

A BUYER'S GUIDE FOR  
RANGE COOKTOPS AND MICROWAVE OVENS

by

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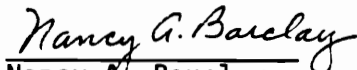
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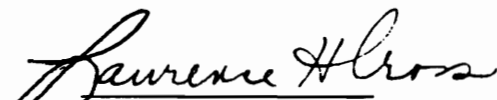
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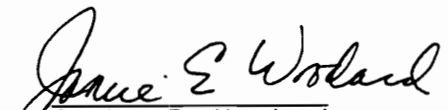
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THE DEVELOPMENT OF A BUYER'S GUIDE FOR  
RANGE COOKTOPS AND MICROWAVE OVENS

by

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Housing, Interior Design, and Resource Management

(ABSTRACT)

A proliferation of choices available to consumers as they select a major cooking appliance necessitated the development of a Buyer's Guide which will provide consumers with generic information by which they can compare range cooktops and microwave ovens. The microwave oven is included because it is often used in the place of a cooktop.

The Buyer's Guide for Range Cooktops and Microwave Ovens as an information resource is designed to be used by consumers to assist in making an informed purchase decision. The study was conducted in three phases: 1) identification of items included in the Buyer's Guide; 2) establishment of test procedures; and 3) focus panel evaluation of the Buyer's Guide.

Phase 1 - Eleven items considered to be important in making purchase decisions were identified by members of the Virginia Retail Merchants Association and by Virginia home economics Extension agents. Items rated as important for inclusion were: purchase price, maintenance, life expectancy, operating costs, energy use, speed of heating, evenness of heating, heat retention, heat recovery, ease of cleaning, and ease of use.

Phase 2 - Using standardized test procedures, data were obtained for the radiant coil electric smoothtop to allow the comparison of items found on the Buyer's Guide with other types of range cooktops (conventional electric coil, gas burner, induction cooktop, smoothtop resistance coil, solid element) and the microwave oven.

Phase 3 - Four focus panels were conducted to evaluate the Buyer's Guide for Range Cooktops and Microwave Ovens for clarity of content, practicality of format, and its usefulness to consumers. The 26 focus panel participants recommended changes which were incorporated into the Buyer's Guide for Cooktops and Microwave Ovens. They indicated a belief that the Buyer's Guide would be useful for consumers seeking generic information by which to compare major cooking appliances.

Further research is needed to evaluate the Buyer's Guide for Range Cooktops and Microwave Ovens for its usefulness to consumers in the selection of a cooking appliance in the marketplace.

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This dissertation is dedicated to the memory of my  
grandparents:

Evelyn and Maceo Early  
and  
Martha and Thaddeus Savage

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## CHAPTER I

### INTRODUCTION

Consumers of today are faced with an increasing number of complex purchase decisions as appliances become more sophisticated. The information needed to make a satisfactory decision is usually less than complete. Consumers often must rely on visual inspection, information from a product testing organization, or statements made by a salesperson about a product. As Sanik & Purchase (1982) pointed out with respect to vacuum cleaners, consumers need objective data on which to base their purchase decisions. Likewise, consumers also need access to data based on research about major cooking appliances which will result in a purchase best suited to the individual consumer's needs.

Goss and Lovingood (1978), Hill and Anderson (1983), Lovingood and Laughon (1980), Lovingood, Bentley, Lindstrom, and Walton (1987), Peters and Hunt (1974), and Scheidler (1987) have conducted laboratory studies which document differences in the performance characteristics of major cooking appliances. Martin (1988) found significant differences in performance among the types of cooking appliances in the evenness of heating, speed of heating, and retained heat. Young (1988) developed a decision-making matrix which provides information by which a consumer can make a choice of a major cooking appliance. This study will expand the choices of range cooktops on the Buyer's Guide with the inclusion of the smoothtop range to complete the basic range cooktop types which are available in the marketplace. While there are research findings of variations in cooktops,

there is no source readily available to consumers which combines research-based findings with respect to performance characteristics in a single source. The Buyers' Guide will allow consumers to compare generic cooktop types.

## CHAPTER II

### LITERATURE REVIEW AND THEORETICAL FRAMEWORK

#### Literature Review

In President Kennedy's 1962 message to Congress, he outlined four consumer rights: "(1) the right to safety, (2) the right to be informed, (3) the right to choose, and (4) the right to be heard" (cited in U. S. Congress Senate Committee on Government Operations, 1970, p. 253). To help insure the consumer's right to be informed with respect to major cooking appliances, it is important to provide objective information which enables the consumer to make a satisfactory purchase decision.

In the context of this research, resources are the means for meeting or reaching goals. Information as a resource is the means for a consumer to make a decision and set standards for the characteristics desired for a specific cooktop or microwave oven.

"It is through the decision-making process that resources are directed toward achieving a single goal or are distributed among several goals" (Gross, Crandall & Knoll, 1973, p. 175). Decision making is the process of defining a need and seeking means by which the need can be met. The decisions made will allow the consumer to set standards for the characteristics desired for a major cooking appliance. The setting of standards will be a result of using the information resource - a Buyer's Guide for Range Cooktops and Microwave Ovens. A standard is a measure of the desired characteristics for a cooking appliance.

The Buyer's Guide will help consumers select a cooktop or microwave oven based on a comparison of generic information. Useful consumer information

as defined by Aaker (1982) has to move the consumer toward an explicit standard in a proposed purchase decision. "Useful consumer information is information that will help consumers buy or use a product or service" (p. 135). Aaker suggests that the information should expose attributes of the product that consumers should consider in making a purchase decision. Aaker's statements support the framework of this research. He points out that the optimal method of presenting information to consumers is in the form of comparisons among characteristics versus information comparing brands as is currently available in the Consumer Reports article on "Microwave/Convection Ovens" (1989).

The steps to planned buying, defined by Williams (1982) as making a rational decision, are to:

1. define the problem; define the desired good or service;
2. identify possible alternatives - comparison shopping by collecting information;
3. select the best alternative;
4. evaluate the action.

The information found in the Buyer's Guide for Range Cooktops and Microwave Ovens will allow consumers to satisfy components in the process of buying an appliance as outlined by Williams. Comparison shopping, the act of collecting comparative information, will be facilitated by allowing the comparison of characteristics across generic types of major cooking appliances, specifically cooktops and microwave ovens, instead of comparing features of one specific type of cooktop or microwave across brand names.

Thorelli (1982) proposed that the comparison of information be part of a consumer information system which is directed toward a classification

of consumers that he identifies as information seekers. A plea is made for these information seekers to have information available at the point of purchase.

This is a different approach than that which is normally used by consumer product testing organizations. For example, the article on electric and gas ranges in Consumer Reports (1989) contains brand-oriented findings from testing specific appliance models with respect to features, characteristics, and options. Relatively little information that would facilitate generic comparisons of performance characteristics is widely available in the public domain.

Household equipment text books (e.g., Pickett, Arnold, and Ketterer, 1986), Extension publications, and generic information from appliance manufacturers such as Maytag, General Electric, and Tappan give information about the features and the configurations, but information which is based on comparisons of specific characteristics across generic types does not exist. For example, there is no buyer's guide which compares the speed of heating for the gas burner and the conventional coil. Nor is there a comparison between the types of cookware best suited for the range cooktop and the microwave oven. The Buyer's Guide is intended to be used as a resource containing generic information about range cooktops and microwave ovens in making a purchase decision.

The Association of Home Appliance Manufacturers has standards for the performance of major cooking appliances in relation to the intended purpose of a feature or component part to verify the appliance manufacturer's objective of producing a working appliance (Association of Home Appliance Manufacturers, 1972).

For a number of years, the F-11 Committee of ASTM (American Society for Testing and Materials) has worked on the development of a buying guide for vacuum cleaners. The purpose of the Committee's work is to provide consumers with objective vacuum cleaner information. Reference is made to this article because of its similarity to the development of a buyer's guide for major cooking appliances. The method of identifying vacuum cleaner performance characteristics is analogous to the method of identifying range selection characteristics. The questions addressed by the F-11 Committee have been:

1. What performance characteristics should be measured? In what characteristics are consumers interested?
2. How should test performance be measured?
3. What testing standards will provide useable information for consumers to make appliance choices?

In her dissertation research, Young (1988) developed a matrix that included 11 factors or characteristics considered to contribute to the total cost of buying and using a cooking appliance and thus are important in making a purchase decision for a major cooking appliance (Table 1). Young's research was developed from a consumer information model proposed earlier by Lovingood and Young (1988) to provide objective information which consumers could use to select a major cooking appliance. Savage and Shin (1989) incorporated 10 of Young's 11 items in a survey of 100 consumers randomly selected from the Montgomery County telephone directory during Spring 1989 from 31 Montgomery County residents (Appendix A). Pilot testing of the survey instrument resulted in rewording, reordering, and omitting the item "evenness of heating" so

Table 1

Young's (1988) Decision Making Variables

1	P =	Purchase price of appliance
2	L =	Life expectancy
3	M =	Maintenance
4	E =	Energy utilization of appliance
5	T =	Appliance operating time
6	Uco =	User interaction with appliance
7	S =	Speed of heat-up
8	R =	Heat recovery rate
9	H =	Retained heat
10	Eh =	Evenness of heat
11	Ucl =	Ease of cleaning

$$C = f(P+L+M+E+T+S+R+H+Eh+Uco+Ucl)$$

C = cost of owning and using a major cooking appliance.

The equation represents the summation of the decision-making variables which will influence consumers in the purchase of a major cooking appliance.

as not to confuse consumers with evenness of heating when using the oven for baking. In the rank ordering of the items, long life was ranked first in importance with ease of cleaning ranking second (Table 2).

The items included on the Buyer's Guide as a result of the pilot study with some name changes were:

1. Long life
2. Ease of cleaning
3. Purchase price
4. Operating costs
5. Repair costs
6. Speed of heating
7. Attention required during cooking
8. Speed of returning to a boiling point
9. Time to cook a meal
10. Having heat in the burner.

#### Purpose of the Study

The purpose of this study was to develop an information resource based on a systematic investigation of major cooking appliances to enable consumers to compare characteristics of range cooktops and microwave ovens representative of those most commonly sold in the U. S. at this time.



