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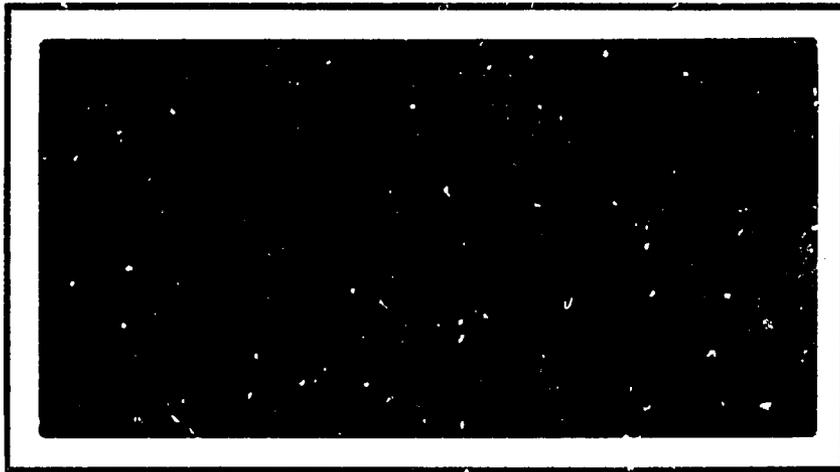
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AN EVALUATION OF THE
CONCOR SYSTEM OF
NTS RESEARCH CORPORATION

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PREFACE

This report is the product of an intensive review of the progress of the CONCOR (Consistency and Correction) system being developed by NTS Research Corporation, in Durham, North Carolina. It was written in collaboration with Dr. Michael Levin, a training consultant, demographer, and instructor for the U.S. Bureau of the Census. Dr. Levin had been involved directly in CONCOR since 1978, when he began teaching Version 0. Widely recognized for his census and survey work in the South Pacific, he has donated his services to the CONCOR project and has taught numerous workshops in the system, both in Washington, D.C., and at the East-West Center in Hawaii. Responsible for an early edition of the CONCOR Systems Reference Manual, he also has reviewed in detail the documentation on CONCOR. Dr. Levin recently taught a CONCOR course to survey specialists from sixteen Asian and African countries for the U.S. Bureau of the Census.

Fred Grant, team leader and technical consultant for this assignment, is an independent, professional data-processing consultant who works out of Marietta, Georgia. He formally reviewed CONCOR on two earlier occasions. His experience with CONCOR dates from October 1979, when he made a complete review of the COBOL CONCOR package. Early in 1980, he attended a two-week workshop and produced an additional report on the adequacy of the system and progress in its completion.

A list of Dr. Levin's and Mr. Grant's publications on CONCOR is attached as Appendix A. The scope of work for the assignment is attached as Appendix B.

In this document, the authors provide a succinct assessment of the technical and educational components of NTS research and examine how the research has contributed to the development of CONCOR. The discussions are based on the consultants' experience in census work and data processing; the authors examined how procedures in these fields may be used to develop the system.

In addition to evaluating the contract, the two consultants sought to examine again the critical issues about the CONCOR system itself. Of particular interest is this question: Is COBOL CONCOR Version 2.2 a demonstrably adequate software package, a package that can be exported to developing countries without further modification? Throughout the report, the authors examine the alterations that have been made and the additional adjustments which are believed to be essential in realizing the goals for which the system was developed.

The authors believe they completed the assignment with objectivity, and that they discussed fairly and correctly NTS's efforts to satisfy the requirements of the contract. They did not think that it would be appropriate to recommend the continuation or termination of specific activities.

As consultants, they sought only to bring to light the facts and critical issues which an impartial observer might need to make such a determination.

As on earlier occasions, personnel in Thailand were extremely cooperative. The authors acknowledge the hospitality and unstinting cooperation of the staff of the Economic and Social Commission for Asia and the Pacific (ESCAP), in Bangkok, Thailand, especially Mr. Clark and Mr. Ito. They extend their thanks to the personnel at the Asian Institute of Technology (AIT), the staff of Chulalongkorn University, various personnel at the National Statistical Office (NSO), and the participants in the CONCOR workshop, who untiringly and conscientiously provided valuable feedback on not only performance under the NTS contract, but also the current state of CONCOR and the perceptions of foreign nationals who are using the system. In addition, the authors wish to thank Robert Blair and the staff of the International Statistical Programs Center (ISPC), U.S. Bureau of the Census, for their assistance in providing much-needed technical information on the internal components of CONCOR systems and NEC conversion. A list of the people who were contacted during this assignment or who participated in the workshop is attached as Appendix C.

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EXECUTIVE SUMMARY

NTS Research Corporation has made progress in all areas in developing CONCOR; however, considerable work remains. Although NTS staff are competent technically and educationally, they lack expertise in the subject matter (censuses and surveys). If the subject matter is not considered constantly, the results of workshops, the preparation of course materials, and the results of tests of the system will be of little value to the development effort.

The basic structure and conduct of the workshop in Bangkok, Thailand, were good. A major weakness of the workshop was the lack of short exercises that would enable students to master the CONCOR language.

Documentation continues to be a problem. Extensive revisions are required for each manual. The User's Guide contains some sound ideas, but the design and contents need to be improved.

To date, testing has been syntactically oriented. Tests to check syntax have been completed. Other testing is deficient. Tests of the system should be monitored more closely by the chief technical officer at the Agency for International Development. The current NTS Draft Testing Report is poor. A description of the kinds of additional tests that are needed is given in the attached report.

The installation of CONCOR in foreign countries has gone well. All the problems that have been reported have had to do with variations by the COBOL compiler.

CONCOR is not a finished product. In the final chapter of this report, the authors set the direction for and suggest ways to expedite the development of the CONCOR system.

ABBREVIATIONS

AIT	Asian Institute of Technology
AGE	Asian Information Center for Geotechnical Engineering
APHA	American Public Health Association
BKKBN	National Family Planning Coordinating Board
CBS	Central Bureau of Statistics
CONCOR	Consistency and Correction
CSFP	Commodity Supplemental Food Program
CTO	Chief Technical Officer
CU	Chulalongkorn University
DPI	Department of Public Instruction
ENSIC	Environmental Sanitation Information Center
ESCAP	Economic and Social Commission for Asia and the Pacific
FIPSE	Fund for the Improvement of Postsecondary Education
I/U	Input and Output
IFIC	International Ferrocement Information Center
ISPEC	International Statistical Programs Center
MCSO	National Census and Statistics Office
NSO	National Statistical Office
RERIC	Renewable Energy Resources Information Center
TAC	Technical Assistance Center
USAID	United States Agency for International Development

I. INTRODUCTION

I. INTRODUCTION

Background

This report, commissioned by the Office of Population, Agency for International Development (AID), through the American Public Health Association (APHA), is the product of an intensive evaluation of AID Contract DSPE-C-0091, dated September 30, 1980. As specified in the scope of work for this two-year contract, NTS Research Corp., of Durham, North Carolina, is to:

. . . make the final necessary modifications to, and then disseminate, the U.S. Bureau of the Census's COBOL CONCOR computer editing and imputation system, the Basic COBOL Version I₁ (December 1, 1979), to all interested AID-assisted countries, and to train the appropriate personnel in these countries in the use of this computer system. In particular the goal is to provide this editing program to as many countries as possible in time for use in their 1980 census. This editing program must be thoroughly tested and debugged, reliable, and well-documented so that it is easy to install, maintain and learn by computer programmers and other related personnel in developing countries, . . .*

NTS Research Corp. is classified as a small business; it is incorporated in the State of Virginia. (Additional general information on the corporation is contained in Appendix D.)

The CONCOR system, or CONCOR, an acronym for consistency and correction, is best characterized as software to expedite the editing and imputation of data collected in population censuses and surveys. A metacompiler written in the COBOL language, the system reads and verifies statements in the CONCOR language to produce an executable program for an editor. The objective of the process is to create an error-free file which can be used at a later time in tabulation.

The package performed unsatisfactorily when it was released on December 30, 1978. Since then, numerous elements of the system have been modified extensively. A complete history of the CONCOR project is available in a number of other reports and is not elaborated in this evaluation.

* Contract AID/DSPE-C-0091, Article 1, Statement of Work.

Scope of Evaluation

Generally, the scope of work for this evaluation included those tasks which were to be completed during the first six months of the AID contract (see Statement of Work). The activities are numerous and detailed, and they also overlap. The following five activities were the focal points for the review:

1. The completion of tests of the system and of speed-testing
2. The review and completion of documentation on the system, including manuals for reference, installation, and the diagnosis of errors
3. The preparation of a guide for users
4. The organization and conducting of a workshop
5. The installation and conversion of CONCOR to other computer systems.

Each of these activities is discussed in a separate chapter in this report.

Itinerary

A complete itinerary for the evaluation is shown in Exhibit 1.

The evaluation began in early May 1981, when both the technical and training consultants received copies of the drafts of manuals which NTS intended to distribute, and ended in late June 1981, when the technical consultant traveled to Durham, North Carolina, for an on-site inspection of the NTS facility.

The February 1981 draft of the User's Guide which the consultants were asked to review differed substantially from the manual distributed at the workshop. Consequently, additional time was needed to re-review the guide and other documentation on CONCOR.

Before the consultants departed for Thailand, the International Statistical Programs Center (ISPC) of the U.S. Bureau of the Census, was contacted to make a preliminary determination of the kind and extent of assistance which NTS had received. At that time, it was confirmed that the ISPC was solely responsible for maintaining CONCOR Version 2.2--the

Exhibit 1

ITINERARY FOR EVALUATION

- May 1 Received preliminary background information on consultancy.
- May 9 Received in-depth briefing materials, including copies of the Draft User's Guide and the Draft System Testing Report.
- May 11 Workshop began, Bangkok, Thailand.
- May 18 Training consultant arrived in Thailand.
- May 20 ISPC contacted about working arrangements with NTS.
- May 24 Technical consultant arrived in Thailand.
- May 27 Site inspection at AIT.
- May 28 Site inspection at NSO. Training consultant departed Thailand.
- May 29 Site inspection at Chulalongkorn University; workshop ended.
- May 30 Technical consultant departed Thailand.
- June 12-14 Technical and training consultants wrote report, Washington, D.C.
- June 15 Technical Consultant met with ISPC.
- June 16 Site evaluation at NTS, Durham, North Carolina.
- June 17-25 Draft of report prepared.
- July 7 Debriefing at AID, Rosslyn, Virginia.

most recent version, and that NTS depended on the center to provide installation tapes. It was learned that NTS itself had not made any changes in the internal components of the CONCOR system but that it had conducted informally a working agreement with the ISPC. Given the conditions in the AID contract, it was necessary to clarify this arrangement. A meeting was arranged to discuss how labor would be divided among the two organizations. The results of this meeting and the consultants' findings are discussed elsewhere in this report.

Participants' Evaluations of Workshop

The official opening and closing remarks of the workshop are attached as Appendix E.

During the workshop, the consultants had intended to administer a questionnaire based on their earlier experience with CONCOR. (See Appendix F.) NTS personnel revealed that it was their intention also to administer a questionnaire. (See Appendix G.) Meetings were held to discuss how the two questionnaires might be combined into a single questionnaire to which respondents could provide more open-ended answers.

Agreement on this matter was reached early in the last week of the workshop, and a new questionnaire (see Appendix H) was designed. However, before it could be administered, NTS personnel let it be known that they intended to make a formal protest to the AID and the APHA about the administration of the joint questionnaire. They argued that administration of the questionnaire would inconvenience the participants in the workshop because the survey was too long. The consultants, not wishing to interfere with the workshop or in any way inconvenience the participants, acquiesced and the original questionnaire designed by NTS was administered.

The fact that NTS opted to use its original questionnaire did not in any way constrain the participants in providing feedback. The consultants recommend, however, that NTS expand the scope of the evaluation to increase the frequency and amount, and improve the quality, of feedback from participants.

During the last week of the workshop, all the participants were interviewed. Their comments were quite to the point, consistent, and reinforced the impressions of the evaluation team. The consultants were permitted to review the participants' responses to the NTS questionnaire. (See Appendix I.)

CONCOR Site Reports

During the week of May 25, 1981, the technical consultant visited three sites, in addition to the Economic and Social Commission for Asia and the Pacific (ESCAP), which had received installation tapes. In general, the installations of CONCOR went very well; a few minor problems arose which were diagnosed successfully by Thai technical specialists. (For comments on the ease with which CONCOR is installed, see Chapter VI.)

Site Trips to NTS

One of the evaluators traveled to Durham, North Carolina, to examine how CONCOR is installed at NTS, to determine how and when the system was tested for both speed and accuracy, and to evaluate the results of tests of the system, giving specific attention to actual census and survey files.

The consultants were able to run successfully three CONCOR programs in Thailand; because they had no apparent problems, they determined that additional programming specifically to test the command features of the system was not necessary. When they returned to the United States, the two consultants agreed that it was not necessary to spend a week at NTS's offices. They felt that in one day an intensive auditing of the results would reveal whether sufficient progress had been made in this area. (The results of the on-site inspection are described in Chapter V.) They also agreed that it would be more appropriate to submit their written report before a formal debriefing on the assignment was held.

II. THE CONCOR WORKSHOP

II. THE CONCOR WORKSHOP

Facilities

During the period May 11-29, 1981, a COBOL CONCOR workshop was held at ESCAP's offices in Bangkok, Thailand. According to various personnel at ESCAP, NTS began organizing for this workshop well in advance of the program. There is evidence in ESCAP's correspondence files to support this. Exhibit 2 is a reconstructed scenario of events leading to the workshop.

ESCAP's facilities are modern. The workshop was held in two large rooms with comfortable seating, tables, blackboards, and overhead projectors. The participants had access to free phones, banking facilities in the building, the cafeteria, and snack areas.

The NEC 350 computer is satisfactory. (This installation is described in Appendix J.) ESCAP, however, refused to allow the participants to punch their own programs, preferring instead to train its own personnel at the same time. This caused long delays in obtaining output and correcting errors, which were frequent because the keypunchers were unfamiliar with CONCOR. It was unfortunate that the participants did not have more access to the keypunches and the computer; not only would the work have gone faster, but many of the participants who come from countries with less sophisticated computer facilities would have benefited from the opportunity to use the system at ESCAP. In general, there were few complaints about the keypunching; participants were dismayed, however, that they were unable to complete the second exercise--the consequence of delays.

Arrangements for Participants

All the non-Thai participants, NTS staff, and APHA evaluators were housed at the R/S Hotel in Bangkok, which is within walking distance of ESCAP's facilities. The hotel, although not elegant by Western standards, suited well the needs of the participants. Each non-Thai participant had a single room, the cost of which was paid by NTS according to the terms of the AID contract; the amount was deducted from the weekly per diem the participants received. All the participants felt that the hotel was more than adequate (several felt it was somewhat better than accommodations usually provided for this kind of conference), and all were content with the amount of per diem. One participant felt that it would be better to give each participant the entire allocation for per diem and then allow him to find his own accommodations. In this

Exhibit 2
RECONSTRUCTED PLANNING CHRONOLOGY
THAILAND CONCOR WORKSHOP

<u>Date</u>	<u>Event</u>
10-7-80	The ISPC briefs NTS on CONCOR.
11-24-80	AID sends a cable to ESCAP outlining the proposal for the workshop.
11-25-80	USAID sends a memorandum to all population officers at AID missions.
12-9-80*	NTS sends to the ISPC an outline for a user's guide and a CONCOR competency model.
12-12-80	NTS approves the "Dear Colleague" letter from CONCOR.
1-12-81	The ISPC's supporting letter is received by ESCAP.
1-14-81	ESCAP responds to the AID cable, requesting information on <ul style="list-style-type: none">a. method of issuing invitations,b. the countries for which fellowships have been provided; andc. method of issuing per diem.
1-30-81	NTS asks the ISPC to review the outline of CONCOR documentation and suggest revisions.
2-19-81	The ISPC responds, providing comments on the outline.
3-6-81	NTS requests that AID and the ISPC review Chapters 1-7 of the <u>Systems Reference Manual</u> .
3-9-81	NTS requests a change in the contract line-item for the payment of administrative overhead to ESCAP.
3-11-81	ESCAP prepares a tentative list of participants.
3-20-81	The workshop agreement with ESCAP is finalized.
3-22-81	The ISPC completes CONCOR Version 2.2.
3-24-81	ESCAP sends out the first invitations.
4-2-81	NTS sends the ISPC thirty copies of the set of brochures on CONCOR.
4-21-81	The ISPC furnishes NTS with three CONCOR 2.2 installation tapes (NEC, OS, DOS versions) and a copy of the procedures for installing NEC.
4-26-81*	NTS personnel arrive in Thailand.
5-11-81	Workshop begins.
5-29-81	Workshop ends.

Date is approximate.

arrangement, it would be possible for two participants to room together to save money and stave off loneliness.

There was some last-minute confusion about the selection of several participants, but this was not considered to be unusual.

All the participants felt that the arrangements for transportation were handled well.

Several of the non-Thai participants felt that the Thai participants should be compensated, at least for lunches, because they were away from their offices and had to eat in the cafeteria. Indeed, it might be useful to compensate in-country participants for transportation and lunch. Such an arrangement might help improve relations between nationals and participants from other countries.

Description of the Workshop

The lectures and sessions in the laboratories were held at ESCAP's facilities. Neither evaluator was able to attend the first week of the workshop; the participants with whom the team talked indicated that the plan of activities for the second week was similar to that for the first week. The teaching plan, a copy of which is attached as Appendix K, was adequate, but there was considerable departure from the schedule. The objectives of the workshop need to be re-emphasized at every level at which the course is taught.

