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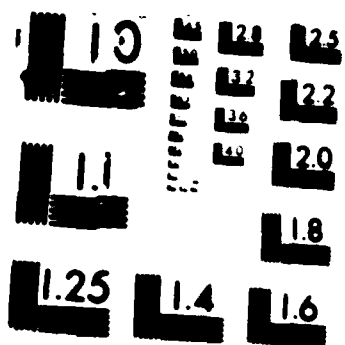
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**Development of SEA-LECT: A Computer-Based  
Guidance and Information System**

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DEPARTMENT OF THE NAVY  
 NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER  
 SAN DIEGO, CALIFORNIA 92152-6800

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From: Commanding Officer, Navy Personnel Research and Development Center

Subj: DEVELOPMENT OF SEA-LECT: A COMPUTER-BASED GUIDANCE AND INFORMATION SYSTEM

Encl: (1) NPRDC TN 87-27

1. This research developed a prototypic computerized occupational information and vocational guidance system for the Long Beach Naval Shipyard. The system, a demonstration version at this point, will be useful in the general work orientation and placement of apprentice trades job applicants. Funding was provided by the Naval Sea Systems Command (NAVSEA).

2. The research reported here is expected to benefit NAVSEA, the various naval shipyards, and the research community.

*John J. Pass*  
 JOHN J. PASS  
 By direction

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**Development of SEA-LECT: A Computer-Based Guidance  
and Information System**

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<p>SEA-LECT, a prototypic computerized occupational information and guidance system, was developed to allow naval shipyard management to assess how computer-based guidance might improve the placement of shipyard apprentices at the Long Beach Naval Shipyard. Detailed information on three trades (electronics mechanic, marine mechanic, and painter) was compiled. Recommendations are to complete the system by including all naval shipyard trades and to test the system with job applicants in the field.</p>						
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## SUMMARY

### Problem

Current procedures for hiring trades apprentices at the Long Beach Naval Shipyard do not include a means of providing comprehensive occupational information to the job applicant or of formally assessing the applicant's preferences and expectations. Such procedures are needed to improve person-job matching and to decrease the rate of turnover among these workers.

### Objective

The objective of this project was to develop a prototypic computerized occupational information and guidance system that could provide naval shipyard management an opportunity to assess how computer-based guidance might improve the placement of shipyard apprentices at the Long Beach Naval Shipyard.

### Approach

The development of the system, called SEA-LECT, was based on the following:

1. A comprehensive list of common work activities, work conditions, and physical demands associated with the 23 Long Beach apprentice trades.
2. Specific, detailed occupational information from three trades (electronics mechanic, marine mechanic, and painter) that was compiled from discussions with Long Beach training program personnel and printed sources.

### Results

SEA-LECT runs on an IBM-PC micro-computer, in color, with attractive displays. The listing of trades in the system can be easily modified to include only those for which training programs are currently being offered. SEA-LECT is user-friendly, requires no previous knowledge of computers, and can be completed in about one-half hour.

### Conclusions

The demonstration version of SEA-LECT was well received by shipyard management. Based on discussions with trades and administrative personnel, it appears that a system such as SEA-LECT would probably enhance the shipyard placement procedures. It should be noted, however, that it remains incomplete, being limited to three shipyard trades.

### Recommendations

1. Complete the SEA-LECT system. This would require adding information for the 20 remaining trades and obtaining a complete review by appropriate trades experts.
2. Conduct a field test of the system with job applicants.
3. Analyze user ratings for the preference elicitation component of the system.
4. Investigate the feasibility of transferring the SEA-LECT technology to other shipyards.

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## INTRODUCTION

To fill a variety of skilled and semi-skilled jobs, the Naval Sea Systems Command (NAVSEA) primarily relies on local hiring at the particular shipyards. This hiring situation parallels that of armed services recruiting (Baker, 1985a) in that a majority of the job applicants for NAVSEA trade openings are between 17 and 22 years of age, with little or no work history and no developed job skills. Youthful applicants such as these are usually career naive and know little about their own abilities, interests, and job preferences (Baker, 1983).

The Long Beach Naval Shipyard has an extensive apprentice training program designed to develop highly skilled journeymen, thus providing a pool of trained workers for the shipyards. The program is a 4-year, planned course of study that includes both classroom instruction and on-the-job learning.

