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Date November 30, 1990

A READABILITY STUDY

OF

MARTIN MARIETTA ENERGY SYSTEMS, INC.'S

DAILY INTERNAL

EMPLOYEE COMMUNICATION MEDIUM

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Linda Fullington Cabage

December 1990

DEDICATION

This thesis is dedicated to the memory of my father, who loved me unconditionally and supported my every endeavor, while treating me like a princess.

And to my mother, who has proven that a person can do anything at any age--as long as she has a little strength and a lot of determination.

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ABSTRACT

This study used a computerized readability program written by Wayne Danielson to determine the readability levels of the Inside Lines, an employee communications medium used by Martin Marietta Energy Systems, Inc., in Oak Ridge, Tennessee, and to determine if the Inside Lines are too difficult for the average reader to understand easily. This study builds on an earlier work by Mary McSpadden on the readability of news releases at Martin Marietta Energy Systems.

Inside Lines from July 1989 to December 1989 were run through the Danielson program. The program produces grade score adaptations for the Flesh Reading Ease Formula, the Farr-Jenkins-Paterson Formula, the Gunning Fog Index, the Danielson-Bryan Formula and the SMOG Grade. The program also produces scale scores for the Flesch, Farr-Jenkins-Paterson and the Danielson-Bryan formulas. Scores are interpreted by a table provided with the Danielson program.

The resulting readability scores were tabulated, and averages were calculated to generalize the data. The results of this study showed that the Inside Lines were written at a level too difficult for average readers to read and comprehend easily.

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CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

Background

Readability has been defined as all the elements in a piece of printed material that affect the degree to which people will understand the piece and find it interesting (Wimmer and Dominick 1987). Studies in readability began in the 1880s when Sherman calculated sentence length to distinguish between early English and contemporary writing styles.

In the early 1920s readability formulas were developed for testing educational textbooks. Other researchers became interested in the use of the formulas and followed with new ones. Rudolf Flesch developed the Reading Ease Formula, which calculates readability by determining the total number of syllables and the average number of words per sentence in a 100-word sample of writing. The Farr-Jenkins-Paterson Formula counts the number of one-syllable words and the number of words in each sentence per 100 words. The SMOG Grading method developed by G. Harry McLaughlin determines the educational grade required by a person to easily understand a certain passage. The Gunning Fog Index by Robert Gunning calculates average sentence length and the number of words three syllables or more per 100 words.

Danielson and Bryan developed a computer program patterned after the Farr-Jenkins-Paterson Formula (Wimmer and Dominick 1987).

These popular formulas continued to be used in education and were used later in other fields such as journalism, public relations, technical writing, law, government, publishing and business. Readability testing, however, can be time-consuming. Counting words and syllables is a tedious task, but computers and computer programs capable of performing the required counting now make the use of readability formulas easier and practical.

Readability research in mass communication tries to determine the factors that make writing easy or difficult to read by using formulas to measure the ease or difficulty of reading a piece of writing. However, these formulas not only measure the readability of written material but also look for those aspects of style that influence their readability. Some researchers even have tried to formulate ways to measure objectively the interest level of written material.

Public relations professionals are becoming more aware of the importance and the need for quantifiable results in their work. "Theoretically, evaluation is an essential part of the public relations process, equal in importance to research, planning, programming and even communications itself" (Wright 1979). Readability studies are useful in

public relations research because they can help determine the approximate reading levels of publications and news releases and help public relations staffs direct readable information to appropriate target audiences.

Martin Marietta Energy Systems, Inc.

Martin Marietta Energy Systems, Inc., is the managing contractor for the U. S. Department of Energy's research and development, component production and uranium enrichment facilities in Tennessee, Kentucky and Ohio. Three of the facilities are located in Oak Ridge, Tennessee; one is in Paducah, Kentucky; and one is in Portsmouth, Ohio. This study will be limited to the Oak Ridge sites.

Oak Ridge National Laboratory (ORNL) is the nation's largest energy research and development laboratory. The Oak Ridge K-25 Site (K-25) is a multipurpose site for applied technology. K-25 was formerly the Oak Ridge Gaseous Diffusion Plant, a center for enriched uranium production until 1985. The Oak Ridge Y-12 Plant (Y-12) is a manufacturing and developmental engineering organization engaged primarily in national defense programs.

The public relations department at Martin Marietta Energy Systems in Oak Ridge produces an employee communication medium called the Inside Lines. About 15,000 employees in Oak Ridge have access to the Inside Lines, which

is the only daily communication medium available to them. The employees at these three facilities have diverse educational backgrounds.

The editorial policies for the Inside Lines at present are not established formally, but a draft version of Inside Lines Information and Guidelines (Lundy 1990) was provided as information for this study. The purpose of the Inside Lines, as stated informally, is to list the following types of information:

1. Information on company policies and procedures.
2. Information on office or department schedules for operation.
3. Information on site-specific research and development programs.
4. Information on company-sponsored programs, such as Savings Bond and United Way campaigns and Medic blood drives, in addition to requests for volunteers by community service agencies or organizations (not including requests for donations).
5. Job listings as requested by senior management.
6. Information on in-house training courses.
7. Seminar announcements and meeting notices for technical and professional organizations whose activities are related to ongoing company programs.

8. Information on community and recreation programs that have company or Department of Energy sponsorship.
9. Information on the activities of other divisions or companies within the Martin Marietta Corporation.
10. Media advisories, selected responses to media inquiries and abbreviated versions of selected news releases (in an effort to inform employees of important activities before they read about them or hear about them in the external media).

News is gathered, edited (using traditional print journalism guidelines) and placed on the computer system by members of the public relations staff.

Some of the information included in the Inside Lines is site specific. Information that may affect employe -12 may be of no interest to the employees at ORNL. There also is a difference in the type of employees working at each facility. Many employees at Y-12 are production-oriented, and employees at ORNL and K-25 are involved mostly with research and administration activities. Therefore, three different Inside Lines are produced: InsideY for about 6,700 employees at Y-12, InsideK for about 2,900 employees at K-25 and InsideX for about 5,400 employees at ORNL. (The name InsideX is derived from "X-10," ORNL's wartime code name and common name used in referring to ORNL.)

Employees who use computers regularly can access the communication system through their computer terminals. Employees at Y-12 who do not have access to computers can read abbreviated versions of InsideY on television monitors located in break rooms. This system is called the Electronic Bulletin Board System. In addition to television monitors, computer terminals also are being placed in break rooms to allow access to the communication system without computer access codes otherwise needed. Employees will be able to read InsideY by typing a generic access code providing entry to the information system.

Employees at ORNL and K-25 who do not have access to the computer system can call a telephone number at their respective facilities and hear recorded versions of InsideX and InsideK. Some employees read Inside Lines that are printed and posted by other employees with access to computers.

The Problem

The public relations staff at Martin Marietta Energy Systems in Oak Ridge supports an ongoing communications research program. As part of that program, a computerized readability study of news releases was conducted in the summer of 1987 (McSpadden).

McSpadden's study showed that technical and nontechnical news releases written for the external audience by the Martin Marietta Energy Systems public relations staff were too difficult to read for the average reader. McSpadden also compared the readability of technical news releases to the readability of resulting news stories in three local newspapers. The study found that although the stories published in the newspapers were more readable than the original news releases, the majority of the articles were still too difficult for the average reader.

McSpadden's study focused on the readability of articles written for the external audience. The aim of this study will be to evaluate the readability levels of the Inside Lines, which are intended for the internal audience--the employees of Martin Marietta Energy Systems in Oak Ridge.

This study will address concerns by the Martin Marietta Energy Systems public relations staff of whether the Inside Lines, similar to the news releases evaluated by McSpadden, may be too difficult for the employees to read and comprehend easily. Findings of this study will be compared with the results of McSpadden's study and provide suggestions for improvement and further research, if needed.

The readability levels of InsideX, InsideY and InsideK will be determined by using the Danielson computer program. The program uses adaptations of the Flesch Reading Ease Formula, the Farr-Jenkins-Paterson formula, the Danielson-

Bryan formula, the Gunning Fog Index and the SMOG Grade to calculate readability levels.

The study will try to answer the following questions:

1. What are the average readability scores of InsideK, InsideX and InsideY as determined by the Danielson program? Where do the average scores fall in each of the five readability formulas calculated?

2. How do the average scores of the Inside Lines compare with each other?

3. How readable will the Inside Lines be to most of the employees at Martin Marietta Energy Systems in Oak Ridge, according to their educational levels and as predicted by the average readability scores?

4. How do the readability levels for the Inside Lines compare to the readability levels of technical news releases and nontechnical news releases that were determined by a previous computerized readability study conducted at Martin Marietta Energy Systems?

Chapter I serves as an introduction to this study and contains the problem statement. Chapter II examines the development of readability studies by providing a review of

literature. Chapter III discusses the procedures used in the study, including the collection of data and the use of Danielson's computer program. Chapter IV presents the findings of the study. Chapter V contains final conclusions and recommendations.

CHAPTER II

REVIEW OF LITERATURE

Background

A review of literature in readability shows much reading is available to provide background information. The material reveals readability research began when educators searched for ways to rate the reading ease of school textbooks. Since the establishment of readability formulas, readability studies have been used in mass communication to evaluate works in this field.

Historic Background

The evidence of one of the first readability studies is found among the works of religious teachers in 900 A. D. Talmudists counted words and ideas to distinguish usual from unusual meanings. In 1840 the ease of understanding vocabulary in McGuffey Readers was considered, and Kaeding developed a word count in 1898 to further relate vocabulary to reading difficulty. In 1889 Rubakin constructed a list of 1,500 familiar words, which illustrated the continued interest in the relevance of vocabulary lists to readability (Klare 1963).

Rubakin also considered long sentences a factor of reading difficulty, but Sherman, a professor of English literature at the University of Nebraska, was the first to quantitatively calculate sentence length. In the 1880s Sherman used sentence length to determine the difference between the early English writing style and the writing style of his contemporaries (Klare and Buck 1954).

Sherman found average sentence lengths had declined progressively from earlier times to the turn of the 20th century. Average sentence length in the Elizabethan period was about 50.14 words (Klare and Buck 1954); sentences in the 1890s contained about 20 words (Gunning 1968). Sherman felt shorter sentences were more readable and were a move toward a "universally best style" (Klare and Buck 1954, 43).

Sherman also found writers consistently used a pattern of similar sentence lengths. This discovery was important because it introduced the use of samples instead of an entire work of writing when counting sentence lengths (Klare and Buck 1954).

In 1921 Kitson, a psychologist, used the number of syllables in words and sentence length to measure the readability of two newspapers and two magazines. After analyzing the newspapers (the Chicago Evening Post and the Chicago American) and the magazines (the Century and the American), Kitson found average word and sentence lengths in the Chicago American were shorter than the Chicago Evening

Post's. He also found average word and sentence lengths for the American were shorter than the Century's (Klare and Buck 1954).

Kitson's primary interest was not in measuring the difficulty of the periodicals but in estimating an audience's intellectual level to help an advertiser select an advertising medium. His work was important because syllable and sentence-length counts were later used by Flesch and others to develop readability formulas that are popular today (Severin and Tankard 1988).

Sherman and Kitson analyzed pieces intended for adults. In 1932 Lively and Pressey, who are credited with developing the first readability formula, dealt with the problem of selecting science textbooks for junior high school students. Lively and Pressey's research was based on the assumption that vocabulary difficulty, as associated with word frequency, was a key factor in determining the difficulty in understanding written material.

Educators in the early 1920s felt school textbooks were too difficult and less difficult ones would help students learn more effectively. Lively and Pressey's formula was developed when teachers reported a high amount of technical terminology in junior high school science textbooks. The researchers argued that because the textbooks contained so much technical vocabulary, most of the time spent in classes was used teaching vocabulary (Chall 1988).

The Lively and Pressey formula was based on E. L. Thorndike's Teacher's Word Book, which listed 20,000 words most common in English. Words in Thorndike's book were indexed with numbers--the higher the number, the more common the word. The weakness in Lively and Pressey's formula lay in interpreting scores. The researchers did not provide a scale, so readability studies had to be scored in relation to other studies. One book could be shown to be more difficult than another, but a book could not be rated alone. The Lively and Pressey formula was a beginning, however, and led other researchers to develop readability formulas.

In 1928 Vogel and Washburne created a formula by analyzing books children enjoyed reading. Vogel and Washburne's work was different from previous research because they measured interest as opposed to comprehension (Klare and Buck 1954).

Lewerenz devised several readability formulas between 1929 and 1939. In one research effort, Lewerenz found words beginning with the letters "w," "h" and "b" were easier to understand that words beginning with "i" and "e." This discovery was not very useful, however, and Lewerenz later used vocabulary difficulty, diversity, interest and percentage of polysyllabic words to measure readability (Klare and Buck 1954).

Readability research in the early 1920s concentrated on vocabulary, but in 1926 the Winnetka Formula incorporated

sentence factors with vocabulary to predict the reading difficulty of children's books. The Winnetka Formula led the way for Gray and Leary's book published in 1935 titled What Makes a Book Readable in which the authors took a closer look at the elements influencing readability. Gray and Leary were driven by the problem that many American adults were not reading because much of the available material was too difficult to read. They began their research by surveying publishers, librarians and others interested in adult education and asked them to list the elements they thought contributed to readability for adults with limited education (Severin and Tankard 1988).