Mr. Richard Merrit, the principal instructor and a representative of NTS, spent part of one day lecturing on the various commands used in CONCOR, and then asked the participants to spend the rest of the day writing and debugging their programs. For the entire three-week workshop, the participants were expected to write only two programs. Most of the first program was finished in the first week. Each participant completed a questionnaire supplied by NTS which was coded and punched at ESCAP. He or she then wrote a short CONCOR program to edit the data. Everyone successfully produced a finished project as part of the exercise.

In the second exercise, part of the benchmark program was written as edits for coding by the participants. The participants quickly discovered that there was a relationship between the editing specifications and the benchmark program. Some paired groups simply copied the benchmark; others worked up a program, either checking against the benchmark as they went along or independently developing the program logic. Most of the participants thought that the second program was too long and involved; they felt that they would have benefited more from a number of smaller exercises. No person was successful in completing the second exercise.

There is no question that NTS personnel managed the workshop well. One of Mr. Merrit's strengths is his grasp of the system. He also is helpful in initiating the programs. Both Ms. Huff and Mr. Merrit seem to be sensitive to Asians' attitudes toward classroom-learning. Mr. Merrit himself has experience in teaching in the classroom.

The basic structure of the NTS workshop was fine, but few examples of censuses or surveys in Asia or the Pacific were discussed. Nor was it shown how the examples in the text might relate to problems in census work in the participants' own countries. Programmers may not be concerned particularly about the relevance of the text, but experts in census and survey work are. More attention should have been given to subject matter. In the future, more graphic illustrations should be used, and the technical and operational aspects should be improved. Examples that reflect real survey conditions would be instructive for both programmers and non-programmers.

Interaction between NTS personnel and participants was very good. Clearly, NTS staff related to the participants personally.

A number of participants had trouble understanding the lectures because they were not fluent in English. It is unlikely, however, that their comprehension would have improved significantly even if some other agency had given the lectures.

The overhead projection foils were excellent, although there were too many errors in the CONCOR examples. (For representative examples of the slides, see Appendix L.) It would be useful to use the graphics to illustrate how the editing logic of a sequence can be improved, although consideration of the subject matter would be essential when materials were being prepared. CONCOR has been developed primarily for use in censuses and surveys; if the subject matter is not considered constantly, the course and the system will have no relation to conditions and situations in the real world.

Ideally, one of the instructors should be a subject-matter expert or a technician with considerable census experience, both in the field and in the office, developing editing specifications and analyzing the results of the edits. Such a person would be able to pull examples from his or her own experience and be able to verify the examples to make certain that they are valid as subject matter.

The evaluators concur with the participants that there should be more, but shorter, examples of and problems editing.* Because editing is an important part of the CONCOR system, more time should be spent on

* The participants' responses to NTS' evaluation on CONCOR are provided in Appendix I.

various topics, such as hot- and cold-decking, the constraints on time and finances of each method, and the order of the edits (e.g., making certain that as few imputed values as possible are allocated on the basis of the values imputed earlier). The User's Guide should address these matters as well. Except for the first exercise, in which the User's Guide was used to limited purpose, it is not clear that the manual is necessary for training.

During the latter part of the workshop, the participants tried to learn the various nuances of the system and how to exploit them (e.g., they tried to determine whether to use an ALLOCATE statement to obtain reports of errors or a LET statement which produces no reports of errors).

Exhibit 3 is a summary of the strengths and weaknesses of the workshop. For additional information on the participants, see Appendix Q.

Exhibit 3

CONCOR WORKSHOP EVALUATION SUMMARY

Strengths

Weaknesses

I. Instructor

- High technical competence with NEC computer
- Mastery of CONCOR language
- Good use of graphics in presentations
- Ability to relate to participants

- Lack of appreciation for subject matter
- Few examples based on actual surveys or censuses
- Difficulties relating User's Guide and other documentation to course

II. Workshop Materials

- Adequate in amount

- Use of handwritten materials
- Inordinate number of errors in CONCOR documentation, graphics, and handouts

III. Course Content and Exercises

- Level 1 exercise run by all students
- Adequate lesson plan and statement of objectives

- Course content too "programmer-oriented"
- Too few exercises and exercises too long; objectives need to be reinforced through exercises; no student completed Level II programming exercise
- Inaccurate estimation of English-language abilities of participants

IV. Workshop Logistics

- Preparations begun sufficiently in advance
- Adequate hotel facilities
- Excellent facilities at ESCAP

- Administrative support for key-punching not adequate
- Lack of flexibility in arranging for hotel accommodations

III. ISPC-DEVELOPED DOCUMENTATION

III. ISPC-DEVELOPED DOCUMENTATION

System Reference Manual

The Systems Reference Manual and handouts distributed by the ISPC at the January 1980 workshop were compared with NTS's version of the manual, which is dated April 1981. The content of the current manual is virtually the same as that of the earlier manual; a page-by-page comparison revealed only minor modifications. It is apparent that NTS has wed with the text several of the handouts distributed at earlier ISPC workshops.

The systems manual was assessed thoroughly. It contains sufficient information, but needs to be reorganized. This change and the addition of examples would make it a more useful and usable document. A number of other changes also should be made. For example:

1. Reorganization of Chapters 1-4 of the manual

Concepts should be presented simply and logically. More illustrations should be used and more text should accompany the illustrations. A more extensive overview of the system is needed. In the current version it is assumed that the reader has some knowledge of earlier versions of CONCOR (the document was written originally with this in mind). Chapter 3 should be combined with other chapters.

2. Revision of the benchmark program

The reproduction of the benchmark program should be improved. Better instructions to simplify the program and make it easier to understand should be provided. The example now used is inaccurate, and it is not clear that the output skips pages (i.e., is not exhaustive). The uses and limitations of the program need to be explained.

3. Other Changes

The number of the edition should be marked clearly. Some components of the system (e.g., unique CONCOR values which are computer-specific) should be covered in separate appendices.

All examples referenced in the text should be cross-referenced to the benchmark when appropriate.

Because the manual is virtually identical to the original documents produced by the ISPC, the original criticisms of the earlier reports are still valid.

System Internals and Installation Guide

To ensure that a software package is thoroughly understood and capable of being used and maintained at all times, it must be documented thoroughly. A description should be provided of all computer programs in the system and of the methods for organizing, storing, and maintaining those programs.

Usually, the following items are included in a complete documentation of a computer system:

1. Graphic display of the program logic--a flowchart or table identifying each step in the logical process to solve a problem.
2. Narrative explanations--descriptions of the purpose and objectives of each computer program in the system, including definitions of inputs and outputs, statements of assumptions, and a description of a general method of operation (pseudo-code).
3. Description of formats for inputs and outputs--a narrative or graphic description of the formats for inputs (e.g., the number of characters per field on an input record, the kind of data to be recorded in the field, etc.) and outputs (e.g., a narrative description of the printed report of outputs).
4. List of the coded program--a printout of encoded computer program(s). List of programs usually are assembled or compiled. They include a printout of the source program, as well as machine-language instructions and the location where each instruction is stored.
5. Operating instructions--a complete set of instructions to run the program on the computer. The instructions should include, but need not be limited to, the following information: location of the computer program, location of the master control decks, location of and instructions for preparing required

input data, identification of I/O devices used to execute the program, a description of normal operating conditions, a list of messages on errors in the system, action to be taken by the operator, procedures for restarting the program, and a brief discussion of significant steps in processing.

6. Copies of master control decks--copies of all the control decks needed to load and execute the program and output its results.
7. Set of test data--a copy of the test data, both actual and hypothetical, used to debug the program.

If the standards, documentation, and procedures are accurate and comprehensive, a systems analyst or programmer with no knowledge of CONCOR can monitor the system to identify and correct irregularities or problems as they occur. Insufficient documentation and non-standard procedures would make it virtually impossible for anyone other than the designer of the system to correct problems in the system.

The current Systems Internals and Installation Guide consists of the appendices which the SPC prepared earlier for COBOL CONCOR Systems Reference Manual printed in December 1980. Few changes have been made in the text. The guide contains useful information; however, it is not developed sufficiently to be considered a finished product.

The following deficiencies must be corrected:

1. The manual should be updated to reflect the changes in Version 2.2.
2. Chapters should be reorganized in order of presentation of information.
 - a. Some descriptions of programs should be chapters, and not sections. New sections on programs should begin on a new right-hand page.
 - b. The indexing scheme is not complete. It is apparent that some of the indexed appendices are copies of original documents.
 - c. The first chapter of the manual should contain a statement about the development of CONCOR and how the manual can be used best. More information is needed on how CONCOR establishes the various control pages and on what data are needed. Graphic presentations would be useful here.

- d. The purpose of system-level messages should be explained in detail.
3. The order in which concepts for each program are presented should be modified. To make the presentation more effective, information should be presented in the following order:
 - a. Each program should be presented graphically.
 - b. The general purpose should be described briefly.
 - c. The structure of the pseudo-code should be presented.
 - d. Remaining detailed specifications should be presented in accordance with guidelines.

Diagnostic Error Guide

The manual for diagnosing errors is virtually the same as the original. The current edition, which was updated to reflect the changes in Version 2.2, is adequate for its purposes.

IV. THE USER'S GUIDE

IV. THE USER'S GUIDE

The consultants reviewed two drafts of the User's Guide. The later draft, which was distributed at the workshop, is marginal, but a tremendous improvement over manuscripts prepared in February 1981.

The User's Guide is deficient in several respects.

1. It duplicates many of the details contained in the Systems Reference Manual.
2. It is wordy and pedantic.
3. It contains too few graphic illustrations of important concepts.
4. It does not reflect adequate consideration of the subject matter.
5. It is organized poorly. Discussion does not proceed from the simple to the complex. Concepts do not seem to build one on the other.
6. Its structural and editorial quality is poor. It contains numerous grammatical and typographical errors and other mistakes.

Much more thought should be given to the guide. For example, what is its purpose? At this time, it is merely impressionistic, a duplication of the Systems Reference Manual. It should contain a discussion of the subject matter and provide information on why we edit, how much editing should be done, how editing should be done, and whether imputation should be cold deck, hot deck, or neither (e.g., simple assignment within the RANGE statement). None of these questions are covered adequately in the current User's Guide. Also, some of the examples need to be changed to reflect actual survey conditions. In general, more examples with documentation should be included. The final chapter of the guide should contain specific examples on how to optimize the CONCOR code in both development and production.

V. TESTING THE CONCOR SYSTEM

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Introduction

The testing of software is an art as well as a science. Often, it is impractical to test every combination of logic which might cause a system to go awry. There are, nonetheless, certain generally recognized principles that can be applied in tests of a system. The major principles are:

1. State what the testing philosophy is before testing begins.
2. Establish a formal period for testing.
3. Identify a methodology for testing.
4. Rigorously and consistently apply to the system the philosophy and logic of the methodology.

In addition to these principles, several more technical, subjunctive elements must be considered. However, the satisfaction of the more technical points depends on the satisfaction of the criteria. Data that are designed especially for testing frequently are used to uncover errors in a program design; the output of a computer run in which such data have been used can be compared with predetermined results to check the validity of the program.

If a good methodology is used to test a program, it is highly probable that most of the conceivable conditions that could occur during actual operation of a program will be tested. Testing data should include the real data that a system is designed to process and the hypothetical data that represent conditions that might be present when real data are processed; a combination of both real and hypothetical data might be used also.

Large, complex programs should be divided and the various segments tested separately before a test of the complete program is considered. Tests should be designed to check first normal operating conditions, then exceptions and errors. Copies of the output of the test should be retained.

One confounding variable in testing CONCOR is the continuous change in both the system and the supporting documentation. Changes have been made since the system was first conceived. Although the various agencies have adopted similar administrative procedures for developing CONCOR, the system has not been optimized as software.

The system and the accompanying documentation should have been completed and tested by this time. In a system that is changing constantly, there is always a possibility that coding mistakes will be introduced or reintroduced. Some improvements have been made, but several major deficiencies remain to be corrected.

It is poor practice to test one version of a program while major changes to the same system are under way. NTS personnel believe they have a responsibility to test Version 2.2, as they intend to use it in the field. As NTS knows, new errors could have been introduced when Version 2.2 was corrected.

NTS Draft System Testing Report

The Draft System Testing Manual (transmitted with the memorandum dated March 3, 1981) was reviewed. It is a poor document. It is stated in the draft that the basic operational philosophy behind NTS testing is "to simulate errors that actual CONCOR users might make."

This kind of testing is primarily syntactical. The documents and data sets which were said to have been used in the CONCOR tests were examined; they revealed that the philosophy was operational. The only CONCOR programs in the draft appear to have been created by the ISPC (the examples from the benchmark program). Although it is possible to simulate the four kinds of data CONCOR processes by using the data sets of the Head Start Highway Patrol and actual data sets from censuses, the output contains nothing that would show that this had been accomplished. In light of the evaluators' findings, CONCOR should continue to be tested.

Review of Results of NTS Tests

According to NTS personnel, NTS first received a CONCOR installation tape from the ISPC in early October 1980. (Apparently, this was CONCOR 2.1. See Appendix M for a summary of the differences in versions 2.0, 2.1, and 2.2.) Shortly thereafter, on or about October 24, 1980, NTS installed CONCOR on the computer used for testing at Triangle University Computer Center.

NTS employed five full- or part-time staff to test CONCOR. The tests were conducted between October 1980 and June 1981.

The tests which have been conducted to date have not been of the most recent version of CONCOR. And NTS has not retained the output of all its tests. (If the output of every test were retained, paper would accumulate needlessly; nevertheless, at least the output from major runs of data sets or tests of segments should be retained.) The output that

it did retain was available for examination. It covered the period October 1980 to June 1981. It is apparent that a considerable amount of organized work was done.

Most NTS testing programs are variations of the benchmark program, and most of the data for the tests come from the benchmark data set. The set was either shortened or lengthened by file-copy techniques. Exhibit 4 is a summary of the data used in the tests. The source of the data and the date of representative output are listed.

Several representative examples of tests to compare SAS and CONCOR were obtained. (See Appendix N.) This kind of example shows that a testing methodology is being applied consciously and is a prerequisite of certification.

Run-Time Estimating and Speed-Testing

The only satisfactory way to estimate computer time is to take a representative part of an application, code it, and then run it. When the duration of each operation is calculated, a reasonably accurate estimate of time can be extrapolated. The following specific processes should be included in the estimation: input and output (I/O); calculating and processing; off-line functions of equipment; and miscellaneous operations.

The manufacturer specifies the speed of the I/O equipment; thus, calculation of I/O time is relatively accurate.

When the time for calculating and processing is estimated, coded instructions often are counted as the number of executions multiplied by the time required to execute each kind of instruction. Careful attention usually is given to those instances where buffering is used and there is a degree of overlap between calculating and processing and input and output. The time expended on printing and the production of reports on output is also calculated and noted separately.

Miscellaneous, time-consuming operations (e.g., mounting and dismounting tape during and between runs, rewinding tape) should be considered in the estimating process. They should be noted in estimates of time to process census data.

The benchmark program is deficient as an exhaustive test of the language facilities of CONCOR, but it is considered to be a good indicator, at the time of installation, that CONCOR has been installed properly. With the program it is possible to make a reasonable estimate of the speed at which CONCOR processes data, even though a typical census application may be two to three times as long.

Exhibit 4

RECONSTRUCTED CHRONOLOGY FOR TESTING

- 10-29-80 CONCOR 2.1 installed on NTS machine. Benchmark examples available by command from 10-29-80 to 3-1-81. CONCOR CDI output available 12-5-80 and later. SAS/CDI comparison output available 4-23-81 and later.
- 12-19-80 Public-use sample data and SPSS frequencies from the 1970 Chile census given to NTS by the University of Pennsylvania.

 Numerous examples of output of Chilean data set available for review; set dates from 1-8-81 to 2-9-81. Examples of SAS comparison runs available, dated 2-4-81 and later.
- 2-2-81 Panamanian government grants permission to use Panama socioeconomic census data. Data tape later supplied by the ISPC to NTS. These data represent one district of 3,000-4,000 households; set contains a COBOL parallel testing program. Most representative output of parallel testing dated 6-11-81 to 6-15-81 (CONCOR Version 2.2).
- 2-28-81 Columbia data set supplied by POPLAB. (Data set not used in any tests to date.)
- 3-25-81 The ISPC gives to NTS CONCOR Version 2.2. Numerous examples of benchmark output dated 4-1-81 to 4-13-81.
- 4-27-81 -
5-30-81 Installation and workshop activities, Bangkok, Thailand.
- 6-5-81 and
later Examples of CONCOR 2.2 Highway Patrol output available.
- 6-16-81 Technical consultants inspect NTS facilities in North Carolina.

The benchmark program has been used to estimate the time for almost all versions of CONCOR. The results of these tests are known. One can assume that, under similar circumstances, valid comparisons of the versions can be made.

NTS has compared Version 2.0 with Version 2.2. The consultants were able to examine the output. (For a summary of the data, see Appendix O.) Runs were made between late February and April 1981. The largest data set run with each version was 100,000 records. It would not be appropriate to make conclusions at this time because NTS has not published the results of the speed tests.

