerable application.

A National Bureau of Prisons spokesperson similarly agreed that the meals' shelf stability could be useful in preparing for emergencies. The meal system's costs, however, were thought serious obstacles to its implementation, since the Bureau's facilities typically feed inmates for \$1.50 to \$1.60 per day. Long-term storage of processed foods can involve both extra labor and warehouse costs.

Packaging and Preparation

In its present packaging form, the meal system provides one complete meal per box. Individual food items are opened either by tearing a pouch or pulling off an easy-open can top, then using boiling water, a heated saucepan, or brief refrigeration.

Viewing the meals as easier to prepare than some other forms of food preparation, the U.S. Veterans' Administration commented that individual meals could be issued certain patients on discharge from VA hospitals. Sometimes patients have no one else at home during the day to cook, and have to remain in the VA facility until they themselves are able to prepare meals. The VA feels NASA-type meals may be an alternative. Additionally, noting rapidly rising hospital labor costs, the VA is interested in less labor-intensive meals.

The American Hospital Association noted that in-hospital uses of the meals may be useful. Containers that hold one serving (or up to six servings) have been tested in some hospitals. The hospitals found such containers required too many manhours to open and prepare. Containers holding twenty or more servings may be more economical and useful.

This opinion was typical of several organizations. In most institutions, regularly scheduled mass-feeding is the norm. Individual meal boxes would be cumbersome. USDA noted this is true for most public schools, while the National Bureau of Prisons made a similar observation. For the meals to be included in such meal programs (in a minor role as a supplement or emergency standby), the containers would have to be larger.

Two comments about the meals' packaging, preparation, and intent were made by The Children's Foundation (a private nutrition and social service advocacy group, located in Washington, D.C.). The group noted that over half of the participants in the NASA/LBJ field demonstration "mixed and matched" items from different meals. To the Foundation, this indicated "(1) that the elderly target group was capable of putting together a meal with convenient ingredients already available, and (2) that they weren't altogether satisfied with the NASA meals." In response, the LBJ

School field demonstration report notes that having prepackaged meals to meet everyone's preferences is impossible. The meals are flexible, and different foods can be used.

The Foundation voiced a more fundamental reservation about the NASA meals' style of packaging and preparation. While not directly addressed to institutional applications, their comments question application of this technology to a number of uses:

As you can tell, I'm totally opposed to this outrageous rip-off of taxpayers' money to develop a commercial scam using elderly people as pawns. Whatever value the program may have for the poor and isolated senior citizens not now reached by other programs is minimal when you consider what a cop-out it is to opt for low cost and convenience rather than spend the money to adequately serve those who are not easily served under existing programs.

If all we care about is cost and convenience, why don't we feed 'em pills—multivitamins, soy tablets, kelp pills, lecithin, etc. Better yet, why not feed 'em intravenously—they wouldn't have to lift a finger and no one would complain about the taste. I can see it all now: we'll hook Granny up to machines, and she won't have to bother being self-sufficient. Why, the space-age takes care of everything.

Taste and Appearance

The Citizens for Better Care Institute, a Detroit research group involved in nursing home planning, wrote us that dietary complaints are the third largest patient complaint category in Michigan. Cold food, unappetizing food, insufficient food, and special diets not followed were among the most frequent dietary complaints. A CBC representative felt that

Implementation of the NASA Meals System into institutions such as nursing homes could be particularly beneficial in assisting these institutions in providing shelf-stable meals that are palatable, nutritious and conveniently managed.

HEW spokespersons commented that deficiencies do exist in some hospital and nursing home programs, but the NASA system may not automatically solve those problems. A representative of HEW's Health Service Administration (responsible for hospital and nursing home nutrition) felt that these meals may differ from home cooking:

The hospitalized patient and the aged and handicapped sitting at home are captive audiences who must be provided a sense of security. Familiarity of foods satisfies a partial need for their general well-being. Freeze-dried foods are new to them and a degree of skepticism and apprehensiveness can be present.

A representative of the American Hospitals Association, who sampled NASA foods in 1975, found that "the quality and variety of these foods was certainly acceptable." Another nutritionist, from the non-profit Nutrition Today Society, agreed that user acceptance is of primary importance. Implying that the best way to measure acceptance is to test-serve the foods institutionally, the nutritionist only semi-facetiously suggested that such tests weigh the food people leave on their plates.

Possible Institutional Uses of the NASA Meal System

Several possible uses were discussed with numerous institutions and organizations. These uses involve limited staffing periods, emergencies, overcrowding, staff use, and field trips.

Late Dining

Concerning hospitals and nursing homes, Humana, the AHA, and two nursing home associations felt that in some facilities the NASA meals could provide meals or snacks. Because of anorexia, late arrival, or clinical tests, patients occasionally miss meals. These groups indicated a reserve of NASA-type meals, perhaps in larger portions, may be useful for late feeding and limited staff periods (weekends and holidays).

The National Bureau of Prisons noted that in theory the meals could be useful for such contingencies. Cost, however, is their major concern. Given the meals were cost-competitive, the meals could be useful. The Bureau doubts such cost-competitiveness is possible. Additionally, the Bureau is concerned that access to late meals could create security problems.

Emergencies

Concerning emergency uses for the meals (power failure, staff strike, isolation due to weather), hospitals and nursing homes have generally reacted with interest. As mentioned earlier, new accreditation standards for hospitals require provision for emergencies. Again, the prime concern is cost. Several health-related institutions and groups indicated their desire for such meals would be contingent on cost-comparisons done for each specific facility.

As is the case with hospitals and nursing homes, prisons obviously cannot send their residents home during emergencies (unlike public schools). All of these groups did agree that emergency meals back-up is desirable. Cost-comparison data would be important to these groups in deciding whether the NASA meal system would play even a small role.

Overcrowding

Occasionally, various institutions become temporarily overcrowded. Hospitals receive victims of flu outbreaks, while public schools may shelter victims of natural disasters. The hospital groups listed earlier, plus disaster relief groups (the Red Cross and Salvation Army) feel that the NASA single-serving containers are usually inappropriate for such mass-feeding instances. As suggested by the AHA, larger containers and packages could have possible application as a stored reserve food supply. The National Bureau of Prisons, by contrast, thought cost problems would outweigh the benefits of maintaining such a reserve.

Staff Use

To most of the institutions and groups that responded, staff feeding is, at most, a secondary concern. We asked a number of institutions if they make any provision for the feeding of night, weekend, and holiday personnel. In most cases, the staff is expected to use vending machines or provide their own bag lunch. This is a general policy of the National Bureau of Prisons.

In many facilities (particularly hospitals and public day schools) staff members have access to cafeteria facilities during the daytime. Night feeding is not a problem for public schools, while hospital groups did not mention the feeding of evening staff as a major concern.

Field Trips

Most of the institutions surveyed (with the exception of hospitals) occasionally take members on field trips or work details. One state training school mentioned that modified NASA-type meals might be useful during such field trips (athletic events in particular). Other groups likely to conduct field trips (day schools in particular) were skeptical that a NASA-type meal would be as cheap or as easy to prepare as an old-fashioned, brown-bag lunch.