Gray and Leary began with a list of 289 elements, which they narrowed to 82 after eliminating style elements. When elements that could not be measured objectively were removed, 64 elements remained; and when some of these elements were shown to appear infrequently, the list was pared to 44. Further research showed that 21 elements had significant correlations with reading comprehension. Of those 21 remaining elements, the researchers chose five elements that could be expressed mathematically and developed this final formula:

$$X_1 = -.01029X_2 + .009012X_5 - .02094X_6 - .03313X_7 - .01485X_8 + 3.774$$

where X_1 = reading score

X_2 = number of different hard words (words not on a list of 756 easy words) in a passage of 100 words

X_5 = number of first-, second- and third-person pronouns

X_6 = average sentence length in words

X_7 = percentage of different words

X_8 = number of prepositional phrases

Two researchers with the Readability Laboratory of Teachers College at Columbia University took readability studies a step further. In 1939 Lorge found some simple, two-element combinations produced higher correlations in reading comprehension scores than Gray and Leary's five-element formula. Lorge's research showed number of prepositional phrases and number of difficult words; average sentence length and number of difficult words; and number of prepositional phrases and average sentence length were reliable combinations (Severin and Tankard 1988).

Flesch took Lorge's strategy and developed his own reading ease formula in 1943. Flesch used linguistic theory, which suggested that "'seeing verbal relationships, logic, ideas, meaning' might be an important element in adult reading that was left out of earlier formulas . . ." (Severin and Tankard 1988, 72). He created a list of 12,918 words to measure the "abstract" element of writing. Flesch found in

later research, however, that counting affixes (prefixes and suffixes) was a good measure of abstraction and dropped his abstract word count. He kept Gray and Leary's sentence length measure and included a count of personal words, which were thought to add appeal to written pieces. The first Flesch readability formula appeared as:

$$X = .133X_s + .0645X_m - .0659X_h - .7502$$

where X = reading score

X_s = average sentence length in words

X_m = number of affixes within a 100-word sample

X_h = number of personal references within a 100-word sample

The resulting score was evaluated by checking a chart, which interpreted the score by providing a description such as "very easy" or a grade level of the potential audience (Severin and Tankard 1988).

Flesch revised his formula the next year. He dropped the personal references count from the original formula to develop a new "human interest" formula. Flesch also replaced the affixes count with the number of syllables per 100 words, a measure of word length. Two formulas resulted:

R.E. = 206.835 - .846 wl - 1.015 sl

where R.E. = reading ease score

wl = number of syllables per 100 words

sl = average number of words per sentence

The resulting score was found on a chart that ranged from 0 to 100.

The human interest score appeared as:

H.I. = 3.635 pw + .314 ps

where H.I. = human interest score

pw = number of personal words per 100 words

ps = number of personal sentences per 100 sentences

This score also fell between a range from 0 to 100 (Flesch 1948). According to Klare (1963), the Flesch Reading Ease Formula is the readability formula most often used. (See Table 1 on page 18 for the Flesch Chart of Reading Ease Scores.)

Table 1. Flesch Chart of Reading Ease Scores

Reading Ease Score	*Description of Style*	*Estimated Reading Grade*
90-100	Very easy	5th grade
80-90	Easy	6th grade
70-80	Fairly easy	7th grade
60-70	Standard	8th/9th grade
50-60	Fairly difficult	10th/12th grade
30-50	Difficult	college
0-30	Very difficult	college graduate

Flesch's formula was revised later that year by Farr, Jenkins and Paterson. The Farr-Jenkins-Paterson Formula simplified the Flesch Reading Ease Formula by counting the number of one-syllable words per 100 words instead of counting the number of individual syllables per 100 words. The researchers found the correlation between the two variables high enough to allow the substitution and the method was faster and required no knowledge of syllabification by coders (Farr, Jenkins and Paterson 1948). The resulting formula appeared as:

New Reading Ease Index = 1.599 nosw - 1.015 sl - 31.517

where nosw = number of one-syllable words per 100 words

sl = average sentence length in words

In 1948 Dale developed a readability formula with Chall to test the grade-level difficulty of reading materials (Dale and Chall 1948). Their formula was based on the vocabulary load of words outside Dale's list of 3,000 familiar words and average sentence length. Their formula appeared as:

$$X_{c_{50}} = .1579X_1 + .0496X_2 + 3.6365$$

where $X_{c_{50}}$ = reading-grade score of a pupil who could answer one-half of the test questions on a passage correctly

X_1 = Dale score (relative number of words outside Dale list of 3,000 words)

X_2 = average sentence length

3.6365 = constant

Dale and Chall (1948, 20) admitted their formula was not definitive and cautioned about "writing for a readability formula."

> We must remember at all times that a formula is a statistical device. It means that, on the whole, longer sentences make comprehension more difficult. This does not mean that all long sentences are hard to read and understand. There are some very short sentences that may be harder to comprehend than longer ones. The same holds true for the use of familiar words. On the whole, the more unfamiliar the words used, the harder the material will be to understand. But sometimes familiar words are used in a symbolic or metaphoric sense. "To be or not to be" is not an easy idea although the sentence is short and the separate words used would usually be called simple and familiar ones. Readability formulas are not sensitive to such subtle variations in meaning.

Another offshoot of the Flesch formula was developed by Gunning in 1952. The Gunning Fog Index was based on average sentence length in words and the number of words three syllables or more per 100 words. In formulating the index, Gunning proposed difficulty in writing could be calculated by adding the average sentence length and the percent of words with three or more syllables and multiplying the sum by 0.4 to produce a score equivalent to school grade reading levels

(Bogert 1985). (See Table 2 on page 22 for Gunning's Fog Index Chart.)

Gunning (1968, 31) provided a warning with his readability formula.

> Like all good inventions, readability yardsticks can cause harm in misuse. They are handy statistical tools to measure complexity in prose. They are useful to determine whether writing is gauged to its audience. *But they are not formulas for writing.* Anyone who sets out to pattern his writing to the few factors of a formula alone may find that he is turning out dull, standardized writing that fails to attract readers.

In 1953 Taylor published the results of his study to produce another tool for measuring readability. Taylor called his unit a "cloze," which is pronounced like the verb "close" but is derived from the noun "closure." The cloze procedure deletes every fifth word of a written section and has the reader fill in the blanks using information from the rest of the passage (Hansell 1976).

Fry in 1968 designed a Readability Graph for plotting readability levels. Fry suggested few people used readability formulas because of the time needed to count syllables, words and sentences. To locate readability levels on his chart, Fry: 1) selected three 100-word samples from the beginning, middle and end of a book; 2) counted the number of sentences

Table 2. Gunning Chart for Fog Index

	Fog Index	*Reading Level By Grade*	*By Magazine*
	17	College graduate	(No popular magazine this difficult)
	16	College senior	
	15	College junior	
	14	College sophomore	
Danger Line	13	College freshman	
	12	High school senior	*Atlantic Monthly* and *Harper's*
	11	High school junior	*Time* and *Newsweek*
	10	High school sophomore	*Reader's Digest*
Easy-reading Range	9	High school freshman	*Saturday Evening Post*
	8	Eighth grade	*Ladies Home Journal*
	7	Seventh grade	*True Confessions* and *Modern Romances*
	6	Sixth grade	Comics

in each passage; 3) counted the number of syllables in each sample and averaged the three totals; and 4) plotted on the graph the average number of sentences and the average number of syllables.

In 1969 McLaughlin devised an even faster method to calculate readability. SMOG Grading determined the educational grade a person must have reached to understand a particular written piece. Grades 1 through 12 indicates the need for an elementary and high school education to understand a piece; grades 13 through 16 indicates the need for college education; grades 17 through 18 indicates the need for graduate education; and 19 and above shows the need for advanced professional training.

To figure McLaughlin's SMOG Grading: 1) count 10 consecutive sentences near the beginning, in the middle and near the end of a written piece; 2) in the 30 samples, count every word containing three or more syllables; 3) estimate the square root of the number of polysyllabic words counted; and 4) add three to the approximate square root, which produces the SMOG grade.

Klare (1963, 205) concluded that:

> Readability formulas are limited to imperfectly measuring difficulty of style. Formulas do not rate content, organization, word order, format, imagery, or the qualities of the readers. It seems a readability formula should not be used as the only criterion in judging or rating materials.

Computerized Readability Formulas

To further simplify the use of readability formulas, several researchers have developed computer programs for various computer systems. Danielson and Bryan (1963) wrote a computer program in 1963 to eliminate time-consuming word and syllable counts. The computer program, written for the UNIVAC 1105 computer, was based on the Farr-Jenkins-Paterson Formula, which was rewritten in a style the computer could recognize. The computer's resulting score could be checked on the Flesch reading ease chart or on a chart designed by Danielson and Bryan, which is shown in Table 3.

Table 3. Danielson-Bryan Score Interpretations for the UNIVAC 1105 Computerized Readability Program

Score	Level
90-100	Very easy, third grade level
80-89	Easy, fourth grade level
70-79	Fairly easy, fifth grade level
60-69	Standard, sixth grade level
50-59	Fairly difficult, junior high school level
30-49	Difficult, high school level
0-29	Very difficult, college level

In 1968 Fang (1969) developed the "Flesch Reading Ease Counter" for the IBM 1401 Computer, which used Flesch's

formula and a syllable counter to determine the readability score for 36 newscasts and 36 newspapers.

Barry and Stevenson used the Dale-Chall formula in 1975 to develop a computer program to measure readability. The program was written in FORTRAN for a Control Data Corporation Computer No. 3150. In 1979 Barry (1980) further developed programs to include the Flesch; Farr, Jenkins and Paterson; Gunning Fog Index; Spache and Spaulding (Spanish) formulas (Barry 1980).

In 1980 Kincaid, Aagard, O'Hara and Cottrell (1981) developed a program that sorted uncommon and misspelled words; suggested easier substitutions for difficult words and phrases; and calculated readability grade levels. The readability formula was a revised Flesch Reading Ease Formula called the Flesch-Kincaid Readability Formula. A Common Word List was developed out of the Dale-Chall list and other lists to identify uncommon words. Supplementary Technical Word Lists and substitution lists also were developed.

Bell Laboratories in 1981 designed a computer program to reduce wordiness and to suggest simplifications in sentences. Called Writer's Workbench, the program ran on PDP-11/45, PDP-11/70 AND VAX 11/780 computer systems (Wilken 1981a) and calculated average word and sentence length; percentage of simple, compound and compound-complex sentences; and percentage of active and passive verbs (Wilken 1981b).

Researchers compared test results against the Kincaid formula to predict readability (Wilken 1981a).

Another computerized readability system was developed in 1982 by Schuyler to perform readability calculations more quickly. Schuyler wrote a program in Applesoft BASIC for the Apple II microcomputer, which produced scores for the Fog Index, Flesch's Reading Ease Formula, Dale-Chall and several others.

In 1986 Danielson rewrote the Danielson-Bryan computer program to run on an IBM personal computer. The new program used adaptations of the Flesch formula, the Farr-Jenkins-Paterson formula, the Gunning formula and the Danielson-Bryan formula. Flesch, Farr-Jenkins-Paterson and Gunning used syllable counts and sentence length as predictors of reading ease. The Danielson program estimates the number of syllables by counting the number of letters in a sentence.

Danielson revised his program in 1988. The new program contained the original adaptations of the Flesch Reading Ease Formula, the Farr-Jenkins-Paterson Formula, the Gunning Fog Index and the Danielson-Bryan Formula, and added McLaughlin's SMOG Grading as a fifth readability predictor. When using Danielson's program, grade and scale levels for the Flesch, Farr-Jenkins-Paterson and Danielson-Bryan formulas are provided. The Danielson program does not calculate scale scores for the Gunning Fog or SMOG formulas. Scores for texts run through Danielson's

table. (See page 28 for Table 4. Interpretations of Scores Produced by Danielson's Program.)

Newspaper Readability Studies

Researchers have performed readability studies on newspapers to determine their readability levels and to determine if the newspapers are read easily by their audiences.

In 1947 Lostutter analyzed 150 articles and 10 letters from readers published by The State Journal in Lansing, Michigan, and compared them to 10 Associated Press stories and 10 staff-written articles from the Detroit Free Press. Lostutter used the Flesch and Lorge formulas and found the letters by readers were the easiest to read. Sports and society articles ranked second and third for easy reading. Stories on local government, politics and business all measured within the college reading level in Flesch's formula.

Lostutter also found the leads to The State Journal's stories raised the overall scores of the articles. "The practice of trying to answer all the 'W's' in one breath is unnecessary," according to Lostutter (1947, 313).

Razik in 1969 studied newspaper readability in metropolitan and nonmetropolitan areas. Razik selected 50 newspapers each from metropolitan and nonmetropolitan areas

Table 4. Interpretations of Scores Produced By Danielson's Program

Grade Scores	Scale Scores	Meanings Assigned
2	90-100	Extremely Easy
3	89-89	Very Easy
4	70-79	Easy
5	60-69	Easier Than Average
6	50-59	Average
7	40-49	More Difficult Than Average
8	30-39	Difficult
9	20-29	Very Difficult
10	0-19	Extremely Difficult

and used the Dale-Chall formula to compare the readability of front page stories. He found the stories of metropolitan newspapers were easier to read than the stories of nonmetropolitan newspapers.