To be eligible for the program, applicants must apply to the Office of Personnel Management and then pass a test administered by that office. Eligible applicants are then invited to a job fair that is conducted by the shipyard to help applicants choose trades for which they want to be considered. Typically, several hundred applicants attend the fair, where they are given brief write-ups about the trade options and have the opportunity to speak to representatives from the various trades.

Job offers and subsequent classification are accomplished during a placement interview. Typically, that interview is conducted by the general foreman who knows about the trades for which hiring is taking place.

### Problem

The current procedures for hiring apprentice journeymen do not include any means of providing personalized, comprehensive occupational information to the job applicant, nor do they include adequate means by which an applicant may explore and validate occupational preferences.

While the job fair may well serve the purposes of some applicants, others might need more help, either because they have not given adequate thought to what they want from their work or because they do not have a good understanding of the nature of the trades or the training programs. Still others may need help weighing the pros and cons of several trades they are considering. Even though they may have attended job fairs and received information about NAVSEA jobs, the expectations of such applicants are frequently unrealistic. Indeed, their expectations require validation or even confrontation.

Suboptimal placement is a genuine risk. Trades openings are apt to be filled by individuals who have perhaps minimal career maturity and who are operating under unvalidated or even erroneous job expectations. Once on the job, disconfirmed expectations and work under unforeseen conditions frequently leads to dissatisfaction. Consequences of job dissatisfaction include lowered morale, decreased productivity, and shortened tenure (Baker, 1985b).

High turnover rates among workers in the skilled trades indicate that the procedures used to place naval shipyard tradesmen are in need of sophistication and refinement (Baker, 1986). Since training an apprentice involves a large investment in time and money, it is especially important to get as good a match as possible between the person and the job.

## Objective

The objective of this project was to develop interactive software on the IBM PC microcomputer to support occupational information retrieval and presentation and job preference elicitation for use at the Long Beach Shipyard. Specific tasks were to:

1. Design and develop a prototypic occupational information system.
2. Design and develop an on-line preference elicitation instrument (PEI) to assess the work preferences of apprentice program applicants.
3. Develop an occupational information data base for three shipyard trades (electronics mechanic, marine mechanic, and painter).
4. Demonstrate the prototypic system to give naval shipyard management the opportunity to see how computer-based career guidance might enhance the apprentice placement program at the Long Beach Naval Shipyard, and make revisions as required.

## Background

One possible approach to improving person-job matching is to provide preemployment guidance that helps people assess their work preferences and gives them comprehensive information about jobs. One promising method is the use of a computerized occupational information system.

Computer-based career guidance and information systems have been in use for over 15 years. Their effectiveness has been well documented in studies conducted by both their developers and by purchasers of the systems. However, for a number of reasons, none of the existing, commercially available systems is appropriate for use at a shipyard.

Most existing computer-based career information and guidance systems assume users have a wide set of possible options to consider. Typical users of these systems are high school and college students, who have almost all of their significant decisions about education and training ahead of them. Career choice for them centers on an orderly investigation of self and occupations. The occupations available for their consideration generally cover the entire world of work, and the information about those occupations is generalized to describe a diversity of jobs within an occupation. The System of Interactive Guidance and Information (SIGI) and DISCOVER are two examples of career guidance systems for these audiences. Other examples of popular career information systems include Guidance Information System (GIS), CHOICES, and COIN.

Some of the more recently developed systems have enlarged their designs to serve a population of users that includes adults who have concerns about reentry and midcareer transitions. An example is SIGI PLUS. Though designed to address some of the special needs of adults, SIGI PLUS like its predecessor SIGI, assumes that its users can consider a wide diversity of career options. Consequently, the self-assessment component covers values, interests, and skills as they relate to occupations in general. Occupations are broadly defined, and information about occupations is generalized and not job specific.

The concerns of applicants to the naval shipyard, however, are quite different from those of high school students, college students, and adults who use commercially available systems. These applicants have already made the decision to work at the shipyard, which significantly narrows their work choices. For some, the decision might be whether or not

to accept the offer of a trade that is not one of their top choices. In any case, an examination of the entire world of work is not appropriate. What is called for is a more focused exercise that looks at options that are relevant for the applicants to the shipyard.

In addition, other concerns, such as the time it takes to use comprehensive systems such as SIGI and DISCOVER (typically, over 2 hours) and the inappropriateness of generalized information, make currently available systems unattractive choices for use at the naval shipyard.