Whether any of these possible applications of the meal system will become reality is uncertain. Given the amount of food institutions currently prepare, even a small percent represents a large number of meals. As Humana, Inc. notes,

Should tests of your product in health care institutions prove successful, the shelf-stable meal might conceivably have valid applications in our facilities. We expect to serve over 8 million meals in fiscal year 1977. Even a relatively minor role in such a large program might be significant in terms of meals required.

Questions for Discussion:

1. Under what circumstances might the NASA meals be useful in institutional settings?
2. Would individual meal boxes require too many manhours to open and prepare? What other problems might be encountered? What advantages?
3. What modifications in the NASA meals would make them better suited to meet institutional needs?

INSTITUTIONAL FEEDING PROGRAMS— CONFERENCE DISCUSSION

Conference participants also considered the potential of the NASA meal system to meet some of the food needs in institution settings. Discussion focused for the most part upon health care settings.

There was general agreement that the meal system in its present design would be impractical for general use in health care institutions because of the number of hands needed to open individual food packages. As it stands, the system is too labor-intensive. Hospitals presently use large, institutional size cans for meal preparation, and this practice is functional considering the great number of meals that need to be served. A switch from large-size containers to single-serving size containers would be counter-productive.

However, the meals might be useful as standby meals for late arrivals, those returning to the hospital after furloughs, and for those who must fast for certain lab tests and in doing so, miss their regularly scheduled meals.

The meals might be used to replace the current method of storing emergency supplies of food in hospital settings. Even under emergency situations, preparation of the meals could be accomplished, since accredited hospitals must have a backup supply of water, and some means of generating their own power. In this regard, it was brought out that if absolutely necessary, food items could be eaten as is from the can or freeze-dry packet without heating or reconstitution.

Within health care settings, the greatest potential for use of the meal system lay in the areas of patient discharge planning, convalescent care, and home health care. Consuming nutritious meals is particularly important for those individuals who have undergone surgical procedures, or have been ill. Yet practical circumstances sometimes make it difficult for these persons to obtain nutritious food at home: the convalescent may live alone; or if the convalescent has a spouse or children, the work associated with taking care of the recovering patient may leave little time to shop or prepare nutritious meals.

Meals could be provided for convalescing patients in a variety of ways. For example, the VA operates a home health program, providing direct care by its own team in the patient's home. The families (usually the elderly spouse) are taught how to care for the patient. Without this program, the patient would usually have to be hospitalized. When legislation permits, the VA is interested in making a shelf-stable meal system available for use in the home health care program. The meals would be provided for both the patient and the spouse, and delivered by members of the VA home health team.

The VA also contemplates using the meals in other health care settings, such as outpatient clinics, personal care homes, and in institutions where veterans are receiving social rehabilitation, and are being reoriented to living independently. In all these instances, the meal system would fit into the VA's program of nutritional maintenance and preventive care.

Some rough idea of numbers of potential users within the VA was presented. At this date, there are 29½ million living veterans, and 3½ million veterans over 65. By the end of this century, there will be 7 million veterans over 65. Approximately 78,000 veterans are treated in VA hospitals on any one day. Another 25,000 are in nursing homes and receiving health services. Approximately 9,000 veterans are in domiciliary programs for social rehabilitation. It is from these groups of veterans that potential users of the meal system would come. The VA definitely feels that they have a population that the meals could benefit. For example, it is estimated that 1,000 of the VA's nursing home patients could be at home if they could provide some sort of meals for themselves.

The VA is representative of the general population, and their problems are similar. Thus, if the meal system has a potential for use within the VA health care program, it has a similar potential for use within other health care programs, both public and private. For example, the meal system could be given to patients at the time of their discharge from hospitals as an aid to their convalescence. Presently, there are 933,000 Americans in convalescent care institutions. Some portion of that number could probably be at home if their meal needs could be met in a satisfactory manner.

There was general agreement that the meal system would not be effective for use in school lunch programs for the same reasons it would not be effective for general use in hospitals. The unit cost per meal per child would be too high if single-serving meals were used. Most schools operate cafeterias and prepare meals in bulk using institutional-size cans and surplus commodities made available from the USDA.

DISASTER RELIEF AND INTERNATIONAL AID— BACKGROUND PAPER

The meal system has several characteristics that may be of value in a variety of famine and emergency situations. It must be realized, however, that the meal system was not designed as a major food source for famine or emergency situations. But the NASA meal system might be useful as a supplementary tool, perhaps serving specialized needs. In this section of the paper, several characteristics of the system will be discussed with regard to how each characteristic relates to famine and emergency situations. These characteristics include economics, transport, and delivery; storage; packaging and preparation; plus appearance, taste, and nutritional content. Since potential domestic and international applications are somewhat different, each section will discuss these two separately.

Disaster Relief and Emergency Agencies

Domestically, extended famine relief is not a concern. With regard to domestic disaster and emergency relief, three characteristics stand out. First, in any type of emergency, food is almost always procured locally. Second, such procurement is usually done in bulk quantities, preferably in large containers. Third, responsibility for meeting food needs is dispersed among several agencies.

The severe flooding that occurred in Wilkes-Barre, Pennsylvania in 1973 is an example of all three. Following Hurricane Agnes, these floods left an estimated 100,000 people homeless for thirteen days. Finding bulk food supplies locally was not an insurmountable problem, even though the need was on a very large scale.

The third characteristic of domestic emergency food assistance, dispersed responsibility, proved a more difficult problem. In the Wilkes-Barre case, the U.S. Department of Agriculture's Food and Nutrition Service had lead responsibility and found supplies quickly. Several other agencies were involved in purchasing, transporting, and distributing the food supplies. Coordination of these various agencies became a problem.

In 1970, President Nixon dissolved the Office of Emergency Preparedness, and transferred its duties to several existing agencies. As a consequence, many agencies have partial responsibility to deal with domestic disaster and emergency food relief. The following table gives a partial breakdown of these responsibilities:

Agency

U.S. Department of Agriculture
(Food and Nutrition Service)

U.S. Department of Housing and Urban Development
(Federal Disaster Assistance Administration)

U.S. General Services Administration
(Federal Preparedness Agency)

U.S. Department of Commerce
(National Atmospheric and Oceanic Administration)

U.S. Department of Defense
(Defense Civil Preparedness Agency)

Representatives of some of these agencies remarked that division of responsibility made coordinated disaster response increasingly difficult.

A number of private, voluntary agencies are also involved in disaster food relief. These agencies include the American National Red Cross, the Salvation Army, the National Catholic Disaster Relief Committee, and many others.

Agency

U.S. State Department (Agency for International Development), Washington, D.C.

United Nations (Food and Agriculture Organization) Rome, Italy

International Civil Defense Organization, Geneva, Switzerland

Church World Service, New York City

League for International Food Education, Washington, D.C.

CARE, Inc., New York City

Economics

The NASA meal system uses sophisticated processing and packaging techniques. Compared to bulk foodstuffs, the NASA meals system will not be economically competitive in the foreseeable future. Surplus commodities, purchased by USDA to maintain domestic price

Food-Related Activities

Distribution of surplus commodities and school lunch supplies; distribution of food stamps.