Table 2

Results of Savage and Shin's Cooking Appliance Survey, Spring 1989,  
31 Residents of Montgomery County, Virginia

Response Choice Ratings of Importance Factors

Characteristic	Frequencies					Mean	Rank
	5	4	3	2	1		
Long life	26	5	1	0	1	4.67	1
Ease of cleaning	21	8	3	0	1	4.45	2
Purchasing price	22	4	6	0	1	4.39	3
Operating costs	15	11	5	1	1	4.15	4
Repair cost	17	7	6	2	1	4.12	5
Speed of heating	6	17	7	1	2	3.73	6
Attention required during cooking	9	9	11	1	3	3.61	7
Speed of returning to boiling point	6	15	7	2	3	3.58	8
Time to cook a meal	7	11	11	0	4	3.52	9
Having heat in the burner	5	4	9	7	8	2.73	10

5 = Very important  
 4 = Important  
 3 = Somewhat important  
 2 = Unimportant  
 1 = Very unimportant

### Justification

As families manage their financial resources, there is a concern that they be able to make informed decisions based on reliable information. The days of choosing only between a gas burner or conventional electric coil are over. Each year new models of ranges and microwave ovens with new and more sophisticated technologies are introduced. Ranges with solid elements which are popular in Europe are now available in the American market. The emergence of the glass ceramic cooktop which has fast heating electric coils, versus the older, slower heating models, is yet another choice available to consumers. Although not an exhaustive list, Table 3 shows a few of the decision choices a consumer must consider. Microwave ovens are affordable for the majority of consumers and also have been accepted as a major appliance for food preparation. Manufacturers of major cooking appliances potentially can utilize the Buyer's Guide as a marketing tool. Consumers will have access to more information with which to make more informed purchases which will lead to more satisfied consumers.

### Theoretical Framework

Theoretically, this study was grounded in family resource management theory which states that families use resources to achieve goals (Deacon & Firebaugh, 1988). Within a systems framework, resources are the inputs to the management system. The desire or need for a new major cooking appliance is the demand which is an input. In combination with resources, demands are processed in the throughput. The output is changed resources which are facilitators in reaching or meeting the goals or demands defined in the input of the managerial system.

Table 3

Decision Choices for Selecting a Major Cooking Appliance

1. Energy source
  - a. Electricity
  - b. Gas
2. Configuration
  - a. Ranges
    - (1). free standing
    - (2). slide in
    - (3). drop in
    - (4). built in
      - (a). cooktop
      - (b). oven
  - b. Microwave
    - (1). full size
    - \* (2). compact
    - \* (3). sub compact
  - c. \*Combination Microwave/Radiant
    - (1). microwave/convection
    - (2). microwave/conventional
    - (3). microwave/convection/conventional
3. Cooktops
  - a. Conventional electric coil
  - b. Conventional gas burner
  - \*c. Solid element
  - d. Glass ceramic
    - (1). radiant coil
    - \* (2). induction
    - \* (3). halogen
4. Ovens
  - a. Cleaning system
    - (1). automatic
      - (a). continuous clean
      - (b). self-cleaning
    - (2). non automatic (standard clean)
  - b. Heat circulation method
    - (1). natural convection (no fan)
    - \* (2). convection (fan forced air movement)

\*Choices which have become available in the last 20 years.

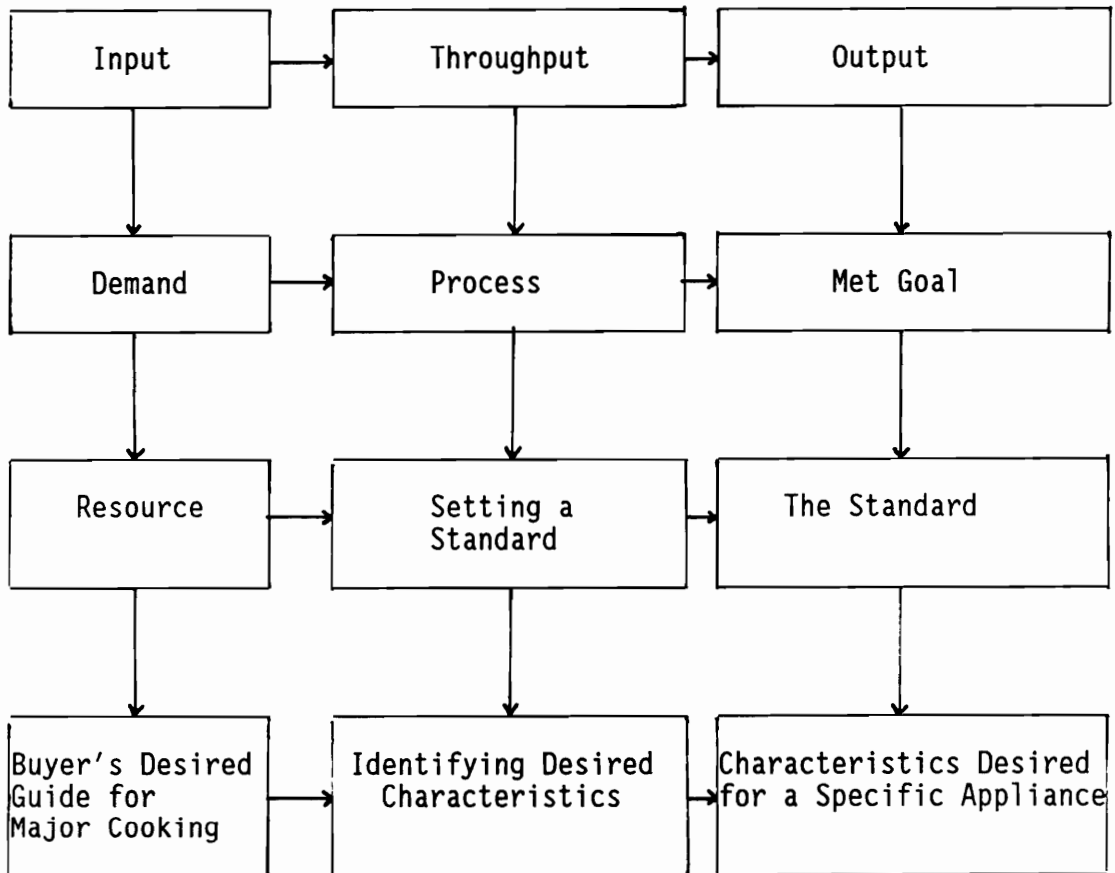
Within a systems framework, resources facilitate the achievement of the goal of purchasing a major cooking appliance by incorporating information as a resource input to the system (see Figure 1). Resources are the means that provide the meeting of demands and goals which give direction to managerial action.

In this study, the desired outcome is an information resource which will give consumers a means of comparing cooking appliances. The standard setting process defines the specific set of qualities desired in the appliance. Decision making is an on-going process in which consumers evaluate the choices from among major cooking appliances available in the marketplace, identifying the characteristics and features which meet their desired standard for a range cooktop or microwave oven.

#### Empirical Model

The Buyer's Guide for Range Cooktops and Microwave Ovens was developed to be used as an information resource and as an input into the managerial process of selecting characteristics desired in a major cooking appliance. The Buyer's Guide will provide the consumer with a method of comparing monetary considerations, cooking performance characteristics, and cookware specifically recommended for each cooking appliance. In the use and care booklets provided with the appliance, the manufacturer makes recommendations for specific cookware to obtain optimum cooking performance.

A standard set of tests for measuring the performance characteristics was established using existing data in combination with data collected in a study of a current model of a smoothtop range. The objective of using



Based on Deacon & Firebaugh's Systems Approach to Management (1988)  
Fig. 2.2, p. 22

Figure 1. Theoretical Model: The Development of The Buyer's Guide Using a Systems Approach

a method for measuring each of the items in the Buyer's Guide for Cooking Appliances was to be able to give consumers objective, comparative generic information about major cooking appliances.

In summary, the empirical model displayed in Figure 2 illustrates the phases of this research project to develop the Buyer's Guide for Range Cooktops and Microwave Ovens. A systematic approach to data collection was carefully followed.

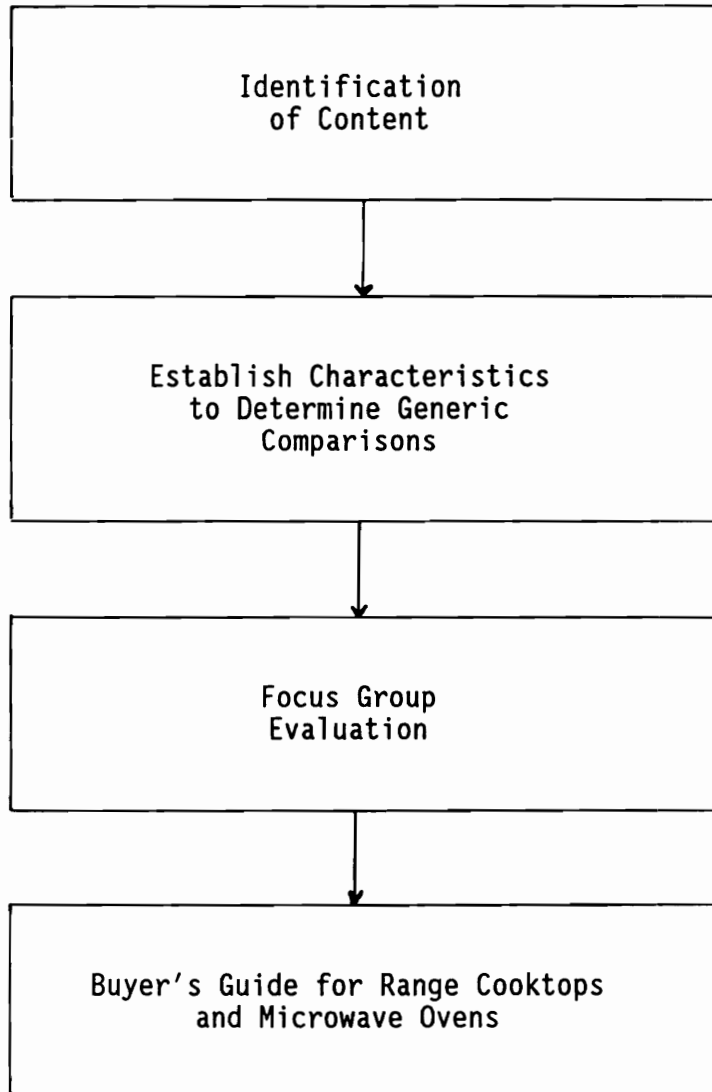


Figure 2. Empirical Model: Procedural Steps in the Development of the Buyer's Guide for Range Cooktops and Microwave Ovens

## CHAPTER III

### PHASE 1 - IDENTIFICATION OF BUYER'S GUIDE ITEMS

Virginia home economics Extension agents and members of the Virginia Retail Merchants Association were surveyed to identify the items important to consumers for inclusion in the Buyer's Guide for Range Cooktops and Microwave Ovens.

#### Procedures

##### Home Economics Extension Agents

The Virginia home economics Extension agents' survey was conducted using a mailed questionnaire (Appendix A). The questionnaire was sent to all Extension home economists in the state of Virginia. In two counties which did not have a home economics Extension agent at the time of the mailing, questionnaires were addressed to the respective Extension unit directors. The questionnaire was divided into two sections: the importance items and the demographic information. An open-ended question asked for any additional items of importance.

##### Retail Merchants

The Virginia Retail Merchants Association was contacted for assistance in securing the most recent listing of merchants who sell major cooking appliances across the state of Virginia. This listing included the member's name, the type of store, address, and telephone number.