A guidance system for the naval shipyard, though limited to a small number of trade options, should be highly interactive, interesting, easy to use, and include the following:

1. Comprehensive coverage of all the steps in the career decision-making process.
2. A self-assessment component that is well matched to the characteristics of the trade options at the shipyard.
3. Specific and detailed information about trades and the training programs that lead to entry into the trades.
4. Use of information developed in one section in succeeding sections.
5. Printouts of screen information.
6. Function keys for backing up a screen and for a quick exit of the system.
7. Suggestions for the use of outside resources.

### OVERVIEW OF SEA-LECT

SEA-LECT, a computer-based guidance and information system, was designed as a comprehensive program that covers the major steps in the career decision-making process. Its overall purpose is to help applicants to the training program decide which trades they want to be considered for and to teach them a process for making that decision. Its specific purposes are to help applicants (1) assess how their work preferences relate to the apprentice trades, (2) identify trade alternatives that might be most satisfying, (3) get information about trade alternatives, and (4) evaluate their choices.

SEA-LECT has a brief introduction and three sections. The introduction describes typical steps in career decision making and lists the trade options that are available. The list of trades can easily be revised to reflect the options currently being offered.

The first section, ABOUT YOU, elicits occupational preference. It helps users assess their work preferences as well as work factors they might want to avoid. This section is especially useful for applicants who are not familiar with the trades and have had little or no relevant work experience. It should also help to broaden the options of someone who has focused on one particular trade because of a lack of awareness of important similarities among the trades. For example, a person who likes troubleshooting might consider trades as diverse as electronics mechanic or plastics molder.

The second section, ABOUT WORK, gives detailed information about the trades and the training programs. The information is divided into topic areas so that an applicant

can get as much or as little information as desired. This section also provides a link to videotape presentations about the trades.

The third section, **SELECTING**, draws on users' experiences from the first two sections and gives help with evaluating and choosing from among trade alternatives. At the end of **SELECTING**, applicants can get a printout of their preferences.

In **SEA-LECT**, users have the option of starting at the beginning and going through the sections in their intended order (the recommended way), or starting in any section they prefer. Another important feature of **SEA-LECT** is that shipyard management can determine which trades should be included in the system at any time. For example, if one year's program does not include training for boilermakers, that trade can be excluded from the listing and therefore from consideration by users.

**SEA-LECT** was designed to run on the IBM PC with a color monitor. The software is written in C language, is contained on a single floppy disk, and requires no more than 256K RAM. A printer is desirable, but not required.

## **DEVELOPMENT OF SEA-LECT**

**SEA-LECT** was developed in two stages. First, an early version was written, programmed, and demonstrated to shipyard management. Reactions to the system were gathered and information about the trades was reviewed. The system was then revised in light of what was learned from this visit.

### The Introduction to SEA-LECT

A brief introduction to the system tells users about the print key (F1) and the quick exit key (F2) and lists the trade options available at the time. It also describes the steps in the career decision-making process and relates them to the sections in the system.

### ABOUT YOU--The Preference Elicitation Instrument (PEI)

**ABOUT YOU**, which is the PEI section of **SEA-LECT**, was designed with a highly specific purpose in mind; namely, to assess the work preferences of applicants to the Long Beach apprentice program. Since these applicants have already made the decision to work at the shipyard, their choices have already been narrowed to the trade options available there. Consequently, rather than querying users about the world of work in general, **ABOUT YOU** focuses instead on trades at the Long Beach Naval Shipyard.

#### Part 1: Work Activities and Features

The first part addresses preferences for work activities and features, which fell naturally into four categories: The broadest category was **WHAT IS WORKED ON OR WITH**, the next broadest category was **MAJOR WORK ACTIVITIES**, and the least broad was **SPECIFIC WORK ACTIVITIES**. The fourth category included statements about **HOW OR WHERE WORK IS DONE** (Figure 1 contains the menu of work activities and features). Users are presented with an item and asked if they want it in their work. If they want it, they are shown a list of trades that involve that feature. If they do not want it or are unsure, no list is presented. If users are unclear, they can ask for examples.