The published report on the speed tests should contain the following information:

- A list of the requirements of each CONCOR module (e.g., time for processing, size of data set) to determine what resources are needed to create a usable editing program.
- Size of runs. Runs of fewer than 1,000 inputted records should be discontinued.
- CONCOR statistics. These data, especially the count-input command, significantly affect run-time.
- Comparisons of versions. Comparisons are valid if and only if output and input modes are similar between runs (i.e., disk I/O should be faster than tape I/O).
- Specific dates and times of tests.
- Results of tests.
- Adjusted estimates of time to process census data. The benchmark program is not long enough or complex enough to be representative of runs of edited census data.

Conclusions and Recommendations for Continued Testing

To date, testing has been inadequate to certify the CONCOR system for use in foreign countries. The benchmark test is not an exhaustive test of CONCOR's facilities. However, the preliminary findings indicate that CONCOR is capable of performing to specification.

To ensure that the system is certified, the AID must take action immediately to correct deficiencies in testing. CONCOR has not been tested on a sufficiently wide range of data sets, and most problems with

the system are discovered in the field. It might make sense to use real data from at least one Asian and one African country to test the system in the field over a specified period.

CONCOR Version 3.0 should not appear before the results of the tests are documented. A list of the programs and errors should be prepared and bound in a pamphlet that can be distributed in developing countries to persons who are writing programs. CONCOR should be tested on data sets and editing schemes peculiar to census and survey work, even though it has performed successfully on other kinds of data sets.

NTS should use larger volumes of real census data in simulating typical environments. Experts in the subject matter will be needed to ensure that the tests are not a purely mechanical application of logic.

There is no evidence that NTS uncovered an unknown error in CONCOR during testing and then modified the internal components of the system. There also is no evidence that NTS has been directly responsible for any of the changes that have been made. The evidence suggests that the ISPC has been solely responsible for enhancements to CONCOR. (For a description of the changes in Versions 2.0, 2.1, and 2.2, see Appendix M.) NTS and the ISPC have cooperated informally, and the two organizations may have agreed that specific, necessary changes take priority.

The syntax analyzer has been tested thoroughly and methodically to determine its ability to detect coding errors in the source language. This does not necessarily mean that CONCOR's ability to generate executable COBOL statements or logic has been tested sufficiently.

For the degenerative and simple cases, CONCOR's imputation facilities have produced results verifiable by other programming methods. The imputation component appears to be working properly; however, additional tests using real hierarchical census data are warranted.

No test data have been generated specifically to test CONCOR's questionnaire-control commands for complex questionnaires. Benchmark data are not believed to be representative in this instance. Additional work in this area is needed.

Progress has been made in testing. The reviewing agency should be encouraged by this progress; a substantial amount of work has been done. Additional testing should be monitored carefully because the results will be critical. Complex data sets should be obtained and parallel testing should be continued. The simple cases have been covered adequately.

VI. INSTALLATION SITE REPORTS

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ESCAP CONCOR Installation

Persons Interviewed

The following persons were interviewed at ESCAP:

Mr. K. O. Clark, Chief, Data Processing Section

Mr. A. Ito, Regional Adviser on Data Preparation

Mr. Robert Siegel, Systems Analyst.

How CONCOR Was Installed

NTS personnel installed the system. The object modules were transferred by tape, which was supplied by the ISPC. It was not necessary to compile the source programs. Minor modifications to the NEC macro (job-control language) were made by NTS. (The NEC conversion was accomplished solely by the ISPC in Indonesia. However, there were several meetings between NTS and ISPC at which the conversion process was discussed.)

Time Required

Approximately three days were required to install CONCOR. The first successful benchmark is dated April 28, 1981.

Hardware

NEC 350 was used (see Appendix J).

Intended Uses

There are no plans to use the system at this time.

AIT CONCOR Installation

Persons Interviewed

The following persons were interviewed at the Asian Institute of Technology:

Mr. Mimitra Kattiyakul Wanich, Program Development Coordinator

Miss Prapaporn Tungsarote, Systems Analyst

Mr. Chotechai Piyavongsiri, Programmer and Analyst.

How CONCOR Was Installed

NTS gave AIT a copy of the OS version of CONCOR 2.2. AIT staff installed the system without the assistance of NTS. All source programs were successfully copied onto disks. The job-control language was modified to make it compatible with the operating environment at AIT. However, on first attempt, none of the COBOL programs would compile successfully. A day later, NTS personnel returned to the AIT to check on the progress of the installation. They reviewed the problem but were unable to diagnose its cause. Mr. Chotechai Piyavongsiri was assigned to the problem part-time; within a week, he discovered that the AIT COBOL compiler was not current. The compiler was updated and the programs were compiled successfully. A successful benchmark program was then run.

Time Required

Approximately five days were required to install the system.

Intended Uses

At this time, there are no formal plans to use the CONCOR, but staff at the AIT intend to study CONCOR programs.

Comments

General information on the AIT can be found in Appendix P.

Chulalongkorn University CONCOR Installation

Persons Interviewed

The following persons were interviewed at Chulalongkorn University (CU):

Mr. Somchai Thayarnyong, Director, Computer Service Center

Ms. Chuleeporn Kitrungrotpisan, Systems Analyst.

How CONCOR Was Installed

NTS personnel assisted the university's technicians in installing the system. Some minor problems in compiling information occurred. No specific information on the problems is available. No benchmark was available for inspection. The director of the center did say, however, that CONCOR is functioning. A description of the computer center at CU is given in Exhibit 5.

Intended Uses

CONCOR may be used in future surveys.

NSO CONCOR Installation

Persons Interviewed

The following persons were interviewed at the National Statistical Office:

Mrs. Anuree Wanglee, (Past) Director, Population Division

Mr. Angsumal Sunalai, Director, Programming 1980 Census

Ms. Chookul Authanupun, Programmer.

How CONCOR Was Installed

This office had some experience installing CONCOR. NTS gave them some assistance on the first day. Installation was completed later by NSO personnel. Benchmark output was available for inspection. The census department within the NSO has stopped using CONCOR because they are uncertain about its capability and think that it is unwieldy. Other departments within the NSO (e.g., survey groups), do intend to use CONCOR.

Time Required

Two days were required to install the system.

Intended Use

CONCOR will be used in survey work requiring considerable imputation.

Conclusions

Numerous interviews were conducted during the site inspections. The following conclusions are based on information acquired during those interviews.

1. Technical personnel must accompany installation tapes and should participate as advisers in the installation process.
2. All the problems reported by foreign national had to do with variations in the COBOL compiler.
3. Experienced personnel can install CONCOR in approximately three days.
4. Those organizations which do not intend to use CONCOR do not understand how it can be used.
5. The installation procedure seems to be more lengthy than difficult.

VII. CONCLUSIONS

VII. CONCLUSIONS

Recommended Changes

CONCOR is useful. But it might be more useful if it were modified. In addition to changes in the supporting documentation (described in the preceding chapters), five different modifications could be made to improve the system. Each modification is described below.

1. Those elements of the system which are internally inconsistent and which do not enable programmers to learn easily how to use the system should be modified.
 - a. Divisions should be titled DICTIONARY DIVISION, EXECUTION DIVISION, and REPORT DIVISION. Use of section headings should be deemphasized. It is inconsistent to use END-DIVISION commands and not division headings. The section headings are cumbersome. (They were not coded by participants in the workshop.) They could be deleted from this version of the language altogether without sacrificing understanding of the organization. The CONCOR language is a distinct product, and was not meant to be an imitation of COBOL. The section identifiers are burdensome and should not be used. The intent of the original CONCOR project was to develop an uncomplicated system.
 - b. Consistency among data identifiers should be improved. Alphanumeric variables could be coded, and of the same length as numeric variables, but strings of comparison throughout the DICTIONARY DIVISION would not have to be mandatory. A single-dimension row and column vectors could be coded in the same way as multidimensional arrays.
2. Selective commands and internal variables should be used to facilitate the use of CONCOR in census applications. The following commands and variables could be applied:
 - a. LOAD/UNLOAD arrays--commands that would save and replace automatically "hot-decked" values from batch to batch.

- b. TOTAL-QUESTIONNAIRE-COUNT/TOTAL-RECORD-COUNT internal variables independent of AREA CONTROL.
 - c. HOUSEHOLD-PERSON-POINTER to indicate which record is being processed in filter-routing.
3. The GOTO or PERFORM PROCEDURE command should be used.
4. Improvements should be made to increase speed. At this time, CONCOR cannot turn off error-checking routines. As a result, the program is slowed. It also cannot be used on small computers because of excessive core usage.
5. Procedures should be revised. The CONCOR system is not cohesive. The separate programs should be, but are not, transparent to the user. Users of COBOL simultaneously develop the various divisions (i.e., coding in the PROCEDURE DIVISION may be followed by changes in the DATA DIVISION or working-storage variables), but users of CONCOR are encouraged to develop first error-free DICTIONARY DIVISIONS and then code EXECUTION DIVISION statements. In practice, the DICTIONARY DIVISION of CONCOR often requires extensive modifications after it has been made "error-free" to accommodate the editing logic. Students become frustrated and often feel as though they are failing when they try to follow the procedures.

One could argue that these changes need not be made to complete the CONCOR package. The improvements described above would, however, make the language more internally consistent, and thus easier to learn and apply in census work. The modifications are neither arbitrary nor cosmetic; rather, they are based on hands-on programming experience in the field and the observations and recommendations of numerous users of CONCOR.

The latest release was too late to be used in Asia in the 1980 round of the census; however, African nations should be able to profitably use CONCOR's facilities.

It may be unrealistic to expect complete satisfaction with the structure of any programming language, but a complete package that reflects a consideration of the objectives of the COBOL CONCOR system is desirable. An explicit statement of objectives has not been included in any of the documentation on the system.

COBOL CONCOR is an unfinished product. The CONCOR system contains more than twenty programs which use approximately thirty files. CONCOR is complicated to install, to learn, and to use. Subsequent versions should be restructured and simplified.

The point has been made in earlier reports, but must be reemphasized here: software evolves over time. Agencies should be prepared to evaluate the success or failure of a project in terms other than immediate utility. Interim solutions are costly and are not meant to cover problems likely to arise at a later date. It is the philosophy underlying the system, and not the system itself, which ultimately will be exported.

Formalized Administrative Policies

NTS Research Corp. has demonstrated its competence in developing the CONCOR system. On numerous occasions, staff have asked for and received from the ISPC considerable assistance and materials. NTS's relationship with the ISPC has prevented it from re-inventing information and wasting time on problems to which solutions have already been found.

NTS should not have accepted as complete or adequate the materials developed by the ISPC. These materials are useful primarily in reorganizing, clarifying, and enhancing the system. No inventory has been taken of the materials. NTS has received from the ISPC virtually all the materials on CONCOR. NTS should be required to inventory monthly the assistance and materials it receives from all outside organizations.

NTS and ISPC, separately and jointly, disseminate CONCOR. It would be appropriate, therefore, that the AID periodically audit the efforts of each. At NTS, formal mechanisms are already in place to accomplish this. Audits should serve two purposes. One, they should ensure that the required work has in fact been done, on time and professionally. Two, they should lead to an examination of important technical and substantive issues which otherwise might be overlooked. With information on all the relevant factors, the AID can make an informed decision. The emphasis here is on a constructive examination that results in the development of guidelines that ensure the adequacy and completeness of the CONCOR product.

Less direct methods must be used to audit the ISPC. Work in the early years notwithstanding, the ISPC has done a considerable amount of work to develop the system. Its recent work on CONCOR is of high caliber.

It is important that a government agency provide technical support to develop CONCOR; because AID does not possess this expertise, the ISPC should continue in its current role. Given the effort that has been made and the cooperation that has been provided, the AID should pursue the completion of key aspects of the system. Because work on CONCOR has been decentralized, the AID should coordinate all efforts to finish the product.

APPENDICES

Appendix A

LIST OF PUBLICATIONS ON CONCOR

Appendix A

LIST OF PUBLICATIONS ON CONCOR

- Grant, F.J. Developing COBOL CONCOR Edit and Imputation Systems. Washington, D.C.: American Public Health Association, October 1979; pp. 1,100-1,174.
- . The CONCOR Edit and Imputation System: Its Adequacy and State of Completion. Washington, D.C.: American Public Health Association, January 31, 1980; pp. 582-1,012.
- Levin, M.J. CONCOR Systems Reference Manual (Version 1). Washington, D.C.: ISPC, 1978.
- . Evaluation of CONCOR for AID, April 1979.
- . Computer Editing and Imputation for Census Data. 6th Census Conference, East-West Center, Hawaii, September 1979.

Appendix B

MORANDUM, HEISLER TO HALADAY,
April 28, 1981

UNITED STATES GOVERNMENT

Memorandum

TO: DS/POP/FPSD, Robert Haladay
FROM: DS/POP/DEMO, Douglas Heisler
SUBJECT: Criteria for APHA evaluation of NTS Research Inc. contract,
AID-DSPE-C-0091.

DATE: 4/28/81

Two consultants are requested to participate in a review of DSPE-C-0091:
A. The first with technical computer skills and familiarity with COBOL/CONCOR to evaluate NTS' testing and modifications to the package, documentation preparations and revisions; and B. The second, with instructional expertise in COBOL/CONCOR to evaluate the training materials, workshop organization and effectiveness of NTS' instruction in a regional workshop with international participants.

This is to be a complete evaluation of the contract to date. The AID Language Training Office has completed a language examination of the contractor through the Foreign Service Institute, and APHA will include the FSI evaluation to make a complete report. In general, the points to be considered are those tasks to be completed during the first six months of the contract noted in the contract Statement of Work. The following specific points should be highlighted during the APHA consultants' evaluation in conjunction with the first regional training workshop scheduled May 11-29, 1981 at ESCAP, Bangkok, Thailand.

A. Technical Consultant

Testing:

1. What test files were used and were they adequate in length and structure to fully and rigorously test all features of COBOL/CONCOR so we may have confidence in its ability to edit a national census or survey? When did NTS acquire specific test files? How were the test files obtained? When did NTS begin to use specific test files to test COBOL/CONCOR?
2. What were the specific COBOL/CONCOR commands tested? What were the test results by command and what evidence is there that the tests were successful?
3. To what extent has NTS tested COBOL/CONCOR to determine whether "bugs" previously identified by Delta Systems and other AID consultants have been removed from the system?
4. What were the results when NTS checked the test files with the DEBE or other edit package? What evidence is there that NTS verified the results of the COBOL/CONCOR test runs by comparison to the outputs of other edit packages? How relevant to COBOL/CONCOR test evaluation is comparison with DEBE or other edit packages?
5. What modifications were made to COBOL/CONCOR by NTS as a result of the NTS tests and what modifications were made by the Bureau of the Census?



6. Comment on the NTS SYSTEM TESTING draft report. Is COBOL/CONCOR "debugged" and ready to be released without reservation for use by a national census or statistical office in editing a national census or survey, or is further testing and modification necessary? If further testing and modification is needed, what specific elements of COBOL/CONCOR should be tested or modified, how serious are the modifications in terms of the useability of COBOL/CONCOR, and how much person time will be required to complete the testing and modification?

7. What tests did NTS make to evaluate the speed of COBOL/CONCOR? What are the results of the speed tests? Are the results of those speed tests transferable to other computers? Were any modifications made to COBOL/CONCOR by NTS as a result of those speed tests to improve its performance?

Documentation

1. Review and comment on the new and revised COBOL/CONCOR documentation prepared by NTS comparing it to previously existing documentation including the USER'S GUIDE, SYSTEM REFERENCE MANUAL, SYSTEM INTERNALS AND INSTALLATION GUIDE, and DIAGNOSTIC MESSAGE GUIDE.

2. When evaluating the documentation referenced above, comment on at least the following points: Are the documents clearly and logically organized and written without unnecessary jargon or colloquialisms, including sufficient flow diagrams and examples to permit use by the inexperienced programmer or subject matter specialist? Do the documents all refer to the most recent, tested version of COBOL/CONCOR? Does each specific document relate to the other documents? Does the USER'S GUIDE allow the inexperienced user to understand the purpose and structure of COBOL/CONCOR? Does the USER'S GUIDE in union with the other documents provide enough information for the inexperienced user to write a simple COBOL/CONCOR program either in a formal training program or through self study? Are the documents non-IBM or other machine dependent? Does the SYSTEM INTERNALS AND INSTALLATION GUIDE provide sufficient information in a format that would allow COBOL/CONCOR to be installed by inexperienced programmers and subject matter specialists, and should it?.

Dissemination and Installation

1. Can COBOL/CONCOR be distributed by post to a majority of countries for installation without TDY assistance? What level of competence by host country programmers would be required to make a COBOL/CONCOR installation using the NTS prepared materials without TDY assistance?

2. What COBOL/CONCOR conversions are available for which computers, who prepared them, and to what extent have they been tested?

The consultant will evaluate the documentation and test reports and other relevant materials, then proceed to the regional training workshop in Bangkok on or about May 25, 1981 where (s)he will evaluate COBOL/CONCOR from a "users" perspective through interviews with participants, participation in solving computer problems in the workshop, review of NTS' installation experience on the new NEC machine at ESCAP, running tests on the computer being used in the workshop, and discussions of the package and accompanying documentation with the technical experts at ESCAP. After the workshop the consultant will travel to Durham, North Carolina, to NTS Research Corporation for approximately one week where (s)he will review NTS' COBOL/CONCOR test outputs, programs and other testing evidence; prepare and run test problems on the NTS computer based on prior experience with COBOL/CONCOR problem areas; and will participate in a workshop debriefing. The consultant will then prepare the final report in consultation with the training consultant.