Razik also tested wire stories by Associated Press and United Press International that were used on the front pages of these newspapers. He found no significant difference in the readability of AP articles in metropolitan or nonmetropolitan newspapers but found UPI articles in nonmetropolitan newspapers were more difficult to read than UPI stories in metropolitan papers (Razik 1973).

In 1973 Hoskins studied the readability levels of wire copy from the Associated Press and United Press International. Hoskins tested the wire services to see if they followed suggestions that news stories should be written at the sixth-grade (12-year-old) level or at least at the ninth-grade level. Hoskins used the Flesch formula to study AP copy published in The North Texas Daily and UPI copy published in the Denton (Texas) Record-Chronicle. The study revealed AP scores ranging from 36 (difficult) to 63 (standard) and UPI scores ranged from 10 (very difficult) to 68 (standard).

Bittner and Shamo in 1976 computed the Gunning Fog Index, Spache's Grade Level Indicator, Flesch's Reading Ease Formula and the Lorge formula with the TEXAN computer program to calculate the readability level of The Mini Page, a syndicated newspaper insert for children five to 12 years old

(kindergarten to fifth grade). The Flesch formula indicated the stories in The Mini Page were written at a seventh grade or higher level. The Fog Index showed some stories were written at the 12th grade level. The Spache measurement indicated the stories were written at fifth and sixth grade levels, while Lorge's formula reported them at the seventh grade level.

In 1981 Stempel compared the readability of six types of newspaper content--international news, national news, local news, editorials, women's or family living news and sports. Stempel used the Flesch formula and computed 630 articles representing 21 daily newspapers. He found the overall average score was in Flesch's "difficult" range (only 33 percent of the U. S. adults can comprehend this writing level). Stempel's study showed international news to be the least readable followed by local news and national news. The most readable were the women's sections followed by sports. Readability scores for individual newspapers placed each in the "difficult" category (Stempel 1981).

Also in 1981, a study was conducted at Brigham Young University to determine the difficulty of eight newspapers and stories by two wire services. Researchers used Bell Laboratories' Writer's Workbench, a computer program designed to aid writers, and found overall average scores reached 11.19 (high school junior level) (Wilken 1981b).

Fowler and Smith conducted a study in 1982 to determine the comparative readability levels in Time and Newsweek magazines. Fowler and Smith divided articles between immediate-reward and delayed-reward categories to calculate readability scores. Immediate-reward stories are crime-news, disaster, sports, recreation, social and human interest articles that provide "instant satisfaction." Delayed-reward stories include public affairs, economics, social problems, science, education, weather and health articles.

The researchers used Flesch's formula and found the mean readability score for all articles was 56.5 (high school education). However, delayed-reward stories were found to be more difficult to read than the immediate-reward stories.

In 1983 Fusaro and Conover used the Fry readability formula to assess readability levels of two tabloid and two nontabloid newspapers. Fusaro and Conover compared the two nontabloids, the New York Times and the Wall Street Journal, against two tabloids, the New York Daily News and the New York Post. The researchers found the Times and the Wall Street Journal required readers to have at least a college freshman level education. The Daily News and the Post required readers have high school senior level education to comprehend the four newspapers.

Johns and Wheat in 1984 designed a study to determine any differences in the readability levels of impersonal and personal newspaper articles. Impersonal articles are those

not dealing with named persons. Personal articles name people and their situations. Johns and Wheat chose 54 articles from two Chicago dailies and evaluated them using the Fry formula. They found personal stories had lower readability levels than impersonal stories.

In 1987 the Lexington Herald-Leader in Kentucky introduced a readability evaluation in its newsroom by using a computerized Flesch formula. A computer program was integrated into the newspaper's library system, where it analyzed two entire issues of the paper. The program calculated hard-news and business stories at the 10th to 12th grade level and feature and life-style stories at seventh, eighth and ninth grade levels (Haynes 1989).

Other Readability Studies

Readability studies have been conducted in other mass communication disciplines. Barnett and Leoffler evaluated readability levels of selected accounting and auditing messages found in annual reports. In 1975 the researchers selected footnotes and audit reports of financial statements collected from the first 50 corporations on the Fortune 500 list.

Barnett and Leoffler calculated these readability levels and compared them to the results of a previous study conducted in 1969. They used the Flesch Reading Ease Formula and found

all of the footnotes in the 1975 study were classified as "very difficult" or at the college level. In the 1969 study, 73.5 percent of the notes fell in the same category. Barnett and Leoffler found the audit reports also fell in the "very difficult" category.

In 1980 Christ and Pharr reported the results of a readability study involving public information brochures for the State of Florida. The Flesch and the Dale-Chall formulas were used to determine the readability levels of brochures found in seven state government departments. Scores in five departments fell in the ninth grade to 12th grade range. Scores in one department reached the college level and in another, the ninth to 10th grade level.

Heath and Phelps (1984) studied the ability of shareholders to understand annual reports. They randomly selected 20 companies on Fortune's list of the top 500 corporations and used Gunning's Fog Index to measure the readability of their 1981 annual reports. The researchers chose sample passages from the reports' three main sections: the president's letter to shareholders, the general text and the notes on the financial statement.

Results of the study showed the president's letter sections had an average readability score of 14.20; the general sections an average score of 14.18; and the financial section an average score of 15.92. When compared to Bureau of Census statistics that indicated 34 percent of the

shareholders had no college education and 31 percent had not completed college, at least half of the shareholders would find the annual reports difficult to read (Christ and Pharr).

Hoskins (1984) conducted readability studies on the 1980 annual reports of the top 24 corporations on the Fortune 500 list. Hoskins used the Flesch Reading Ease Formula and found four of the reports rated "very difficult"; 19 rated "difficult"; and one rated "fairly difficult." Hoskins plotted the scores on Fry's graph and found nine reports rated at grade 17+ (college graduate) and five at the college senior grade. One report rated at the high school graduate level.

James Suchan and Clyde Scott reported in 1986 the results of a study determining the difficulty levels of collective bargaining agreements. Readability levels were determined for three clauses from each of the 196 agreements selected. The Flesch formula, the Gunning Fog Index and the Farr-Jenkins-Paterson index were used for the study. The Flesch and Farr-Jenkins-Paterson formulas calculated 95 to 99 percent of the agreements at the "difficult" or "very difficult" range. The Gunning Fog Index showed an average grade level of 18.73--a college degree plus two years of graduate study--was needed to read easily and comprehend the agreements.

In 1987 McSpadden conducted a readability study of technical and nontechnical news releases produced by Martin Marietta Energy Systems. She also evaluated the readability scores of stories in three local newspapers that resulted from

the news releases. The three newspapers were the Oak Ridger, the Knoxville News-Sentinel and the Knoxville Journal.

McSpadden found the mean scores of technical news releases were rated as "difficult" and "very difficult" while nontechnical news releases were scored as "more difficult than average" and "difficult." Based on those scores, McSpadden determined that technical news releases were more difficult to read than nontechnical news releases, but the difference between the two was small. She concluded that both the technical and nontechnical releases were too difficult for the average reader to read or comprehend easily.

McSpadden also checked the readability levels of newspaper stories that resulted from the news releases. She found the newspaper articles were easier to read than the original news releases, which supported her hypothesis that the newspaper stories would be more readable because of editorial changes made by the newspaper staffs.

McSpadden included as part of her research an analysis of Danielson's computer program. She found the program was not precise and did not produce consistent, reliable and valid data. Other discrepancies included inconsistencies between grade and scale scores.

McSpadden concluded that, although the study showed the computer program produced imprecise measures, the general scores yielded by the program were beneficial in providing

the Martin Marietta Energy Systems public relations staff a "warning" against long sentence or word lengths.

CHAPTER III

METHOD

The population for this study included every Inside Line produced in 1989 from July 1, 1989, to December 31, 1989. Readability scores for each of these Inside Lines were calculated using the Flesch Formula, the Farr-Jenkins-Paterson Formula, the Gunning Fog Index, SMOG Grading and the Danielson-Bryan Formula, which are all contained in the latest Danielson computer program.

McSpadden (1987) conducted a readability study of technical and nontechnical news releases produced by the Martin Marietta Energy Systems public relations staff. She found that both types of releases and also the resulting stories in three newspapers were too difficult for the average reader to read and understand easily. The results of McSpadden's study led to concerns by Martin Marietta Energy Systems public relations staff of whether the Inside Lines also may be too difficult to read or understand easily.

InsideX, InsideY and InsideK are produced Monday through Friday, except for federal holidays. The holidays occurring during July, August, September, October, November and December in 1989 were: July 3 and 4 (July 4th with a companion day off), September 3 (Labor Day), November 23 and 24 (Thanksgiving with a companion day off), and December 25 and 26 (Christmas Day and a companion day). Inside Lines

were not produced on those dates. A readability study for the November 13 Inside Lines was not calculated because the computer communication system was not operating that day. A total of 366 Inside Lines were run through the Danielson program.

Past issues of the Inside Lines that were stored in the computer were transferred from a central computer file to an IBM personal computer file used for this study. The Inside Lines that were not available in the computer were typed into the computer file manually. The following rules, which are contained in Danielson's Five Readability Formulas: Version 2.1 manual, were strictly observed:

1. Each sample text was started with a title typed at the left of the first line.
2. A return was used at the end of each line.
3. All spaces at the end of a line were eliminated.
4. The end of the text was marked with three sharps (###) at the left of a separate line.
5. Any hyphens at the end of a line were eliminated.
6. Two spaces were used to separate sentences.

Each Inside Line was "cleaned up" to conform to the Danielson program's requirements. Headlines were removed, two spaces between sentences were verified and hard returns were placed after each line. Tables and lists that appeared

on some days also were removed. Each Inside Line was then converted to the ASCII-II computer language and run through Danielson's program on an IBM personal computer for calculation. Entire Inside Lines, as opposed to 100-word samples, were run to increase the accuracy of the results (Danielson and Bryan 1963). Scores for each Inside Line were tabulated by the computer program and printed. (See Appendix A for samples of Inside Lines before formatting for the Danielson program and Appendix B for Inside Lines after formatting for the Danielson program.)

Danielson recommended researchers not expect the different formulas to produce the same results. "Except for the SMOG score, which is based only on word length, the formulas probably will give fairly consistent readings most of the time. Taking a mental average of the formulas might not be a bad idea" (Danielson 1988, 9). Based on this recommendation, means and medians of all the tabulated scores were calculated.

Limitations

The limitations of this study are those inherent to the use of readability formulas. Many researchers have said that while readability formulas can help determine whether writing is appropriate for certain audiences, they do not tell an

author how to write. They should be used to help anticipate reading ease (Bogert 1985, Wright 1979).

Other researchers warn against using readability formulas. Irwin and Davis (1980), developers of a readability "check list" as an alternative to objective formulas, criticized readability formulas for not taking into account many critical factors. Irwin and Davis warned that formulas do not examine the reader's conceptual background and the text's concept load; do not examine the way new concepts are introduced; and do not consider motivational factors or factors necessary for retention.

Davison and Kantor (1982, 189) argued that objective readability formulas measure factors such as sentence length and familiarity of vocabulary but do not define what actually makes text easy or hard to read.

> Objections may be made to readability formulas in general. Reading difficulty may be affected by purposes and background of the reader and the inherent difficulties of the subject matter; it is not just a function of measurable properties like length and vocabulary.

Bogert (1985, 9) wrote that readability formulas:

> . . . reduce a complex concept to only two variables, sentence and word length, but making sentences shorter does not necessarily make them more readable. They eliminate choice in writing

and emphasize the product rather than the process of writing.

Persons writing for a particular audience may use words familiar to that particular audience. Responding to a readability study performed at The Worcester (Mass.) Evening Gazette, Managing Editor Diane Benson said, "Often a reporter has to use multi-syllable words, but the use of such words does not necessarily make a piece difficult to read" (Porter 1982).

A similar situation exists at Martin Marietta Energy Systems. Multi-syllabic words may be used in Inside Line, but the words may be familiar to the readers at Y-12, ORNL and K-25. On the other hand, acronyms, which may be used without clarification, may cause reading difficulty for some. These acronyms, however, are counted as single syllable words and may cause a readability formula to score lower although the reader does not have a clear understanding of the written passage.

Despite the shortcomings found in readability formulas, they still can be used as aids to improve writing. Writers can use the formulas as guides to see if their sentences and words could be shortened for improved clarity and conciseness. Readability studies also are effective for determining whether certain publications or other public relations vehicles are within the "ball park" of their target audiences. Authors should re-evaluate their writing if

scores are way above the educational levels of their audiences.

CHAPTER IV

RESULTS

For this study, six months of InsideX, InsideY and InsideK were run through the Danielson computer readability program. The Danielson program provides the following information for each sample of text run through the computer program:

Number of characters in text
Number of words in text
Number of words with four or fewer letters
Percent of words with four or fewer letters
Number of words with eight or more letters
Percent of words with eight or more letters
Number of sentences
Characters per sentence
Characters per word
Words per sentence
Estimated syllables
Estimated syllables per 100 words

GRADE SCORE PREDICTORS:
(Estimated grade in school needed for average comprehension)
Estimated Flesch Grade Score
Estimated Farr-Jenkins-Paterson Grade Score

Danielson-Bryan Grade Score

Estimated Gunning Fog Index

Estimated SMOG Index

SCALE SCORE PREDICTORS:

Estimated Flesch Scale Score

Estimated Farr-Jenkins-Paterson Score

Danielson-Bryan Scale Score

(Scale scores are not calculated for Gunning Fog and SMOG.)