All stores were either appliance stores or furniture stores where appliances were sold. The listing consisted of 60 entries. There were no major appliance chain stores such as Circuit City represented by a member



of the Virginia Retail Merchants Association. Two stores were listed twice because there were two members of the Virginia Retail Merchants Association at that one location.

A letter was sent to all members on the list to alert them to the forthcoming telephone interview (Appendix A). A telephone survey was chosen to increase the response rate from the limited sample. In the letters to the merchants, they were told to expect a call between May 16-19, 1990. Calls were begun on May 16 ending on May 17. To be consistent with each merchant and to solicit unbiased data, a script was followed as closely as possible (Appendix A).

Telephone numbers which were incorrect or no longer in service were verified with directory assistance. If the person listed in the Retail Merchants Association directory was not available to come to the telephone, the assistant manager for sales was requested. All information was recorded on the questionnaire. Twenty-eight of 59 merchants responded representing a 49% response rate.

#### Description of Respondents

##### Home Economics Extension Agents

Virginia Home Economics Extension agents are an extension of the mission of Virginia Tech who are planners, implementors, and evaluators of various projects and programs in home economics subject matter areas. Priorities are determined by national initiatives and local or state needs. Most of the 103 agents who responded had been on the job for less than 20 years but the range was from 1 to 31 years. Eleven agents have 20 years of experience. The majority (59%) hold B.S. degrees in home economics education.

Fifteen percent have a B.S. degree in adult education. One agent holds a Ph. D. degree in textiles and clothing. Most agents have held their current position as their only position of employment. Those who have not most often came to the Extension service from a teaching position. Sixty-seven percent indicated that their offices are located in rural areas. One-hundred-three questionnaires were completed and returned representing a 84% response rate.

#### Retail Merchants

Twenty-eight questionnaires were completed by the retail merchants. They sold the types of range cooktops or microwave oven which are included on the Buyer's Guide with the exception of the induction cooktop which was sold by only one retailer. Eight stores sold only microwave ovens with 20 selling ranges and microwave ovens. In those stores where service on ranges was available, the most frequent repair was the replacement of a surface unit or the replacement of an oven heating element. General Electric, RCA, and Gibson were the brands with the top market share.

#### Survey Responses

Table 4 shows the means and standard deviations of the responses to the survey completed by the Extension agents and retail merchants. Also shown are the F ratios used to test whether the means differ significantly across the two samples. The Extension agents indicated that the items on the questionnaire are important, in their professional opinion, in making a purchase decision for a major cooking appliance.

The hypothesis for the importance of the items was that there would be no difference between the two groups. The ANOVA table shows that there is no significant difference, at the .05 level between the two groups with respect to the importance of speed of heating, ease of use, and heat recovery (Table 4). There is a significant difference between the respondents for the other variables. When categorizing the importance items, it appears that the viewpoints of the two groups differ with regard to those items related to a decision concerning money. The agent, who is the consumer advocate, expressed a different perspective from the merchant who desires to make a financial profit from an appliance sale.

The home economics extension agents and the retail merchants validated the importance of the following items which were included in the Buyer's Guide. The items were:

1. Purchase price
2. Maintenance
3. Life expectancy
4. Operating cost
5. Energy utilization
6. Speed of heating
7. Evenness of heating
8. Retained heat
9. Heat recovery (return to boil)
10. Ease of cleaning
11. Ease of use

Table 4

Analysis of Variance: Comparison of Home Economics Extension Agents' and Retail Merchants' Responses to the Importance of Items on the Buyer's Guide for Range Cooktops and Microwave Ovens

Importance Item	Retail Merchant (n=28)	Extension Agent (n=103)	F-Ratio	F prob
Purchase Price			14.58	.0003
X	2.53	2.85		
SD	.51	.35		
Life Expectancy			6.76	.0100
X	2.39	2.70		
SD	.68	.53		
Maintenance			25.89	.0001
X	2.32	2.87		
SD	.77	.41		
Energy Utilization			33.35	.0001
X	1.53	2.33		
SD	.79	.60		
Operating Costs			8.42	.0004
X	1.67	2.11		
SD	.77	.69		
Speed of Heating			2.34	.128
X	2.00	2.21		
SD	.72	.63		
Retained Heat			15.40	.0001
X	1.43	2.07		
SD	.63	.79		
Evenness of Heating			16.05	.0001
X	2.10	2.64		
SD	.68	.60		
Ease of Cleaning			14.03	.0003
X	2.60	2.91		
SD	.62	.28		
Ease of Cooking			1.37	.244
X	1.96	2.17		
SD	.92	.82		
Heat Recovery (return to a boil)			2.63	.107
X	1.57	1.83		
SD	.92	.71		

The items on the Buyer's Guide and those found in Young's matrix are not exactly the same. For example, speed of heat-up was referred to as speed of heating. The order and the name changes were made as a result of pilot study evaluations. Differences in the results from this survey and the survey of consumers conducted by Savage and Shin may result from a difference in the knowledge base of information about cooking appliances.

#### Recommendations

A larger sample of retailers of range cooktops and microwave ovens is needed. There should be a distinction made between large appliance retail chains or "mass merchandisers" and small local retail appliance stores where there may be less of a selection of range brands, types, and prices. The telephone interviewing technique should be used in conjunction with another technique to assure that the findings are not biased by the voice communication. The language of the survey instruments should be revised so that there is no chance that participants will interpret the item "ease of cleaning" as "ease of cleaning the oven."

The "other comments" section should be incorporated into another question which includes style, size, and color. The survey might be expanded to include interior designers who work closely with consumers in designing and remodeling kitchens.

## CHAPTER IV

### STAGE 2 - ESTABLISHING TEST PROCEDURES

In the previous chapter, conclusions were reached about the characteristics of cooktops and microwave ovens of interest to consumers. In order to provide comparative information about those characteristics, it is necessary to establish a data base which can be "translated" into useable information for consumers. The purpose of this chapter is to explain the procedures used with representative cooking appliances that may be categorized as conventional (electric coil, gas burner) and innovative (cooktops with solid elements or with radiant or induction coils under glass ceramic, or microwave ovens).

#### Procedures Used in Comparisons

Data from previous studies with the electric coil, gas burner, induction element, solid element, and microwave oven were compiled and presented by Young (1988). In the present study, data were collected in the summer of 1990 with a cooktop that featured radiant electric coils under glass ceramic.

#### Operational Definitions

Characteristics included in the Buyer's Guide for Range Cooktops and Microwave Ovens are purchase price, life expectancy, maintenance, operating cost, energy use, speed of heating, evenness of heating, heat retention, heat recovery (return to boil), ease of cleaning, and ease of use. Following are operational definitions that have been used to establish the data base.

Purchase price was determined by calling local appliance stores to ask the suggested retail price.

Maintenance was determined by the average number and cost of repairs performed on comparable appliances as indicated by local appliance retailers in telephone inquiries.

Life expectancy was established from industry reports of the average length of time a consumer owns a range before it is replaced (A Portrait of the U.S. Appliance Industry, 1990).

Energy use was determined by the amount of electricity used to prepare 25 items (surface operations) in the AHAM Menu for Range Energy Testing (Eisele, 1976) as measured by a watt-hour meter. Watt-hours were converted to British Thermal Units (Van Zante, 1964).

Operating costs were determined by multiplying the national average cost of a kilowatt hour of electricity by the number of kilowatt hours used to prepare selected foods from the AHAM Menu (Eisele, 1976). All foods were prepared following general procedures which were developed for energy testing by Lovingood and Goss (1980).

Speed of heating was determined by heating 3 quarts (2.85l) of water in a covered pan to the boiling point 209°F (98°C) on the HI setting. (Due to the elevation of the town of Blacksburg, the boiling point of water is lower than 212°F or 100°C.) The same water was used to determine retained heat by recording the time taken for the water to drop to the temperature of 190°F (98°C) at which time 8 oz. (244g) of spaghetti noodles were added. Heat recovery was the time required for the water to reach the boiling point again.

Evenness of heating was established by measurement of light reflectance from the surface of crepes as determined with a reflection meter (Photovolt,

Model 577, Reflection Meter). The patterns of browning were recorded from the center and from each of the four quadrants of each crepe.

(Appendix B).

Ease of cleaning was determined by boiling over oatmeal and frying ground beef then recording the time required to return the cooktop to its original state of cleanness. Ease of use was determined by using the user interaction scale developed by Lovingood, et al (1987). On that scale, 1 = none to 5 = continual for the user's involvement in cooking, items from the AHAM Menu for Range Energy Testing.

All tests were conducted with cookware of the type recommended by manufacturers of the respective appliances. In actuality, consumers use a variety of cookware, but to establish comparative data cookware must be held constant.

#### Smoothtop: Data Collection and Findings

Data were collected in the summer of 1989 with a range that featured a cooktop of glass ceramic over four radiant electric coils (Maytag, Model BCRE955; 6-inch element, 1200 watts; 8-inch element 2100 watts). Procedures described above were used. Based on responses from local retailers, the purchase price of a smoothtop range is approximately \$450-600 (Table 5). Maintenance costs for this cooktop were reported to be between \$50-\$100 (Table 5). The life expectancy of this cooktop was estimated at approximately 17 years. Operating costs as defined in this study were determined by the cost of electricity needed to cook the 25 selected foods from the AHAM Menu. Forty-four cents worth of electricity was used (Table 5,6). Energy use measured 5.510 KWH (18,817 BTU).



Table 5

Summary of Data Collected Summer 1990 at VPI & SU Using the Maytag BCRE955 Electric Resistance Coil Under Glass Ceramic for Items Included on the Buyer's Guide for Range Cooktops and Microwave Ovens

Characteristic	Smoothtop	
	Range of Values	Mean
Purchase price	\$450-\$600	\$525
Maintenance	\$ 50 - \$100	\$50 or less
Life expectancy	14-20 years	17 yrs.
Operating costs	\$0.41 - \$0.46	\$0.44 <sup>1</sup>
Energy use (BTU)	17,550-19,968	18,817 <sup>2</sup>
Speed of heating	10.80-11.00 min.	10.87 min. <sup>1</sup>
Evenness of heating	38.0-52.48 range scores	41.484 <sup>3</sup>
Heat retention	29.0 - 30.29 min.	29.7 min. <sup>1</sup>
Heat recovery	.15 - .25 min.	.22 min. <sup>1</sup>
Ease of cleaning	6.8 - 7.3 min.	7.1 min. <sup>1</sup>
Ease of use	- - - -	2.3 <sup>4</sup>

## Key:

1. Average of three means (3 replications)
  2. Energy use - KWH of electricity in BTU's - 3 replications
  3. Evenness of heating range of scores from reflectance readings.
  4. Average of all scores for ease of use - #1 - #5, 3 replications
- Life expectancy data - A Portrait of the U.S. Appliance Industry, September 1990.