B. Training Consultant

The consultant will comment on at least the following points:

1. Travel, lodging and expense reimbursement arrangements for workshop participants.
2. Workshop facilities arrangements.
3. NTS' workshop plan including specific recommendations for revision as needed:
4. Are the training materials, the USER'S GUIDE and other documentation clear, logical, well designed, and easily understood by inexperienced programmers and subject matter specialists?
5. Do the training lectures, exercises and materials relate well to the USER'S GUIDE and other documentation?
6. Do the NTS teachers have a good grasp of COBOL/CONCOR and can they transmit it to an international audience; is NTS culturally sensitive to workshop participants?
7. Do the NTS instructors present sufficient examples and assign exercises that relate to census and survey editing problems likely to be encountered in the participants' home countries?
8. Does NTS encourage active interaction between participants and with the NTS instructors in class, during applied problem sessions on the computer and informally after class?
9. Are the training materials, reference materials and documentation presented related to the most recent version of COBOL/CONCOR.
10. Are the workshop training materials, class lectures and COBOL/CONCOR documentation understandable by workshop participants who do not have English as their first language?

The consultant will review training materials and new and revised COBOL/CONCOR documentation then proceed to the regional training workshop in Bangkok, Thailand on or about May 18, 1981. During the final two weeks of the workshop (s)he will evaluate all aspects of the training program through participation, observation, and interviews with the participants, NTS personnel, ESCAP and USAID staff as required. After the workshop the consultant will travel to Durham, North Carolina, to NTS Research Corporation for approximately two days where (s)he will will participate in a workshop debriefing, after which (s)he will prepare a final report in consultation with the technical consultant.

Clearances: AA/DS, S. Joseph _____
DS/POP/DIR, J.J.Speidel _____
DS/POP/DEMO, J.W.Brackett _____

Appendix C
LIST OF CONTACTS

Appendix
LIST OF CON

Bangladesh

- Mr. A. L. Jamil Akhtar, Assistant Programmer, Bangladesh Bureau of Statistics, Bangladesh Secretariat, Dacca
- Mr. Abdul Malik, Statistical Officer, Mapping Cartography and Geo-Information Wing, Statistical Division, Ministry of Planning, Dacca

India

- Mr. E. B. Adlakha, Director, Electronic Data Processing, Registrar General's Office, New Delhi
- Mr. V. V. Rao, System Analyst, New Delhi

Indonesia

- Mr. Sam Suharto, Director, 1980 Census of Indonesia, Central Bureau of Statistics, Jakarta
- Mr. Sudarmadi, Acting Chief, Bureau of Evaluation, National Family Planning Coordination Board, Jakarta

Nepal

- Mr. Hari Har Nath Regmi, System Analyst, Central Bureau of Statistics, Kathmandu

Philippines

- Mr. Valentino Abuan, Computer Programmer, National Census and Statistics Office, Manila

Sri Lanka

Mr. D. M. W. Jayawardena, Senior Programmer, Department of Census and Statistics, Colombo

Thailand

Mr. K. O. Clark, Chief, Data Processing Section, Division of Administration, Economic and Social Commission for Asia and the Pacific (ESCAP), Bangkok

Mr. R. Siegel, Systems Analyst, Programming and Systems Support, Data Processing Section, Division of Administration, ESCAP, Bangkok

Mr. A. Ito, Regional Adviser on Data Preparation and Processing and Censuses and Surveys, Data Processing Section, Division of Administration, ESCAP, Bangkok

Mr. Chotechai Piyavongsiri, Regional Computer Center, Phatumthanee Province, Asian Institute of Technology (AIT), Bangkok

Miss Prapaporn Tungarote, Systems Analyst, Regional Computer Center, AIT, Bangkok

Nimitra Kattiyakulwanich, Program in Computer Application Development Coordinator, AIT, Bangkok

Mrs. Anuree Wanglee, (Past) Director, Population Division, National Statistical Office (NSO), Bangkok

Mr. Angsumal Sunalai, Director, Programming 1980 Census, NSO, Bangkok

Ms. Chookul Authanupun, Programmer, NSO, Bangkok

Miss Roja Thasanasugarn, Programmer, Computer Center, Chulalongkorn University, Bangkok

Mr. Sittipan Nuanual, System Analyst, Computer Service Center, Chulalongkorn University, Bangkok

Miss Chuleeporn Kitrungrotpisan, System Analyst, Computer Service Center, Chulalongkorn University, Bangkok

Somchai Thayarnyong, Director, Computer Service Center, Chulalongkorn University, Bangkok

NTS Research Corporation, Durham, N.C.

Mr. David A. Birnbaum, Director, Computer Applications Center

Mr. Richard Hyde Merritt, Senior Systems Analyst

Mrs. Doree Trottier, Programmer

Mr. Norm Friberg, Programmer

Ms. Danine Huff, Educational Media Specialist

USAID, Washington, D.C.

Mr. Douglas W. Heisler

ISPC, Washington, D.C.

Robert Blair

Cathy Chamberlin, Systems Analyst

Appendix D
NTS: AN OVERVIEW

NTS: An Overview

NTS Research Corporation is a client-oriented, woman-owned, small business which provides research and development services to both public and private sector clients. NTS's current professional staff has had graduate training in eleven different academic disciplines including mathematics, computer science, operations research, statistics, medicine, health, sociology, psychology, education, political science and English. The capabilities of these staff members are complemented by a talented multi-media design staff with expertise in producing everything from instructional texts to slide/audiotape presentations. Every client is serviced by doctoral or masters degree level professionals, each of whom combines technical expertise with efficient management skills.

The NTS management structure incorporates the most practical aspects of matrix staffing to provide each client with effective and efficient utilization of all pertinent resources. NTS's clients include both large corporations and small businesses, as well as Federal, state and local governmental agencies. Founded in 1973, NTS has successfully conducted both small and multi-million dollar contracts ranging in duration from a few days to several years. Whether developing and implementing computer programs in underdeveloped countries or evaluating health and nutritional services at home, the corporation's experience and capabilities are readily available to meet its clients needs.

NTS: *Research and Development Services*

- *Training and Technical Assistance*
- *Computer Applications*
- *Medical Research*
- *Policy Analysis*
- *Statistical Design and Analysis*
- *Evaluation*
- *Instructional and Graphic Design*
- *Survey and Market Analysis*
- *Field Studies*
- *Measurement*

The research and development services listed above cover the major areas of expertise of NTS Research Corporation. These services are frequently combined to enable NTS to better serve its clients. The following pages contain an explanation of each of the services, along with an illustrative description of one project which has used the service and a list of some of NTS's other projects which have also used the highlighted service.

Training and Technical Assistance

NTS provides training and technical assistance to expand and improve the capabilities of its clients through the use of multiple delivery systems. The delivery systems include on-site consultations, on-site workshops, phone interactions, letters, and other multi-media methodology. NTS draws on multiple resources to design a tailored technical assistance and training package.

Technical Assistance Center, Region III
Contract No. 300-79-0483; Department of Education

NTS serves as the Technical Assistance Center (TAC) for ESEA Title I program evaluation for Region III. The focus of NTS/TAC activities is the building of the capacity of state and local education agency personnel in Title I evaluation with emphasis on the implementation of evaluation models measuring program treatment effects and a companion reporting system. In order to assist in the effective use of the evaluation models, NTS serves as a technical evaluation consultant to SEAs and LEAs throughout the region, with TAC staff acquainting users with the models, helping users to choose the most appropriate models, and instructing users in the data analysis and reporting techniques.

In addition, TAC staff work on other Title I evaluation activities such as instrument selection, data collection, sampling, quality control, student selection, reporting of test results, utilizing data, types of scores, and process evaluation. If requested, users are aided in developing alternatives to, or variations in, existing evaluation models. NTS/TAC is regarded as a leader in the development of instructional materials and workshops.

Other projects which draw upon training and technical assistance skills include "1980 Round of Census (CONCOR)," "Establishment of Statewide Network for Literacy Volunteers," and "Technical Assistance in Evaluating Career Education Projects."

Computer Applications

NTS develops sophisticated system designs and software packages. Our expertise includes systems analysis, document design and implementation, documents receipt and control, data collection, data entry, data management, and data analysis. Software use includes current statistical programs, file management systems, report generating systems and all high level computer languages. NTS applies the most effective mix of procedures to best match the computer problem which needs to be solved.

1980 Round of Census (CONCOR)
Contract No. AID-DSPE-C0091; Agency for International Development

NTS is testing and modifying the CONCOR software, a consistency and correction system designed and programmed in COBOL by the U.S. Bureau of the Census to aid developing world nations in editing and correcting their census data. NTS has written the CONCOR Users' Manual, revised the CONCOR Technical Manual, prepared a training workshop on CONCOR to be given worldwide, installed the software in a developing nation and trained participants in CONCOR use. NTS provides additional technical assistance to lesser developed countries by installing CONCOR at their computer sites and training their personnel in its use.

Other projects which draw upon computer applications services include "Optical Mark Readable Document Processing for Client-Oriented Data Acquisition Process," "National Evaluation of Head Start Educational Services ," and "Evaluation of the Washington, D.C. ESEA Title I Program."

Policy Analysis

In the broadest sense, policy analysis consists of collecting and presenting data in a fashion that assists policy-makers in making decisions that will determine future policy. In order to provide its clients with policy analysis of the highest quality, NTS combines statistical, legal, sociological, historical and economic analysis to develop policy options for NTS's Federal clients. NTS policy studies frequently include interviews with people making or affected by particular policies, case studies of the implementations of Federal policy and legal analysis of laws and regulations. When requested, NTS has been able to conduct and complete policy studies in as little as 48 hours.

Educational Policy Development Center
Contract No. 300-79-0421; Department of Education

Under contract to the Office of Planning and Budget within the Department of Education, NTS maintains an Educational Policy Development Center focusing on issues related to educational quality and improvement. The Office of Planning and Budget is responsible for making recommendations regarding legislative, regulatory, and administrative policies in the field of education. Major issues being addressed include the following: improvement in the quality of instructional services; improvement in the quality of schools; the effects of CETA upon secondary schools; the transition from school to work; and the improvement in the quality of intergovernmental relationships.

Other projects which have used policy analysis include "Evaluation of State Capacity Building Program in Dissemination," "Evaluation of the Fund for the Improvement of Postsecondary Education," and "National Evaluation of Head Start Educational Services."

Medical Research

NTS conducts medical and epidemiologic research. NTS staff: (1) design medical data collection forms; (2) prepare manuals for abstracting, coding, interviewing and tracing; (3) locate individuals and obtain their consent to be included in a variety of studies; (4) abstract information from thousands of medical records; (5) conduct surveys; (6) trace individuals to determine their vital status; (7) obtain death certificates; and (8) key, edit, and code a variety of medical data prior to data analysis.

Followup Study of Patients Who Had Iodine-131 and Other Diagnostic Procedures During Childhood Contract No. 223-79-6031; Food and Drug Administration

Under contract to the Bureau of Radiological Health of the Food and Drug Administration, with support from the National Cancer Institute and the Nuclear Regulatory Commission, NTS is conducting a national cooperative followup study of persons who, as children and adolescents, received diagnostic iodine 131 over the period 1946-1967. The study is investigating whether increased risk of long-term radiation effects, such as the development of thyroid neoplasms, is associated with exposure to relatively low doses of I-131 such as are (or have been) used in the diagnosis and evaluation of thyroid function. If a radiation effect (i.e., increased risk of the development of thyroid neoplasm) is detected, an attempt is made to determine the relationship, if any, between the level of exposure to diagnostic I-131 and the risk of thyroid neoplasm. NTS is acting as the central agency for the collection of the data to be sure that data are comparable. Questionnaire design, sampling, data management and analysis are conducted by NTS staff.

Additional projects which use the expertise of medical research include "Community Health Information Policy Study - Hospital Discharge Survey," "Medical Self Care Survey," and the "Florida Hospital Data Collection Project."

Statistical Design and Analysis

NTS designs and conducts statistical analyses to meet the information needs of decision makers at all levels of management and government. NTS design studies using both matched and randomly selected comparison groups in addition to conducting research using case-study methodology. Analytic techniques are selected to provide useful information to decision makers and may include methods such as descriptive statistics, analysis of variance or covariance, regression analysis, factor analysis, or path analysis.

Evaluation of the Commodity Supplemental Food Program (CSFP) Contract No. 53-3198-0-110; Department of Agriculture

The major objective of the CSFP evaluation is to assess the health and nutritional impact of the CSFP on pregnant women, infants, and children. Retrospective data from program and health records is used to make comparisons between CSFP participants and individuals who were eligible but did not participate in the CSFP. A multivariate matching procedure is being used to match CSFP participants with comparison group members on a variety of continuous and categorical variables. Data analysis procedures will determine the benefits of the CSFP. The benefits for pregnant women will be determined by an examination of such variables as weight gain during pregnancy and newborn birthweight. For infants and children, the benefits will be assessed using variables indicative of growth and nutritional well-being, including hemoglobin, height, and weight.

Projects which make further use of our statistical design and analysis have included "Evaluation of the State Capacity Building Program in Dissemination," "Evaluation of State Capacity Building Program in Dissemination," "National Evaluation of Head Start Educational Services," "Technical Assistance in Evaluating Career Education Projects," and "Evaluation of the Fund for the Improvement of Postsecondary Education."

Evaluation

NTS conducts evaluations of programs and products in both the public and private sectors. These evaluations have often caused changes in Federal, state and local practices and have even been cited by Congress as rationale for changing a law. NTS's evaluations combine the expertise of social scientists and technical experts to ensure both rigorous scholarship and state-of-the-art research methodology. An NTS evaluation always meets the high standards of excellence.

Evaluation of the Fund for the Improvement of Postsecondary Education (FIPSE); Department of Education

NTS is conducting an evaluation of FIPSE for the Office of Planning and Budget, Department of Education. FIPSE is a Federal agency whose mission is to assist postsecondary educational institutions and agencies to realize a broad range of reforms designed to improve the efficiency and quality of programs and operations. The evaluation includes extensive process analyses, case studies, a survey of grantees, surveys of the field of postsecondary education and preparation of Congressional testimony for FIPSE's reauthorization.

Additional evaluations that NTS has conducted include "Evaluation of State Capacity Building Program in Dissemination," "The National Evaluation of Head Start Educational Services," "The Evaluation of the Comprehensive Project in Functional Literacy," and the "Evaluation of the Commodity Supplement and Food Program."

Instructional and Graphic Design

Instructional and graphic design assists clients in analyzing all aspects of human learning and communication problems, and subsequently in designing, implementing, evaluating and managing solutions to those problems. By working closely with its clients, instructional and graphic design develops the appropriate procedures, ideas, devices, and organization to meet all informational needs. Instructional and graphic design products include brochures, graphs, posters, self-instructional materials, instructional curricula, and slide/audiotape productions. The staff also designs and implements workshops and conferences.

Development of the Home Study Course "Emergency Management, USA"
Contract No. EMW-C-0176; Federal Emergency Management Agency

NTS developed a home study course on personal emergency preparedness and protection from natural disasters, technological disasters, and nuclear attack. The applied services for this specified self-instructional course included an analysis of the available literature and conceptualization with the client of content organization and delivery. NTS staff produced the course objectives, selected the most appropriate learning strategies, prepared pre and post tests, wrote and edited the text, and packaged the course into a highly attractive visualized self-contained manual. The course was validated by a representative field sample and a system of quality control reviews.

Other projects which draw upon the wide range of services available from instructional and graphic design include "1980 Round of Census (CONCOR)," "Technical Assistance Center, Region III," and "Delaware Test Item Bank Development," and "American Seminars Corporation's Virgin Island Series' Brochure."

Survey and Market Analysis

NTS gathers and analyzes information for the purpose of making valid and reliable recommendations. Visible products and processes include the development of questionnaires and other survey instruments, determination of unbiased samples, obtainment and training of field and telephone interviewers, verification and analysis of results, and coordination and presentation of findings. Assistance is also provided in determining methods for analyzing market potential and impact as well as ways to reach, influence and motivate people.

North Carolina Citizens Surveys
North Carolina Department of Budget and Management

Over the past four years multiple surveys have been used to gather and analyze information from several thousand North Carolinians concerning such topics as health, education and community. The data have been collected through both in-person and telephone interviews which have lasted approximately 30 minutes. NTS has devised a tracking system which schedules three telephone attempts followed by three in-person attempts before a respondent is replaced.

Additional projects which make use of the survey and market analysis include "Medical Self Care Survey," "Family Planning Survey," "Liquor-by-the-Drink Survey," the "North Carolina Bicycle Usage Survey," and "Evaluation of the Fund for the Improvement of Postsecondary Education."

Field Studies

NTS conducts field studies evaluating the implementation and impact of Federal, state and local programs or practices. These field studies frequently require the establishment of a field-based staff spanning the nation; a recent study required staff in 44 different cities in 27 different states. Furthermore, NTS regularly employs medical record abstractors in 19 different cities in eight different states. Studies requiring case studies have caused NTS staff members to conduct site visits in each of the 50 states. The professional staff of NTS has expertise in designing, implementing, and managing expansive data collection efforts in the field whether the area of interest is blood samples or organizational management practices.

National Evaluation of Head Start Educational Services and Basic Educational Skills Initiative
Contract No. HEW 105-78-1306; Department of Health and Human Services

For the Administration for Children, Youth, and Families of the Office of Human Development Services, NTS conducted the initial phase of a longitudinal evaluation of Head Start Education Services and of the Basic Educational Skills Initiative. During the planning phase, NTS developed data collection instruments for the random selection study of 30 Head Start programs across the country to represent Head Start nationwide. Baseline data was collected in the spring of 1979 on 30 Head Start and 17 Basic Educational Skills Programs. During the fall of 1979, 4,200 children and their parents were tested and then interviewed for additional baseline data.