The grade and scale scores are interpreted on Danielson's table, which is provided with the program. (See Table 4 on page 27 for Danielson's scores table.)

Danielson cautions that because the formulas used in his program were developed many years ago (the last update was in the 1960s), the numbers should be used as "general indicators rather than specific predictors of grade levels of reading material" (Danielson 1988, 8).

Danielson recommends that large samples of text be used for better accuracy in calculating results. Therefore, entire Inside Lines (without headings, tables and lists) were used in this study. (See Appendix B for examples of the Inside Lines after formatting for the Danielson program.) He also warns that because the formulas were written at different times with different criteria, they may not give

the same results. He recommends averages of the scores be taken.

The formulas used in the Danielson program are adaptations of the Flesch, Farr-Jenkins-Paterson, Danielson-Bryan, Gunning and SMOG formulas. Because the formulas were adjusted and are not the original formulas, again averages should be used for interpreting scores.

Mean and median values of the grade and scale scores were calcuated for each formula used in the Danielson program. Mean values for the Flesch, the Farr-Jenkins-Paterson and the Danielson-Bryan formulas grade scores combined and scale scores combined were then calculated to provide an average. (The Gunning Fog and SMOG formulas were excluded from the average because scale scores are not provided for these formulas.)

Research questions 1 and 2 in Chapter I asked for the average reability scores of InsideK, InsideX and InsideY as determined by the Danielson program; where the average scores fell in each of the five readability formulas calculated; and how the readability scores compared with each other.

The mean and median grade scores for InsideX are as follows:

Formula	Grade Mean Score	Grade Median Score
Flesch	7.83	7.8
Farr-Jenkins-Paterson	6.67	6.8
Danielson-Bryan	6.91	6.9
Gunning Fog	6.78	6.8
SMOG	13.90	13.9

The mean and median scale scores for InsideX are as follows:

Formula	Scale Mean Score	Scale Median Score
Flesch	28.12	28.45
Farr-Jenkins-Paterson	31.82	31.9
Danielson-Bryan	55.44	56.05

The Flesch grade mean score of 7.83 and grade median score of 7.8 both are considered "more difficult than average" on the Danielson chart. The Flesch mean scale score of 28.12 and the Flesch median scale score of 28.45 are interpreted as "very difficult." According to the original Flesch Reading Ease Formula, the scores also fall in the "very difficult" category. Readers would need to be college graduates to easily read the text.

The Farr-Jenkins-Paterson mean grade score of 6.67 and the median grade score of 6.8 are considered "average" by Danielson. The mean scale score of 31.82 and the median scale score of 31.9 are considered "difficult."

The Danielson-Bryan mean grade score of 6.91 and median grade score of 6.9 are considered "average." The mean scale score of 55.44 and the median scale score of 56.05 also are interpreted as "average."

The Gunning Fog mean grade score of 6.78 and median grade score of 6.8 are "average." The original Gunning Fog Index considered these scores to be read easily by sixth graders. The SMOG mean and median grade scores of 13.9 go beyond the difficulty limit of the Danielson-Bryan grade score of 10. One can only assume that according to the SMOG score, the text is beyond "extremely difficult."

The mean value for the Flesch, Farr-Jenkins-Paterson and Danielson-Bryan grade scores combined is 7.14, which is considered "more difficult than average." The mean value of the scale scores is 38.46 or "difficult."

The mean and median grade scores for InsideY are as follows:

Formula	Grade Mean Score	Grade Median Score
Flesch	7.99	7.0
Farr-Jenkins-Paterson	7.00	7.1
Danielson-Bryan	7.08	7.1
Gunning Fog	6.89	6.9
SMOG	14.26	14.3

The mean and median scale scores for InsideY are as follows:

Formula	Scale Mean Score	Scale Median Score
Flesch	25.82	25.2
Farr-Jenkins-Paterson	27.52	27.5
Danielson-Bryan	54.19	54.35

The Flesch grade mean score of 7.99 and grade median score of 7.0 both are considered "more difficult than average" on the Danielson chart. The Flesch mean scale score of 25.82 and the Flesch median scale score of 25.2 are interpreted as "very difficult." According to the original Flesch Reading Ease Formula, the scores also fall in the "very difficult" category. Readers would need to be college graduates to easily read the text.

The Farr-Jenkins-Paterson mean and median grade scores of 7.00 are considered "more difficult than average" on the Danielson table. The Farr-Jenkins-Paterson mean scale score of 27.52 and the Farr-Jenkins-Paterson median scale score of 27.5 are considered "very difficult."

The Danielson-Bryan mean grade score of 7.08 and median grade score of 7.1 are considered "more difficult than average." The mean scale score of 54.19 and the median scale score of 54.35 are interpreted as "average."

The Gunning Fog mean grade score of 6.89 and median grade score of 6.9 are "average." The original Gunning Fog Index considered these scores to be read easily by sixth graders. The SMOG mean score of 14.26 and median grade score of 14.3 go beyond the difficulty limit of the Danielson-Bryan grade score of 10, which the Danielson table lists as "extremely difficult."

The mean value for the Flesch, Farr-Jenkins-Paterson and Danielson-Bryan grade scores combined is 7.36, which is considered "more difficult than average." The mean value of the scale scores is 35.84 or "difficult."

The mean and median grade scores for InsideK are as follows:

Formula	Grade Mean Score	Grade Median Score
Flesch	7.83	7.8
Farr-Jenkins-Paterson	7.35	6.8
Danielson-Bryan	6.86	6.9
Gunning Fog	6.8	6.8
SMOG	12.59	13.8

The mean and median scale scores for InsideK are as follows:

Formula	Scale Mean Score	Scale Median Score
Flesch	28.30	28.35
Farr-Jenkins-Paterson	30.03	30.1
Danielson-Bryan	55.85	56.35

The Flesch grade mean score of 7.83 and grade median score of 7.8 both are considered "more difficult than average" on the Danielson chart. The Flesch mean scale score of 28.30 and the Flesch median scale score of 28.35 are interpreted as "very difficult." According to the original Flesch Reading Ease Formula, the scores also fall in the "very difficult" category. Readers would need to be college graduates to easily read the text.

The Farr-Jenkins-Paterson mean grade score of 7.35 is considered "more difficult than average" and the median grade score of 6.8 is considered "average" by the Danielson table. The Farr-Jenkins-Paterson mean scale score of 30.03 and the Farr-Jenkins-Paterson median scale score of 30.1 are considered "difficult."

The Danielson-Bryan mean grade score of 6.86 and median grade score of 6.9 are considered "average." The mean scale score of 55.85 and the median scale score of 56.35 also are interpreted as "average."

The Gunning Fog mean and median grade scores of 6.8 are considered "average." The original Gunning Fog Index considered these scores to be read easily by sixth graders. The SMOG mean score of 12.59 and median grade score of 13.8 go beyond the difficulty limit of the Danielson grade score of 10, which the Danielson table lists as "extremely difficult."

The mean value for the Flesch, Farr-Jenkins-Paterson and Danielson-Bryan grade scores combined is 7.35, which is considered "more difficult than average." The mean value of the scale scores is 38.06 or "difficult." (See Table 5 on page 52 for the Table of Mean Values for Grade and Scale Scores for Each Inside Line.)

Table 5. Table of Mean Values for Grade and Scale Scores for Each Inside Line

InsideLine	*Mean Grade Score*	*Mean Scale Score*
InsideX	7.14 (more difficult than average)	38.46 (difficult)
InsideY	7.36 (more difficult than average)	35.84 (difficult)
InsideK	7.35 (more difficult than average)	38.06 (difficult)

The table above shows the comparison of results for each Inside Line. The mean values for the grade scores showed that Inside X, InsideY and InsideK were each in the "more difficult than average" category. The mean values of the scale scores for each Inside Line were in the "difficult" category.

Gunning (1968) provided guidelines with his formula that have served as standards in the field of readability research. He suggested that, for reading ease, sentences should average about 20 words per sentence and the count of difficult words (words with three or more syllables) should be kept to less than 12 percent.

The Danielson program calculated the average number of words per sentence for each Inside Line entered. The mean of those values listed by the Danielson program for each Inside Line was then calculated. The average number of words per

sentence for InsideX was 17.64; the average number of words per sentence for InsideY was 18.55; and the average number of words per sentence for InsideK was 17.91. According to Gunning's standard of an average of 20 words per sentence, these counts would be considered acceptable.

Danielson designed his computer program to estimate the number of difficult words by calculating the number and the percent of words with eight or more letters. If the count of words with eight or more letters is used to define difficult words, the Danielson program calculates that the average percent of hard words for each Inside Line is 22 percent. This number is much higher than Gunning's suggested 12 percent or less.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Introduction

In his research, Gunning (1968, 13, 14) suggested writers limit their prose to the Fog Index of 12, which is the high school senior level. He stated that research shows readers prefer best-selling books and popular magazines be written at that level.

> If a person's motive is strong enough, he will plow through any complexity of words, signs, or hieroglyphs. They can read the most complex material if forced to do so. But the material they prefer to read is written simply.

Business and government writing is often less readable. Writing may be complicated because topics are complex. However, unlike best-sellers, which require a large number of readers to be profitable, business writing may be difficult to read because the writers do not depend on the readers. Gunning said (1968, 21):

> When writing does not depend directly on the reader for its existence, it tends to become needlessly complex. Some writers are pompous. Others write complexly because they *think* complexly and will not take the time or trouble to card out their thoughts before trying to communicate them.

In 1964 the U. S. Department of Agriculture began using the Fog Index to improve the readability level of some of its publications. The agency set the Fog Index of 12 as its goal and in two years reduced the average for directives from 17 to 15, for letters to the public from 15 to 14 and letters from the Office of the Secretary from 15 to 14 (McKee 1967).

Readability formulas began as a way for educators to calculate the readability of student textbooks. The formulas were adapted by researchers in mass communication and were used in predicting readability for the "average" reader.

Research questions 1 and 2 in Chapter I asked for the readability scores of each Inside Line, their averages and how the averages compare with each other. The scores and averages are found in Chapter IV on pages 45 to 52.

Research question 3 asked how readable the Inside Lines were to most of the employees at Martin Marietta Energy Systems, according to their educational levels and as predicted by the average readability scores.

Educational Levels

The average reader for this study was calculated by finding the mean grade of the educational levels represented at each of the three Martin Marietta Energy Systems sites in Oak Ridge (Benson 1990). (See Appendix D for the Educational Statistics.)

The mean grade at Oak Ridge National Laboratory (ORNL) is three years of college; the median grade is the bachelor's degree. 30.40 percent of employees at ORNL have educational levels that go beyond bachelors' degrees. Some employees have completed advanced degrees while others have attended schools after completing their bachelors' degrees.

19.50 percent of the employees hold bachelors' degrees; 11.82 percent of the employees attended college but did not complete degrees; 8.72 percent of the employees hold two-year program degrees (associate degrees or equivalent); 26.85 percent of the employees hold high school diplomas; and 2.55 percent of the employees do not have high school diplomas. (See Table D-1 in Appendix D.)

The average person at ORNL is one who has had three years of college. 58.62 percent of the employees at ORNL have two-year college degrees. 70.49 percent of the employees have at least one year of college.

The mean and median grades for the Oak Ridge Y-12 Plant (Y-12) is one year of college. 7.09 percent of employees at Y-12 have educational levels that go beyond bachelors' degrees. 17.73 percent of the employees hold bachelors' degrees; 15.89 percent of the employees attended college but did not complete degrees; 9.69 percent of the employees hold two-year program degrees; 41.73 percent of the employees hold high school diplomas; and 7.59 percent of the employees do not have high school diplomas. (See Table D-2 in Appendix D.)

At Y-12, the average person has had one year of college. 34.51 percent of the employees have two-year college degrees. 41.73 percent of the Y-12 employees hold only high school diplomas.

The mean and median grades for the Oak Ridge K-25 Site (K-25) is two years of college. 12.5 percent of employees at K-25 have educational levels that go beyond bachelors' degrees. 25.53 percent of the employees hold bachelors' degrees; 12.50 percent of the employees attended college but did not complete degrees; 7.96 percent of the employees hold two-year program degrees; 36.17 percent of the employees hold high school diplomas; and 5.10 percent of the employees do not have high school diplomas. (See Table D-3 in Appendix D.)

The average person at K-25 has had two years of college. 45.99 percent of the employees have at least two-year college

degrees and 36.17 percent have high school degrees. An additional 12.50 percent of the employees have attended college but did not attain degrees.

Conclusions and Recommendations Derived from the Educational Levels and the Readability Scores

Interpreting the readability scores of each Inside Line and preparing recommendations from those scores is difficult when each Inside Line's diverse audience is considered.

The majority of employees at ORNL have at least two years of college. InsideX's mean grade score of 7.14, as determined in Chapter IV of this study, is considered "more difficult than average" by Danielson; the mean scale score of 38.46 is considered "difficult."