Table 6

Energy Use and Operating Cost for Cooking Selected AHAM Menu Items Using  
an Electric Smoothtop With Resistance Coils Under Glass Ceramic: 3

Replications

Menu Item	Lowest Watt hour Reading	Highest Watt hour Reading	Test Means	SD
1. Beef stew	1032	1090	1055	31.22
2. Spaghetti	886	1020	903	192.35
3. Pancakes & Sausage	493	528	516	20.07
4. Rice pilaf	389	412	402	11.79
5. Pork chops	396	409	401	6.55
6. Scrambled eggs & bacon	228	246	236	9.30
7. Spinach	173	197	186	13.91
8. Cheese Sandwiches	178	188	184	5.80
9. Pot roast	169	179	173	4.52
10. Soft cooked eggs	131	146	136	8.66
11. Hard cooked eggs	100	124	120	13.02
12. Scalloped potatoes	109	135	119	13.80
13. Broccoli	111	129	118	9.64
14. Vanilla pudding	107	129	118	11.00
15. Tapioca pudding	92	130	115	20.03
16. Oatmeal	111	116	114	2.82
17. Lemon pie filling	93	101	97	4.04
18. Left over beef stew	77	116	95	19.76
19. Chicken soup	88	92	90	2.00
20. Vegetable soup	68	77	71	4.79
21. Peas	50	64	60	9.60
22. Green beans	49	61	56	6.09
23. Hot dogs	55	58	56	2.65
24. Mashed potatoes	51	49	48	11.93
25. Apple sauce	33	51	41	9.29
	WH 5139	WH 5847	WH 5510	
	<sup>1</sup> BTU 17,550	19,968.46	18,817	
	<sup>2</sup> Cost \$ .41	\$ .46	\$ .44	

<sup>1</sup>Energy used = WH X 3.415 BTU conversion (Van Zante, 1964)

<sup>2</sup>Operating cost = KWH X \$ .08

(.08 National average cost of a KWH of electricity, FTC revises residential energy figures, 1990)

Results for speed of heating, retained heat and heat recovery are found in Table 7.

Speed of heating for this cooktop ranged from 10.80 to 11.0 minutes with a mean of 10.87 minutes (SD = 0.116 min.).

Retained heat for the quart of water ranged from 29.01 minutes to 30.29 minutes (SD = 1.146 min.).

Heat recovery after adding spaghetti noodles ranged from .15 of a minute to .22 of a minute (SD = .058 min.).

Evenness of heating reflection meter (Photovolt, Model 577 Reflection Meter) reading mean scores ranged from 52.48 to 38.0. The differences in mean range scores was 1.8 to 6.7 (Table 8).

Ease of cleaning required an average of 7.1 minutes to clean the glass ceramic cooktop to its original state of cleanness. Test 1 required 6.8 minutes, test 2, 7 minutes, and test 3, 7.3 minutes.

Ease of use received an average score rating of 2.3 based on the scale: 1 = none, 2 = slight, 3 = moderate, 4 = frequent and 5 = continual. The AHAM Menu food items selected for preparation in this study on the smoothtop range required slight to moderate user interaction (Table 5).

#### Smoothtop in Relation to Other Appliances on the Buyer's Guide

A summary of all data used to establish the basis of comparison between the conventional electric coil, gas burner, smoothtop, solid element, induction and microwave oven is found in Table 9.

Purchase price of the smoothtop at \$450-600 is comparable with the gas burner, solid element and microwave oven. The range in prices is \$250 - \$600.

Table 7

Speed of heating, Retained heat, and Heat recovery for 3 quarts (2.85l)  
of water on the Electric Resistance Coil Glass Ceramic Cooktop

Test	Range		Mean	SD
Speed of Heating (water to 209°F. from 70°F)	Time to boil (Minutes)			
	10.80	11.00	10.84	.116
Retained Heat (water to 190°F. from cooled 209°F)	Time to cool (minutes)			
	29.01	30.29	29.70	1.146
Heat Recovery (after noodles, return to 209°F.)	Time to return to boil			
	.15	.25	.22	.058

Tests were repeated three times.  
Time was recorded in minutes

Table 8

Reflection Meter Readings for Browning Patterns of Crepes Using a 7" Medium Gauge Crepe Pan on the Maytag BCRE955 Electric Glass Ceramic Smoothtop Range: Evenness of Heating

Meter Readings for 4 Replications				
CREPE	1	2	3	4
Quadrant 1	52.9	44.5	47.0	45.9
2	53.8	42.0	47.7	45.3
3	51.1	38.0	47.7	47.0
4	51.9	35.7	49.1	47.1
Center	52.7	33.9	46.6	45.9
Mean	52.48	38.0	47.62	46.24
Range Difference	2.7	6.7	2.5	1.8

Reflection meter readings for the crepes:

The lower the number the lighter the crepes. The greater the range of scores, the more uneven the heating.

Table 9

Summary of Data from Cooking Appliances in the Buyer's Guide for Range Cooktops and Microwave Ovens

	Elec. <sup>3</sup> coil	Gas <sup>1</sup> burner	Smooth- <sup>2</sup> top	Solid <sup>3</sup> Element	Induc- <sup>3</sup> tion	MWO <sup>3</sup>
Purchase price	\$450	\$450-600	\$450-600	\$450-600	\$600	\$250-500
Maintenance	\$50	\$50	\$50	\$50	\$100	\$50-100
Life expectancy (years)	14-20	14-20	14-20	14-20	14-20	5-11
Operating Cost	\$0.46	\$0.23	\$0.43	\$0.46	\$0.41	\$0.49
Energy use (BTU's)	19,455	40,062	18,817	19,496	17,317	20,834
Speed of heating	7.70	13.59	10.86	11.48	10.51	-
Evenness/heat (range of score)	14.51	9.95	14.48	7.88	41.35	12.52
Retained heat (minutes)	16.65	17.80	29.7	22.93	12.66	11.13
Heat recovery (minutes)	.21	.82	.22	.57	.40	-
Ease of cleaning (minutes)	8.8	6.1	7.1	5.6	4.8	3.4
Ease of use (1-5 scale)	2.42	2.36	2.30	2.21	2.50	1.80

<sup>1</sup>Boschung (1985)

<sup>2</sup>Young (1988)

Maintenance costs are based on an average repair cost. The designations for costs are: High = \$100, Medium = \$50 - 100, Low = \$50.00. Maintenance costs are low on most ranges with the exception of the induction. The repair costs are moderate for the microwave oven.

The life expectancy of all cooking appliances is reported as 17-19 years with the exception of the microwave which is 5-11 years (Portrait of the U.S. Appliance Industry, 1990). A plausible explanation might be that consumers often replace microwave ovens when children leave home taking them along as there are more sold than other cooking appliances.

The smooth-top compares favorably with the other cooking appliances in its operating costs. The gas range costs less to operate than the others because at this time the national average cost of natural gas is lower than that of electricity.

Energy use among the cooktops varies. The smoothtop is similar in energy use with the other electrical appliances. The gas range uses more energy, however, it costs less.

Speed of heating of the smoothtop is comparable to the solid element, induction, and the microwave. The electric coil is the fastest. This test was not conducted with the microwave because of the length of time required to heat 3 quarts (2.85l) of water this test was impractical.

Evenness of heating for the smoothtop was comparable to the electric coil and the microwave oven. The induction may have the lowest evenness due to the material of the cooking utensil used. Induction cooking is dependent upon a magnetic field which can be influenced by the cooking

utensil. The electric coil had high evenness which could have been influenced by the utensil material and the directness of heating.

Retained heat on the smoothtop was the highest measured of all the cooktops. An explanation for this result may be found in the cooktop design in which heat is trapped under the glass ceramic top.

Heat recovery on the smoothtop was comparable to the electric coil. The discrepancy observed in the speed of heating is also evident in heat recovery for the gas burner. Again, for the microwave oven this test was not performed because the length of time required to boil the volume of water made use of the microwave oven impractical.

In ease of cleaning following the manufacturer's recommended procedures, the smoothtop compares favorably with the gas burner and solid element. The microwave and the induction cooktop took the least amount of time to clean; the electric coil took the longest. The number of component parts to remove and clean contributed to the time required to clean the electric range.

Ease of use as rated by the preparation of selected foods from the AHAM menu was rated as moderate. The microwave oven was rated as the easiest to use.

#### Summary and Recommendations

The data on Table 9 are a compilation of results from standardized test procedures for the electric coil, gas burner, smoothtop, solid element, and induction cooktops and microwave ovens. The data for each range cooktop were categorized into high, medium, and low based on the distribution of



Scores for each characteristic as indicated in the description for Buyer's Guide items (Table 5). Due to the fact that raw data were not available for comparison with the smoothtop data, descriptive analyses are not available with the exception of mean scores.

## CHAPTER V

### STEP 3 - FOCUS PANEL EVALUATION OF THE BUYER'S GUIDE

Stage 3 in the development of the Buyer's Guide for Range Cooktops and Microwave Ovens was the evaluation of the Buyer's Guide for Major Cooking Appliances using focus panel discussion groups. The Buyer's Guide was evaluated for clarity of vocabulary, ease of reading, and format.

#### Procedures

##### Selection of Participants

The criterion for selection of panel participants required that at least four meals per week are cooked at home. The solicitation of participants for the panels was first conducted by telephone. Telephone numbers beginning with 961, 951, 953, or 552 were selected at random from the local telephone directory and invited to participate. Examples of responses were: "I'm sorry, I will be on vacation the week of July 30- August 4", "I don't prepare more than one meal at home per week", or "Thank you for calling. At this time I'm not interested in being a participant." Twenty calls were made with no participants accepting the invitation to be a focus panel member. As an alternative, volunteers who met the selection criterion were sought from among graduate students, faculty, and staff in the College of Human Resources at Virginia Polytechnic Institute and State University.

##### Conduct of Focus Panel Interviews

The four focus panels were conducted with a total of 26 participants. Sessions 1 and 2 (7 and 8 participants respectively) were held in the household equipment lab in the College of Human Resources during the noon hour.

Participants were seated around one large table. A battery operated tape recorder was placed within an arm's length of the moderator who was seated in a corner position. Sessions 3 and 4 (6 and 5 participants respectively) were held at 7:00 P.M. with participants seated around a conference table in Litton-Reaves Hall on the campus of Virginia Polytechnic Institute and State University.

The author served as facilitator for all four sessions. Elizabeth Mitchell was the assistant for sessions 1, 2, and 4 Vinitha Aliyar for session 3. In all four sessions the first name of each participant was placed on a name card which was placed in front of the participant on the table. After an explanation of the objectives of the focus panel and an introduction to the study, participants were informed that the session would be recorded on a cassette tape. Each participant was given a copy of the Buyer's Guide for Major Cooking Appliances. Discussions were begun by the moderator after each participant read the Buyer's Guide. Participants answered all of the desired questions which were developed by the researcher to discover the thoughts, impressions, and evaluation of the Buyer's Guide for Major Cooking Appliances (Table 10).