Additional projects which have included field studies are "Evaluation of the Fund for the Improvement of Postsecondary Education," "A Follow-up of Patients Who Had Iodine-131 and Other Diagnostic Procedures during Childhood," "Florida Hospital Data Collection Project," "Evaluation of State Capacity Building Program in Dissemination," "CETA's Effect on Secondary Education," and "The 1980 Round of Census."

Measurement

NTS develops and refines instruments to measure areas as diverse as self-awareness, system configuration status, writing competency, nutrition knowledge, psychomotor abilities, and career awareness. These efforts involve utilizing a variety of techniques to assess the reliability and validity of these instruments. Both classical and latent trait measurement models are used as well as confirmatory and exploratory factor analyses and scalogram analyses. As a result, users of the instruments are able to place a high degree of confidence in the accuracy and validity of the measurements.

Delaware Test Item Bank Development Delaware Department of Public Instruction (DPI)

NTS completed a contract for the development and packaging of a test item bank and supplementary materials designed to measure student achievement of DPI's state minimal performance requirements. NTS developed a total item bank of over 800 Mathematics items, 600 Reading items, and 200 Writing items. The instruments were pilot tested to determine item appropriateness and effectiveness with junior and senior high school students in Pennsylvania and Delaware. Student, class, and school record forms were developed and produced. Materials for training teachers in the use of the bank were prepared. NTS also conducted training sessions for DPI personnel in the use of the bank and supplementary materials and the procedures for training other teachers. Finally, project staff created and produced users' manuals, packages, and supplementary materials for the bank. The packaging was designed to be sturdy, durable, and convenient to use.

Other projects which draw upon the diverse services of measurement have included "Maryland Nutrition Education Needs Assessment," "Research and Development Necessary for Field Testing Writing Exercises as a Minimum Competency Test," and the "Louisiana Pupil Assessment Program - Development of Test Items for Reading and Writing Objectives 1978-1979."

NTS: Selected Projects

Project	Agency	Amount of Contract	Contract Officer	Project Officer
Technical Assistance Center, Region III	Department of Education/Office of Program Evaluation	\$4,409,828	Jean Milazzo (202) 477-9022	Robert Stonehill (202) 245-9401
1980 Round of Census (CONCOR)	Department of State Agency for International Development	\$ 874,252	Peter Staples (703) 235-9076	Doug Heisler (703) 235-9692
Florida Hospital Data Collection Project	Florida Association of Health Systems Agencies/Florida Department of Health	\$ 76,000	William W. Alfred (904) 487-2506	Phillip J. Hughey (904) 377-4404
Establishment of Statewide Network for Literacy Volunteers	North Carolina Department of Natural Resources and Community Development	\$ 54,000	Susan Gurlac (919) 733-4524	Madelyn Gue (919) 733-4524
Optical Mark Readable Document Processing for Client-Oriented Data Acquisition Process	Department of Health and Human Services/National Institute on Drug Abuse	\$ 243,000	Nancy Hurd (301) 443-6677	D. Robitaille (301) 443-6687
Educational Policy Development Center	Department of Education/Office of Planning and Budget	\$ 483,082	Charles Blum (202) 426-5137	Frank Nassetta (202) 245-8182
A Follow-up of Patients Who Had I-131 and Other Diagnostic Procedures During Childhood	Department of Health and Human Services/Food and Drug Administration	\$ 824,494	David R. Ramos (301) 443-4420	Peggy Hamilton (301) 443-4203
Evaluation of the Fund for the Improvement of Postsecondary Education	Department of Education/Office of Planning and	\$ 422,421	Charles Blum (202) 426-5137	Keith Baker (202) 245-1888
Technical Assistance in Evaluating Career Education Projects	Department of Education/Office of Career Education	\$ 322,000	Robert Rothenberger (202) 447-9187	Terry Newell (202) 245-2331
Community Health Information Policy Study - Hospital Discharge Survey	Research Triangle Institute/National Center for Health Statistics	\$ 56,359	Robert G. Manion (919) 541-6188	David L. Bayless (919) 541-6317
Development of a Design for Secondary Exploratory Vocational Education in North Carolina	North Carolina Department of Public Instruction/Division of Vocational Education	\$ 24,966	Jack Setliff (919) 733-3809	Daniel E. Hardee (919) 733-7362
Evaluation of the Commodity Supplemental Food Program	Department of Agriculture/Food and Nutrition Service	\$ 280,447	Robert B. Dickson (202) 447-8739	Laura Summer (202) 447-6993

Project	Agency	Amount of Contract	Contract Officer	Project Officer
National Evaluation of Head Start Educational Services and Basic Educational Skills Initiative	Department of Health and Human Services/ Office of Human Development Services	\$1,383,667	Eleanor Normant (202) 245-6011	Dennis Deloria (202) 251-7750
Evaluation of Comprehensive Project in Functional Literacy Education	North Carolina Department of Community Colleges and North Carolina Department of Natural Resources and Community Development	\$ 81,000	Susan Gurlac (919) 733-4524	T. R. Dudley (919) 733-7557
Evaluation of ESEA Title I Program 1975-81	District of Columbia/Bureau of Material Management	\$ 900,000	Doreen Brown (202) 724-4137	Mildred Cooper (202) 724-4246
Evaluation of State Capacity Building Program in Dissemination	Department of Education/National Institute of Education	\$1,036,939	Vic Westbrook (202) 254-5080	John Egermeier (202) 254-6050
Development of the Home Study Course "Emergency Management, USA"	Federal Emergency Management Agency	\$ 53,296	Robert Weiss (202) 634-7541	Delbert Kohl (202) 653-7727
Medical Self Care Survey	Health Services Research Center University of North Carolina	\$ 62,168	William Young (919) 966-3411	Gordon DeFries (919) 966-5011
North Carolina Citizens Survey	North Carolina Department of Budget and Management	\$ 158,000	NA	Karen Bunn (919) 733-7601
Liquor-by-the-Drink Survey	North Carolina Department of Human Resources	\$ 10,000	NA	Earl Griffith (919) 733-6650
North Carolina Bicycle Usage Survey	North Carolina Department of Transportation	\$ 20,000	Curtis Yates (919) 966-2155	Curtis Yates (919) 966-2155
Energy	Institute for Research in Social Sciences/ University of North Carolina	\$ 7,085	NA	Mary Ellen Marsden (919) 933-3061
Student Survey	Learning Resources Network/University of Tampa	\$ 19,500	NA	Bob Chapman (919) 628-6391
Family Planning Survey	North Carolina Population Center/ University of North Carolina	\$ 103,000	W. W. Fulk (919) 966-2155	J. R. Udry (919) 966-2155
Memphis Newspaper	Princeton Consulting Center	\$ 15,000	NA	Leon Kaplan (609) 896-2005

Project	Agency	Amount of Contract	Contract Officer	Project Officer
Client Legal Needs Survey	Legal Services of North Carolina, Inc.	\$ 50,000	NA	Denison Ray (919) 832-2046
Louisiana Pupil Assessment Program-Development of Test Items for Reading and Writing Objectives 1978-79	Louisiana State Department of Education	\$ 44,000	Hugh I. Peck (504) 342-3750	R. Christian (504) 342-3748
Maryland Nutrition Education Needs Assessment	Food & Nutrition Branch, Maryland State Department of Education	\$ 47,727	Jaxon Taylor (301) 796-8300	Kathy Cannady
Delaware Test Item Bank Development	Delaware Department of Public Instruction	\$ 53,100	James L. Spartz (302) 678-4662	Alice Valdes (302) 678-4583
Research and Development Necessary for Field Testing Writing Exercises as a Minimum Competency Test	North Carolina Department of Public Instruction	\$ 35,000	Jack Setliff (919) 733-3809	William Brown (919) 733-3809
A Study of Admission Practices at North Carolina School of Science and Mathematics	North Carolina School of Science and Mathematics	\$ 5,000	Joe Gibbs (919) 683-6654	Mike Collins (919) 683-6658

NTS: *Our Clients*

- Department of State
 - Agency for International Development

- Department of Education
 - National Institute of Education
 - Office of Program Evaluation
 - Office of Planning and Budget

- Department of Health and Human Services
 - Office of Human Development Services
 - Food and Drug Administration
 - National Institute of Drug Abuse

- Department of Agriculture
 - Food and Nutrition Services

- Environmental Protection Agency

- Federal Emergency Management Agency

- State of North Carolina
 - Department of Public Instruction
 - Department of Agriculture
 - Department of Natural Resources and
Community Development
 - Department of Community Colleges

- State of Louisiana
 - Department of Education
- State of Maryland
 - Department of Education
 - Attorney General's Office
- State of Florida
 - Department of Health and Rehabilitation Services
- State of Delaware
 - Department of Public Instruction
- District of Columbia Public Schools
- East Harlem Block Schools
- Frank, Bernstein, Conaway and Goldman, P.C.
- McKinney, Silver and Rocket
- Princeton Consulting Center
- Management Improvement Corporation of America
- Union Carbide Corporation
- Bellamy-Carrigg
- North Carolina National Bank
- Allied Mills

Appendix E

**OFFICIAL OPENING AND CLOSING REMARKS,
SECOND WORKSHOP ON THE CONCOR COMPUTER,
ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC**

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

Second Workshop on the CONCOR Computer
Software Package for Census Edit
11-29 May 1981
Bangkok

INAUGURAL STATEMENT BY MR. P.H. SIRIWARDENE, DEPUTY EXECUTIVE SECRETARY,
ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

Distinguished participants, ladies and gentlemen,

It gives me great pleasure to welcome you to the Second Workshop on the CONCOR Computer Software Package for Census Edit.

Timely and accurate statistics generated from censuses and surveys provide Governments with the basic information needed for administration and for economic development; thus, their usefulness cannot be too highly emphasized. For this reason ESCAP has long been supporting a substantial programme for the improvement of all aspects of statistics.

At its recent sessions, the ESCAP Committee on Statistics has stressed the need for an active regional programme in data processing techniques. I am very pleased therefore that we are able to host this Workshop, in which technical support and fellowships have been generously provided by the United States Government.

The present meeting should be considered as part of the continuing programme for promoting improved techniques for processing censuses and surveys. The programme began in 1974, when ESCAP held a regional workshop on COCENTS, which had been designed by the United States Bureau of the Census for the tabulation of censuses and surveys in a machine environment similar to that found in most of our member countries. COCENTS has been found very useful, and we have now reached the point where the bulk of the statistical tabulation in the region is done by that system.

In 1977 a workshop was held at ESCAP to focus on two other critical areas which affect the timeliness of statistical processing: data entry and the editing of input data. Although CONCOR was then only at an early stage of development, that workshop recognized its potential contribution to census processing and gave its full support to the development of CONCOR.

The first version of COBOL CONCOR was released some time after that. The United States Bureau of the Census provided the funding and other support needed for a regional workshop in ESCAP held in June 1979. That version of CONCOR had some limitations which I understand have since been corrected.

The present Workshop will be based on the new, enhanced version of CONCOR, which offers the speed, reliability and ease of use that are needed by statistical officers to edit and correct their data files before tabulation.

During the Workshop I understand you will be given instruction in using CONCOR, applying its command language and running CONCOR programmes to generate reports.

I believe the new version will provide you with a greatly improved capability to screen data collected in the field, sometimes under difficult conditions, and present them in a form that can be used for tabulating the results of censuses and surveys. After three weeks of instruction and practice at this Workshop, I trust you will be in a position to use the system once it has been installed in your country.

I should like to thank Dr. Birnbaum, Mr. Merritt and Ms. Huff of NTS Research Corporation for installing CONCOR on the ESCAP computer system and for preparing the content and materials for this Workshop. We are most appreciative of the continuing support we have had from the United States Government in providing readily usable computer software for service throughout the region, and look forward to continuing co-operation in the present programme.

I wish you a very useful and successful Workshop and also a pleasant stay in Bangkok.

Introduction

1. The Second Workshop on the CONCOR Computer Software Package for Census Edit, was organized by the Economic and Social Commission for Asia and the Pacific (ESCAP) in co-operation with the United States Government, met at Bangkok from 14 to 29 May 1981.

Attendance

2. The Workshop was attended by 18 participants from 7 countries viz. Bangladesh, India, Indonesia, Nepal, Philippines, Sri Lanka and Thailand and the ESCAP secretariat. The NTS Research Corporation, contractor to the United States Agency for International Development (USAID) provided the services of Dr. David Birnbaum, Mr. Richard Merritt and Ms. Janine Huff as resource persons to conduct the Workshop.

Opening of the Workshop

3. In his opening address, the Deputy Executive Secretary of ESCAP emphasized the usefulness of timely and accurate statistics generated from censuses and surveys for administration and for economic and social development in the ESCAP countries. He observed that ESCAP had long supported a programme for promoting improved techniques for processing censuses and surveys. This has included hosting a regional workshop on COCENTS (a tabulation software package) in 1974, a regional workshop on data entry and the editing of input data in 1977, and a regional workshop on an earlier version of COBOL CONCOR in 1979.

4. The Deputy Executive Secretary thanked the United States Government for its continuing support in the development of the computer packages of COCENTS and CONCOR and the NTS Research Corporation for preparing this Workshop on CONCOR.

Programme

5. The Workshop principally involved the training of participants in the use of the CONCOR language to handle data editing and correction by computer. The Workshop was organized in three phases: Beginning CONCOR, Intermediate CONCOR and Advanced CONCOR. One week was allocated for each of these phases.

CONCOR

6. The version 2.2 CONCOR was a high-level language for programming the editing and imputation phases of censuses and surveys. It was designed to identify data items which were invalid or inconsistent, to provide structural editing, to correct or impute erroneous or missing data with no human intervention, to format and recode data, to produce a clean data file for statistical tabulation and analysis, and to provide error statistics for review and audit.

7. The CONCOR language had a COBOL type structure with a PL/1 flavour. It was coded in three "DIVISIONS" i.e. Data Dictionary, Execution and Report Division and their internal "SECTIONS" and^{was} compiled or translated to generate an editing and imputation COBOL programme which was further translated into machine codes of the installation to process actual data. The CONCOR compilation system was as excellent as the corresponding compilers of the manufacturers for COBOL, FORTRAN, PL/1 etc.

8. The participants were given four substantial manuals on version 2.2 CONCOR: User's Guide, System Reference Manual, Diagnostics Message Guide and System Internals and Installation Guide.

9. As in earlier versions, a notable feature of CONCOR was a "hot-deck" imputation capability. While normal imputation involved the assignment of values from pre-determined constant values ("cold-deck"), the "hot-deck" method involved the imputation of values based on related variables in the same questionnaire plus a knowledge of the same variable and related variables

from other questionnaires which were similar in certain characteristics and were most recently processed and had passed the checks in question.

Training

10. The CONCOR language was presented to the Workshop participants, who undertook two exercises, viz. a simple CONCOR programme development, followed by an exercise of more complicated and practical nature.

11. The ESCAP data processing facility was utilized for the participants' exercises: CONCOR programmes, after being coded by participants, were key-entered on floppy disk together with job control commands and sent for compilation and execution on the NEC 350 computer system (on which CONCOR had earlier been installed by NTS). Programmes were corrected and run several times until they were completed.

12. Those exercises, which occupied a considerable part of the time of the Workshop, provided practical experience in the use and operation of the CONCOR language and package.

13. Besides the four manuals on CONCOR, the participants were given numerous handouts and sample exercises, which helped greatly their mastering of CONCOR.

14. Participants in the Workshop completed their exercises to a satisfactory level, and enabled them to assess CONCOR's potential in the processing of census and survey material.

Comments from participants

15. The Workshop was informed that the present version of CONCOR could perform inter-record consistency checks which its former versions could not and noted that it was now capable of handling almost any kind of censuses and surveys.

16. A participant suggested to activate the "SUBSCRIPT-CHECK IS YES/NO: clause currently ignored by the system to speed up the execution time, based on his experience on a former version of CONCOR. He also suggested simpler error reports to be incorporated in the system.

17. One minor inconvenience with the present version would be the rigidity of "WRITE-FILE" in which all fields of one record were required to be of the same size and type of data. The improvement in this file would facilitate a means for manual corrections although the developers of CONCOR did not recommend them. Manual corrections are nevertheless necessary when, for example, a header record e.g. housing or household record is missing since the "OUTPUT" command to produce a clean data file does not allow an "imputed record" to be written thus necessitating the insertion of the record through another computer step.

Dissemination of the CONCOR package

18. The Workshop was informed that countries that have a USAID mission or representative can request NTS or USAID directly for technical assistance in obtaining the package, and that countries requesting assistance in statistics and data processing from the United Nations may also make requests for CONCOR through the normal channels: the resident United Nations data processing adviser or regional data processing adviser at ESCAP, through the local United Nations Development Programme Office.

Summary

19. The Workshop, as part of the continuing programme for the supporting techniques for the processing of censuses and surveys in the ESCAP region, provided practical training in the effective use and operation of CONCOR. The Workshop concluded that CONCOR had attained the objectives of being portable and easy to use, that it satisfied most census and survey editing and correction requirements and that the package was a significant resource-saving tool for census and survey processing.

Appendix F

CONSULTANTS' QUESTIONNAIRE: COBOL/CONCOR EVALUATION

COBOL/CONCOR EVALUATION

Bangkok, Thailand

May 11 - 29, 1981

Please assist us in evaluating this Thailand CONCOR workshop, and the current status of the CONCOR computer editing package by answering the following questions. Please answer as fully as possible, using examples whenever you feel necessary. Please use the back of the questionnaire if you need more room. Don't worry about your English. What you have to say is most important, not how you say it. Your help is very much appreciated.