Coordinates response of other Federal agencies regarding emergency food supply.

Coordinates advance planning of other Federal emergency agencies; food supply planning for post-nuclear attack period.

Emergency preparedness planning assistance to state and local officials; publishes food stockpiling suggestions for the general public.

Fallout shelter food supply.

Several agencies are involved in overseas food supply. Some emphasize disaster and emergency supply, while others are involved in famine relief as well: (See following table.)

These are only partial listings, intended to show the variety of agencies involved in this work.

Food-Related Activities

Famine and disaster food supply; maternal and child nutrition; technology transfer; coordination of food donations.

Distributes food donated for disaster and famine relief.

Food stockpiling for disaster relief.

Distributes foods donated for disaster relief.

Technical research.

Distributes foods donated for disaster and famine relief.

support levels, are a source of free foodstuffs to many relief agencies. CARE, Inc., FAO, and Church World Services are a few examples. For them, only packaging and shipping costs are involved. The NASA meals system and similar options would be far more expensive, CARE and other groups noted.

For other, more specialized uses (stockpiling, for example), the NASA meal system may be more viable. The International Civil Defense Organization, as well as Church World Services, suggested these specialized uses, despite their higher cost, may be worth further research.

The total cost for the NASA meals currently ranges from a maximum of \$5.80 to a minimum of \$2.45 per meal, with an average cost of \$3.05. These figures include research costs incurred under demonstration conditions. Subject to FDA approval, modified packaging could be implemented. The FDA recently approved certain modifications in the meal system's packaging, which could reduce the average cost to \$2.17. (These figures all include meal costs and delivery costs.) Mass production or larger containers could also reduce costs.

Transport

The transport characteristics of the meals might be useful (logistically and economically) for certain emergency conditions. The meals require no refrigeration during transport. Expenditures for temperature control equipment and energy are unnecessary. Prolonged exposure to temperatures above 70°F can, however, reduce the meals' shelf-life.

We asked whether the meals' relatively durable and compact nature would have any transport advantages over other packaging. Lower weight per meal, compared to some other food supplies, was another consideration.

The Federal Disaster Assistance Administration was skeptical that the transport characteristics of the meal system would be an advantage. The meal system's capability of being transported long distances without temperature control was of little appeal to them. Since almost all emergencies are localized and temporary, FDAA feels present retail, wholesale, and governmental networks are comprehensive enough to handle any situation.

In extreme situations, involving geographic isolation of victims, airdropping the meal system might be considered, but such situations are very rare. In 1958, a Red Cross airdrop fed 10,000 people for thirty days. Canned goods and other durably packaged foodstuffs were distributed, where an unexpectedly severe blizzard in Virginia and North Carolina isolated many from regular food supply networks. A Red Cross spokesperson suggested that NASA style meals, perhaps in larger containers, could be useful in such rare situations.

For international relief situations, the Agency for International Development (AID) of the U.S. Department of State is interested in possible shipping cost savings. Since most water is removed from the freeze-dried foodstuffs, the meals' relatively low weight and small size may mean lower shipping costs. AID stressed

the importance of this, since long distance shipping is expensive.

Storage

In its current form, the meal system has a guaranteed shelf-life of two years (at 70°F). Actual shelf-life is much longer. As part of our research, we asked emergency and disaster relief agencies how important this might be to their activities. Would central, regional, or local stockpiles of the meals be useful in planning for emergencies and famines?

Responses varied widely. In the 1950s and early 1960s, shelf-stable foods were stored as part of emergency planning. For example, the Defense Civil Preparedness Agency, Department of Defense, from 1962 to 1964 stocked fallout shelters with a total of 318 million pounds of cereal biscuit survival rations, packed in sealed five-gallon tins. Recently, the Agency has begun disposing of the rations, and has no plans to restock the shelters. The decreasing emphasis by private citizens and the federal government on fallout shelters has all but ended food stockpiling for nuclear emergencies.

The General Services Agency, Emergency Preparedness Branch, is continuing such stockpiling, however. The Branch has procured limited amounts of shelf-stable foods in number ten (institutional size) cans from Oregon Freeze Dry Foods, Inc. According to that manufacturer, a ten-day feeding cycle would include eggs with bacon, pork chops, coffee, cocoa, beef almondine, chicken salad, apples, and other foods.

Currently, the manufacturer is conducting a ten-year storage test, while the U.S. Army Food Development Center (Natick, Massachusetts) is in the midst of a seven-year test. In both cases, the expectation is that the foods will be in excellent condition at tests' end. According to the manufacturer:

Freeze drying is the most delicate method of drying and, therefore, produces a superior product. This superiority carries through the life of the product.

This is based on the assumption that the product is packaged properly and not mishandled so as to allow oxygen to reach the product . . . the #10 can can stand a lot more abuse than a flexible foil laminated pouch. Our oxygen levels in the #10 cans are well below one percent.

Also, storage temperatures will affect the keeping qualities. Chemists use a rule of thumb that a change in temperature of 18°F to a 100°F will halve the time of the reaction. All foods are chemicals and, therefore, you will have a more palatable product if it is stored at a reasonable temperature.

The foods and processes used are very similar to the NASA system's.

Two other agencies note that stockpiling by individuals or local groups may be practical. In areas where risk of natural disaster is high (hurricane, tornado, earthquake), the Commerce Department's National Oceanic and Atmospheric Administration (NOAA) suggests that a family stockpile may be practical. NOAA has outlined a diet of canned, freeze-dried, and/or dehydrated foods available from supermarkets and sporting-goods stores. The National Catholic Disaster Relief Committee has recommended that member churches think about similar stockpiles.

Negative comments regarding stockpiling mentioned the reliance of disaster relief groups on local procurement and perishable foods. The FDAA, the Salvation Army, Red Cross, and other groups usually procure foods from USDA (tapping local school lunch stockpiles) or local wholesalers and retailers.

Regarding international disaster and famine relief, other organizations have suggested shelf-stable foods may be suitable for stockpiling. The International Civil Defense Organization, headquartered in Geneva, Switzerland, notes that civil defense agencies in several Western European nations maintain stocks of packeted shelf-stable foods. The supplies are intended for relief operations in case of war. AID officials, meanwhile, think that regional stockpiles overseas might be useful. For about 48 hours after a disaster, food is often in short supply, particularly in isolated areas. Shelf-stable meals from local stockpiles, AID suggests, could buy time until other food relief arrives. Again, cost and packaging are important considerations.

Agencies, such as CARE and AID handle mostly bulk quantities of perishable goods. Widespread famines usually require such large quantities. AID, in coordination with voluntary agencies (CARE, Catholic Relief Services, Church World Services, and Lutheran World Relief) distributes Food for Peace Commodities. Such surplus foodstuffs (milk powder, grain, corn) are highly desired by many third-world nations, and AID suggests shelf-stable stockpiles may be useful as supplements to these bulk supplies.

Packaging and Preparation

Shelf-stable foods were used under extreme conditions in 1973, when Hurricane Agnes and subsequent flooding left 100,000 Wilkes-Barre, Pennsylvania residents homeless for thirteen days. USDA used canned goods available from school lunch programs, plus K-rations obtained from the Defense Department. These foods required no cooking or refrigeration, an important consideration in an area of severe electric and water shortages.