According to the average educational levels found at ORNL, most of the employees at ORNL should be able to read and understand InsideX. However, even readers with high educational levels may avoid text written at "more difficult than average" and "difficult" levels because they are not easy to read and require more time to comprehend. Readers simply may not want to devote the time needed to read and understand the text.

Y-12 has a larger percentage of employees with high school diplomas. The mean grade score for InsideY of 7.36 is considered "more difficult than average." The mean scale

score of 35.84 is considered "difficult." These scores indicate than many of the employees at Y-12, especially those with only high school diplomas, may not be easily reading or may be avoiding InsideY.

K-25 also has a large percentage of employees with at least two years of college, but the number of employees with only high school diplomas is also large. InsideK's mean grade score of 7.35 ("more difficult than average" and mean scale score of 38.06 ("difficult") may indicate that the employees with only high school diplomas may have difficulty reading InsideK. Despite the large percentage of employees with some college, InsideK should be written so it is read easily by everyone.

Instead of writing for the average reader at each site, Inside Line writers and editors should use general standards established by researchers to ensure all employees with access to the Inside Lines will be able to easily read and comprehend the Inside Lines.

Flesch considered the eighth and ninth grades as standard reading grades and any material written beyond that as difficult to read. Gunning suggested writing at the 12th grade level for the average person's reading ease (1968, 39-40).

> Copy with a Fog Index of 13 or more runs the danger of being ignored or misunderstood . . . anyone who writes with a Fog Index of more than 12 is putting his communication under a handicap . . . .

Results of a more recent study conducted by the U. S. Department of Education (Severin and Tankard 1987, 82) showed that 95 percent of young adults between the ages of 21 to 25 can read at the fourth grade level. The study randomly selected 3,600 subjects and also found that one-fifth of the subjects could not read past the eighth grade level. Around 40 percent could read a "somewhat difficult" newspaper story and about 10 percent could understand more demanding material.

The study also determined that text written past the eighth grade level is above 20 percent of the adult population, and "somewhat difficult" newspaper stories "will probably exclude more than 60 percent of the adult population." The authors stated (69):

> A newspaper editorial might be making the most important statement in the world, but if it is written so that a person needs a college education to understand it, it will go over the head of 80 percent of the population.

Inside Line writers and editors should consider this study and use standards suggested by researchers such as Flesch and Gunning when preparing text. Although educational statistics show a large percentage of the employees at Martin Marietta Energy Systems have higher education, those numbers should not mislead Inside Line editors to prepare text at a more difficult level than is recommended generally.

Writing at a higher level may leave out those readers who are not able to read difficult text easily. They may not have the time or the inclination to decipher materials that are hard to read. Even those employees who are able to read at adequate levels may not spend the time to read difficult material. The fast pace of corporate life today may not offer the luxury of sifting through difficult text. Employees at Martin Marietta Energy Systems may be missing important information because they do not have the time to easily read the Inside Lines.

Sentence and Word Length Counts for the Inside Lines

The count of the average number of words per sentence for each Inside Line is listed on pages 51 and 52 in Chapter IV. The Danielson program computed the average number of words per sentence for InsideX as 17.64; for InsideY as 18.55; and for InsideK as 17.91. These averages are under Gunning's recommended average of 20 words per sentence.

The count of the percentage of difficult words per sentence showed, however, that the number of hard words per sentence in each Inside Line is higher than the percent recommended by Gunning. He suggested a hard word count of less than 12 percent. According to the results of the Danielson program, each Inside Line resulted in a difficult word count of 22 percent. If Gunning's guideline is followed, the number of hard words should be lowered to improve the readability levels for the Inside Lines.

Long words are prominent in the vocabulary at Martin Marietta Energy Systems. Because of the nature of work handled at each facility, substitutions may not be available for technical terms used commonly. These words, however, should be familiar to those who use them regularly and should be taken into consideration when calculating readability levels.

At the same time, acronyms also are familiar "words" at Martin Marietta Energy Systems. These short words may improve the hard word count although many employees may not know what the letters mean. Therefore, care should be taken when writing text for the Inside Lines. Long words should be substituted when appropriate, and acronyms should be spelled out to ensure readers will know their meaning.

Comparison to McSpadden's Study

The average sentence length for the Inside Lines was calculated at 18.03, which is under Gunning's recommended 20 words per sentence. In comparison, McSpadden (1987) found in her study that the average sentence length for technical news releases was 25.5 and average sentence length for nontechnical news releases was 20.9. Both of these are considered high according to Gunning's standard and are higher than the average sentence lengths calculated for the Inside Lines.

The difficult word count for each Inside Line was 22 percent, which is higher than Gunning's recommended 12 percent or lower. McSpadden found in her study that the percent of words with nine or more letters (the 1988 version of Danielson's program used for this study calculates words with eight or more letters) for nontechnical news releases was 18.2, which is higher than Gunning's recommendation.

The percent of words with nine or more letters for technical news releases was 17.5, which is still higher than recommended. However, these figures are lower than the 22 percent of hard words calculated by the Danielson program for Inside Lines. The difference in percentages may be a result of the change in Danielson's program. Further research is needed to determine if this is true.

McSpadden found the mean of the Flesch, Farr-Jenkins-Paterson and the Danielson-Bryan grade scores for technical news releases was 8.1. According to the Danielson program, the material was considered "difficult." The mean of the scale scores was 27.3, which is considered "very difficult."

The mean of the grade scores for nontechnical news releases was 7.5, which is considered by Danielson to be "more difficult than average." The mean scale scores was 34.2, or "difficult."

McSpadden's scores fall closely to the mean scores for all the Inside Lines combined. The mean scale score for the Inside Lines is 7.28 ("more difficult than average"). The scale score average of 37.45 is considered "difficult." In both the news releases studied by McSpadden and the Inside Lines researched in this study, the material was considered too difficult for the average reader.

The Danielson Computer Program

This study provided general data to determine if InsideX, InsideY and InsideK were easy to read, as predicted by the Danielson computer program and the audiences' educational levels. The Danielson program is an adequate tool for producing general data. It is also a fast tool. The program enabled this researcher to run 366 complete Inside Lines and eliminated tedious hand counts, which would

not have been practical. The Danielson program allowed the calculation of several readability formulas in a short time.

The accuracy of the numbers produced is questionable, however. As recommended by Danielson, averages were taken to generalize the answers. However, researchers seeking precise figures may have difficulty accepting the general figures calculated by the Danielson program.

Recommendations for Additional Research

Additional research using the Danielson program might include determining why there is a discrepancy in the grade scores and the scale scores calculated for the same text. In all the Inside Lines run through the Danielson program, the grade scores resulted at the "more difficult than average" level, but the scale scores resulted at the "difficult" level. (See Table 5 on page 52.) Those pursuing exact figures may find hand counts of samples will produce more accurate results.

Another inconsistency found with the results produced by the program was the SMOG Grades provided. Although the figures given for the Flesch, Farr-Jenkins-Paterson, Gunning Fog and Danielson-Bryan formulas were generally agreeable, the SMOG formula numbers were always considerably higher. Additional research in exploring this incongruity is suggested.

Klare (1963) claimed the Dale-Chall formula was the most accurate readability formula. Dale-Chall scores are not calculated by the Danielson computer program. Perhaps Dale-Chall readability levels of Inside Line samples could be calculated for further comparison of the Danielson results.

Recommendations for further study of the Inside Lines includes a readership survey to collect demographic information about the audience, to gather psychographic data about the readers and to ask the Inside Line audience members about their reading habits, preferences and interests.

No data is available that shows how many employees actually read the Inside Lines or consider it an important communication vehicle. A survey is recommended to gather information about when, why and how often employees read the Inside Lines.

Research also is needed to show if readers prefer to read the Inside Lines on the computer screens or if they prefer to read printed paper copies of the Inside Lines. Information also should be gathered on the employees who do not have access to computers. Do they read paper copies of Inside Line, do they read the Electronic Bulletin Board or do they prefer to hear the recorded versions of the Inside Line?

The Inside Lines are produced using traditional print media guidelines and are made available to employees via computer terminals, television monitors and telephones, which are broadcast media. Videotext, the use of text on video

screens, was not researched for this study. However, research into videotext and its possible effects on the Inside Lines' readers is recommended strongly. Questions such as these might be answered: Do readers prefer print copies and why? Could the Inside Lines be made more readable if broadcast guidelines, as opposed to print journalism standards, were used? What typographic elements of videotext might improve readability and readership? Would an effective broadcast style used on the recorded telephone versions increase listeners?

REFERENCE LIST

Barnett, Andrew and Leoffler, Keith. 1979. Readability of accounting and auditing messages. The Journal of Business Communication 16 (Spring): 49-59.

Barry, Jeanne G. 1980. Computerized readability levels. IEEE Transactions on Professional Communication 23 (June): 88-90.

Barry, Jeanne Gardner and Timothy E. Stevenson. 1975. Using a computer to calculate the Dale-Chall Formula. Journal of Reading. 19 (December): 218-222.

Benson, Rick. 1990. Educational statistics of ORNL, K-25 and Y-12. Martin Marietta Energy Systems, Inc. Oak Ridge, Tennessee.

Bittner, John R. and G. Wayne Shamo. 1976. Readability of the 'Mini Page.' Journalism Quarterly 53 (Winter): 740-743.

Bogert, Judith. 1985. In defense of the Fog Index. The Bulletin of the Association of Business Communication 48 (June): 37-54.

Chall, Jeanne S. 1988. The beginning years. In Readability: Its Past, Present, and Future, eds. B. L. Zakaluk and S. J. Samuels, 2-13. Newark, Delaware: International Reading Association.

Christ, William G. and Paula Pharr. 1980. Readability of brochures produced by state of Florida. Journalism Quarterly 57 (Spring): 159-160.

Dale, Edgar and Jeanne S. Chall. 1948. A formula for predicting readability. Educational Research Journal 27 (January): 11-20.

Dale, Edgar and Jeanne S. Chall. 1948. A formula for predicting readability: Instructions. Educational Research Journal 27 (February): 37-54.

Danielson, Wayne A. 1986. User Manual: Four Readability Formulas. Austin, Texas: The University of Texas at Austin.

Danielson, Wayne A. and Sam Dunn Bryan. 1963. Computer automation of two readability formulas. Journalism Quarterly 40 (Spring): 201-206.

Davison, Alice and Robert N. Kantor. 1982. On the failure of readability formulas to define readable texts: a case study from adaptations. Reading Research Quarterly 17: 187-208.

Fang, Irving E. 1969. Computers on behavioral science. Behavioral Science 13: 249-251.

Farr, James N., James J. Jenkins and Donald G. Paterson. 1948. Simplification of Flesch reading ease formula. Journal of Applied Psychology 35 (October): 333-337.

Flesch, Rudolf. 1948. A new readability yardstick. Journal of Applied Psychology 32 (June): 221-223.

Fowler, Gilbert Len, Jr. and Edward J. Smith. 1982. Readability of delayed and immediate reward content in Time and Newsweek. Journalism Quarterly 59 (Autumn): 431-434.

Fusaro, Joseph A. and Conover, Willis M. 1983. Readability of two tabloid and two nontabloid papers. Journalism Quarterly 60 (Spring): 142-144.

Fry, Edward. 1968. A readability formula that saves time. Journal of Reading 11 (April): 513-516, 575-578.

Gunning, Robert. 1968. The technique of clear writing. New York: McGraw-Hill Book Company.

Hansell, T. Stevenson. 1976. Readability, syntactic transformations and generative semantics. Journal of Reading 19 (April): 557-562.

Haynes, Steve. 1989. See spot write. Columbia Journalism Review 28 (May/June): 17.

Hoskins, Robert L. 1973. A readability study of AP and UPI wire copy. Journalism Quarterly 50 (Summer): 360-363.

Hoskins, Robert L. 1984. Annual reports I: difficult reading and getting more so. Public Relations Review 10 (Summer): 49-55.

Irwin, Judith Westphal and Carol A. Davis. 1980. Assessing readability: the checklist approach. Journal of Reading 24 (November): 124-130.

Johns, Jerry L. and Thomas E. Wheat. 1984. Newspaper readability: two crucial factors. Journal of Reading 27 (February): 432-434.

Kincaid, J. Peter, James A. Aagard, John W. O'Hara and Larry K. Cottrell. 1981. Computer readability editing system. IEEE. Transactions on Professional Communication 24 (March): 38-41.

Klare, George R. 1963. The measurement of readability. Ames, Iowa: Iowa State University Press.

Klare, George R. and Byron Buck. 1954. Know your reader. New York: Heritage House.

Lorge, Irving. 1944. Predicting readability. Teachers College Record 60 (March): 404-19.

Lostutter, Melvin. 1947. Some critical factors of newspaper readability. Journalism Quarterly 24 (January): 307-314, 331.

Lundy, Cindy Ross. 1990. A draft version of Inside Lines Information and Guidelines. Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee.

McLaughlin, G. Harry. 1969. SMOG Grading--A new readability formula. Journal of Reading 12 (May): 639-646.

McSpadden, Mary K. 1987. An analysis of the Danielson computerized readability program as applied to a corporation's news releases. M. S. thesis, University of Tennessee.

Porter, William C. 1982. Shop talk at thirty: the value of readability studies. Editor and Publisher, 1 May, 84.