1. Is the USER'S GUIDE clear, logical, well designed, and easily understood? Would you recommend it for use in your country?

2. Are there any ways the USER'S GUIDE could be improved?

3. Were the other training materials in the course easy to understand and use?

4. Did the training lectures, exercises and materials relate well to the USER'S GUIDE and other documentation? What were the strongest parts, and what were the weakest parts?

5. Were the examples the instructors used easy to understand? Did you feel that they understood the CONCOR system and how it relates to your country's editing problems? Did their examples show they were able to adapt their examples to your own country's census editing conditions?
6. Were the assigned exercises relevant to the census and survey problems likely to be encountered in your home country? Please make any suggestions about whether more or fewer, or the same amount of exercises should be used in other workshops?
7. Did the instructors encourage active interaction between the participants and with the instructors in class, during applied problem sessions on the computer, and informally after class? Did you feel free to ask the instructors for help any time you had a problem, or did you feel reluctant to ask for help? If you felt reluctant, why?
8. Were the training materials, reference materials, documentation, and instruction presented related to the most recent version of CONCOR?

9. Do you feel that the training materials, class lectures, and COBOL/CONCOR documentation are understandable, in general, by people whose native language is not English? If not, how could these be improved?

10. For this workshop: Were your travel, lodging and expense reimbursement arrangements satisfactory? Do you have any comments?

11. For this workshop: How were the workshop facilities, including computer access and computer time?

12. Do you have any other comments about the non-CONCOR language aspects of the workshop?

CONCOR LANGUAGE:

1. Were test files used adequate in length and structure to fully and rigorously test all of the features of the CONCOR program you wrote? Do you have confidence that you would be able to use the system to edit your national census or a survey?

2. Were you able to test all of the commands in the manuals? Were there any problems testing the commands? Could you always tell that the command was tested successfully?

3. Did you find any "bugs" in the system? If so, describe them.

4. Please comment on the current status of each of the following concerning their usefulness to you as a programmer? Express the your feeling about the good points and bad points of each:
a. SYSTEM INTERNALS AND INSTALLATION GUIDE:

b. DIAGNOSTIC MESSAGE GUIDE:

c. USER'S GUIDE:

d. SYSTEM REFERENCE MANUAL:

5. In the materials above, was each document clearly written, and with enough and the right kind of examples for programmers and subject matter people in your country to use them?

6. Does the USER'S GUIDE allow an inexperienced user to understand the purpose and structure of CONCOR? Does it provide enough knowledge (with the REFERENCE MANUAL) for an inexperienced user to write a simple CONCOR program either in a formal training program or through self study?

Thank you very much for your help. If your name can be used, please write it here. Please return to Dr. Levin.

Appendix G
NTS QUESTIONNAIRE

CONCOR Workshop

ESCAP, Bangkok, Thailand
May 11-29, 1981

Name _____
Date _____

WORKSHOP EVALUATION

Directions:

Please answer each question honestly and thoughtfully. Your opinion about the CONCOR system, the workshop, the instructors, and the quality of instruction is of high value.

The CONCOR Edit and Imputation System

1. How does COBOL CONCOR Version 2.2 compare with your present edit and correction method?
2. What are the advantages of COBOL CONCOR Version 2.2 versus custom-coded programs to edit data files?
3. What are the disadvantages of CONCOR versus custom-coded programs to edit data files?
4. On what types of projects do you plan to use CONCOR?
5. If you use CONCOR on a large project, what major problems do you expect to encounter?
6. What improvements would you suggest for CONCOR?

CONCOR Documentation

7. Please circle the number that best reflects your opinion of each of the manuals. The highest opinion is 6 and the lowest opinion is 1.

	Very Useful	Not Useful
a. System Reference Manual	6 . . . 5 . . . 4 . . . 3 . . . 2 . . . 1	
b. User's Guide	6 . . . 5 . . . 4 . . . 3 . . . 2 . . . 1	
c. Diagnostic Messages Manual	6 . . . 5 . . . 4 . . . 3 . . . 2 . . . 1	

8. What are the good and bad points of the manuals, and how can they be improved?

	Good Points	Bad Points	Suggested Improvements
REFERENCE MANUAL			
USERS' GUIDE			
DIAGNOSTIC MESSAGES MANUAL			

9. What other types of CONCOR documentation would be useful to you?

The Workshop

10. Please circle the number which best reflects your opinion of each workshop element listed below. The most favorable is 6, and the least favorable is 1.

	Most Favorable	Least Favorable
a. <u>Content</u>		
Topics covered	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Order of presentation	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Difficulty of topics	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Understandability	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
b. <u>Visuals and Handouts</u>		
Number of visuals	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Quality of visuals	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Helpfulness in understanding topics	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Number of handouts	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Usefulness of handouts	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
c. <u>Labs and Exercises</u>		
Number of exercises	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Helpfulness of exercises in learning CONCOR	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Time available for labs	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Lab problems	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Usefulness of labs	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
d. <u>Instructor(s)</u>		
Lectures	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Quality of instruction	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Knowledge	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Helpfulness	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Availability	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
e. <u>Overall Workshop</u>		
Value to you	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Relevance to your daily work	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Interest and stimulation	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1
Recommendation to others	6 . 5 . 4 . 3 . 2 . 1	6 . 5 . 4 . 3 . 2 . 1

11. Which topics were not presented clearly?
12. Which topics are still unclear to you at this time?
13. What improvements would you suggest for the Workshop?

Personal Skills and Knowledge

14. How do you rate your ability to use CONCOR both before the Workshop and at the conclusion?

	Before the Workshop	Conclusion of Workshop	
Very High	<input type="checkbox"/>	<input type="checkbox"/>	Able to write complex edit programs using all of the capabilities of CONCOR
High	<input type="checkbox"/>	<input type="checkbox"/>	Able to write uncomplicated programs using most of the capabilities of CONCOR
Intermediate	<input type="checkbox"/>	<input type="checkbox"/>	Able to write simple programs using the basic features of CONCOR
Low	<input type="checkbox"/>	<input type="checkbox"/>	Able to understand the basic capabilities of CONCOR but not able to write CONCOR programs
Marginal	<input type="checkbox"/>	<input type="checkbox"/>	Do not fully understand editing principles or the basic functions of CONCOR

Appendix H

JOINT CONSULTANTS'/NTS QUESTIONNAIRE

Appendix H

JOINT CONSULTANTS'/NTS QUESTIONNAIRE

CONCOR Workshop

ESCAP, Bangkok, Thailand
May 11-29, 1981

Name _____
Date _____

WORKSHOP EVALUATION

Directions:

Please answer each question honestly and thoughtfully. Your opinion about the CONCOR system, the workshop, the instructors, and the quality of instruction is of high value.

The CONCOR Edit and Imputation System

1. How does COBOL CONCOR Version 2.2 compare with your present edit and correction method?
2. What are the advantages of COBOL CONCOR Version 2.2 versus custom-coded programs to edit data files?
3. What are the disadvantages of CONCOR versus custom-coded programs to edit data files?
4. On what types of projects do you plan to use CONCOR?
5. If you use CONCOR on a large project, what major problems do you expect to encounter?
6. What improvements would you suggest for CONCOR?

CONCOR Documentation

7. Please circle the number that best reflects your opinion of each of the manuals. The highest opinion is 6 and the lowest opinion is 1.

	Very Useful						Not Useful
a. System Reference Manual	6 . . .	5	4	3	2	1	
b. User's Guide	6 . . .	5	4	3	2	1	
c. Diagnostic Messages Manual	6 . . .	5	4	3	2	1	

8. What are the good and bad points of the manuals, and how can they be improved?

REFERENCE
MANUAL

- a. Good Points
- b. Bad Points
- c. Suggested Improvements

USERS' GUIDE

- a. Good Points
- b. Bad Points
- c. Suggested Improvements

DIAGNOSTIC
MESSAGES
MANUAL

- a. Good Points
- b. Bad Points
- c. Suggested Improvements

9. Please circle the number which best reflects how much you agree or disagree with the following statements. Strong agreement is 6 and strong disagreement is 1.

	STRONGLY AGREE		←————→			STRONGLY DISAGREE
a. The User's Guide is clear, logical, well-designed, and easy to use.	6	5	4	3	2	1
b. I would recommend that the User's Guide be used in my country.	6	5	4	3	2	1
c. The lectures, exercises, and training materials related well to the User's Guide and other documentation.	6	5	4	3	2	1
d. An inexperienced programmer can understand the purpose and structure of CONCOR with the User's Guide.	6	5	4	3	2	1

12. Which topics were not presented clearly?
13. Which topics are still unclear to you at this time?

Personal Skills and Knowledge

14. How do you rate your ability to use CONCOR both before the Workshop and at the conclusion?

	Before the Workshop	Conclusion of Workshop	
Very High	<input type="checkbox"/>	<input type="checkbox"/>	Able to write complex edit programs using all of the capabilities of CONCOR
High	<input type="checkbox"/>	<input type="checkbox"/>	Able to write uncomplicated programs using most of the capabilities of CONCOR
Intermediate	<input type="checkbox"/>	<input type="checkbox"/>	Able to write simple programs using the basic features of CONCOR
Low	<input type="checkbox"/>	<input type="checkbox"/>	Able to understand the basic capabilities of CONCOR but not able to write CONCOR programs
Marginal	<input type="checkbox"/>	<input type="checkbox"/>	Do not fully understand editing principles or the basic functions of CONCOR

Answer questions 15-18 only if you have had previous census or survey experience.

15. Did you feel that the instructors understood the CONCOR system and how it relates to your country's editing problem? Please explain.

Did their examples show they were able to adapt their examples to your own country's census editing conditions? Please explain.

16. How the assigned exercises relevant to the census and survey problems likely to be encountered in your home country?

Please make any suggestions about whether more or fewer, or the same amount of exercises should be used in other workshops?

17. How much confidence you have that you would be able to use the system to edit your national census or a survey? Please explain fully.

18. Did you find any "bugs" in the system? If so, describe them.

19. In what ways were the training materials, class lectures, and COBOL/CONCOR documentation understandable, in general, by people whose native language is not English?

How could these be improved?

20. For this workshop please comment on your satisfaction or dissatisfaction with your travel, lodging and expense reimbursement arrangements.

21. For this workshop please comment on the workshop facilities, including computer access and computer time.

22. Please write any other comments or suggestions to improve the non-CONCOR language aspects of the workshop.

Appendix I
RESPONSES OF PARTICIPANTS

RESPONSES OF PARTICIPANTS

1. How does COBOL CONCOR Version 2.2 compare with your present edit and correction method?

CONCOR is easier to use.

It is better.

Easy to write and easy to debug.

It is considered to have more accuracy and reliability than manual edit and correction methods.

I have no idea to this question because I am not a programmer.

Good improvements.

COBOL CONCOR covers most of the edit features covered in our present edit and correction method. It does not cover to checking for validity of area controls, specifically for sample schemes.

Hot-decking is not incorporated in our editing method, assuming that the number of errors is small. Manual correction is considered necessary.

Not Applicable.

It is shorter, but not easy to code.

A complete and sophisticated system, complex.

Each serves its own purpose.

It does not bother about the edit program and correction program at the same time; but present one is more open to deviate to any side.

CONCOR can do anything more than my present edit and correction method.

Relatively simple to use.

I think it is easy to use only for suitable questionnaires. If we design the questionnaire as same as or nearly the same questionnaire, so CONCOR is very easy and useful.

I don't understand the edit specification of CONCOR.

It is not difficult to use instructions, but it is difficult to define specification for edit.

2. What are the advantages of COBOL CONCOR Version 2.2 versus custom-coded programs to edit data files?

Easier to code, faster programming time.

Structure check is simple.

We have a lot of problems with present CONCORE version (CONCORE A), so without practical experience I cannot answer this question.

It is considered to have more accuracy reliability than manual edit and correction methods.

The data will be clean enough for further uses.

COBOL CONCOR simplifies editing compared to custom-coded programs, to a certain extent.

Saves coding and manual correction. Hot-decking, self-documentation. Sophisticated error reports for review. Sophisticated compiler.

Not Applicable.

It gets rid of the unnecessary coding. Most of the coding is brief and go through the points.

A complete system for edit and imputation.

Have not evaluated as yet.

We don't need any correction program if we use COBOL CONCOR.

Hot-decking and Cold-decking.

Saving time and money with certain standards.

It can check range and impute the invalid data. If we use another language I think it more difficult to do that.

They can edit and update data in one program.

They are more appropriate to special work. Especially for the processing of censuses and surveys. Almost any work is rarely about census and surveys.

3. What are the disadvantages of CONCOR versus custom-coded programs to edit data files?

Inability of CONCOR to "create" (impute) a whole record. (Please see attached comments on CONCOR).

Too many long reports.

We have lots of problems with present CONCORE version (CONCORE A), so without practical experience I cannot answer this question.

The program and the output report are too long.

1) It does not give any space to the user to represent output file and generate write file in a free format. 2) Volume of printing is too high, 3) It does not provide to incorporate a user-routine, as is done in sort-packer, etc.

Does not assume manual correction to be made. Reports are not suitable in this regard.

Not applicable.

CONCOR is not flexible, such as, the way to jump out from some condition decking, the restriction of producing derivative file and redrafting the input format CONCOR cannot display the error, input items with their current value, because they were filtered by DD.

Difficult system and there are many programs should be written.

Have not evaluated as yet.

No comment.

Questionnaire must be designed in the same form.

Serve the particular need and reporting of the organization in some aspects less than the custom-coded programs. Extra work might be needed to fulfill the objective by the users.

CONCOR isn't to use perform as COBOL or use GO TO as FORTRAN. Because of this reason, writing CONCOR is more difficult than another language in some things.

They can use especially work.

The characteristics of define file and logic program is not comfortable to edit data file which is not census and surveys.

4. On what types of projects do you plan to use CONCOR?

1981 Census of Agriculture and Fisheries, Dairy Family Income, and Expenditure Survey, Quarterly Intergrated Survey of Households.

Population Census 1981.

For editing sample surveys with low input volumes.

To work on edit specification plan as by subject matter specialists.

Population projects such as migration, fertility and so on.

We would like to use CONCOR in editing of our Survey and Census data.

I prefer to use CONCOR only for small projects like surveys and other miscellaneous studies data.

Very urgent surveys which are not supported in fund and human resources.
Cheap editing

I work on "National Migration Survey" project and CONCOR was recommended to our participating countires for editing our data.

Any survey or census.

To edit and imputation for family planning survey and characteristics of F. P. acceptors data.

Inter-census surveys.

If it is available in our installation, I will try to edit my Census of Manufacturing Industry by using this package.

May be Socio-Economic Survey.

Population Surveys and Planning.

For Land Settlement Survey Project.

Household Survey Project.

I plan to use CONCOR in project land settlement which is about household.

5. If you use CONCOR on a large project, what major problems do you expect to encounter?

Insufficient core storage for the EDITOR program.

Large volume of reports.

Hopper wastage. Checkpoint operations not handling key CONCOR file.

We have a complicated and clumsy user's program.

I think the problem should be the time spent of programming, because the program will sure be longer than the exercise.

I don't know.

1) In large projects, the processing time may be high compared to custom-coded programs. 2) Print volume will also be too high. 3) at the stage of data preparation, a particular type of format may not be possible since output of edit program requires format for further processing. To reformat the edited output for large projects involves a good deal of processing time.

Manual correction procedures if not complete imputation is chosen.

Our questionnaire is very complete, complicated. The CONCOR program for editing it must be very long.

1) The edit specification problem. 2) must consider whether the output from CONCOR is compatible with any package you have in you installation for calculating statistics. 3) Some projects have more than 50 record types and the numbers of items might be restricted by CONCOR. 4) A large amount of statistical output caused by the output design.

No Comments.

I think no invalid code is coded in OMR Questionnaire. So there will be no use of Range Check.

I must try to write CONCOR in the way that can serve the edit specification which was written by subject matter specialist.

Enormous volumes of output reports.

CONCOR isn't used to perform as COBOL or use GO TO as FORTRAN. Because of this reason, writing CONCOR is more difficult than other languages sometimes.

Format of input data file and edit specification corresponds to CONCOR.

I think to encounter the defining the edit specification and defining edit data file corresponds the work of CONCOR.

6. What improvements would you suggest for CONCOR?

Adjustment in report division, so that report can be prepared according to customer.

1) There should be capable to build new data records. 2) There should be capable to decode (alphanumeric).data items (ex. occupation code consists numeric and alphanumeric codes.

I would suggest a more concise way to make a user's program.

I am not smart enough to suggest, but I hope you can find the way to shorten the program.

I suggest some provision should be made to incorporate user-routines and to call the SORT subroutine also, for sorting within a small and for editing.

Consideration on manual correction feasibility. Simpler reports as a fourth report. Input image error record listing for manual corrections.

There is no command for skipping. It would be much easier to make skipping by one or a few commands.

Improve the output report.

No comment.

You may improve in some cases.

Exercise Level II are so difficult to understand. I suggest that we should Exercise 3 and Exercise Level II might not be difficult as this.

Condense the output report volumes. Advertising the usage of CONCOR in other applications (e.g., marketing research in more details so that other business fields will be aware of its existence.

I don't know about the difficulty for this improvement but I think if CONCOR can write into separate routine and it can call each of the routines again and again, it's very good.

Develop instruction about "IF" statement because it is so confusing.

REFERENCE MANUAL

Good Points

Gives the details of the CONCOR system.