The USDA/FNS official who coordinated food supply and preparation in Wilkes-Barre felt the NASA system merits further study. Individual containers may be appropriate for only very special circumstances (such as for mobile rescue workers), while larger containers may have greater applications.

The problem, as the FNS spokesman put it, is that no two disasters are alike. Every meal mechanism has certain advantages and drawbacks, each varying with the specific situation. According to FNS, if the NASA meal system were to be considered in contingency planning, it would be as one of many food supply tools available. Different situations require different tools.

For example, availability of electricity and water supplies vary for each situation. While not designed for such use, if necessary, every element of the meal system can be eaten without heating or reconstituting. In the Wilkes-Barre situation, water was available (via Army trucks), but electricity and firewood were not. The point emphasized by FNS is that access to a variety of meal types can give on-scene personnel greater flexibility in meeting nutritional needs.

Some other agencies were skeptical about the usefulness of individually-packed meals, regarding disaster and famine relief. FDAA, the Red Cross, CARE, and the World Food Program (UN/FAO) deal almost exclusively with mass-feeding situations. These agencies prefer bags of raw foodstuffs or large containers.

FDAA, in particular, felt the only innovation of the NASA system was individualized packaging: they felt this held no advantage over existing foods. FDAA felt that larger-sized containers would simply duplicate already-existing supplies. In sum, FDAA believes that packaging is the NASA system's only innovation, and has no applicability to FDAA activities.

Two agencies frequently involved with international relief responded with some interest. Church World Services of New York believes individually-packaged meals would not be appropriate for the situations they deal with. Most of their work involves distribution of bulk U.S. surplus commodities overseas, but they are "very interested in exploring the use of freeze-dried foods in this whole area of disaster response and in normal programming." The AID response was similar. Neither agency plans to use the NASA meal system in the immediate future, but representatives of both informally suggest that, with modifications, the system may have use in certain circumstances.

Appearance, Taste, and Nutritional Content

Each meal was designed to meet at least one-third of the daily recommended dietary allowance for males fifty-one years of age and older. No special menus were developed for individuals with health-related dietary

restrictions or those who prefer traditional ethnic foods, although it would be technically easy to design such meals.

Responses from agencies contacted suggest that some overseas users would have difficulty with present appearances and tastes of the foods. Officials at CARE, for example, felt the present NASA meals' North American orientation would be unpopular among third world populations. Many of these people presently receive CARE-distributed rice, beans, and other staples. The NASA meal concept is flexible enough to accommodate such foods.

Overseas agencies have used processed foods. The FAO World Food Program often purchases stable foods in bulk (preferably from developing countries), but they do handle blended "special protein foods" from the U.S. Corn soya milk, corn soy fortified soya mix, wheat soya blend, and soy fortified sorghum grits have all been occasionally used for disaster or famine relief. Some of these foods were in shelf-stable form. FAO was unsure how the NASA meal system would fit into these activities, but they did suspect such foods "may not be readily acceptable to the people in many of the areas which are usually disaster prone."

The Agency for International Development has expressed interest in adaptations of the meal system concept for disaster relief. Of even greater concern to them are the potential benefits of the meals system concept for maternal and child nutrition overseas. Whether due to famine, war, or natural disaster, child malnutrition is, according to AID, currently the major nutritional concern of developing countries. Young children in poorer countries often lack weaning foods and develop low resistance to disease. Milk powder is badly needed, but is scarce and expensive.

Although details have not been discussed, AID did feel that variations of the meals concept may be worthy of further study and possible implementation. Currently available meals systems, relying on bulk shipments of raw foodstuffs, are frequently inappropriate for the special needs of very young children. Such foods are perishable, difficult to transport to isolated areas, and less useful for child nutrition.

The NASA meal system uses processing technology both more expensive and more sophisticated than most other feeding methods. Interestingly, AID thinks this sophistication may be an advantage. To provide high protein and other nutritious foods to young children, processing and packaging concepts from the NASA system could be adapted to meet the needs of specific countries. The technology involved could be useful to developing nations, by letting those nations *themselves* process the foodstuffs.

Suggesting a high level of technology transfer, AID hypothesizes U.S. public and private agencies could

teach shelf-stable food processing techniques to developing countries. The goals could be multiple: host countries could develop indigenous raw materials, process the materials themselves, and use the results for their own needs. For example, milk could be processed into shelf-stable milk powder and used as a weaning food. In addition to meeting nutritional needs, the host country would be developing an internal industrial base as well.

AID suggests that perhaps one or two dozen countries could handle the technology involved, and use processed foods to counter domestic disasters or famines. Bangladesh and India are examples. Brazil is another, since it has occasional need for such foods (due to floods and droughts), and has the resources to meet these needs (capital, technology, manpower). Central American nations, having a somewhat common diet, could conceivably share regionalized facilities. Such programs could help these nations develop their own food processing industries. The concept involved in the NASA meals system would, of course, be only a small part of this.

To summarize, most agencies feel the meal system in its present form has little value to famine or emergency relief. Several agencies suggested, however, that adaptations of the meal system may have a number of potential applications. For overseas famine relief and child nutrition, such adaptations may be useful supplements to existing supplies. For domestic emergencies, adaptations of the meal system may be a backup in some situations.

Questions for Discussion:

1. In what disaster situations might individual meal packages be useful as a supplement to other food supplies?
2. In what famine relief situations might individual meal packages be useful?
3. How might the NASA meals be integrated into existing disaster and famine relief distribution and delivery systems? What advantages would the NASA system have? What problems?

DISASTER RELIEF AND INTERNATIONAL AID—CONFERENCE DISCUSSION

Does the NASA meal system have potential for use in areas of disaster and emergency relief and international aid? What elements of the system make it appropriate for use under these conditions? What elements of the system mitigate against its use?

No two disasters are alike, and the food needs of those in disaster situations can be very different. For this reason the flexibility of having different types of food

and food packages available is preferable. The NASA meal system allows for this flexibility. For example, often on the first days of a disaster, there are logistic problems associated with general food relief efforts—roads and bridges can be out, preventing the transport of food supplies to the site. It may also be extremely difficult to establish field kitchens in the general confusion of the disaster. For these situations, NASA meals could be airdropped into the disaster areas. Even if electricity and water supplies were not available, all food items could be eaten without heating or reconstitution.

Disasters and emergencies need not be on a large scale. Tornadoes may flatten only two or three houses; a fire might damage one or two houses. Whatever the scale, food relief must be provided to the families in need. In these situations, mass feeding through field kitchens is not necessary. What is needed is an easily manageable food supply system, such as that found in the NASA meal system. If supplies of meals were stockpiled at local and regional centers, such as the Red Cross, they could be quickly transported to families in time of need.

The biggest problem in use of NASA-type meals in emergency relief situations is with the present pattern of food availability and food procurement. At present, food supplies used in relief efforts are often "pulled" from existing food sources, such as the School Lunch Program or Army rations. The problem is one of getting the shelf-stable meal system into the stream of availability from which it can be pulled in disaster relief efforts. In the case of the School Lunch Program, this would mean that supplies of meals would need to be on hand for potential use of field trips, away from school functions, or emergency use in the school. Once the meals were procured by schools, they would then be available for non-school purposes, such as local or regional disaster relief.