<u>What is Worked on or With</u>	<u>How or Where Work is Done</u>
machines, engines	working mostly in a shop
electronics, electricity, electrical equipment	working mostly on or inside a ship or on crane
metal, plastics	working mostly alone
wood/fabrics, insulating material	working mostly as a member of a team
masonry, tiles, paint	doing work that's mostly physically active
ship structures, cranes, boilers	doing work that's mostly physically inactive
pipng	doing work where you get dirty
weapon systems	doing work where you stay clean
hoisting, pulling gear	doing a wide variety of tasks
welding equipment	doing mostly the same tasks
precision tools and instruments	

#### Major Work Activities

repairing, maintaining  
 overseeing a process or operation  
 producing a finished article, making things  
 installing, assembling, constructing, wiring  
 testing, inspecting, calibrating  
 painting, restoring, refinishing, covering  
 moving, positioning heavy loads

#### Specific Work Activities

doing extensive troubleshooting  
 making templates, patterns, sketches  
 bending, shaping, molding, fabricating, welding materials  
 making highly precise measurements or adjustments, working to close  
 tolerances  
 doing complex math and applying formulas  
 making simple calculations, using geometry  
 keeping detailed records, making reports  
 mixing and blending materials  
 interpreting electronic/electrical schematics or wiring diagrams  
 interpreting detailed mechanical drawings  
 interpreting detailed assembly drawings  
 following complex written procedures  
 cutting, sewing, upholstering, trimming, polishing  
 providing technical assistance to others  
 making lots of decisions about what to do and how to do it  
 making critical decisions about safety  
 keeping up to date on technical know-how

Figure 1. Menu of work activities and features.

The list grew out of an analysis of the 23 Long Beach apprentice trade options. In creating the list, the intention was to (1) identify common features shared by several trades, (2) cover all of the major work activities for the 23 trades, and (3) make the list as short as possible. These considerations helped determine how specific or how general to make an activity. For example, "bending and shaping metal" is an important activity for sheetmetal workers while "bending and shaping insulation" is important for insulators. This led to the activity "bending and shaping materials."

Each trade was evaluated by the contractor on whether or not it satisfied a preference for each particular item on the menu. After users view all the work activities and features, they are shown a list of all of those they have said they want. This is then used to generate a grouped listing of trades (see Figure 2). The evaluation was nominal; a trade either satisfied a preference or failed to satisfy a preference. Sample evaluations of the trades are presented in Table 1.

machines/engines	repairing	troubleshooting
Air Cond Equip Mech	Air Cond Equip Mech	Air Cond Equip Mech
Boilermaker	Elect Measur Equip Mech	Electrician
Hvy Mobile Equip Mech	Electronics Mechanic	Elect Measur Equip Mech
Marine Machinist	Hvy Mobile Equip Mech	Electronics Mechanic
Ordnance Equip Mech	Marine Machinist	Hvy Mob Equip Mech
	Indus Elect Control Mech	Marine Machinist
	Instrument Mechanic	Indus Elec Control Mech
	Ordnance Equipment Mech	Instrument Mechanic
		Metals Inspector
		Ordnance Equipment Mech
		Pipefitter

If a trade is in green, it has all 3 of your most important activities.

If a trade is in blue, it has 2.

Press SPACE BAR.

Figure 2. Sample screen from SEA-LECT's preference elicitation instrument.

Table I  
Sample Evaluation of Trades on Activities

ACTIVITY	Trades*																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
machines/engines	•						•	•	•		•					•							
electronics/electricity/electrical equipment	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
metal/plastics	•						•					•	•	•	•	•	•	•	•	•	•	•	•
wood/fabrics/insulating materials	•	•				•				•						•							
masonry/tiles/paint	•																						
ship structures/cranes/boilers	•	•					•						•										
pipng	•	•																					
weapon systems																							
hoisting/pulling gear																							

\* 1 = Air Conditioning Equipment Mechanic, 2 = Boilermaker, 3 = Electrician, 4 = Electronic Measuring Equipment Mechanic, 5 = Electronics Mechanic, 6 = Fabric Worker, 7 = Foundry Molder, 8 = Heavy Mobile Equipment Mechanic, 9 = Industrial Electronic Control Mechanic, 10 = Instrument Mechanic, 11 = Insulator, 12 = Marine Machinist, 13 = Metal Forger, 14 = Metals Inspector, 15 = Molder (Plastics), 16 = Ordnance Equipment Mechanic, 17 = Painter, 18 = Pipefitter, 19 = Rigger, 20 = Sheet Metal Mechanic, 21 = Shipwright, 22 = Shipwright, 23 = Welder.