Razik, Taher A. 1969. A study of American newspaper readability. Journal of Communication 19 (December): 317-324.

Schuyler, Michael R. 1982. A readability formula program for use on microcomputers. Journal of Reading 25 (March): 560-574.

Severin, Werner J., and James W. Tankard. 1988. Communication Theories. New York: Longman, Inc.

Stempel, Guido H. III. 1981. Readability of six kinds of content in newspapers. Newspaper Research Journal 3 (October): 32-37.

Suchan, James and Clyde Scott. 1986. Unclear contract language and its effect on corporate culture. Business Horizons 29 (January/February): 20-25.

Wilken, Earl, ed. 1981. Bell Laboratories designs computer programs to aid writers, editors. Editor & Publisher, 4 April, 35-7.

Wilken, Earl, ed. 1981. Study shows newspaper/wire copy hits 11th grade; freshman level. Editor & Publisher, 3 October, 28.

Wimmer, Roger D. and Joseph R. Dominick. 1987. Mass Media Research. Belmont, Calif.: Wadsworth Publishing Co., 499.

Wright, Donald K. 1979. Some Ways to Measure Public Relations. Public Relations Journal 35: 17-18.

APPENDIXES

APPENDIX A

SAMPLES OF INSIDE LINES

BEFORE THE DANIELSON PROGRAM

Sample Insidey

**********UPDATE, 2:30 P.M. FRIDAY**********

MORE TESTS OF Y-12 PUBLIC WARNING SYSTEM--Additional tests of the new Y-12 Public Warning System will be conducted in Oak Ridge July 17-21 to ensure that the 22 siren/speaker units are operating according to specifications. The tests will consist of voice messages, chime tones and siren sounds.

The initial tests conducted in June revealed that a few of the units required additional adjustment. These will be tested on an individual basis July 17-20 with tests of the full system scheduled at approximately 10 a.m. and 1 p.m. Friday, July 21. Once the system is deemed fully operable, it will be tested with a chime tone sound at noon on the first Wednesday of each month. The principal purpose of the system is to warn members of the public and employees who are outdoors in the unlikely event of the release of hazardous materials from, or around, the Y-12 Plant.

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RESERVATION PROPOSED FOR NATIONAL PRIORITIES LIST--The Environmental Protection Agency is proposing 52 federal facilities--including the Oak Ridge Reservation--for its Superfund National Priorities List (NPL) of most serious hazardous waste sites. The NPL is EPA's list of hazardous waste sites potentially posing the greatest long-term threat to health and the environment. EPA identifies and ranks NPL sites according to threats to humans through actual or potential contamination of groundwater, surface water, or air.

Other facilities proposed in EPA's Thursday announcement include the Fernald, Ohio, nuclear materials production center; the Savannah River Plant in South Carolina, part of the Lawrence Livermore Laboratory in California and the Brookhaven National Laboratory in New York.

ENERGY SYSTEMS CITED FOR COMMUNITY INVOLVEMENT--Energy Systems has won the right to fly the red, white, and blue C-Flag, the symbol of the President's Citation Program for Private Sector Initiatives. The flag, which bears the slogan "We Can . . . We Care," recognizes outstanding contributions to the American spirit of volunteerism and community action.

Energy Systems qualified for the C-Flag because of its involvement in the Career Awareness Day and Abilities Expo held last October. This program now will be considered for the top 100 Private Sector Initiatives awards and citations to be presented by President Bush at the White House later this summer.

LABOR EXPOSITION THIS WEEKEND--Union members from ORNL, Y-12, and ORGDP will be participating in the Union-Industries Exposition in the Knoxville Convention/Exhibition Center at the World's Fair site today through Sunday. One of the highlights of this 100th anniversary year exposition is an exhibit featuring a number of local industries, including Martin Marietta Energy Systems. The exhibit is free and the general public is encouraged to attend. The exposition is sponsored by the Knoxville-Oak Ridge Area Central Labor Council of the AFL-CIO.

OAS OFFICES CLOSED TODAY--The Office Automation Support offices will be closed today (July 14) until 1 p.m. for a staff meeting. In case of emergency, call 4-3364.

UNIX BASICS CLASS--The first UNIX Basics (CS420) class begins July 17. The five-day course is being taught on-site by OED Information Sciences and includes such topics as the UNIX file system, C shell for interactive use, Bourne shell programming, and the vi editor. Registration is being handled by Human Resource Development personnel (6-7233), and additional classes will be scheduled as needed.

NEW PHP DOCTORS--The following physicians have been granted approval for membership in the PHP provider network:

Robert A. Helsel, M.D. Cardiovascular Surgery 2001 Laurel Ave. 637-6392 37916 525-2640

Donald T. Ellenburg, M.D. Allergy and Immunology Alcoa Hwy. 405 Newland Professional Bldg. Knoxville, TN 37920 Knoxville, TN

Devyani Sanders, M.D. Family Practice 642 Tri-County Boulevard Oliver Springs, TN 37840 435-1933

The following doctors are no longer members of the PHP network: Micke J. Smith, M.D., of Oliver Springs and Glenn E. Jeffries, M.D., of Knoxville.

JULY DESIGNATED TRAFFIC SAFETY AWARENESS MONTH--July has been designated as Traffic Safety Awareness Month at Y-12. This emphasis is a result of questions and concerns brought before the Partyline Communications Council. During the remainder of the month, InsideY is publishing traffic safety reminders.

TRAFFIC SAFETY REMINDER--Always drive in a defensive manner, being courteous to pedestrians and other drivers.

COMPUTER TRAINING COURSES--There currently are openings in two Teamdata and two DECreporter classes to be held on the following schedule: Teamdata--July 31-August 1 and August 2-3; DECreporter--August 4, morning and afternoon. Teamdata is a program that aides in problem solving through combining data management, spreadsheet work, graphic analysis and simple report writing. DECreporter is an interactive VAX tool that allows for the creation of reports from Rdb or Datatrieve databases. For more information, contact Beth Ramsey of Computing Education at 6-7233 (e-mail RAM-SEYEA).

DEVELOPMENT DIVISION PICNIC--The Y-12 Development Division Picnic will be held Saturday, July 22, at the large shelter at Clark Center Park. This year's menu features pork barbecue. Activities will include a softball tournament and children's art show. Tickets are $4.75 (food and beverage) and $4 (food only) for adults and $3 for children 5 to 11. (There is no meal charge for children under five.) For more information, contact Matt Boring, 4-1883.

MARTIN MARIETTA STOCK--Closed Thursday at $ 47.63 a share, down 1/8.

VANGUARD GROUP, WINDSOR FUND--14.98.

FOOD FOR THOUGHT--

The Y-12 Cafeteria menu for TODAY includes chili con carne, New England clam chowder, deep-fried shrimp, old-fashioned beef stew, baked chicken with rice, french-fried potatoes, yellow squash, buttered carrots, blueberry pie, chocolate chess pie, and spice cake.

The Y-12 Cafeteria menu for Monday includes chili con carne, homemade vegetable soup, baked fillet of fish, Italian cutlet with spaghetti and sauce, marinated chicken breast sandwich with fries, french-fried potatoes, cut green beans, collard greens cauliflower with cheese sauce, apple pie, cherry Boston pie, and white cake.

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If you have an announcement or news for "InsideY," call Jim Joyce, 4-8093, or send it by electronic mail to InsideY.

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Sample InsideK

THE ORGDP EMPLOYEE COMMUNICATIONS SYSTEM -- Monday, December 18, 1989

NEW JOS POSTINGS--Administrative Secretary II (A0133Y, level 58) in the Site Managers Division at Y-12, posted: 12/15/89; application deadline: 12/27/89.

Senior Secretary (A0127K, level 56) in the Site Managers Division at ORGDP, posted: 12/18/89; application deadline: 12/27/89.

Senior Secretary (A0126K, level 56) in the Plant Support and Protection Division at ORGDP, posted: 12/18/89; application deadline: 12/27/89.

Please see the posted job bid announcements for descriptions of duties. Questions from ORGDP employees should be directed to B. T. Hicks in the Staffing Office at 4-8600. JOS positions are open to ORGDP, Y-12, and ORNL non-exempt bidders.

VALUES VIDEOTAPE--A 12-minute videotape, in which Clyde Hopkins discusses MMES values with a group of employees, has been developed for use in new employee orientation and supervisory training.

This videotape is available for use in other applications, as appropriate, by calling Margaret Childs, 4-8284. A longer version is being developed for use in a Values Training Program for all employees and will be ready after the first of the year.

HEALTH PHYSICS TECHNICIAN TRAINING--Energy Systems has announced the implementation of a health physics technician training program designed to help meet the critical shortage of technicians, as well as to help minimize the impact of personnel reductions in non-radiation protection areas. Application to the program is open to any Oak Ridge employees who meet selection criteria. The program will consist of training in the following areas: radiation protection fundamentals; instrumentation; on-the-job training; DOE orders, standards, and laws governing radiation protection; and emergency/abnormal operations.

The application deadline for the program has been extended until 4 p.m. today, Monday, December 18, and the selection process for candidates will be held later in December. Candidates who wish to apply must have the following minimum qualifications to be considered for initial screening: high school diploma; high school education in algebra and one or more of the basic sciences (chemistry, biology, and physics); and willingness to accept an assignment at any Energy Systems facility in Oak Ridge. The selection process will take into account performance record, academic qualifications, and desire and commitment to course completion and subsequent job performance. Interested individuals should send completed Job Opportunity System (JOS) Form UCN #11199, high school/college transcripts and one-page explanations of their interest in the program to Sandralita Lowe, Y-12 Bldg. 9106, MS-8022. If school transcripts cannot be obtained before the application deadline, a written description of the applicant's high school/college background may be substituted. Successful candidates will be notified of selection by January 8, and training

will begin January 15. Because of the trial nature of the program, only 20 applicants will be selected. For more information, contact Duane Hymer, 4-0684.

PROHIBITED ARTICLES--With the holiday season here, employees are reminded that alcoholic beverages, guns, ammunition, etc., cannot be brought into the plant even if they are intended as Christmas gifts and are still in the original packaging. Items of this nature will be confiscated by security inspectors.

CALL FOR 'R&D 100' NOMINATIONS--Entries for the 1990 "R&D 100" competition, sponsored by R&D magazine, may now be submitted to the Energy Systems Honors and Awards Office. This international awards program--in its 28th year--recognizes innovators and organizations for outstanding practical technical developments and identifies significant technological advances that were marketed, available for contract or licensing, or completed and delivered by a federal agency or laboratory during calendar year 1989. Energy Systems facilities continue to be leaders with a total of 66 winning entries since 1967. To obtain more information, all Energy Systems employees, except those at Y-12, should call the Honors and Awards Office, at 576-7590 or 574-9618.

Completed nomination forms--including support materials and photographs--are due for all Energy Systems nominations, except those from Y-12, by December 22, and completed clearance forms are due by February 9. For Y-12, completed nomination and clearance forms are due by December 18. For more information on submitting Y-12 nominations, call Alice Brandon in the Office of Organizational Improvement Programs at 576-2963.

REMOTE ACCESS OF COMPUTERS--Users who are dialing in to Energy Systems computers from off-site must go through the central network control device called the DAEMON. The program that controls DAEMON allows routing through another site if there are problems at the site to which the user is trying to dial in. If you dial in, make a note of other modem telephone numbers to use in case there is a problem and your call does not go through. The telephone numbers and their site locations are as follows: 574-7474 through 574-7513 at ORNL; and 576-4822 through 576-4829, 576-5750 through 576-5757, and 576-6922 through 576-6929 at ORGDP. If you have any questions or need more information about dialing in, call Gene Rooks at 4-5210.

RACQUETBALL SIGN-UPS--Sign-ups have begun for the Second Session of the Martin Marietta Racquetball League; anyone interested should contact Phyllis Philpot at 4-8528. Deadline is January 3, 1990.

BULGING CONTAINERS--Employees are urged to be alert to drums and other containers that appear to be bulging or disfigured from internal pressure. Bulging containers should not be touched or handled, but should be reported immediately to the PSS office, 4-3282.

RETIREMENT PLANNING SEMINAR--Applications are being accepted for Energy Systems Pre-Retirement Planning Seminars to be conducted during

1990. Seminars are held at each Energy Systems facility for employees there. If you are 45 years of age or older and would like to register for a 1990 seminar, or if you need more information, call Elmo Wolfe or Debbie Randolph in Energy Systems Personnel at 4-2907.

EXEMPT JOB POSTING--Lead Shift Captain (Job Posting 89-144) in the Safeguards and Security Division at Y-12, posted: 12/14/89; application deadline: 12/19/89. Interested employees should send a current resume to Buck Hall, MS-6107, Bldg. 9764.

JOS POSTINGS--Administrative Associate I (A0076X, level 58) in the Quality Division at ORNL, posted: 12/15/89; application deadline: 12/24/89.

Please see the posted job bid announcements for descriptions of duties. Questions from ORGDP employees should be directed to B. T. Hicks in the Staffing Office at 4-8600. JOS positions are open to ORGDP, Y-12, and ORNL non-exempt bidders.