Should help a lot when facing any complicated problem.

It explains in detail the language and process of CONCOR.

It tried to give a brief and detailed description of all points.

Comprehensive, systematic.

Very useful for programmer.

Contains all possible conditions which might be related to that specific commands.

Well drawn up.

I think the commands in the book are in good detail.

I think that if I have a problem I can understand by reading this.

Have more detail on the subject commands.

Bad Points

It does not properly explain about the importance of flags, incomplete.

No command reference summary in the back of manual.

It ought to be more examples than there are.

Voluminous for some of the commands.

A little example with many kinds of differences.

Suggested Improvements

Increase examples for printing.

Semi-colon and colon not clear in the sample programs.

It should try to give more internal locations of data fields for CONCORs reference, e.g., TYPE-COUNT, etc. Additional locations should be mentioned for user routines.

Add more command reference summary, more detailed INDEX section.

You can write this book more systematically.

Condensation of the description is needed. Group the detailed explanation in several small paragraphs with subheadings so that the users do not have to read across the whole page to find their answers.

Should increase the examples and explanations.

DIANOSTIC MESSAGE MANUAL

Good Points

Easy to correct programs.

It's OK.

It is useful to pinpoint the errors and suggests the action to make in data free from error.

Comprehensive.

Very useful just in case we can't find out the errors in the programs.

The messages are very well explained even though only short sentences.

Well drawn up.

I didn't read it.

I haven't gotten time to look at the manual in great detail.

Bad Points

Suggested Improvements

I have a suggestion, because I rarely use it, but I think that it is useful for working.

USERS' MANUALGood Points

Easy to understand for non-programmers also.
 It is easy to search for a special command.
 Very clear and easy to understand.
 For a new user it can help to have an overview of the CONCOR language.
 It gave a good explanation.
 Presents brief concepts.
 It's easy for beginners to learn CONCOR.
 Covers the overview of CONCOR system.
 Simple and understandable.
 Well drawn up.
 Book is easily understandable.
 Presents the basic function and introduction of the package.

Bad Points

Too many duplications.
 The example on page 18 has too small letters.
 It didn't cover about flags.
 Syntax description is not systematic enough.
 Only with a user's guide a programmer will be able only to write a simple program.
 We still need a reference manual.
 IBM JCC¹ procedures should be removed from this manual.
 Less examples.
 Example is not sufficient in some cases.

Suggested Improvements

Increase examples.
 Semi-colon and colon not clear in the sample problems.
 More examples.
 Could you please improve the example on page 18?
 Coverage about flags should be included. It shall give full details about the data listed in appendices.
 A little more self-satisfactory so that reference to System Reference Manual can be avoided at most times.
 Should have more details about internal identifiers.
 Remove JCC¹ procedures from this manual.
 More examples should be added.
 If you would express and illustrate some commands with more examples, it would be a nice one.
 Use more colors to diagram picture for visual attraction.
 They should be show the command to easy for looking for.

12. Which topics are still unclear to you at this time?

In fact there are many topics still unclear to me, but the manual would help alot.

I am not clear about generation of reports.

None, except system internals.

Its not clear to me how those routines work and how the machine stores the data while executing each routine. That causes trouble in understanding the CONTINUATION FLAG and INCOMPLETE FLAG.

Report overfullness. Content of each file.

PROLOG, FILTER, EPILOG and LOOPING.

Pattern of report.

Hot-deck and Cold-deck and how to impute data.

13. What improvements would you suggest for the Workshop?

Participants should have access to a computer terminal to avoid the time of waiting for the print-outs.

Increase Lab examples, example 2 should be shorter, small example would be better.

Full-time keypunching services in the lab.

Level II programmer to be more compact and to be different from the example coding in the manuals.

More details on CONTINUATION FLAG and IMCOMPLETE FLAG.

Should have more exercises, small exercises but each concentrates on different aspects. Should have some minitests each week.

Before to go the CONCOR system there are lectures about the rule of basic programming in COBOL. There are more lab exercises.

The lab work could be better organized.

If you would work with smaller exercises, it would be better.

Have more short lab exercises rather than a long second lab exercise; more exercises on various applications fo CONCOR, e.g., marketing research, etc.

If you want me to be working and have less problems, you should be giving me more lab as Level II.

I think that the workshop should have more exercises which is cost difficult.

NTS Supported Participants

Please comment on your satisfaction or dissatisfaction with your travel arrangements, hotel accommodations, and disbursement of your expense allowance.

Payments for hotel should be included in the daily per diem. With this way, several participants can share a room and save a part of their per diems for shopping.

All good.

Very good.

Travel arrangements and hotel accommodation was quite satisfactory. A provision may be made to choice of hotel, is preferred. Disbursement of allowance is quite satisfactory. A few social activities like organization of sightseeing could be included.

Fast and good information to participant. Fast and good travel arrangement, other things are OK.

Fully satisfied.

Travel arrangements were OK, the space and other facilities in hotel is almost OK, disbursement for this time is OK.

Appendix J
NEC 350 INSTALLATION

BEST AVAILABLE DOCUMENT

Hardware summary description

system 350 mainframe:

	<u>Type</u>	<u>No. of Units</u>
Central Processing Unit (main memory 1 million bytes, MT/MP, cycle time 600 nanoseconds/4bytes, 1.5 million instructions per second (MIPS), MOS LSI 10Kbytes per chip)	N7001-01	1
Add-on memory (1 million bytes)	N7135-01	1
Console display with CRT/Keyboard (7 colour, 80 characters x 25 lines)	N7206-13	1
Serial printer for console (125 characters per second)	N9206-13	1
Floppy disk unit (2 x 1 million bytes, transfer rate 62.5 K per second)	N9306-5	1
Magnetic tape controller	N9335-02	1
Magnetic tape units (transfer rate 120 K bytes per second at 1600 BPI, 60 K bytes per second at 800 BPI)	N7613	6
9-track (1600 BPI, 800 BPI)		5 drives
7-track (800 BPI, 556 BPI, 300 BPI)		1 drive
Magnetic disk controller	N7235-01	1
Magnetic disk unit (200 million bytes per unit for total capacity 600 million bytes, transfer rate 100 K bytes per second, average seek time 10 milliseconds, average latency time 6.3)	N7740	3
Line printer (460/930 lines per minute, upper/lower case, EBCDIC, 132 characters per line)	N7339	2
Modem	BREAN N1200	7
Communication control processor (BASIC transmission protocol)	N9035-50 CCP type 2	1
Asynchronous line adapter A (half-duplex, 1200 bytes per second)	N9035-01	7

Effective: 1 June 1981

Replaces:

2.1.2 Off-line video display terminal

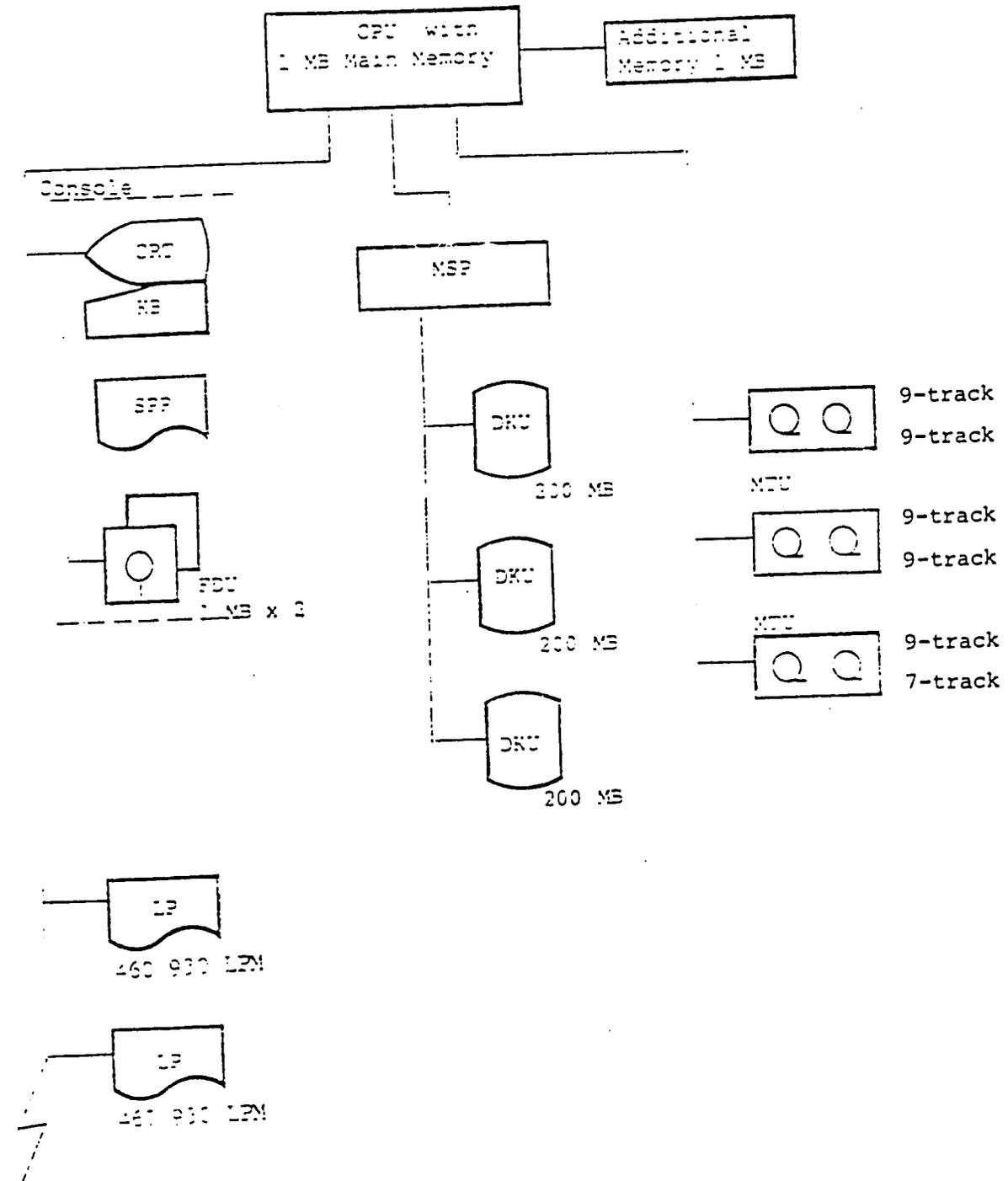
	<u>Type</u>	<u>No. of Units</u>
Terminal control, including communication controller, keyboard, CRT, 1 K memory, floppy disk unit (2 x 1 million bytes, upper/lower case, ASCII, transfer rate 1200 bits per second, 40 characters x 25 lines)	W6313-21	7
Serial printer (55 characters per second)	W6313-21	7
Modem	LAN N1200	7
Magnetic tape unit (9-track, 1600 BPI, 600 BPI, transfer rate 60 K bytes per second at 1600 BPI, 30 K bytes per second at 600 BPI)	N6333-30	1

2.1.3 Off-line data entry system:

Dual data entry terminal, including controller, two CRT's, two keyboards and two floppy disk drives (2 x 240 K bytes, upper/lower case, ASCII, 640 character display)	W6351-5	2
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2.2 Hardware - Configuration diagrams

2.2.1 NEC System 350 Mainframe



To video display terminals

- 4 in Data Processing Section
- 1 in Library
- 1 in Development Planning Division
- 1 in Budget and Finance Section

Appendix K
TEACHING PLAN FOR CONCOR WORKSHOP

CONCOR

Workshop : The COBOL CONCOR Edit and Imputation System, Version 2.2

Host: ESCAP
Bangkok, Thailand

Dates: May 11 to
May 29, 1981

Principal Instructor: Mr. R. Merrit, NTS Research Corporation
Workshop Coordinator: Mrs. J. Huff, NTS Research Corporation

Workshop Hours: ~~8:00~~^{9:00} AM to ~~3:30~~^{4:00} PM

Workshop Description

The CONCOR Edit and Imputation System is a general-purpose computer software package written in COBOL for the identification and correction of invalid and inconsistent data in various types of surveys and censuses. The purpose of the workshop is to provide comprehensive training in the use of CONCOR to support census and survey data editing and correction requirements.

The workshop will be organized into three phases:

- (1) Beginning CONCOR,
- (2) Intermediate CONCOR, and
- (3) Advanced CONCOR.

Each phase will develop competencies required to write, run and use CONCOR programs in increasing levels of difficulty.

Level I	Level II	Level III
Census and survey data processing	Questionnaire design considerations	Data entry and storage problems of very large data sets
Basic Programming	Data entry and storage	Edit instructions for large census or survey
Solving simple editing and correction problems using CONCOR	Edit instructions for CONCOR	Solving complex editing and imputation problems with CONCOR
	Solving edit and imputation problems for population surveys using CONCOR	System dependencies and installation
		User problems

Workshop Objectives

Qualified Computer Programmers will be able to:

- interpret edit instructions;
- apply the CONCOR command language to basic editing and imputation procedures;
- create and run CONCOR programs to generate statistical reports and edited data files;
- use computer system capabilities and utilities to use, support, and maintain the CONCOR system.

Qualified Subject Matter Specialists will be able to:

- write edit instructions which use the full facility of the CONCOR system;
- set reasonable error tolerance levels;
- read and interpret CONCOR-generated statistical reports;
- efficiently test CONCOR edit and data correction procedures.

Workshop Requirements

In order to successfully complete the workshop, each participant:

1. will attend each lecture and lab session
2. will participate in workshop activities
3. will complete the assigned class exercises and labs
4. will complete the Workshop Pretest on the first day
5. will complete the written Final Examination in class on the day specified in the workshop schedule

At the completion of the workshop, each successful participant will receive:

1. a Certificate of Recognition
2. a computer tape of CONCOR programs
3. a full set of CONCOR documentation

Workshop Resources

1. CONCOR manuals
2. ESCAP computer personnel available for program entry
3. Workshop instructors available for consultation

Workshop Schedule

Date	Time	Topic	Activity
Monday, May 11	8:00-12:00 1:30- 3:30	Orientation and Overview Level I Introduction to CONCOR and Census or Survey Editing Census and Survey Data Processing	Introductions Exercise 1.1
Tuesday, May 12	8:00-12:00 1:30- 3:30	The Dictionary Division: Control Fields Entry and Storage of Data Defining Data to the System Writing the Data Dictionary Creating the Dictionary Division	Lab 1.1 Exercise 1.2 Lab 1.2 Lab 1.3
Wednesday, May 13	8:00-12:00 1:30- 3:30	The Execution Division Edit Instructions Writing Edit and Report Statements Editing Commands: RANGE, ASSERT, LET, OUTPUT Organizing the Execution Division Creating the Execution Division Creating the COBOL EDITOR Program	Exercise 1.3 Lab 1.4 Lab 1.5
Thursday, May 14	8:00-12:00 1:30- 3:30	The Report Division CONCOR Reports Controlling Reports Creating the Report Division Producing and Inter- preting Reports Summary of Level I	Lab 1.6

Date	Time	Topic	Activity
Friday, May 14	8:00-12:00 1:30- 3:30	Level II Population Surveys and Censuses The Computer Edit Process Dictionary Division: Level II Presentation of Class Problem Defining Housing and Population Records Working Data NEW-DATA and ARRAY-DATA	Exercise 2.1 Lab 2.1 (begins) Exercise 2.2 Exercise 2.3
Monday, May 17	8:00-12:00 1:30- 3:30	Editing and Imputation Writing Edit Instruc- tions Translating Edit Instructions into CONCOR Statements CONCOR Commands	Exercise 2.4 Lab 2.1 (continued)
Tuesday, May 18	8:00-12:00 1:30- 3:30	Looping Internal Variables Conditional Testing	Exercise 2.5 Exercise 2.6 Lab 2.1 (continued)
Wednesday, May 19	8:00-12:00 1:30- 3:30	Imputation: Cold-decking CONCOR Allocation Symbol Imputation: Hot-decking The UPDATE Command Recoding	Exercise 2.7 Exercise 2.8 Lab 2.1 (continued)
Thursday, May 20	8:00-12:00 1:30- 3:30	An Abbreviated Example of a CONCOR Program Continuation Flags The Execution Division (Level II)	Exercise 2.9 Lab 2.1 (continued)

Date	Time	Topic	Activity
Friday, May 21	8:00-12:00 1:30- 3:30	Review of Report Division Commands and Reports The Report Division (Level II)	Lab 2.1 (completed)
Monday, May 24 to Thursday, May 28		Level III Data Entry and Storage Problems Planning Problems Complex Editing Problems System Dependencies User Problems	Consultation
Friday, May 29	8:00-12:00 1:30- 3:30	Final Examination Workshop Closing	