The meals could also be used in international aid efforts and would be a good tool to have on hand when dealing with climate changes, child nutrition programs, and famine relief. If used for international relief, the meals would have to be adapted to meet local cultural preferences, both in terms of food and food packaging.

The logistics of developing shelf-stable meals acceptable to many different cultural groups could prove very difficult, and expensive. Economies of scale necessary for economical production of the meals would be hard to maintain if acceptability of the products depended upon the availability of many different types of diets.

While cost considerations will impact the potential for use in disaster and emergency relief situations, the unique aspects of the system could mitigate against decisions made solely on a cost basis.

THE ROLE OF INDUSTRY—BACKGROUND PAPER

The interest of the food industry in the concept of a shelf-stable meal system is vital if it is to become a reality. Efforts were made by the LBJ School to determine the degree of interest of the food industry, as well as how it viewed the need for and marketability of such a system. Letters were sent to over 100 food companies and over 30 trade associations. We also had the benefit of several personal discussions with industry representatives. Responses were varied and interesting.

This section will present an overview of the meal system from a commercial perspective, specific comments from some food companies, and a quick look at what has already been done.

The NASA shelf-stable meal system is simple in concept, yet not so simple that it is readily available to those who want it. Convenience foods have been appearing for the last 20 years. Ideas for convenience foods have closely paralleled the NASA Meal System—it is surprising that the system was not developed earlier. For instance, potato flakes and hot milk make mashed potatoes. Single-serving cans contain everything from tuna fish to fruit cocktail and Campbell's Soup. Single-serving meals exist in frozen form.

The NASA meal system simply draws on many of the best characteristics of convenience foods. It draws on the ease of preparation—the time-saving aspects most obviously. It saves time otherwise needed for shopping and menu planning, while ensuring a balanced meal. It can be stored without refrigeration, thus saving electricity and valuable freezer space, and transported in a number of ways—U.S. Mail, airdrop, truck, volunteer delivery, etc.

The question arises: Why wasn't the system developed prior to the NASA/LBJ School Project? The most obvious reasons are: (1) production costs; (2) distribution problems; and, (3) identification of the market.

- (1) Production costs include food processing, primary packaging, secondary packaging, and meal assembly. The following are some examples of the costs: (a) Small packages require more material per item and thus cost proportionately more. (b) The meal box cannot be as simple as an aluminum tray for frozen meals unless every item in each menu is uniform. Even then, the meal box would have to protect several heavy items. (c) The food industry does not appear to be equipped to combine various food items into meal units by machine. (d) Secondary packaging is an expense not incurred in the sale of individual items.
- (2) The retail grocery market may not be the

appropriate outlet for the meal system, so new distribution systems may need to be developed. Whatever the case, the more complicated the system, the more expensive the meals become.

- (3) Production of the meal system is not a simple matter, as the costs indicate, and thus not something food industries are likely to pursue without a well-defined market. Prior to the development of the NASA meal system, the market for shelf-stable meals consisted primarily of campers and the Army. Some companies were concerned with the food needs of the elderly—a rapidly growing group—but had not successfully developed a line of products especially for the elderly. A few companies actually had been toying with the notion of shelf-stable meals, but the needed research and marketing studies would have put production into the 1980s.

Industry responses ranged from "... it looks to me like another government program that spends money that the government does not have." to "There definitely is a place for the products you have developed..." However, two main trends appeared in the industry responses.

The first was that the commercial risk involved in production of a system for a limited market was too great for industry to assume alone. Somehow government would have to underwrite the risk and guarantee a market, or obtain the meals through direct government procurement.

The second position was that if the market for the meal system can be shown to be of reasonable size, production of the meal system is just a matter of time. Of particular interest to several companies is the potential of a system consisting primarily of flex pouch items, since they are lighter, less bulky, easier to open, and of better quality than canned foods.

C. W. Cook, of General Foods Corp., cautioned that careful research is needed, because "consumer behavior can be unpredictable and can result in a good technical approach being a commercial, or even a social, failure." His message was obviously in the minds of many who wrote to us. But, though cautious, most were very interested in the potential of the system, particularly if it reached the elderly. One man said, "We do have a considerable interest in providing nutritious foods for the U.S. consumers, and with the growing number of elderly, this problem and opportunity takes on added importance."

The meal system demonstration prompted more than interest in two cases. Oregon Freeze Dry Foods, Inc. recently developed its own five menu system—"Easy Meal", for use by elderly or confined people. They sup-

plied all of the freeze-dried items for the NASA demonstration—some of which are now being used in their five menus. The meals are for sale at \$1.65 per meal, in cases of 12, by ordering directly from Oregon Freeze Dry Foods. Government agencies and charitable organizations may deduct 5 percent from the list price.

Colonel Jack Sable, a human resources management consultant, is forming a non-profit corporation, Skylab Foods, Inc., to procure and assemble foods for a seven-day menu plan. He hopes to eventually have a system consisting entirely of flex-pouch food items.

THE ROLE OF INDUSTRY— CONFERENCE DISCUSSION

The meal system concept developed by NASA will survive only if industry finds it commercially attractive. Production hinges upon a ready market. Does that market exist? The first step is to identify as comprehensively as possible the demand for shelf-stable meals. What existing meals programs would be interested in using a packaged meal on a full- or part-time basis? What social service programs, presently not providing a meal component, would be interested in widening their scope to include meals? What disaster relief organizations would be interested in purchasing a supply of shelf-stable meals for standby use? What hospitals? What home health services?

Identifying the demand for the meals can be done in several ways. First of all, a number of individuals and agencies have already contacted NASA and the LBJ School to indicate their interest in obtaining shelf-stable meals for use in their areas. Requests of this kind usually have followed receipt of project information, such as progress reports and the final report. The June, 1976 article about the meal system which appeared in *Parade Magazine* also prompted letters of interest, and requests for information about where meals could be purchased.

While a "write-in" campaign does provide some information about the extent of interest in the meal system, a more systematic investigation process needs to be undertaken. Letters should be written to public and private programs providing meals for the elderly, public, and private agencies and organizations providing social services for the handicapped, the poor, the retarded, etc., disaster and emergency relief organizations, hospitals, home health agencies, and other potential users of the meals to ascertain the number of meals they would consider purchasing and at what price. Potential users also need to make known the *kinds* of meals they want to use, e.g., special diet meals, ethnic meals. Once this information is available, it should be compiled in a directory of needs and published.

A companion directory, listing manufacturers' pro-

ducts that are presently available for single-serving meals, should also be compiled. Industrial representatives indicated that food supplies are available for immediate use. For example, Oregon Freeze Dry is producing the Easy Meal System, and has production capabilities to provide 100,000 people with two meals a week. Supplies of single-serving canned products are also available and are being used in vending machines. Such canned products can be obtained through institutional wholesalers for use in meal programs.