MARTIN MARIETTA STOCK--Closed Friday at 40, unchanged

VANGUARD GROUP, WINDSOR FUND--13.30, down .12 (dividend 1.30)

NATIONAL WEATHER SERVICE FORECAST--Mostly cloudy today; high in the middle 30s. Light snow tonight, possibly mixed with sleet, and a low near 30. Chance of snow 80 percent. High Tuesday in the middle 30s, with a 40 percent chance of precipitation. Snow flurries Wednesday, with a high in the middle 30s. Becoming colder Thursday and Friday with a low Friday night between 5 and 10 degrees.

DAILY PA SYSTEM TEST--Each day at 10 a.m., the Shift Superintendent's office performs an audio test of ORGDP's public address (PA) system. Employees are requested to report any audio problems experienced in their facility during the test to the Shift Superintendent's office at 4-3282.

EMERGENCY NUMBERS--To report an EMERGENCY, dial 911. To report an UNUSUAL OCCURRENCE or for routine business with the PSS Office, dial 4-3282.

WHAT'S COOKING--The ORGDP Cafeteria specials for TODAY are: kielbasa, patty melt sandwich, and chicken and rice soup.

The specials for Tuesday are: spaghetti, fish sandwich, and cream of potato soup.

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* If you have an announcement or news for "INSIDEK," call Jack *
* Harper, 6-0437, or send it by electronic mail to INSIDEK. *
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Sample InsideX

INSIDEX Laboratory Employee Communications System--FRIDAY, NOVEMBER 17, 1989

DOSIMETRY SYSTEM MEETS ACCREDITATION CRITERIA--The Energy Systems Centralized External Dosimetry System (CEDS) has successfully met the performance criteria for the DOE Laboratory Accreditation Program (DOELAP) accreditation in personnel dosimetry. Energy Systems applied for and passed performance testing in all seven categories offered by the DOELAP program and in 14 of 15 subcategories, representing all of the available exposure protocols. The company is the first to successfully complete performance testing in all of the available DOELAP exposure protocols, and it demonstrates that commercial technology is available to meet the very stringent DOELAP requirements for personnel dosimetry. Energy Systems will undergo a DOELAP Site Assessment before January 1, 1990, for full accreditation.

AROUND THE CORPORATION--Martin Marietta Corporation has received a 1989 Business in the Arts Award from the Business Committee for the Arts and FORBES magazine. The corporation was cited for its underwriting of the PBS series GREAT PERFORMANCES; its endowment of the Great Hall at the National Museum of Women in the Arts in Washington, D.C.; and its support of the Denver Symphony.

JOB POSTINGS--Senior Secretary (A0073X, Level 56) in the ORNL Engineering Technology Division.

Sr. Accounting Assistant (A0074X, Level 55) in ORNL Central Management Offices.

The closing date for the above positions is November 24. Please see posted job bid announcements for descriptions of duties. Any questions from ORNL employees should be directed to Peggy Lyons at 4-4437. JOB positions are open to ORNL, ORGDP and Y-12 Bidders.

LIBRARY LION UPDATE--Due to a software problem, the simplified version of logging into the Library LION System WAS NOT INSTALLED yesterday as originally scheduled. An announcement will run on INSIDEX when installation is complete.

IEEE MEETING--The Oak Ridge Section of the Institute of Electrical and Electronics Engineers will hold its monthly meeting Monday, November 20, at the Tennessee Innovation Center, 701 Scarboro Road, Oak Ridge. The topic will be personal computer security and will include a demonstration of how data may be removed or altered from PCs connected to a network. This meeting is sponsored by the Oak Ridge Section and the Oak Ridge/East Tennessee IEEE Computer Chapter. A social gathering is set for 7 p.m.; the presentation and demonstrations will begin at 7:30.

TRAINING PROGRAM FOR CONTRACTORS--A Basic Health and Environmental Training Program for Construction/Contractor personnel coming onto the ORNL site is planned for Monday, November 20, at 9 a.m. in Bldg. 4500N, Room C-236. Please call Don Kennedy (Technical Resources and Training Section) at 6-5106 to register for the program. Seating is limited.

CAMERA CLUB SALON--The Martin Marietta Camera Club annual photography salon is open through December 3 at the Oak Ridge Community Art Center on Badger

Avenue. Art Center hours are Saturday-Monday, 1 to 4 p.m., and Tuesday-Friday, 9 a.m. to 5 p.m. The salon includes a slide show chosen from the higher-scoring slides and more than 100 color and black-and-white prints. An exhibit of the work of the late Art Shell, long-time club member, is featured in the Goose Room of the Art Center.

TELEPHONE TRAFFIC RESTRICTIONS LIFTED--Effective immediately, previous restrictions on all commercial and FTS telephone traffic to northern California are lifted. This includes area codes 209, 408, 415, 707 and 916.

GREAT PERFORMANCES--"Letters from the Park," a Cyrano-like tale by Gabriel Garcia Marques about two young lovers wooing through an intermediary in 1913 Cuba, airs on GREAT PERFORMANCES tonight at 9 on WBJK-TV (Channel 3). A Nobel Prize-winning author, Marques has won a worldwide audience for his ability to transform the ordinary into the mystical. He was inspired to produce "Letters from the Park" by a novel he had written previously. GREAT PERFORMANCES is funded by Martin Marietta Corporation, the Corporation for Public Broadcasting and public television stations.

ORNL CAFETERIA MENU--

FRIDAY--New England clam chowder, beef and barley soup; grilled ham & cheese sandwich, country-style steak, chicken and dumplings; green beans, peas and ca rots, summer squash; coconut pie, apple pie, pumpkin pie.

MONDAY--Vegetable soup, tomato soup; hot pastrami sandwich w/potato salad, Kielbasa w/white beans, baked lasagna; green peas, mashed potatoes, spinach, white beans; apple pie, coconut cream pie, strawberry cake.

TODAY'S WEATHER: Partly sunny, brisk and cold. High: 6 C (43 F)
Tonight: Partly cloudy and cold. Low: -3 C (26 F)
Tomorrow: Intervals of clouds and sunshine, breezy, chilly. High: 9 C (48 F)

- MARTIN MARIETTA STOCK closed yesterday at 43 1/4, down 5/8.

If you have an announcement or news for the "Inside," call Sharon E. Boudreaux at 4-6162, mail it to Inside, Bldg. 9704-2, M.S. 8013, or send it by electronic mail to "Inside".

APPENDIX B

SAMPLES OF INSIDE LINES

FORMATTED FOR THE DANIELSON PROGRAM

Sample InsideX formatted for the Danielson program

TUESDAY, AUGUST 1, 1989

The seminar on preparing congressional testimony will not begin at 8 a.m. on Thursday, August 3 as was previously reported, but will begin at 8:30 a.m. and run until noon. This is a "how to" seminar and would be helpful to those who may be called upon to give testimony at some future time. The program is still scheduled to be held in the Central Auditorium, Bldg. 4500-N.

Energy Systems Toastmasters will meet today (August 1) at 4 p.m. in the conference at the west end of Building 9720-8, Y-12. Karen Mitchell, Y-12 Production Maintenance Engineering, will be the Toastmaster for the day. Toastmasters provides an opportunity to develop the ability to "run" a smooth, efficient meeting. The format of the weekly meetings provides a supportive atmosphere for practicing the role of managing a meeting. Through experience, members gain confidence in leading a group through an agenda and learn to avoid common pitfalls. Anyone who is interested in improving his or her communication and leadership skills is invited to attend. For more information, call Joan Roberts (4-1190) or Harriet Keener (4-3538).

Any questions from ORNL employees should be directed to Peggy Lyons in the Staffing Office at 4-4437. These positions are open to ORNL, Y-12, and ORGDP non-exempt bidders. Interested employees should send a current resume to S.G. Cortelyou, Charlotte Hall, Townsite, MS-6501. Telephone inquiries should be directed to Cortelyou at 6-1379.

An informal demonstration of the Kurzweil Scanner and Freedom Software by Xerox will be held on Monday, August 7, at Y-12 in Building 9709, Room 133, from 11 a.m. - 3 p.m. Representatives from Xerox and Synergistic Business Systems will be available to demonstrate the scanner and software with a PC compatible. Please bring documents you would like to have scanned as a test of the capabilities of this scanner and software. For more information, please contact Verilyn Smith at 4-3676 or smithvf by e-mail.

The East Tennessee PC Users Group will meet Thursday, August 3, at 7:30 p.m. at the auditorium in Building A, Pellissippi State Technical Community College. Guest speaker will be Dan Strieb, Computer Associates, San Jose, Calif. He will discuss SuperCalc 5, the latest release of the spread sheet program.

Please see the posted job bid announcement for a description of duties. Any questions from ORNL employees should be directed to Peggy Lyons in the Staffing Office at 4-4437. These positions are open to ORNL, Y-12, and ORGDP non-exempt bidders.

MARTIN MARIETTA STOCK closed yesterday at $48.50, up 3/8.

If you have an announcement or news for "InsideX," call Sharon E. Boudreaux at 4-4162; mail it to InsideX, Bldg. 9704-2, M.S. 8015; or send it by electronic mail to "insidex."

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Sample InsideK formatted for the Danielson program

Wednesday, August 2, 1989

Interested employees should send a current resume with a cover sheet stating name, job title, department number, badge number, division, and the job listing number to C. Lee Ford, Jr., Bldg. 9720-8, MS-8043 (phone: 4-0040). Tomorrow (August 3), the ORNL PC Support Center is sponsoring two seminars. At 10 a.m. and 1 p.m., Symantec Corporation representatives will demonstrate their products developed for the Apple Macintosh, including MORE II, Lightspeed C, Lightspeed Pascal, Symantec AntiVirus, and Symantec Utilities. At 11:30 a.m. and 2:30 p.m., a representative from Synergistic Applications, Inc., will discuss Mainstay's MacFlow v3.0 (flowchart design). Both programs will be held in the conference room 240 of Bldg. 4515 at ORNL. For additional information about these programs, employees should call Alfreda Cook, 6-8358. The Medic Blood Drive continues through Friday in the Cafeteria Conference Room. Employees who missed scheduled appointments to donate earlier in the week and those who did not sign up to give blood can still donate by coming by the conference room or the mobile unit today or at one of the other advertised donation times. The hours for the remainder of the week are as follows: today (August 2) 6 a.m. to 2 p.m., Thursday, August 3, 10 a.m. to 5 p.m., and Friday, August 4, 6 a.m. to noon. Today (August 2), ORGDP employees assigned to other sites may participate as follows: FEDC, 10 a.m. to noon; and American Museum of Science and Energy, 2-4 p.m. For additional information on the drive, employees should call Jan Ausband (6-2566) or Peggy Parten (6-8585) at the conference room at 4-8212. There are several openings in the SDM Overview for Users (CS 166) course scheduled for August 10. For information on the course content or to register call Beth Ramsey, 6-7233, or Cheryl Sanz, 6-7234. Employees who are interested in participating in this program should fill out a Training Program Registration form and send it to Data Entry at K-1007, MS-7021.

A Congressional Testimony Seminar is scheduled tomorrow (August 3) from 8:30 a.m.-noon in the Central Auditorium of 4500N at ORNL. This "how to" seminar should be helpful to those who may be called upon to give testimony before Congress. For additional information, call the ORNL Human Resource Development Department, 4-4446. The Information Services Division is sponsoring a technology showcase on optical filing systems on Wednesday, August 9, from 9 a.m.-1 p.m. in the Weinberg Auditorium, Bldg. 4500N, ORNL. The first half of the showcase will feature speakers who will address various aspects of this relatively new records management technology, including state-of-the-art of optical storage, criteria for selecting an optical filing system, and current and future applications for optical filing usage within Energy Systems. A presentation and question-and-answer session will be led by Dr. Michael Pemberton, professor of Library and Information Science at the University of Tennessee, and one of this area's leading authorities on records management. Following the presentations, there will be system demonstrations and an opportunity for participants to meet with the various optical filing company representatives.

An Economics and Management course, the first of six review classes for the Certified Professional Secretary examination, will begin tomorrow (August 3) at Pellissippi State Technical Community College. For more information about this program, employees should call Nancy Trent, 6-1661; or Kathy Warren, 4-0390. MARTIN MARIETTA STOCK Closed Tuesday at $48.13 a share, down 38.

There will be decreasing cloudiness this morning, and it will become partly sunny by this afternoon. The high today will be in the upper 80's. Tonight's forecast calls for fair and a low temperature in the upper 60's. Tomorrow will be partly sunny and warm, with a high near 90 degrees. The extended forecast for Friday through Sunday calls for partly cloudy, warm, and humid, with scattered thundershowers on Friday and a better chance of showers on Saturday and Sunday. Highs for these three days will be around 90 degrees, and lows will be in the lower 70's. Please see the posted job bid announcement for a description of duties. Any questions from ORGDP employees should be directed to B. T. Hicks in the Staffing Office at 4-8600. These positions are open to ORGDP, Y-12, and ORNL non-exempt bidders.

Interested employees should send a current resume to S. G. Cortelyou, Charlotte Hall, Townsite, MS-6501. Telephone inquiries should be directed to Cortelyou at 6-1379.

To report an EMERGENCY, dial 911. To report an UNUSUAL OCCURRENCE or for routine business with the PSS Office, dial 4-1282. The ORGDP Cafeteria specials for TODAY are: beef turnovers with mushroom sauce, grilled cheese sandwich, and homemade vegetable soup. The specials for Thursday are: veal cutlet parmesan, reuben sandwich, and cheese soup. If you have an announcement or news for "INSIDEK," call Jim Joyce 4-8093, or send it by electronic mail to INSIDEK.