The process for generating the list has undergone changes. In the original version, when users saw the list of chosen work features, they were then asked to select the three most important ones (if the list was larger than three). In response, the computer generated a list of the trades that satisfied each of the three features selected, with the lists set up in three columns. Trades that appeared in two listings were in blue; trades that appeared in only one listing remained in black.

These three-column lists tended to be short, and after users had gone through the eliminating process in the second half of the PEI (described below), they usually ended up with a very small list of trades. In reviewing the original ABOUT YOU section, shipyard personnel expressed concern that applicants might focus on a few trades that seemed to satisfy what they wanted and then later find none of these trades available (either because the applicants do not qualify or because the trade openings have already been filled). To avoid this possibility, shipyard personnel preferred a scheme that provided a rank ordering of all the trades. Therefore, the section was redesigned.

In the revised version, as in the original, users see a listing of all the desired work activities and features. However, instead of selecting three "most important" features, users now rate every one according to how important it is to have that preference in their work. A three-point scale is used (3 = very important; 2 = important; 1 = less important). The computer uses the ratings to compute scores for the trades. An example of how scores are computed is shown in Table 2.

Table 2  
Example of Computation of Scores for Trades

Work Preferences	(A) User's Ratings	(B) Ratings for Electronics Mechanic	(A)x(B)
Work with electronics, etc.	3	1	3
Repairing, maintaining	3	1	3
Producing finished article	2	0	0
Doing extensive troubleshooting	2	1	2
Doing complex math	1	1	1
Being physically active	3	0	0
Score for Electronics Mechanic is:			9

Users are then shown a listing of the trades in two groups--highly desirable trades (at or above their median score) and less desirable (below their median score). Within each group, trades are listed in rank order based on score.

## Part 2: Work Conditions and Physical Demands

The second part of the PEI focuses on work conditions and physical demands that applicants might want to avoid. These are presented as menus, with 13 work conditions and 6 physical demands (see Figure 3). Sample evaluations of the trades for these working conditions and physical demands (reviewed by the contractor with shipyard management approval) are shown in Table 3. If a work condition or physical demand is selected from the menu, users are shown which trades on their lists from the first part of the PEI have that condition or physical demand. Users are given the option of removing those trades from their lists or leaving them on.

<u>Working Conditions</u>		<u>Physical Requirements</u>
excessive heat	solvents (degreasers)	do heavy lifting
excessive cold	radiant energy	do heavy carrying
excessive dampness	electrical energy	often crawl, kneel
excessive noise	working on ladders or	do repeated bending
silica, asbestos,	scaffolding	climb
etc.	hands in water	distinguish basic
fumes, smoke, gases	working in tanks	colors

Figure 3. Menu of working conditions and physical requirements.

Thus, in the revised version, when applicants complete the ABOUT YOU section, they have an evaluation of all the trade options. If they are subsequently offered a trade that is not one of their top choices, they and their counselors can refer to this evaluation to help judge the attractiveness of the trade option being offered. At the end of the ABOUT you section, users are encouraged to use the next section of the system, ABOUT WORK, to find out more about those trades on their lists that appeal to them.

### ABOUT WORK--Information About Trades

Information was developed for three trades: electronics mechanic, marine mechanic, and painter. Major sources of information were job descriptions and descriptions of apprentice training programs, videotapes about the trades, and conversations with training program personnel. After the information was developed, it was reviewed by appropriate staff at the Long Beach Naval Shipyard and revised.

The information, which is presented on-line in the ABOUT WORK section, is divided into nine topic areas, which are presented to the user as a menu: (1) description, (2) procedures followed, (3) responsibilities, (4) salary, (5) skill and knowledge required, (6) working conditions, (7) physical requirements, (8) helpful attributes, and (9) training program. In reviewing these topics, the shipyard asked to have one added that dealt with the level of mathematics aptitude demanded by the trade. Unfortunately, that information was not available in time for inclusion in this project. Figure 4 shows a sample screen from ABOUT WORK.