Many possibilities for local applications of a shelf-stable meal system exist. Individual communities need to assess their particular needs, and adapt the system to meet those needs. For example, they can approach food suppliers and ask for their assistance in procuring and packaging meals. Efforts of this kind can make use of food items presently available.

Local efforts of this type to obtain a shelf-stable meal package may result in not one meal system, but many meal systems. Decentralized procurement will probably not allow for large production and the economies of scale necessary to bring down the unit price of special order food items. However, local efforts can and should be immediately undertaken while the planning and organization necessary to produce a national meal system gets underway.

CHAPTER V

EXPLORING POSSIBLE ACTION

One of the central goals of the Meal System Conference was to critically assess the future of the meal system, and to offer suggestions about possible courses of action that could be taken to implement the system on a wider basis. Discussion followed several lines. A central concern was whether future demonstration programs were in order, and how they should differ from the 1976 Texas demonstration. Participants offered detailed suggestions for food, design, and delivery changes that should be considered in any future programs.

Participants also considered funding alternatives for future programs. Would such programs be dependent upon the passage of new federal legislation, such as S. 519, or could the program be funded through current appropriations, such as Title VII or Title XX? What private sources might be used? The issue of funding was thought to be one of the most crucial determinants of program survival.

Another key issue concerned industry's response to the needs for shelf-stable meals. If funds were available for the purchase of meals, how would user groups communicate their needs to the food industry? Would industry be willing to assist communities in establishing programs?

And finally, conference participants considered what steps should be taken to bring about a shelf-stable meal program. Throughout the meeting, calls for input, action and organization were made. In the final session, participants responded to these calls with the formation of a Task Force to oversee and coordinate future developments. What can the Task Force do to hasten the implementation of the meal system for groups in need? Will national or grassroots efforts prove more successful?

These topics will be addressed in the sections which follow.

FUTURE DEMONSTRATION NEEDS

There was widespread agreement that future demonstrations of the meal system were in order. While the 1976 Texas program was successful, many unanswered questions remain concerning the nutritional balance of

the meals, the optimum delivery system, and the relationship of the NASA meal system to other social service programs. Participants also felt that any future demonstrations should be independently evaluated by an agency or organization that took no part in the demonstration, citing the need to keep evaluative and research roles separate. It was realized, however, that participants in demonstrations may not respond favorably to contacts with numerous evaluations staff.

To which groups should future programs be targeted? The consensus was that the groups most in need of such a program are the homebound elderly and the homebound handicapped whose food needs are not currently being met by existing programs. There was agreement that "homebound" should be broadly interpreted to include those persons who are physically unable to leave their homes, those who are emotionally unable to leave their homes, and those who live in extremely isolated areas and have no other programs available to them. Whenever possible, the spouses of homebound persons should also be allowed to participate in the program.

Participants considered desired changes which should be made in the meal system for future demonstrations. Specific suggestions were made concerning alterations in meal design and meal delivery, which would make the system nutritionally more sound and better able to meet the varied needs of potential user groups.

Meal Design

Participants felt that future demonstrations should utilize a broader array of foods. There was general agreement that the 1976 menus were too narrow in composition. Nutritionists stressed that more variety was necessary in food texture, food color, and food items. Consideration should be given to including fresh fruits, bread, margarine, and commodity food items, even though such items would eliminate the shelf stability of the meal packages. It is important that the food package not only provide nutritionally sound meals, but also serve to educate the consumers.

The 1976 demonstration found that participants mixed and matched food items from different packages.

Participants suggested that the system should be designed to ensure that mixing and matching does not interfere with the proper nutritional balance of the meals. For example, consideration should be given to color coding food items in such a way that participants will be able to choose food items of five different colors and obtain a balanced meal. Food items in one color could be nutritionally interchangeable with another item of that same color. Such a color coding system would provide for greater menu flexibility on the part of food users, while also assuring nutritional balance.

The suggestion was made that the basic nutritional component of each food item in the package should be labeled, as well as the caloric content of each item. Such labeling will strengthen the educational component of the meal system. Participants should be encouraged to read the content labels to better acquaint themselves with the elements found in food.

The question of special medical diet menus was raised repeatedly. Participants felt that careful research was necessary to determine the number of special diet meals that might be necessary in future demonstrations. It was brought out that in Louisville, Kentucky, 48 percent of the meals that are served to homebound elderly are special diet meals.

General concern was also voiced about the level of sodium in the present NASA meal system, and whether it was low enough for those on a restricted sodium diet. No sodium breakdown is available on the 21 menu cycle. A recommendation was made that the level of sodium per meal in future programs be no more than 2 grams, even for diet meals. This recommendation follows from medical findings that excessive salt intake is particularly harmful to the health of the elderly. It must be kept in mind, however, that adding salt at home cannot be controlled and should not be attempted except under medical instructions.

The question of ethnic diets was also raised. Can ethnic diets be developed and economically produced for future programs? To what extent will user acceptability of a shelf-stable meal package depend upon the availability of familiar ethnic, or regional foods? It was brought out that Mexican-Americans who participated in the Texas program did not find the lack of ethnic food a barrier to their enjoyment of the meal system. In most cases, they added additional ingredients or spices to make the meals approximate their normal preferences. If special ethnic diet meals cannot be produced economically, participants in future demonstrations can be encouraged to "doctor" the meals in this way.

Future programs might wish to consider using surplus food items distributed through the USDA. Twenty-one items are currently available, many of which are shelf-stable. Mr. del Castillo of the USDA stressed that

surplus items can be packaged in a variety of ways, not necessarily in bulk. Surplus items have been used in Title VII congregate programs since their inception.

Another food item available through USDA is a fortified, dried milk. When reconstituted with 10 ounces of water, it provides 1/6 RDA for persons 55 and older. AOA has been using this product in elderly feeding programs.

Participants also considered the question of packaging options for future demonstrations. Since assembly and packaging of the individual food items into a meal unit proved to be an expensive part of the 1976 demonstration, future programs might consider using elderly congregate meal participants to package and assemble meals for the homebound elderly. If local efforts of this kind were carried out, the meals could be tailored to the food preferences of the local population in a more exact way.

Delivery System

One of the unique aspects of the shelf-stable meal system is its delivery options. Delivery systems can be adapted to meet the specific needs of user groups. Volunteer, van drop-off, and U.S. Mail delivery were all successfully used during the 1976 demonstration. Each holds promise for certain segments of the population.

For example, mail delivery would be effective in special geographic regions, such as the Alaskan bush. In Alaska, food shipments are often held up because of severe weather, or because rivers become frozen and unnavigable. Even if supplies of food are available for home-delivered programs, volunteers cannot make their deliveries due to poor visibility. Mailing of meals would be of great benefit in this region.

Mail deliveries would also prove a boon in rural areas where many miles separate meal programs from those in need. For many truly isolated individuals, getting a food package through the mail would be the only way they could receive this aid. The food needs of these persons are particularly strong since their distance from stores makes it very difficult to purchase food on a regular basis, particularly in times of ill health or inclement weather.

For those persons who live in more populated areas, a personal means of delivery is to be preferred. Participants felt that a strong nutrition education component should be made part of the delivery system, and suggested that visiting nurses, schools, and health and technology museums be considered as part of the delivery chain.