### Findings

In all four sessions participants indicated that the Buyer's Guide with the recommended changes would be an important resource for consumers who are seeking information in the process of making a purchase decision. The theoretical framework is supported in this evaluation in that the focus panel participants indicated that the Buyer's Guide will be a resource

Table 10

Response Frequencies to the Buyer's Guide for Major Cooking Appliances by Focus Panels.

Questions which were answered in the focus panels:

Yes No

24	2	1. Is the Buyer's Guide in a logical order?
25	1	2. Are the spaces between the entries adequate?
20	6	3. Is the type easy to read?
24	2	4. Is the terminology easy to read?

Are the following entries on the Buyer's Guide meaningful?

26	0	5. Purchase price?
26	0	6. Maintenance?
26	0	7. Life expectancy?
26	0	8. Operating costs?
26	0	9. Energy utilization?
26	0	10. Speed of heating?
26	0	11. Evenness of heat?
26	0	12. Heat retention?
22	4	13. Recovery?
26	0	14. User interaction - ease of cleaning?
25	1	15. User interaction - ease of cooking?
24	2	16. Recommended cookware?
22	4	17. Are the asterisks meaningful?
26	0	18. Is there enough detail in the explanation of the types of cooking appliances?
26	0	19. Will the Buyer's Guide be useful to you?
3	23	20. Are there other factors which are important to making a cooking appliance purchase decision? (size, design of controls, and color)

which will be used by consumers to develop a standard by which they will choose a specific range cooktop or a microwave oven. More information in the form of the Buyer's Guide at the point of purchase will give the consumer an opportunity to comparison shop with generic information.

The panel participants recommended changes to clarify content, practicality of format, and usefulness of the Buyer's Guide to consumers. Examples of the responses were:

"This is the kind of information needed from Consumer Reports."

"Make sure that the title reflects cooktops."

"Needs to open to be able to see the description and the chart at one time."

"Front cover should have an appealing design to attract attention."

"Buyer's Guide is an excellent outline to help me decide what kind of range to buy."

"Write descriptions in columns."

An implication to the question "Are there other factors which are important to making a cooking appliance purchase decision?", could be that not all items influencing a purchase decision are included in The Buyer's Guide for Range Cooktops and Microwave Ovens. Table 10 reports the frequency of responses.

Revisions of the Buyer's Guide for Major Cooking Appliances suggested by focus panel participants, were incorporated into the document, renamed Buyer's Guide for Range Cooktops and Microwave Ovens.

### Summary

The front cover (Figure 3), descriptions (Figure 4), chart (Figure 5), definitions (Figure 6), of the characteristics found on the Buyer's Guide for Range Cooktops and Microwave Ovens were the result of the compilation of data and suggestions from the evaluation of focus panel participants of the Buyer's Guide for major cooking appliances (Figure 8, 9, 10, 11). The Buyer's Guide for Range Cooktops and Microwave Ovens was designed to be an informative resource to assist consumers as an input into the systematic decision making process of selecting and purchasing a major cooking appliance. The Buyer's Guide for Range Cooktops and Microwave Ovens resulted from a three stage process of development which was presented in the empirical model stage of this study.

### Recommendations

To further define the Buyer's Guide for Range Cooktops and Microwave Ovens there needs to be further research. More focus panel evaluations need to be conducted with a variety of groups representative of potential users. In addition, professionals who work with clients or customers in the process of selecting a major cooking appliance could be asked to evaluate the Buyer's Guide for Range Cooktops and Microwave Ovens.

A BUYER'S GUIDE FOR  
RANGE COOKTOPS AND  
MICROWAVE OVENS

Figure 3. A Buyer's Guide for Range Cooktops and Microwave Ovens

## RANGE COOKTOPS AND THE MICROWAVE OVEN



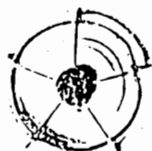
### Electric Coil

- . Metal tube shaped into a coil with flattened surface
- . Heat goes through cookware to cook the food
- . Medium to heavy cookware conducts heat best
- . Fast to heat-up and to cool down



### Induction

- . Heat is created in the cookware, not the cooktop
- . Induction coil is beneath glass ceramic
- . Heat is produced in the pan and conducted to the food
- . A magnet must be able to stick to the cookware
- . Aluminum and glass cookware cannot be used
- . Heating will not occur if the cookware is non-magnetic, or if utensil is less than 4" or if there is no utensil on the unit
- . Fast to heat up and to cool down



### Gas Burner

- . Burners use gas and air to produce a blue flame
- . Flame is lighted by a pilot light or by a spark caused by electricity
- . Heavy gauge aluminum cookware is recommended - cookware is not critical
- . Heat goes through cookware to cook
- . Instant heat-up and cool down

### Smoothtop

- . Heating element beneath cooking area of glass ceramic
- . Heat goes through the glass to the cookware
- . Scratch resistant but can be scratched with sharp knives or rough pans
- . Flat bottomed metal pans are best
- . Slow to heat up and to cool down



### Microwave Oven

- . Microwaves penetrate the food creating heat to cook the food
- . A magnetron tube creates the microwaves by using electrical energy
- . Food shape, temperature, shape of container, and thickness affects cooking time
- . Cooking power (output wattage) and temperature affect cooking time
- . Cookware is made of glass, plastic or paper



### Solid Element

- . Cast iron plates with heating coils inside
- . Plates are sealed in a porcelain or glass ceramic top
- . No drip bowls to clean
- . Use flat bottom pans with more than 1" overhang
- . Slow to heat up and to cool

Figure 4. Cooking Appliance Descriptions



Type of cooking appliance						
Characteristic	Electric Coil	Gas	Smoothtop	Induction	Solid Element	Microwave
Purchase price	L	M	M	M	H	M
Maintenace	L	L	L	L	M	M
Life expectancy	H	H	H	H	H	M
Operating costs	M	L	M	M	M	M
Energy use	M	H	M	M	L	M
Speed of heating	H	L	M	M	M	-
Evenness of heat	M	H	M	H	L	M
Heat retention	M	M	H	H	L	L
Heat recovery (return to boil)	L	H	L	M	M	-
Ease of cleaning	L	M	M	M	H	H
Ease of use	M	M	M	M	M	H

Key: High = H, Medium = M, Low = L

Figure 5. A Buyer's Guide for Range Cooktops and Microwave Ovens

The following are definitions for the characteristics included in this Buyer's Guide for Range Cooktops and Microwave Ovens. The numbers and ranges of scores are a result of tests conducted using standardized performance tests. This Buyer's Guide is intended to be used as a generic resource in the process of selecting a major cooking appliance.

Key: High = H; Medium = M; and Low = L

1. Purchase price - price to purchase range  
H = +\$600 M = \$450-600 L = below \$450
2. Maintenance - cost paid for repairs during life of appliance  
H = \$100 + M = \$50 - 100 L = below \$50
3. Life expectancy - time appliance functions under normal use  
H = 17 + years M = 16 - 10 years L = below 9 years
4. Operating costs - money required to purchase energy source to prepare selected menu items  
H = \$ .60 + M = \$ .41-46 L = \$ .23
5. Energy use - amount of energy (BTU) required to use appliance to prepare a standard selection of foods  
H = 40,062 M = 20,834-18,407 L = 17,317
6. Speed of heat - time to nearest one hundredth of a minute to heat quart of water from 70°F to boiling  
H = 7.70 M = 10.51-11.47 L = 13.59  
Heating this amount of H<sub>2</sub>O too slow in microwave to be practical.
7. Evenness of heat - heat distribution of element as measured by evenness of browning of crepes. Range of mean scores given.  
H = 9.95 M = 12.52-14.51 L = 12.52  
The lower the number the more even the heating.
8. Heat retention - heat that stays in element when turned off. Measured by time for temperature of 1L of water to fall from boiling to 190°F (94°C)  
H = 29.7-22.93 M = 16.65-17.80 L = 12.66-11.13
9. Heat recovery - amount of time needed to return water to boiling after a food item is added  
H = .21-22 M = .40-.57 L = .82  
Not available for microwave.

10. Ease of cleaning - time in minutes required to clean the cooking appliance after food preparation (boiling over oatmeal and frying four hamburgers)  
H = 3.4-4.8 M = 5.6-7.1 L = 8.8
11. Ease of use - intensity of involvement of the user with the appliance preparing food on a scale of:
- 1 = none - put food on, leave alone until done.
  - 2 = slight - put food on turning at appropriate times.
  - 3 = moderate - put food on stirring occasionally, manipulating food at appropriate times.
  - 4 = frequent - stirring occasionally, manipulating food and readjusting control settings.
  - 5 = continual - constantly stirring or manipulating food until done.
- H = 1.80 M = 2.21-2.50 L = 3.0+

Selected menu food items were prepared three times - an average score is reported.

Figure 6. Operational Definitions for the Buyer's Guide for Range Cooktops and Microwave Ovens

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May 1991

Figure 7. Back page of Buyer's Guide for Range Cooktops and Microwave Ovens

**A BUYER'S GUIDE FOR  
MAJOR COOKING APPLIANCES**

Figure 8. Front Page for a Buyer's Guide for Major Cooking Appliances

## Range Cooktops

Conventional Coil Element - Metal tube shaped into a coil with the surface flattened for maximum contact with cooking utensils. Heat is conducted and radiated to a pan placed in the element. Medium to heavy gauge, flat bottom utensils of a heat conducting material perform best.

Solid Element - Cast iron plates into which electrical heating coils have been embedded. Each plate is sealed in place in a porcelain or tempered glass range surface. No drip bowls. Heat spreads through the entire surface of the element and is conducted to the cookware placed on it. Pans the same size or a little larger (no more than 1 inch overhang) than the element are recommended.

Glass-Ceramic Cooktops - Dark colored, generally black, glass-ceramic with one of two types of heating elements under the glass--resistance coil or induction. The glass-ceramic surface doesn't discolor or buckle after prolonged heating, is resistant to scratches, but can be marred by rough bottom pans or sharp knives. It is resistant to the impact of a dropped pan, and to spills, grease, and other deposits. Flat bottom pans are far more essential for success with these cooktops than with conventional coil elements.

Resistance Elements - Coiled heating elements beneath the cooking areas of the cooktop. Heat produced in an element is radiated to the glass-ceramic top and conducted to the cooking utensil. Spaces between cooking areas remain cool. Cookware should be medium to heavy gauge of a good conducting material and should match the diameter of the cooking area.

Induction Element - Uses electromotive force to heat cookware made of magnetic materials such as iron, steel, nickel, or various alloys (identify with a household magnet). Heat is produced in the pan and conducted to the food being cooked. Cooktop surface is heated only by conduction of heat from the pan. If there is no utensil on the cooking area, if the utensil is nonmagnetic, or if the utensil is smaller than 4 inches in diameter, heating does not occur.