Table 3  
Sample Evaluation of Trades on Working Conditions and Physical Demands

WORKING CONDITION OR PHYSICAL DEMAND	Trades*																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
excessive heat	•						•				•	•	•	•			•				•	•	•
excessive cold																	•	•	•	•	•	•	•
excessive dampness																		•					•
excessive noise	•						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
silica, asbestos, etc.	•						•				•						•						•
fumes, smoke, gases	•						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
solvents (degreasers)	•						•				•	•	•	•	•	•	•	•	•	•	•	•	•
radiant energy							•				•	•	•	•	•	•	•	•	•	•	•	•	•
electrical energy							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

\*1 = Air Conditioning Equipment Mechanic, 2 = Boilermaker, 3 = Electrician, 4 = Electronic Measuring Equipment Mechanic, 5 = Electronics Mechanic, 6 = Fabric Worker, 7 = Foundry Molder, 8 = Heavy Mobile Equipment Mechanic, 9 = Industrial Electronic Control Mechanic, 10 = Instrument Mechanic, 11 = Insulator, 12 = Marine Machinist, 13 = Metal Forger, 14 = Metals Inspector, 15 = Molder (Plastics), 16 = Ordnance Equipment Mechanic, 17 = Painter, 18 = Pipefitter, 19 = Rigger, 20 = Sheet Metal Mechanic, 21 = Shipfitter, 22 = Shipwright, 23 = Welder.

## Marine Machinist

The training program for Marine Machinist has two parts:

### WORK EXPERIENCE

major topics:

- (01) Set-Up/Operate Machine Tools
- (02) Machinist Development
- (03) Handwork--Bench and Floor

### CLASSROOM TRAINING

major topics:

- (04) Trade Theory
- (05) Blueprint Reading/Drawing
- (06) Trade Mathematics
- (07) Trade Science
- (08) Oral & Written Communication

For a detailed description of what's covered by any of these topics, press two keys for its number.

When you've seen all the descriptions you want, press SPACE BAR.

Figure 4. Sample screen from SEA-LECT's information about trades.

## SELECTING

The last section of SEA-LECT, which is called SELECTING, has users choose three trades of interest to them. In the original version, no information from the ABOUT YOU section was carried over into the SELECTING section; users were expected to refer to their printouts to help identify trades of interest. To provide better linkage between the sections, SELECTING was revised so that when users choose the trades that interest them, they have a menu showing all the trades grouped as they are at the end of the ABOUT YOU section (i.e., ranked according to scores based on users' ratings).

Having selected three trades, users are then asked to evaluate them in terms of the rewards offered (e.g., salary, work activities) and the chances that they can meet the demands of the trades they are considering. Finally, users select one of their three choices as a possible best choice. If a user selects a trade that is clearly not a best choice (based on the self-assessments), the computer responds with an appropriate message.

The reviewers felt that it was important to highlight the importance of high mathematics aptitude for some trades. Therefore, in the revised version, the screen dialogue reminds users to take mathematics ability into account when they assess their chances for meeting trade demands (i.e., for high-math-aptitude trades).

Job applicants completing SEA-LECT can obtain a printout summarizing their assessments of three top trade choices and a ranking of all the available trades (on the basis of their ratings in the ABOUT YOU section).

## System Flow Chart

Figure 5 shows the overall structure and logical flow of the system. SEA-LECT has three main sections; although the sections are best used in sequence (ABOUT YOU, ABOUT WORK, and SELECTING), each one can be entered directly. Once a section is entered, however, users must either proceed to the next section or use the quick exit function key and leave the system.

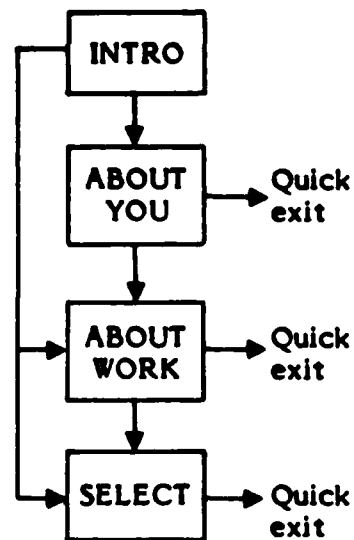


Figure 5. System flow chart.

## Programming of SEA-LECT (Demonstration Version)

The demonstration version of SEA-LECT can run on any IBM PC, XT, or AT microcomputer and many IBM-compatible machines. The program requires 256k of memory and a color monitor (if it is run on a monochrome monitor, many of the displays will be difficult to read.) A printer is recommended but not required; when the system is first booted, the system manager indicates whether or not one is available.

### Components of the System

Four files are needed to run the demonstration version of SEA-LECT: the executable program (SL.EXE), the frames (text) file (SL.FRM), the frame-index file (SL.IND), and the configuration file (SL.CFG).

The executable program (SL.EXE) is written in compiled C. The source code for the program was generated by an authoring system called EASIS, which is the property of Educational Testing Service.