Thought must also be given to whether the system could be delivered economically from grocery stores. This would enable those who are not elderly or

handicapped to purchase the meals to supplement their diet. By having the meals available for general purchase, the "need" for the food would be expanded, and this would justify greater production on the part of the food processors.

FUNDING FOR FUTURE PROGRAMS

Whether or not future demonstrations of the NASA shelf-stable meal concept take place hinges in large part upon the availability of funding. The cost of production of any new system is large, and there is little reason to be hopeful that industry will underwrite the costs by itself. Conference participants felt that Federal funds should not be used to "prove" to industry that there was a need for producing the meal system. However, it was hoped that Federal assistance could be obtained to reduce the overall cost of obtaining the food. What potential sources of funding exist, and how likely is it that they will be made available for additional feeding programs?

Legislation has been introduced in both the United States House and Senate to amend the Older Americans Act to create a national Meals on Wheels program for the homebound. S. 519 originated in the Select Committee on Nutrition and Human Needs, chaired by Senator George McGovern. A section of the bill calls for a three-state demonstration program using the meal system developed by NASA. The demonstration would focus on the "feasibility of using the meal system as a component of, or as a substitute for regular nutrition projects, particularly in areas where normal delivery services are not feasible or practicable or are too costly."

McGovern's bill would give preference in the awarding of grants or contracts to well-established pre-existing meals-on-wheels groups, although Title VII programs projects would also be eligible to participate. Fifteen percent of each project's caseload could be composed of blind or disabled individuals who are not elderly.

Senator Kennedy has also introduced legislation which would establish a national Meals-on-Wheels program. However, his bill, S. 1283, differs from McGovern's in several aspects, the most important of which is that no provision is made for further demonstration projects utilizing the NASA meal system. S. 1283 also gives preference in the awarding of grants or contracts to Title VII projects, and makes no provisions for including non-elderly blind or disabled in the program.

Both bills have not been reported out of Senator Eagleton's Subcommittee on Aging. The Food Research and Action Center feels that chances are almost nil that either bill will obtain a budget waiver necessary for Fiscal 1978 appropriations. However, the Center feels

that it is still important that supporters of home-delivered meals legislation write to members of the Aging Committee and make their feelings known. Some home-delivered meal advocates feel that it is preferable to keep meals-on-wheels legislation separate from the Older Americans Act reorganization, which comes up in 1978.

There is little chance that federal funds will be appropriated for a three-state demonstration of the NASA meal system for Fiscal Year 1977. However, at the discretion of the states, and local Title VII projects, other Federal monies could be used for the purchase of shelf-stable meals.

For example, a portion of Title VII funds can be used for the delivery of meals to the homebound, and Title VII projects could elect to use some of their funds for the purchase of shelf-stable meals. Title XX social service funds can be used for provision of meal service, although conference participants felt Title XX was too cumbersome to administer because of the means test.

Participants also considered the possibility of using food stamps for purchase of shelf-stable meals, although the mechanics of such use was not fully worked out. Several manufacturers at the conference stated that they would apply to the Department of Agriculture for permission to accept food stamps in payment for food products to be assembled into shelf-stable meal packages.

Local, volunteer meals-on-wheels programs could pay for shelf-stable meals for supplementary or weekend use by clients out of available funding. While local efforts of this kind would lack the national thrust that would accompany a three-state, federally funded demonstration, there would be a beginning, which would keep the idea of shelf-stable meals in the public's mind.

A GRASSROOTS STRATEGY: FORMATION OF THE TASK FORCE

As the previous section makes all too clear, there is little likelihood that federal funds will be made available for additional demonstration programs utilizing the NASA meal system. S. 519 is for all practical purposes dead for fiscal year 1978. Does this mean the end of the meal system? Or are there actions that can be taken by interested persons to advance the meal system program on a grassroots level?

The conference signalled the end of the active roles of NASA and the LBJ School in the development and testing of the shelf-stable meal system. But continued organization, publicity, and research must occur for the meal system to survive. Accordingly, a call was made for persons to give their time and energies for the continued development of the meal system. In his address, Dr.

Salant called for the formation of a Task Force to formulate a plan of action, and to bring that plan to fruition. At the close of the conference, thirty persons indicated their interest in serving on such a task force.

What can the task force do? What are its priorities? The first priority is compiling a directory of organizations, agencies, and food programs that want to purchase food items for use in a shelf-stable meal system. Such a listing would include the types of foods desired, and the numbers of units. A companion directory also needs to be compiled listing all foods presently available for single-serving meal systems, the manufacturers, and their cost. Industrial representatives indicated that there were supplies of "normal diet" food items available for immediate purchase and use. They also expressed willingness to work with local communities in assembling meal packages. But, before this can be done, the needs of local communities, and the capabilities of food manufacturers need to be established.

The task force can aid local communities and programs in food procurement efforts by coordinating requests for food items.

Coordination and pooling of requests can lead to increased demand volume. This, in turn, may reduce the unit cost of food items, and perhaps generate enough demand to bring about special order goods. The key, of course, is to encourage local communities to institute shelf-stable meal programs, and then to provide channels through which the ordering of food items and the assembly into meal packages may occur. As mentioned in the section, "Role of Industry," such efforts will result in not one meal system, but many meal systems, each taking into account the specific needs of the communities and the populations who will use them.

Task force leaders see grassroots action of this kind as an important impetus to any future national meal program. While the demand for shelf-stable meals appears to exist, chances for a national program or demonstration are unlikely in the near future due to funding uncertainties. However, if local programs get underway and are successful, they may thrust the concept into national prominence and generate a national funding base.

Members of the Task Force are applying for funding to carry on their work. Peggy Wilson, Peggy Sheeler, and Ren Breck are coordinating these efforts. A complete list of Task Force members is included at the end of Chapter VI under "Participants".

CHAPTER VI

CONCLUDING REMARKS

STRATEGY FOR INNOVATION

Dr. Jurgen Schmandt

Professor, LBJ School of Public Affairs

During the course of the conference, a variety of public sector needs for the NASA meal system or some variation thereof were discussed. We now have some idea of the nature, though not the exact size of possible public sector demands. But, we would fool ourselves if we assumed that the process of innovation in the case of the NASA meal system has run its course. There is still a long way to go before such a system will be available to meet different needs—and it is equally possible that this stage will not be reached at all in the foreseeable future.

To indicate where we are at present and what remains to be done, I propose to put the case of the meal system in a larger context. We are dealing with the introduction of a new technology and a government-sponsored attempt to demonstrate the usefulness of this technology. The RAND Corporation has just completed a study of 24 federally-funded demonstrations which provides some useful parameters for the assessment of the meal system project (Walter S. Baer, L.L. Johnson, E.W. Merrow, "Government-Sponsored Demonstrations of New Technologies", *Science* 27 May 1977, 950-957). Using some of the findings of this study, the following observations can be made.