Gas Cooktops - Have burners which use a mixture of gas and air that is ignited and burned. Typically burners can be removed, but some now have burners that are permanently mounted or sealed in place. Pilotless ignition systems light the burner automatically. Some burners feature automatic reignition--if the flame goes out, the burner will automatically relight. The choice of cookware is not as critical as with any of the electric cooktops; however, heavy gauge, metal cookware is recommended.

Microwave Ovens - Microwaves penetrate the food, creating heat that causes the food to cook. Microwave energy is created by the conversion of electrical energy into microwave energy by a magnetron tube. Food coes from the outside in. The density of the food, the material and the shape of the food container, the cooking power (output wattage), and the temperature of the food load will affect cooking time.

A BUYER'S GUIDE FOR  
MAJOR COOKING APPLIANCES

Type of cooktop	ELECTRIC COIL	GAS BURNER	SMOOTHER	INDUCTION	SOLID ELEMENT	MICROWAVE OVEN
Purchase price	*	**	**	***	**	**
Maintenance	*	*	*	**	*	**
Life expectancy	***	***	***	***	***	**
Operating costs	**	*	**	**	**	**
Energy utilization	**	***	**	*	**	**
Speed of heating	***	*	**	**	**	
Evenness of heating	**	***	**	*	***	**
Heat retention	**	**	***	*	***	*
Heat recovery	*	***	*	**	**	
Ease of cleaning	*	**	**	***	**	***
Ease of cooking	**	**	**	**	**	***
Recommended cookware	Stainless steel Aluminum Ceramic over Steel		→	Magnetic cookware same as gas & coil		Plastic glass paper

Key: High = \*\*\*, Medium = \*\*, Low = \*

Figure 10. A Buyer's Guide for Major Cooking Appliances



The Development of a Buyer's Guide For  
Major Cooking Appliances

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Figure 11. Back page of a Buyer's Guide for Major Cooking Appliances

CHAPTER VI  
SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

Summary

The need for consumer information continues to increase with the proliferation of consumer choices. Information that will enable consumers to compare generic cooktops and microwave ovens has been incorporated into the Buyer's Guide for Range Cooktops and Microwave Ovens. The information presented in the Buyer's Guide was derived from a series of standardized tests and from focus group evaluation and gives the consumer an opportunity to compare purchase price, maintenance, life expectancy, energy use, operating costs, speed of heating, retained heat, heat recovery, evenness of heating, ease of cleaning, and ease of use. The description of each cooktop and the microwave oven was included to give the consumer more information on which to make a purchase decision. The Buyer's Guide for Range Cooktops and Microwave Ovens will be a resource used by consumers as they seek to address the problem of purchasing a range cooktop or microwave oven. The steps outlined by Williams (1982) and in the theoretical framework will assist in the comparison of range information as standards are established for a range cooktop or a microwave oven.

Recommendations

Further development of the Buyer's Guide for Range Cooktops and Microwave Ovens is needed to determine its usefulness to consumers who are shopping for a range cooktop or a microwave oven. The next stage will be to place the Buyer's Guide in retail appliance stores. A consultation with a marketing

firm to determine the best layout, color scheme, and placement of the Buyer's Guide in retail appliance stores will be sought. There is a need to develop a method by which the usefulness of the Buyer's Guide will be evaluated. On-site visitations will be necessary to establish a rapport with appliance retailers and to monitor the evaluation process of the Buyer's Guide.

### Conclusions

The strengths of this research are that there were varied methods of data collection used to develop the Buyer's Guide for Range Cooktops and Microwave Ovens. Stage 1 utilized a telephone and mailed questionnaire with Extension agents and Virginia Retail Merchants. Stage 2 utilized the adaptation of standardized test procedures to measure items for the smoothtop radiant coil cooktop for comparison with the conventional electric coil, the gas burner, induction cooktop, solid element, and the microwave oven. Stage 3 utilized focus group evaluation of the Buyer's Guide for Range Cooktops and Microwave Ovens.

The weakness of this study as seen by this researcher is that there is not a Stage 4 which could have confirmed the actual usefulness of the Buyer's Guide for Range Cooktops and Microwave Ovens at the point of purchase. This would serve to substantiate the contention that consumers need a generic information resource to enable them to make a major cooking appliance purchase. Also, there is a need to clarify the terminology on the Buyer's Guide more clearly using simple, unsophisticated terminology.

If this study is replicated, there are several changes that should be made. There should be more retail merchants surveyed from a larger sample

including discount locations. The collection of data using standardized procedures should be expanded to the innovative cooktop, the halogen unit. The focus panel evaluations should be videotaped and recorded. A proposal for Stage 4 which will be designed to test the usefulness to consumers of the Buyer's Guide for Range Cooktops and Microwave Ovens is needed.

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APPENDIX A - Stage 1

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Savage and Shin Questionnaire to 31 Montgomery County, Virginia Residents

If you were about to purchase a new range, what would help determine your choice? Please circle the number which best describes the importance of each of the following:

How important is:	Very Important	5	4	3	2	1	Hot Important:
1. the time it takes to cook a meal?		5	4	3	2	1	
2. repair costs?		5	4	3	2	1	
3. the speed of heating a burner/element on your range?		5	4	3	2	1	
4. the speed of returning to a boiling point after adding cold food to boiling water, (e.g. frozen vegetables, spaghetti noodles)?		5	4	3	2	1	
5. ease of cleaning the top of your range?		5	4	3	2	1	
6. long life?		5	4	3	2	1	
7. operating costs?		5	4	3	2	1	
8. purchase price?		5	4	3	2	1	
9. having heat in the burner/element after the control is turned off?		5	4	3	2	1	
10. attention required during cooking (e.g. stirring, adjusting control setting)?		5	4	3	2	1	

Please respond to the following items.

11. Did you purchase your current range? (2) Yes (1) No
12. If yes, what was the price of your range? \$ \_\_\_\_\_
13. Are you planning to buy a range in the next six months? (2) Yes (1) No
14. What is the number of people in your household?
  1. 1-2
  2. 3-4
  3. 5-6
  4. 7 or more
15. What is the highest level of education you have completed?
  1. Less than high school
  2. High School
  3. Community college or vocational school
  4. Some college
  5. Bachelor's degree
  6. Graduate degree (Master's or PhD)
16. In what category is your annual household income?
  1. \$ 15,000 - 20,999
  2. \$ 21,000 - 30,999
  3. \$ 31,000 - 40,999
  4. \$ 41,000 - 50,999
  5. \$ 51,000 & above

Please return this survey in the self-addressed stamped envelope by Wednesday, March 15, 1989 to:

Dr. Rebecca Lovingood  
 218 Wallace Hall, Dept. of HDM  
 Virginia Polytechnic Institute and State University  
 Blacksburg, Virginia 24061-0424

## Definitions for Buyer's Guide

Purchase price - the initial price of appliances at the time of purchase.

Life expectancy - the length of time an appliance will function effectively under normal use conditions.

Maintenance - the cost of maintaining and servicing major appliances during a product's useable life.

Energy use - total amount of energy used by an appliance cooking operation as measured by a watt-hour meter.

Speed of heating - the time required to heat one quart (2.85l) water to boiling.

Retained heat - heat that stays in the element after the controls have been turned off.

Evenness of heating - heat distribution of the element as measured by evenness of browning.

Ease of cleaning - time required to clean the cooking appliance after a food preparation activity.

Ease of use - the intensity of involvement of the user with the appliance during food preparation as measured on a scale of:

1 = none - put food on, leave alone until done.

2 = slight - put food on turning at appropriate times.

3 = moderate - put food on stirring occasionally, manipulating food at appropriate times.

4 = frequent - stirring occasionally, manipulating food and readjusting control settings.

5 = continual - constantly stirring or manipulating food until done.

Heat recovery - the amount of time needed to return water to the boiling point after a food item is added.

Operating Costs - the amount of money that is required to use the cooktop.

Recommended cookware - cookware suggested by the cooktop manufacturers for best cooking results on the cooktop.

## Cover Letter to Home Economists

Dear Ms.

As you are well aware, rapid changes in technology have resulted in new and unfamiliar products for the home. For example, cooktops with conventional electric coil units appear side-by-side in retail stores with those having solid elements or those made of glass-ceramic over radiant coils, halogen lamps, or induction elements. Consequently, consumer information needs have changed.

To assist consumers in their decision making, we are undertaking a project to develop a Buyer's Guide for Major Cooking Appliances with partial funding from the Virginia Farm and Home Electrification Council. Because of your contacts with consumers concerning purchase decisions and your basic knowledge of cooking appliances, we are asking for your assistance.

The first step in this project is to determine the characteristics of importance to consumers in selecting a major cooking appliance. Your responses will be used to formulate the content of the initial draft of the Buyer's Guide. In the next step, consumers will be asked to evaluate content of the Buyer's Guide as they choose among cooking appliances.

Please respond to the enclosed questionnaire by March 10, 1990. A stamped, addressed envelope is enclosed for your convenience.

Thank you, in advance, for your contribution to this project. If you have questions, please contact Dr. Lovingood at 703-231-6541.

Sincerely,

Rebecca P. Lovingood  
Project Director

Lydia Y. Savage  
Project Co-Director

## Extension Home Economist Questionnaire

Please indicate by circling the number which ranks the importance of each of the factors or characteristics which you consider important in making a major cooking appliance purchase decision.

How important is?	Very Important	Somewhat Important	Not Important
1. purchase price	3	2	1
2. life expectancy	3	2	1
3. maintenance	3	2	1
4. energy utilization	3	2	1
5. appliance operating time	3	2	1
6. speed of heat	3	2	1
7. retained heat	3	2	1
8. evenness of heat	3	2	1
9. ease of cleaning	3	2	1
10. user interaction	3	2	1
11. recovery rate	3	2	1

Please list any other factors which you think are important in making a major cooking appliance purchase.

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Any other comments:

## Additional Information From Home Economists

1. How many years have you been an Extension Home Economist? \_\_\_\_\_
2. How often do you respond to questions on appliance selection?
  - \_\_\_\_\_ 4 Very often
  - \_\_\_\_\_ 3 Often
  - \_\_\_\_\_ 2 Seldom
  - \_\_\_\_\_ 1 Never

3. Have you always worked as an Extension Home Economist?
  - \_\_\_\_\_ 2 Yes
  - \_\_\_\_\_ 1 No

If no, in which capacity have you worked?