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Sample InsideY formatted for the Danielson program

Thursday, August 3, 1989

Please see the posted job bid announcement for a description of duties. Any questions from Y-12 employees should be directed to H. Frank Shanklin in the Staffing Office at 4-6584. These positions are open to all Y-12, ORGDP, and ORNL non-exempt employees.

The Y-12 Plant Training Department's Resource Center in Bldg. 9709 will be closed for inventory from August 14 through September 15. During this time, only EMERGENCY requests for material or equipment will be handled. Any employee who has material or equipment checked out from the Resource Center is asked to return it before August 14. Advance requests for material or equipment needed during the inventory period can be made UNTIL AUGUST 14. Employees who have questions or need assistance should contact Brenda Holloway at the center at 6-5961. Interested employees should send a current resume with a cover sheet stating name, job title, department number, badge number, division, and the job listing number to J. D. Griffin, Bldg. 9766, MS-8112, telephone 4-3391. United Way agency visits are now being planned for solicitors and coordinators. Details on these visits will be available soon. Employees who are not coordinators or solicitors but who have a particular interest in visiting one of these agencies should contact Beth Sliski, 4-2125 (e-mail to SLISKICE), or Patty Thomas, 6-5486 (e-mail to THOMASPR).

Agency mini-fairs also are being planned for September and October at the Y-12 Cafeteria. These mini-fairs will be scheduled to provide all shifts an opportunity to view a United Way agency exhibit.

To assist with the volume of calls received daily, the Central Staffing Organization within Energy Systems Personnel has installed a voice mailbox (recorder). Callers who try to reach a member of the Central Staffing Organization who is temporarily out of the office or on the phone will be forwarded to the receptionist to leave a message. In the event that the receptionist is handling another call, calls will be forwarded to a voice mailbox. At this point, callers will be prompted to leave messages for the persons they are trying to reach. This system is not meant to depersonalize the staffing operation but to give the best possible service. V. S. Sunderam of the Math and Computer Science Department at Emory University will discuss "PVM: A Framework for Parallel Distributed Computing" at a seminar scheduled today (August 3). This presentation is scheduled for 2 p.m. in the Tower Conference Room of Bldg. 9207A. An informal demonstration of the Kurzweil Scanner and Freedom Software by Xerox will be held Monday, August 7, in Bldg. 9709 (Rm. 133) from 11 a.m.-3 p.m. Representatives from Xerox and Synergistic Business Systems will be available to demonstrate the scanner and software with a PC compatible. Employees who plan to participate in this program should bring documents they would like to have scanned as a test of the capabilities of the

scanner and software. For more information, contact Verilyn Smith at 4-3676 or smithvf by e-mail. Today (August 3), the ORNL PC Support Center is sponsoring two seminars. At 10 a.m. and 1 p.m., Symantec Corporation representatives will demonstrate their products developed for the Apple Macintosh, including MORE II, Lightspeed C, Lightspeed Pascal, Symantec AntiVirus, and Symantec Utilities.

At 11:30 a.m. and 2:30 p.m., a representative from Synergistic Applications, Inc., will discuss Mainstay's MacFlow v3.0 (flowchart design). Both programs will be held in the conference room 240 of Bldg. 4515 at ORNL. For additional information about these programs, employees should call Alfreda Cook, 6-8358. MARTIN MARIETTA STOCK: Closed Wednesday at $48.13 a share, unchanged. Interested employees should send a current resume with a cover sheet stating name, job title, department number, badge number, division, and the job listing number to C. Lee Ford, Jr., Bldg. 9720-8, MS-8043 (phone: 4-0040).

The Y-12 Cafeteria menu for TODAY includes chili con carne, chicken gumbo soup, chicken chow mein on rice, meat loaf with gravy, oven-fried chicken livers, mashed potatoes, kale greens, corn on the cob, buttered cauliflower, shrimp egg roll, mincemeat pie, pumpkin pie, and white cake. The Y-12 Cafeteria menu for Friday includes New England clam chowder, Italian noodles, chicken nuggets with sauce, deep-fried sea trout with fries, french-fried potatoes, cut green beans, whole-kernel corn, blackeyed peas, apple pie, coconut cream pie, and pumpkin cake.

If you have an announcement or news for "InsideY," call Jim Joyce, 4-8093, or send it by electronic mail to InsideY.

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APPENDIX C

SAMPLE DANIELSON SCORES

Sample Insidey scores from the Danielson program

Readability Analysis of Thursday, August 3, 1989

No. of characters in text = 3870
No. of words in text = 714
No. of words with 4 or fewer letters = 360
Percent words with 4 or fewer letters = 50
No. of words with 8 or more letters = 157
Percent of words with 8 or more letters = 21
No. of sentences = 37
Characters per sentence = 104.6
Characters per word = 5.4
Words per sentence = 19.3
Estimated syllables = 1353
Estimated syllables per 100 words = 189

GRADE SCORE PREDICTORS
(Estimated Grade in School Needed for Average Comprehension.)

Estimated Flesch Grade Score = 7.9
More Difficult than Average

Estimated Farr-Jenkins-Paterson Grade Score = 7.0
Average

Danielson-Bryan Grade Score = 7.0
More Difficult than Average

Estimated Gunning Fog Index = 6.8
Average

Estimated SMOG Index = 14.3
Extremely Difficult

SCALE SCORE PREDICTORS*
(Closer to 100 Means Easier Reading.)

Estimated Flesch Scale Score = 27.4
Very Difficult

Estimated Farr-Jenkins-Paterson Scale Score = 28.8
Very Difficult

Danielson-Bryan Scale Score = 54.6
Average

*There are no scale scores for Gunning or SMOG.

Sample InsideK scores from the Danielson program

Readability Analysis of Wednesday, August 2, 1989

No. of characters in text = 4234
No. of words in text = 770
No. of words with 4 or fewer letters = 383
Percent words with 4 or fewer letters = 49
No. of words with 8 or more letters = 168
Percent of words with 8 or more letters = 21
No. of sentences = 41
Characters per sentence = 103.3
Characters per word = 5.5
Words per sentence = 18.8
Estimated syllables = 1480
Estimated syllables per 100 words = 192

GRADE SCORE PREDICTORS
(Estimated Grade in School Needed for Average Comprehension.)

Estimated Flesch Grade Score = 8.0
Difficult

Estimated Farr-Jenkins-Paterson Grade Score = 7.0
Average

Danielson-Bryan Grade Score = 7.1
More Difficult than Average

Estimated Gunning Fog Index = 6.8
Average

Estimated SMOG Index = 14.1
Extremely Difficult

SCALE SCORE PREDICTORS*
(Closer to 100 Means Easier Reading.)

Estimated Flesch Scale Score = 25.3
Very Difficult

Estimated Farr-Jenkins-Paterson Scale Score = 27.8
Very Difficult

Danielson-Bryan Scale Score = 54.0
Average

*There are no scale scores for Gunning or SMOG.

Sample InsideX scores from the Danielson program

Readability Analysis of TUESDAY, AUGUST 1, 1989

No. of characters in text = 2290
No. of words in text = 433
No. of words with 4 or fewer letters = 231
Percent words with 4 or fewer letters = 53
No. of words with 8 or more letters = 91
Percent of words with 8 or more letters = 21
No. of sentences = 29
Characters per sentence = 79.0
Characters per word = 5.3
Words per sentence = 14.9
Estimated syllables = 801
Estimated syllables per 100 words = 184

GRADE SCORE PREDICTORS
(Estimated Grade in School Needed for Average Comprehension.)

Estimated Flesch Grade Score = 7.3
More Difficult than Average

Estimated Farr-Jenkins-Paterson Grade Score = 6.4
Average

Danielson-Bryan Grade Score = 6.4
Average

Estimated Gunning Fog Index = 6.4
Average

Estimated SMOG Index = 12.7
Extremely Difficult

SCALE SCORE PREDICTORS*
(Closer to 100 Means Easier Reading.)

Estimated Flesch Scale Score = 36.0
Difficult

Estimated Farr-Jenkins-Paterson Scale Score = 38.1
Difficult

Danielson-Bryan Scale Score = 60.9
Easier than Average

*There are no scale scores for Gunning or SMOG.

APPENDIX D

EDUCATIONAL STATISTICS

Table D-1

EDUCATIONAL LEVELS

ORNL

Level	Number of Employees
00 No Formal Education	26
01 First Grade	5
02 Second Grade	2
04 Fourth Grade	4
05 Fifth Grade	2
06 Sixth Grade	3
07 Seventh Grade	9
08 Eight Grade	25
09 Grammar School Graduate	10
10 1 Year High School	16
11 2 Years High School	24
12 3 Years High School	11
13 4 Years High School	3
14 High School Graduate	1,471
15 1 Year College	297
16 2 Years College	238
17 3 Years College	89
18 4 Years College/ No Degree	16
19 5 Years College and Over/ No Degree	8
20 Bachelors Degree	1,069
21 Masters Degree	716
22 Doctorate Degree	933
23 Medical Doctor/ MD	5
24 Law LLB/ JD	1
25 Business College Graduate (2-Year Program)	107
26 Technical Institute Graduate (2-Year Program)	60
27 Junior or Community College (2-Year Program)	7
28 Associate Degree(2-Year Program)	217
29 Vocational School Graduate (2-Year Program)	87
41 1 or More Years Work on Masters/ No Degree	7
43 1 Year Work on Doctorate/ No Degree	1
44 2 or More Years Work on Doctorate/ No Degree	3
49 Other	8
Total	5,480

Table D-2

EDUCATIONAL LEVELS

Y-12 PLANT

Level	Number of Employees
00 No Formal Education	100
01 First Grade	2
02 Second Grade	3
03 Third Grade	2
04 Fourth Grade	3
05 Fifth Grade	5
06 Sixth Grade	11
07 Seventh Grade	18
08 Eight Grade	69
09 Grammar School Graduate	9
10 1 Year High School	70
11 2 Years High School	102
12 3 Years High School	104
13 4 Years High School	16
14 High School Graduate	2,825
15 1 Year College	488
16 2 Years College	382
17 3 Years College	166
18 4 Years College/ No Degree	29
19 5 Years College and Over/ No Degree	11
20 Bachelors Degree	1,194
21 Masters Degree	381
22 Doctorate Degree	59
23 Medical Doctor/ MD	4
24 Law LLB/ JD	15
25 Business College Graduate (2-Year Program)	97
26 Technical Institute Graduate (2-Year Program)	73
27 Junior or Community College (2-Year Program)	14
28 Associate Degree (2-Year Program)	166
29 Vocational School Graduate (2-Year Program)	306
31 Educational Specialist Degree	1
32 Engineering Degree (Pre PhD Only)	1
41 1 or More Years Work on Masters/ No Degree	15
43 1 Year Work on Doctorate/ No Degree	2
44 2 or More Years Work on Doctorate/ No Degree	4
49 Other	23
Total	6,770

Table D-3

EDUCATIONAL LEVELS

K-25 SITE

Level	Number of Employees
00 No Formal Education	52
03 Third Grade	1
05 Fifth Grade	2
06 Sixth Grade	3
07 Seventh Grade	7
08 Eight Grade	13
09 Grammar School Graduate	6
10 1 Year High School	21
11 2 Years High School	23
12 3 Years High School	15
13 4 Years High School	5
14 High School Graduate	1,050
15 1 Year College	155
16 2 Years College	127
17 3 Years College	64
18 4 Years College/ No Degree	12
19 5 Years College and Over/ No Degree	5
20 Bachelors Degree	741
21 Masters Degree	295
22 Doctorate Degree	56
23 Medical Doctor/ MD	2
24 Law LLB/ JD	5
25 Business College Graduate (2-Year Program)	67
26 Technical Institute Graduate (2-Year Program)	18
27 Junior or Community College (2-Year Program)	1
28 Associate Degree (2-Year Program)	68
29 Vocational School Graduate (2-Year Program)	77
41 1 or More Years Work on Masters/ No Degree	5
49 Other	7
Total	2903

VITA

Linda Fullington Cabage was born on Tachikawa Air Force Base in Japan on October 25, 1958. At the age of 11 she moved with her family to Morristown, Tennessee, where she graduated from Morristown-Hamblen West High School in 1976. That fall she entered Walters State Community College in Morristown. She was a member of the Phi Theta Kappa Honor Society and Who's Who Among American Junior Colleges and received the State Board of Regents Scholarship. She graduated in May 1978 with an Associate of Arts degree.

She entered the University of Tennessee, Knoxville, in 1978 and graduated in 1980 with a Bachelor of Science degree in Speech and Theatre. In 1986 she returned to the University of Tennessee to pursue a Master of Science degree in communications.

During graduate school, she served internships at the Tennessee Valley Authority and Martin Marietta Energy Systems, Inc. She received the Chancellor's Citation for Extraordinary Professional Promise, the Meeman Fellowship in International Communications and the Karl A. and Madira Bickel Scholarship. She is a member of the Kappa Tau Alpha Honor Society.

She works for Martin Marietta Energy Systems at Oak Ridge National Laboratory and is married to William H. Cabage.