A demonstration serves the purpose of bridging the gap between laboratory development and commercial use. As such, it is intended to prove technical feasibility, develop an appropriate delivery mechanism, study the innovation in its intended service environment, assess social acceptability, measure cost, and identify public benefits which can be expected from the technology. All this has been done in the case of the NASA meal system for one particular group of the intended service population. Additional demonstrations could address similar issues for other service populations and, if possible, for a mix of different groups. This would help to further reduce the several uncertainties which need to be answered: technological uncertainty, cost uncertainty, demand uncertainty, institutional uncertainty, and

uncertainty about externalities which are not reflected in the cost, such as nutritional value and safety of the meal system.

A different stage in the process of innovations is entered once we move from demonstration to diffusion of technology. Everything is scaled upward: investment, risk, production, delivery, consumer reaction. The government at this point may still play a crucial role as purchaser, but the principal action agent is now private industry. Will the meal system lend itself to diffusion, either as a result of the demonstration for the aged, which was done in Texas or of other demonstrations which may follow? The RAND study identifies several conditions which seem to help along the process from demonstration to diffusion:

1. The initiative for the development and demonstration of the new technology does not come directly from the federal government. Diffusion is more likely to occur if the "demand-push" comes from private firms or local governments and service providers. "... Unsolicited proposals, or local projects suggested in response to a broadly stated request for proposals, appear to have better diffusion success than do demonstrations whose approach and technology are specified at the federal level."
2. A strong industrial system exists which takes charge of commercializations. Also, a market exists for similar products. The existence of obvious manufacturers and purchasers of new technology reduces the extent of radical institutional change, and thus facilitates the process of diffusion. If an entirely new market needs to be created, success is less predictable.
3. During the demonstration phase, all elements needed for commercialization are taken into account. Producers, as well as user groups, need to be brought in at an early stage in order to be able to contribute to the planning and conduct of the demonstration.
4. In general, technology push will be less successful than market pull. A real social need is prerequisite to successful diffusion. Technology promotion

will not work unless adequate attention is given to markets and needs.

5. Once the basic parameters of the innovation are established, the best strategy for government is to encourage innovation by increasing availability of program funds. Industry and service providers will then be attracted to undertake the additional research and development which is needed to adjust the technology to different service environments and to large-scale production and marketing.

In conclusion, demonstration will lead to diffusion if the following conditions are met: there exist "technology well in hand, cost- and risk-sharing with non-federal participants, project initiatives at the local level, a strong industrial system for commercialization, participation in the demonstration by those who will take responsibility for further diffusion . . ."

It should be noted that the NASA meal system was not included in the range of demonstrations studied by the RAND Corporation. But, I submit that the prognosis of success based on this assessment of past experience is an optimistic one. The meal system meets all conditions for successful diffusion and commercialization which the RAND study identified. Now it remains to be seen whether industry and service providers, jointly with the government, will come to the same conclusion and make the NASA meal system available on a scale commensurate to the need.

ATTACHMENT A--CONFERENCE PROCEEDINGS

MONDAY, JUNE 6, 1977

Morning

Opening General Session

Purpose of the Conference--Dr. Jurgen Schmandt, Director, LBJ School Meals System Project.

Meals for the Elderly: The 1976 Demonstration

Meals from Space: A Documentary

Design and Production of the Meal System--Gary Primeaux, Director, NASA Meal System Project
Ron Ritz, Meal System Project, Martin Marietta

Delivery Alternatives--Peggy Wilson, Coordinator, Field Network, LBJ School

Demonstration Results--Dr. Lodis Rhodes, Faculty Member, LBJ School, Meal System Project

Medical Aspects--Dr. William McGanity, U.T. Galveston, Medical Branch, Meal System Project Director, Medical Component

Cost and Policy Implications--Jurgen Schmandt

General Discussion Period

Noon

Conference Luncheon--Video Presentation: "Social Insecurity," Renwick Breck.

Afternoon

Second General Session

Presiding--Dr. John Gronouski, Professor, LBJ School

Keynote Address--Nutrition, Aging, and Public Policy
Senator Hubert H. Humphrey

Panel Discussion--*Functional Uses of the Meals*

Panelists--Renwick Breck, Chairman, Alternatives for the Aged and Handicapped Planning Council, Episcopal Diocese of California

Georgia Georgeson, Program Coordinator, Veterans Administration, Nursing Home Programs

Eugene Pitman, USDA, Liaison with Red Cross and Salvation Army

Lowell Bernard, Director, Cleveland Health Museum and Education Center

Concurrent Workshops--"Functional Uses of the Meal System"

Social Services

Session Leader--Renwick Breck

Rapporteur--Barbara J. Dydek, LBJ School Graduate

Institutions

Session Leader--Georgia Georgeson

Rapporteur--Frances Zorn, USDA, Child Nutrition Division, FNS

Disaster Relief and International Aid

Session Leader--Eugene Pitman

Rapporteur--Norm Linsky, Research Assistant, LBJ School Meal System Project

Further Demonstration Needs?

Session I:

Session Leader--Lowell Bernard

Rapporteur--Joe Motter, Research Analyst

Session II:

Session Leader--Margaret Sharpe, Project Nutritionist, Harris County (Houston) Senior Citizen's Project

Rapporteur--Ruth Roth, LBJ School, Meal System Project

TUESDAY, JUNE 7, 1977

Morning

Third General Session

Presiding—Donald F. Reilly, Deputy Commissioner, Administration on Aging

Nutrition and Health—Dr. Donald Watkin, Assistant to the Director, Office of State & Community Programs, Administration on Aging

Shelf-Stable Meals and the Food Industry—Dr. Abner Salant, Director, Food Engineering Laboratories, U.S. Natick Development Center

Workshop Reports—"Functional Uses of the Meal System"

Renwick Breck
Georgia Georgeson
Eugene Pitman

Margaret Sharpe
Lowell Bernard

Concurrent Workshops—"Exploring Possible Action"

Workshop I—will assume a significant volume of production generated by government demand.

Session Leaders—James Schleck, Commodity Operations, USDA

Dr. Michael Pallansch, Assistant Administrator, USDA—Agricultural Research Service

Rapporteur—Anne Kohler, Director, Research Utilization Project, Generation Connection, Texas Department of Public Welfare

Workshop II—will assume that public sector needs will be met directly by industry.

Session Leader—Edward Hirschberg, President, Innovative Foods

Rapporteur—Joseph Brown, Executive Director, Rhode Island Meals-on-Wheels, Inc.

Workshop III—will explore an intermediate strategy of industry-government cooperation.

Session Leader—Jack M. Sable, Human Resources Consultant, Sable Associates, Inc.

Rapporteur—Norm Linsky

Conference Luncheon

Speaker—Dr. Arthur S. Flemming, Commissioner, Administration on Aging

Afternoon

Concluding General Session

Presiding—Scott Bunton, Texas Office of State-Federal Relations

Workshop Reports—"Exploring Possible Action"

Jack Sable
Edward Hirschberg
Anne Kohler

Public Sector Needs and How to Meet Them

Jurgen Schmandt

Panel Discussion: Does the Meal System Have a Future?

Panelists—Edwina McDonald, Veterans Administration

Peggy Sheeler, Executive Director, Meals-on-Wheels of Central Maryland, Inc.

Grace Billings, Nutrition Administrator, Alaska Office on Aging

Robert McMullen, National Products, Manager, Food Service Division, Carnation Co.

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