- \_\_\_\_\_ 1 Appliance consultant in retailing
- \_\_\_\_\_ 2 Home Economist for a power company
- \_\_\_\_\_ 3 Secondary home economics teacher
- \_\_\_\_\_ 4 College instructor/professor
- \_\_\_\_\_ 5 Other \_\_\_\_\_

please specify

4. In what area of concentration is your bachelor's degree?

\_\_\_\_\_ Masters? \_\_\_\_\_  
 No Masters degree \_\_\_\_\_  
 Ph.D. ? \_\_\_\_\_  
 No Ph.D. \_\_\_\_\_

5. How would you describe the unit that you work in?
  - \_\_\_\_\_ 3 Rural
  - \_\_\_\_\_ 2 Suburban
  - \_\_\_\_\_ 1 Urban

### Telephone Survey to Retail Merchants

Interviewer: Hello, My name is Lydia Savage. I am a graduate student in the department of Housing, Interior Design and Resource Management at Virginia Tech. I am calling to ask for your assistance in a telephone survey of cooking appliance merchants in Virginia. Your store was randomly selected from the Virginia Retail Merchants Directory. The objective of my study is to develop a buyer's guide for major cooking appliances. I need your input to be sure that the items that I'm planning to include are the items which you believe are important to consumers in making a major cooking appliance purchase decision.

Please respond to the following questions by indicating whether the item or characteristic is

3 very important

2 somewhat important

1 not important at all

- |   |   |   |   |
|---|---|---|---|
| 1. How important is purchase price?           | 3 | 2 | 1 |
| 2. How important is life expectancy?          | 3 | 2 | 1 |
| 3. How important is maintenance?              | 3 | 2 | 1 |
| 4. How important is energy utilization?       | 3 | 2 | 1 |
| 5. How important is appliance operating time? | 3 | 2 | 1 |
| 6. How important is speed of heat?            | 3 | 2 | 1 |
| 7. How important is retained heat?            | 3 | 2 | 1 |
| 8. How important is evenness of heat?         | 3 | 2 | 1 |
| 9. How important is ease of cleaning?         | 3 | 2 | 1 |

Retail Merchants' Questionnaire Continued

10. How important is user interaction?                    3 2 1

11. How important is heat recovery?                    3 2 1

Are there any other factors which you feel are also important in making a purchase decision?

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Thank you so much for taking the time to complete this survey. Would you like to have a copy of the results of this study which give results of retailers responses? I will be more than happy to send you a copy. Your assistance in this phase of my research is very much appreciated.  
Have a nice day.

## APPENDIX B - Stage 2

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Crepes

One recipe makes 10-12 crepes

3 eggs

1/2 C. dry milk

1/2 C. water

3 T. butter (melted)

3/4 C. flour

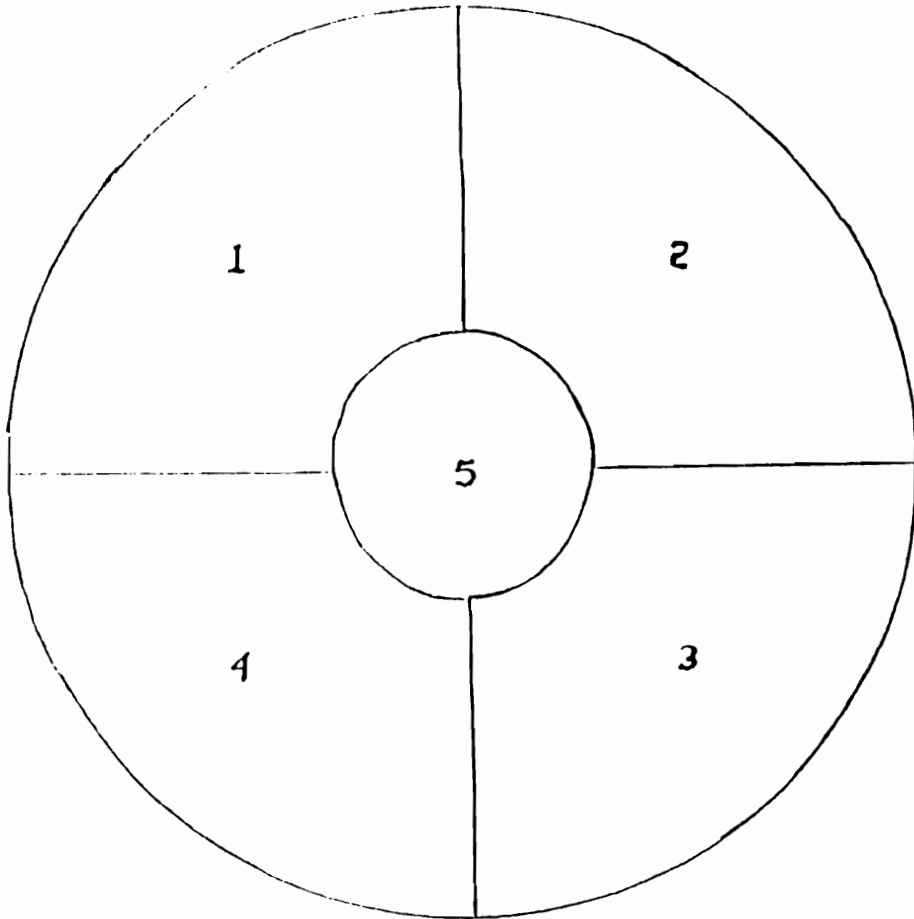
1/2 t. salt

Blend 1 minute. Scrape sides - blend 30 seconds. Put 1/2 t. vegetable oil in pan. Heat on medium until one drop of water sizzles.

Pour 1/4 C. batter in pan.

Heat 7" skillet. Tilt skillet to cover bottom; pour off extra. Brown about 1/2 minute. Turn onto waxed paper with the browned side up.

Location of Reflectance Meter Readings



## General Procedures for Stage 2

To be consistent with the procedures conducted by Young (1988), the same procedures were conducted on the smoothtop range in the household equipment laboratory at Virginia Tech in Blacksburg, VA. The same items from the AHAM Menu for Energy Testing (Eisele, 1976) using procedures developed by Lovingood and Goss (1978), from manufacturer's suggestions, and from preliminary procedures were performed. As in the case of Young (1988), items for testing were numbered. Tests were conducted in the order that the numbers were drawn.

All foods used in this study were purchased from the same local grocery store in Blacksburg, VA. All foods were stored in the appropriate storage area. All frozen foods were stored in the same freezer at -5°F.

The data sheets used in this study were the same as those used by Young (1988). The information recorded was the name of the appliance, the item of food tested, the energy used, the time used, and the intensity of user interaction.

The following variables which might have affected cooking and energy usage were controlled according to recommendations made by Lovingood and Goss (1978) in their manual of test procedures (pp. 4-5).

1. All water used was from the Blacksburg public water system which is not chemically treated other than chlorination and purification. Water was at 70°F. +/- 1°F.
2. Tight fitting covers for saucepans were used where appropriate to bring water to a boil more rapidly.

3. Soups and puddings were heated to specific temperatures.
4. No. 303 cans of applesauce and 10 oz. packages of frozen foods were used.
5. Frozen foods were placed on the counter beside the range when the water was placed on the unit.
6. All units on the smoothtop were cooled before the beginning of each test. Fans as well as ice placed in a 10" skillet were used to assist in the cooling process.

## Directions for AHAM Menu

Adapted for use on the Smoothtop  
(Maytag Model BCRE955)

1. Oatmeal

Record meter reading; start timer. Place 3 cups water in 2 qt. saucepan. Add 3/4 t. salt; cover. Place on unit. Turn control to HI. When water boils (209° F.), add 1-1/3 C. quick cooking oats. Turn control to OFF. Continue stirring for 1 minute. Cover and remove pan from unit. Record time and meter reading.

2. Pot roast

Record meter reading; start timer. Place 2 T. cooking oil in a Dutch oven; place on unit. Turn control to #6; preheat for 1.5 minutes. Add 4 lb. pot roast. After 3 minutes, turn control to #4. Brown for 5 minutes. Turn control to OFF; remove from heat. Record time and meter reading.

3. Grilled cheese sandwiches

Record meter reading. Prepare each of 6 cheese sandwiches with 2 slices of bread and 2 slices of cheese. Spread 1 t. margarine on outside of each slice of bread. Assemble sandwiches. Place 3 sandwiches in the 10 inch skillet; place on unit. Turn control to #6; start timer. After 3 minutes, turn to #3 (turn sandwiches as needed and remove when brown). Brown remaining 3 sandwiches. Turn control to OFF. Record time and meter reading.

4. Vegetable soup

Record meter reading. Place contents of one 10 oz. can of vegetable soup in a 2 qt. saucepan. Add 1 can water; stir; cover; place on unit. Start timer. Turn control to #6. Heat soup to 180°F. Turn control to OFF. Record time and meter reading.

5. Mashed potatoes

Record meter reading. Combine 1-1/3 C. water, 2 T. margarine, 1/2 t. salt, and 1/2 cup milk in 2 qt. saucepan; cover. Place on unit. Turn control to #6. Start timer. Heat mixture to 209°F. Stir in 1-1/3 C. potato flakes with a fork until desired consistency is reached. Turn control to OFF. Record time and meter reading.

6. Green beans

Record meter reading. Drain beans, reserving 1/2 C. liquid. Place beans and reserved liquid in 2 qt. saucepan; cover. Place on unit. Turn control to #6. Start timer. Heat beans to 209°F. Turn control to OFF. Remove saucepan. Record time and meter reading.

7. Scrambled eggs and bacon

Record meter reading. Combine 6 eggs, 6 T. water, and salt and pepper to taste. Beat well and set aside. Cut 8 strips of bacon in half. Place strips of bacon in the 10 inch skillet. Place skillet on unit. Start timer. Turn control to #6. When bacon fries vigorously, turn control to #4. Add more bacon until all strips of bacon are cooked. Remove bacon from skillet,

drain grease. Turn control to #4. Pour eggs into skillet: cook eggs until soft-set, stirring as needed. When eggs are done, turn control to OFF. Remove skillet. Record time and meter reading.

8. Hot dogs

Record meter reading. Place 3 hot dogs in a 2 qt. saucepan. Add 3/4 C. water; cover and place on unit. Turn control to HI. Start timer. Heat to 209° F. Turn control to OFF. Remove saucepan. Record time and meter reading.

9. Beef stew 1

Record meter reading. Place Dutch oven on unit. Add 2 T. cooking oil. Turn control to HI. Start timer. Preheat 2 minutes. Add 2 lbs. stewing beef cubes. Brown for 7 minutes. When brown, add 2/3 C. diced onions, 1 t. Worcestershire sauce, 1/4 t. garlic powder, 2 bay leaves, 1 t. sugar, 1/2 t. pepper, 1/2 t. paprika, and 2 C. water; cover. Heat to 209°F. Reduce heat to #2; cook 1-1/2 hours. Remove bay leaves. Record time and meter reading.

9.1. Beef stew 2

Record meter reading. As timer continues to run, add 1 lb. carrots, cut in 1 inch cubes, and 1.9 lbs. potatoes, quartered for stew; cover. Increase heat to HI and let come to a boil. When stew boils, reduce heat to #2 and cook for 20 minutes. Remove cover; stir; add 1 pkg. 10 oz. frozen

peas; replace cover. Turn control to HI and bring to a boil. Reduce to #2 and cook for 10 minutes. Record time and meter reading.