The frames file (SL.FRM) contains the texts of most of the displays that are seen in SEA-LECT. The frame-index file (SL.IND) tells the location of each frame in the frames file, so that it can be found when needed by the program. The configuration file (SL.CFG)

sets up a number of conventions under which the program will run. For example, the carat (^), which is the last character in this file, tells the program that "end of frame" in the frames file is signified by a carat.

### Programming Changes Needed for a Full Version of SEA-LECT

The prototype occupational information system developed in this project is incomplete and is intended only as a demonstration version. It is limited in the amount of information it includes (only three shipyard trades). Also, the ratings of the trades on the dimensions covered by the PEI were not as fully reviewed as they would be for a final version. Parts of the system are not fully programmed, and system features such as back-up (return to previous screen) and error sensing (e.g., sensing when a wrong key is pressed more than a few times) are not in place. Also, the system has not been tested on its intended audience, applicants to the apprentice training program.

Extensive use of the demonstration version of SEA-LECT may uncover the need for various changes to improve the system. Apart from these, certain changes are already planned for a complete SEA-LECT:

- Users will be free to begin SEA-LECT at the introduction or at any of the three sections. (Currently they must begin with the introduction.)
- The F2 key will bring users to a menu that asks them whether they want to go to another section or leave SEA-LECT. (Currently it causes them to leave SEA-LECT immediately.)
- A "back-up" function key will permit users to review a screen after leaving it.
- Currently, the directions describing how to respond to a display (e.g., "Press SPACE BAR") are highlighted in a color that contrasts with the rest of the text. In the complete version of SEA-LECT, the key portion of these directions will begin to flash at the user after a certain period of time has elapsed without a response.
- Users will have free choice on the menus to the ABOUT WORK and SELECTING sections. (Currently they are limited to 3 trades: painter, electronics mechanic, and marine machinist.) The ABOUT WORK data base for each trade occupies about 14,350 bytes. For 23 trades, about 330,050 bytes will be required--more, if additional information topics are added. This data base will no longer fit a single floppy diskette.
- The ABOUT WORK section will give complete instructions about how to run the videotape player. (Currently, a dummy frame is displayed.)
- In the SELECTING sections, users who are undecided about how to rate a trade will have the option of going back to the ABOUT WORK section, seeing information, and returning to where they left off in SELECTING. (Currently, the option is offered but is not functional.)
- The full menu includes 40 preferences. An initial review by the shipyard suggested that several of the activities might apply to all the trades at the Long Beach Naval Shipyard and therefore might not be useful discriminators. For

example, "making highly precise measurements" and "making simple calculations" were judged to be important activities for all trades; the distinction between "working alone" or "working as part of a team" was also questioned, because in all the trades people worked as a team at least part of the time. For purposes of this demonstration version, the original menu of activities is shown unchanged. It should be noted, however, that these activities need further review and should be subjected to a statistical analysis.

- The system manager will have control over which trades are accessible in the data base at any given time. Those trades which are made inaccessible will be "invisible" to the user.

### CONCLUSIONS

The demonstration version of SEA-LECT was well received by shipyard management. The concept of the system was deemed appropriate; the data base was considered relevant (although all agreed that the information needed a thorough review if and when a decision was made to complete the system); and the design was found to be attractive. It was generally felt that applicants to the apprentice training program would find SEA-LECT both interesting and useful, although there was general agreement that the system should be field tested with applicants. Concerns about time and hardware requirements must be addressed. The typical hiring process used by the shipyard would preclude lengthy per-applicant terminal sessions. On the other hand, use of many terminals is not economically feasible.

### RECOMMENDATIONS

1. Complete the system by (a) developing information about the remaining trades at Long Beach Naval Shipyard, (b) revising all information by appropriate experts, (c) completing the programming, and (d) adding system features such as back-up (i.e., return to a previous screen) and error trapping.
2. Field test the system with applicants. Before the program is released for general use, it should be field tested to determine how well it works with its intended audience. Some of the questions that need to be answered are: Is the reading level appropriate? Are the directions clear? How long does it typically take to complete the system? Do users find the system helpful? Do the shipyard interviewers find the system useful?
3. Perform an analysis of the PEI. Examine the structure of the ratings of trades on the PEI activities and the ratings of users on these activities.
4. Investigate the feasibility of transferring the SEA-LECT technology to other shipyards.

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