10. Vanilla pudding

Record meter reading. Prepare vanilla pudding and pie filling mix in a 2 qt. saucepan according to direction on box (Kroger brand, 3 1/2 oz.). Place on unit. Turn control to #4. Start timer. Bring pudding to a boil; stirring constantly. Cook until thick. Turn control to OFF. Remove saucepan. Record time and meter reading.

11. Chicken noodle soup

Record meter reading. Place contents of one 10 oz. can of chicken noodle soup in a 2 qt. saucepan. Add one can of water. Stir; cover. Place on unit. Set control to #6. Start timer. Bring to a boil (209°F.). Turn control to OFF. Remove saucepan. Record time and meter reading.

12. Hard cooked eggs

Record meter reading. Place 3 eggs and 2-3/4 C. water in a 2 qt. saucepan; cover; place on unit. Turn control to HI. Start timer. When water boils (209°F.), turn control to OFF. Remove from unit. Record time and meter reading. Let eggs remain in water 20 minutes.



### 13. Spaghetti 1

Record meter reading. Prepare meatballs using 1 lb. ground beef, 2 slices bread, 1 egg, 2 T. diced onion and 1 t. salt. Shape into 1 inch balls. Place Dutch oven on burner. Add 1 T. cooking oil. Turn control to HI. Start timer. Preheat for 2 minutes; add meatballs and brown. After 3 minutes reduce heat to #4, drain excess fat. Add 2 C. water, 1 can tomato sauce, 1 can tomato soup (10 3/4 oz.), and 1 3/8 oz. pkg. spaghetti sauce mix with mushrooms. Stir to combine; cover. When mixture boils, reduce heat to LO. Cook for 20 minutes. Turn control to OFF. Remove from unit. Record time and meter reading.

#### 13.1 Spaghetti 2

Record meter reading. Place 3 qt. water in 5 qt. Dutch oven. Add 1 t. salt and 1 T. oil; cover. Place on unit. Turn control to HI. Start timer. Heat water to 209°F. After water reaches desired temperature, add 8 oz. spaghetti noodles. Reduce heat to #6 and cook 10 minutes (pan not covered). Turn control to OFF and remove saucepan. Record time and meter reading.

### 14. Soft cooked eggs

Record meter reading. Place 6 eggs and 3 C. water in a 2 qt. saucepan; cover; place on unit. Turn control to HI. Start timer. When water boils, turn control to OFF. Allow eggs to remain covered in pan for 3 minutes. Record time and meter reading.

15. Left over beef stew

Record meter reading. Remove 3 C. leftover beef stew from refrigerator and place in 2 qt. saucepan. Add 1/2 cup water; cover. Place on unit. Turn control to #6. Heat stew to 209°F. Reduce heat to #6 and cook for 10 minutes. Turn control to OFF. Remove saucepan. Record time and meter reading.

16. Braised pork chops

Record meter reading. Place 1.9 lbs. pork chops in skillet. Place on unit. Turn control to #6. Start timer. After 6 minutes, turn control to #4. After pork chops brown (9 - 10 minutes), add 1/2 t. salt, 1/4 t. pepper, and 1/4 C. water; cover; let come to boil. Reduce heat to #2, simmer for 30 minutes. Turn control to OFF. Remove skillet. Record time and meter reading.

17. Skillet scalloped potatoes

Record meter reading. Place 2-1/4 C. diced potatoes, 1/2 t. salt, and 1/2 C water in a 2 qt. saucepan; cover. Place on unit. Start timer. Turn control to HI. When water boils, turn control to #3. Cook potatoes until tender (19 minutes). Turn control to OFF. Remove saucepan. Record time and meter reading.

17.1 Cheese sauce

Record meter reading. Place 2 T. margarine in a 2 qt. saucepan. Place on unit. Turn control to #5. Start timer. When margarine melts,

add 1/4 t. salt, 1/8 t. pepper, and 2 T. flour. Cook until bubbly. Add 1 C. milk. Cook until thickened; stirring as needed. Add 1/2 C. diced cheese, stir until melted. Turn control to OFF. Remove saucepan. Record time and meter reading.

18. Spinach

Record meter reading. Place 1/2 C. water in a 2 qt. saucepan. Place on unit; cover. Turn control to HI. Start timer. Bring to a boil (approximately 1.5 minutes). Remove cover and add a 10 oz. package of frozen spinach. Replace cover. Bring to a boil. After 5.5 minutes, turn control to #4. Cook for 5 minutes. Turn control to OFF. Remove saucepan. Record time and meter reading.

19. Applesauce

Record meter reading. Place 1 can (15 oz.) of applesauce and 1/2 t. cinnamon in a 2 qt. saucepan. Place on unit on # 4. Start timer. Heat applesauce to 140°F. Turn control to OFF. Record time and meter reading. Allow applesauce to stand 3 minutes before serving.

20. Lemon pie filling

Record meter reading. Prepare 1 box (Kroger brand 3 oz.) lemon pudding and pie filling mix in a 2 qt. saucepan according to directions on box. Place on unit. Turn control to #4. Start timer. Stir constantly until pie filling comes to a full boil. Turn control to OFF. Remove saucepan. Record time and meter reading.

21. Rice pilaf

Record meter reading. Place 1/2 C. margarine in a Dutch oven and place on unit. Turn control to #5. Start timer. As soon as butter melts, add 1 medium onion, chopped and cook until golden brown. After 5 minutes and 4 oz. mushroom pieces and 1/4 C. green pepper, diced. Cook until tender; remove (after approximately 7 minutes). Add 1/4 C. margarine, stirring until melted. Add 1 C. rice and increase heat to #6. Brown rice, stirring as needed. After rice is browned (approximately 14 minutes), add 2 C. water, 2 chicken bouillon cubes, and the vegetables. When mixture boils, cover pan and reduce heat to LO. Cook 20 minutes. Turn control to OFF and remove from heat. Record time and meter reading.

22. June peas

Record meter reading. Drain 1 (17 oz.) can of peas, reserving 1/2 C. liquid in a 2 qt. saucepan; cover. Place on unit. Turn control to HI. Heat peas to 190°F. Turn control to OFF. Remove saucepan. Record time and meter reading.

23. Tapioca pudding

Record meter reading. Prepare tapioca pudding and pie filling mix (Kroger brand, 3 oz.) in a 2 qt. saucepan according to directions on box. Place on unit. Turn control to #4. Bring pudding a to a boil (approximately 15 minutes). When pudding boils, turn control to OFF. Allow pudding to stand 15 minutes before serving. Record time and meter reading.

24. Pancakes and sausages

Record meter reading. Using directions on package of commercial pancake mix, prepare sufficient batter for 12-16 pancakes. Place 9 sausage links in the skillet. Place the skillet on the unit. Turn the control to #6. After 4 minutes, turn control to #4. Cook sausage, turning as needed, until browned (approximately 15 minutes). Remove sausage. Drain fat. Turn control to #6 and cook 3 pancakes at a time, using 1/4 C. batter for each pancake. When all batter is cooked, turn control to OFF. Remove skillet. Record time and meter reading.

25. Broccoli

Record meter reading. Place 1/2 C. water and 1/2 t. salt in a 2 qt. saucepan; cover; place on unit. Turn control to HI. When water boils, add broccoli. Cover and cook for 2 minutes. Break apart stems with a fork. Reduce heat to #2 and cook for 5 minutes. Turn control to OFF. Remove saucepan. Record time and meter reading.

## Test: Ease of Cleaning

## Glass Ceramic Smoothtop with Radiant coils

Test 1

Shape 1 pound ground beef into 1/2 inch thick patties. Place skillet on unit. Preheat skillet on #6 for 2 minutes. Place patties in preheated skillet. Cook on #6 setting to desired doneness, turning once (8 minutes for rare and 10 minutes for well done). When patties are done, turn control to OFF. Remove skillet from unit. Let unit cool.

Test 2

Place 3 cup water (70°F) and 1/2 tsp. salt in 2 qt. sauce pan; cover. Place on unit. Turn control to HI. Bring water to boil (209°F.) about (4-5) minutes. When water boils, stir in 1-1/3 cup oats; cover. Let oats boil over. When oats begin to boil over, start timer and let boil over for 0.5 minutes. Turn control to OFF. Remove pan from unit. Let unit cool.

Test 3

After 2 hours; begin cleaning procedure. Start timer. Wipe off excess spills, wash in warm soapy water. Use the scraping blade at a 45° angle for stubborn soil. Use a soft cloth to buff the glass ceramic. When cooktop is clean, stop timer. Record time and subjective evaluation of effort to clean cooktop.

### User Interaction Scale

Ease of use of the smoothtop was evaluated by rating the effort required to prepare selected AHAM Menu items using the User Interaction Scale.

1 = None - put food on, leave until done.

2 = Slight - put food on turning at appropriate times.

3 = Moderate - put food on stirring occasionally, manipulating food at appropriate times.

4 = frequent stirring occasionally, manipulating food and readjusting control settings

5 = continual - constantly stirring or manipulating food until done.

## DATA COLLECTION SHEET

## Electric Resistance Coil Smoothtop

Brand Maytag  
 Model BCRE955

Food item prepared \_\_\_\_\_

Cooking Unit

Surface unit: 8" \_\_\_\_\_ W. 6" \_\_\_\_\_ W.

Energy (watt-hours)	Test 1	Test 2	Test 3	Mean
After	_____	_____	_____	_____
Before	_____	_____	_____	_____
Differences	_____	_____	_____	_____
Time (minutes)	_____	_____	_____	_____
After	_____	_____	_____	_____
Before	_____	_____	_____	_____
Differences	_____	_____	_____	_____
User Interaction	_____	_____	_____	_____
Environmental Factors				
Atmospheric Pressure	_____	_____	_____	_____
Temperature (F.)	_____	_____	_____	_____
Humidity (%)	_____	_____	_____	_____



## VITA

Lydia Yvonne Savage was born on July 15, 1954 in Hampton, Virginia, where she graduated from Kecoughtan High School in 1972. She received the Bachelor of Science Degree in Home Economics Education from Norfolk State University in 1976 and the Master of Science Degree in Family Environment from Iowa State University, Ames, Iowa in 1980.

She has held the following positions: home economics teacher, Linkhorne Middle School, Lynchburg, Virginia; instructor, Norfolk State University, Norfolk, Virginia; and instructor, and assistant professor, Howard University, Washington, District of Columbia.

She entered the Ph.D. program in Housing, Interior Design and Resource Management at Virginia Polytechnic Institute and State University in 1983 as a transfer student from Oregon State University. While attending Iowa State University, Oregon State University, and Virginia Polytechnic Institute and State University, Miss Savage was employed as a graduate assistant.

Requirements for the doctorate degree were completed in May 1991. Professional memberships include: the American Home Economics Association, the Virginia Home Economics Association, and the American Council on Consumer Interest. She is a certified home economist.

*Lydia Yvonne Savage*