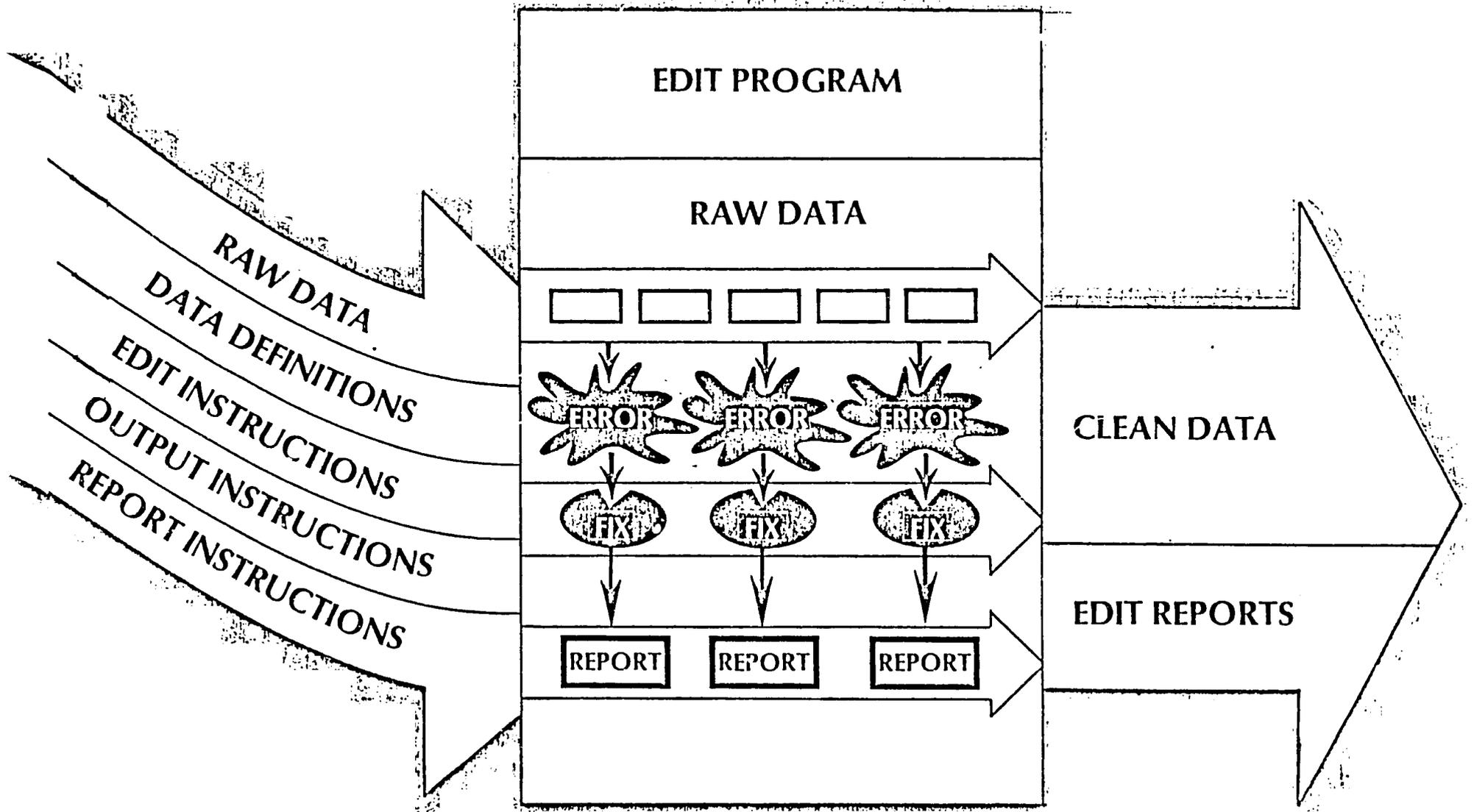
Appendix L
OVERHEAD PROJECTION SLIDES

THE COMPUTER EDIT PROCESS

1. INPUT

2. EDIT

3. OUTPUT



CONTINUATION FLAG



∅

First Record in Store
(Not a Continuation)

1

First Record Out of Store
(Continuation)

INCOMPLETE FLAG

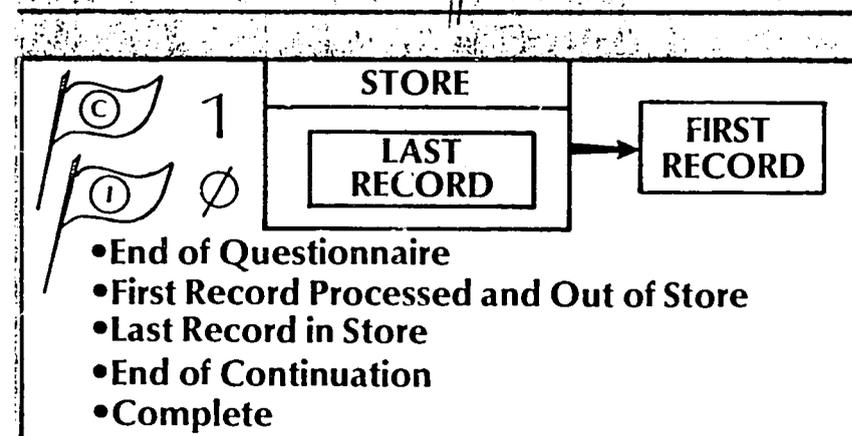
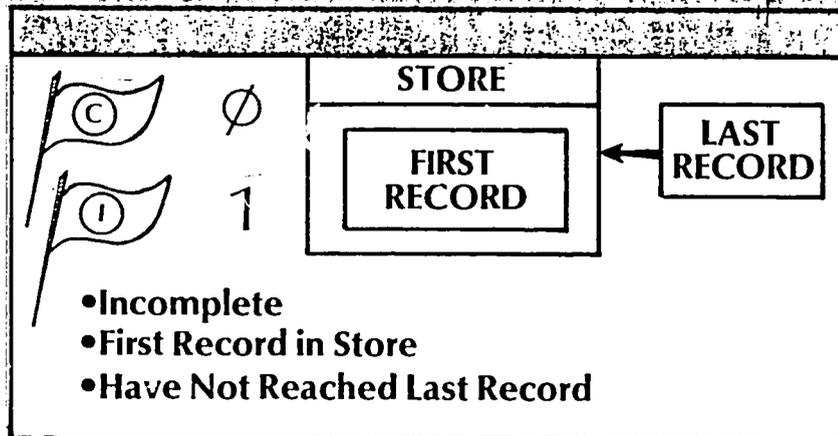
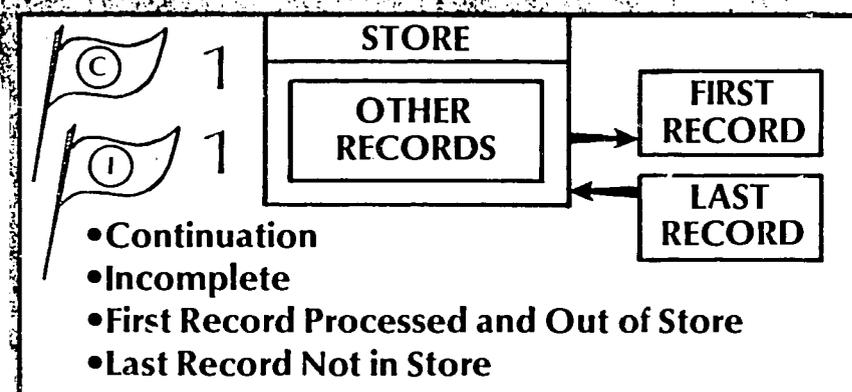
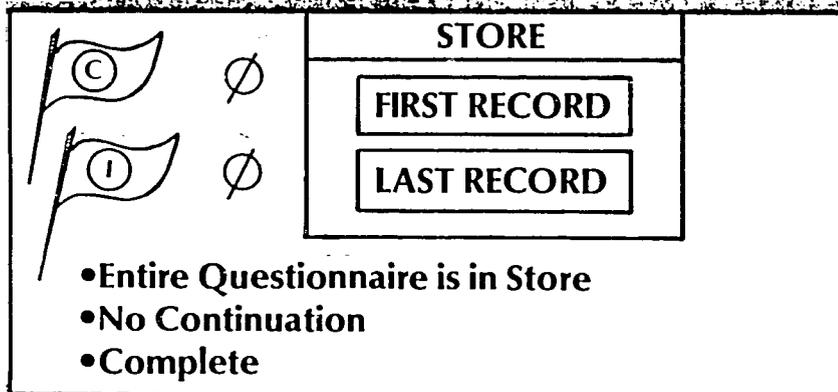


∅

Last Record in Store
(Complete)

1

Last Record Not Yet in Store
(Incomplete)



CONDITION TESTING: IF... THEN/ELSE

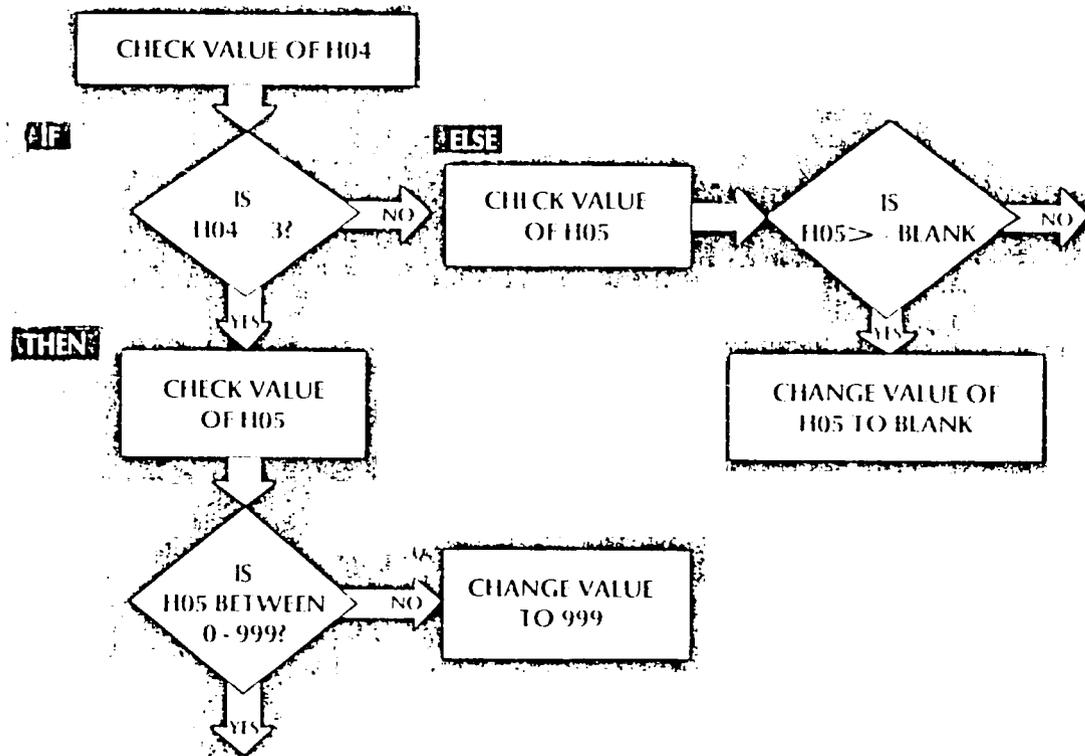
EDIT INSTRUCTION:

If Unit is Rented, Check for an Amount in Rent.

If Unit is Not Rented, Check that Rent Field is Blank.

```
IF H04 TENANTY = 3  
THEN  
  RANGE H05 AMOUNT OF RENT PAID  
  VALUE 0 TO 999 INOMATCH 999  
END THEN
```

```
ELSE  
  IF H05 >= BLANK  
  THEN  
    LET H05 = BLANK  
  END THEN  
END ELSE
```



Appendix M
CHANGES TO CONCOR

Changes made to the COBOL CONCOR Version 2.0 (January 1980) to make Version 2.1

1. The system has been modified to allow the user's program to successfully compile even if no editing commands appear in the program.
2. Large erroneous numbers appearing in edit reports produced by the RDCMDUID program have been corrected.
3. The Dictionary Control Page description in the RDQUEST program has been corrected to eliminate the erroneous suppression of the program output.
4. The problem with the improper order of precedence in analyzing arithmetic operators in the LET command has been corrected.
5. The problem with the OUTPUT command when it appears in a filter routine having a non-subscripted argument and causing a diagnostic message has been corrected.
6. The problem where the TYPE-COUNT internal identifier appears as the only variable argument of a WRITE command and causes a diagnostic message has been corrected.
7. The file containing message text information has been updated to accurately reflect the contents of the Diagnostic Message Manual.
8. One error message in the Execution Division and one error message in the Report Division which previously had no message associated with them have been now assigned specific messages.
9. The problem in which when all ARRAY-DATA defined identifiers in the Dictionary Division took the default values for parameters an error message was incorrectly generated has been corrected.
10. The system has been modified so that now the user can use internal identifiers as subscripted arguments (that is to say they can appear as the subscript itself).
11. When the user was referencing an ARRAY-DATA name in the WRITE command to write out every element of the array the system was not producing the proper paragraph names in the EDITOR program. This has been corrected.
12. Portions of the programs in the system that generated the COBOL code for the Procedure Division of the EDITOR program have been modified to improve the speed of EDITOR.
13. The message being erroneously produced in the Report Division indicating data being out of tolerance at the total run level has been corrected.
14. Some unnecessary titles have been suppressed in the report produced by the RDCMDUID program when the report itself was blank.

Changes (continued)

15. A problem with section headers in the Execution Division (in particular the EDSYNTAX program) has been eliminated.
16. The apostrophe (') was changed to the quote (") in all programs to conform to FIPS standards.
17. Many names internal to the programs were made standard across programs.
18. The GENDD program was substantially modified to allow the GENSRC program to create the EDITOR program much faster.
19. Changes were made to the DDPARSER, EDPARSER, and RDPARSER programs to include the RUN-CONTROL-SECTION commands.
20. Changes were made to the EDSYNTAX, GENMODIFY, and GENED programs to allow for the inclusion of the new RUN-CONTROL-SECTION.
21. Modifications had to be made to the GENMODIFY program to allow for the standardization of data types in conditional statements of the command language.
22. General housekeeping was done on all the programs to bring all programs up to established standards for structured coding.
23. Began renumbering paragraphs and data items in the programs for easier referencing.
24. Eliminated coding in the GENMODIFY program that was only there for debugging purposes.
25. Two counters in the RDCMDUID program which are used for maintaining a running total of the number of input records read were not being initialized to zero at the beginning of the run. Some systems automatically initialized all working storage to zero. Others do not. The program was changed to automatically initialize the two counters to zero.
26. In the RDCMDUID program an O1 level identifier was not present causing an implicit reference to a unique O1 level. This was not a problem for higher level COBOL compilers but was for others. An O1 level name was inserted.

CHANGES FROM CONCOR 2.1 to CONCOR 2.2General

1. A version/release number is checked in all th programs to insure that releases of the system are not mixed, causing erroneous results. All programs except DDPARSER now reference the Data Dictionary File.

2. The internal identifiers values were changed as follows for IBM/OS:

	Version 2.1	Version 2.2 32 bit.	Version 2.2 16 bit.
ALLOCATE	-2147483647	-999999998	-9999998
NOT-NUMERIC	-2147483646	-999999997	-9999997
BLANK	-2147483645	-999999996	-9999996
OUT-OF-RANGE	-2147483644	-999999995	-9999995

3. Return code values were set whenever a program "ABORTED". This will aid in preventing the following programs in a series from executing.

4. Format of the source code changed to aid in the management of the master copy of CONCOR.

5. The picture of all doubleword variables has been changed from 18 to 15 digits. This will reduce the core required for program execution and increase speed as the operating system does not have to include an extra subroutine to process the extra digits of significance.

6. The minimum and maximum values for binary items have changed as follows for IBM/OS and similar systems:

	<u>Version 2.1</u>	<u>Version 2.2</u>
HALF	-32,768 to +32,767	±9999
FULL	-2,147,483,648 to +2,147,483,647	±999999999
DOUBLE	±2 ⁶³	±999999999999999

7. All halfword related code was marked and will not be included in versions for 16 bit machines.

DDPARSER

1. Code was added to utilize the numeric and alphabetic class test capabilities of some compilers to speed up the parsing of strings.
2. All code that is collecting sequence dependent (i.e. EBCDIC vs. ASCII) was marked.
3. All code dealing with signed (type S) and packed (type P) data formats were marked. This code will be kept in the master but will not be distributed.

DDSYNTAX

1. Same as 2 above
2. Same as 3 above
3. A bug concerning array data was corrected. The problem occurred if the last specified array in the Dictionary Division did not have all its initial values specified and the trailing command terminator was not specified. For example:

```

ARRAY-NAME, 2, 3, 5, 1
              1, 2, 3, 4

```

```

END-DIVISION;

```

This would cause an infinite loop of errors pointing at the END-DIVISION command.

DDPRINT
nothing

DDFORMAT
nothing

EDPARSER
same as DDPARSER

EDSYNTAX
1. All RUN-CONTROL-SECTION code was marked and will not be included in distribution versions.

EDPRINT
nothing

RDPARSER
same as DDPARSER

RDSYN'AX
nothing

RDPRINT
nothing

GENMODFY
nothing

GENED

1. When messages and identifiers are generated by the system, CONCOR internal identifiers will not be included in the list of identifiers and their current values in the report by Questionnaire.
2. Changes were made to test the limits of a double word binary value when being outputted by a WRITE command.
3. See below.

GENDD

1. Code was added so the EDITOR program would generate a new record type (0115) for the error file if the count imputes option is requested. This new record would be output by RDCRDCMUID if the user requested a reject file record if the error rate was too high.
2. Code was added to the EDITOR Working Storage to aid in #2 above.
3. In the write command, if an array with one or more non-numeric subscripts was coded the EDITOR program required a GOTO to a paragraph name which was never defined. eg. WRITE (N2) AR (6, NWD);

RDCRIEPG

1. If the same identifier is used more than once in an edit test, the message in the report by user-identifier would appear as many times as the identifier did in the test. This caused the statistics to be biased and made the report confusing. RDCRIEPG was modified to suppress the duplication.

RDMSGTXT

nothing

RDQUEST

nothing

RDCMDUID

1. If requested, a reject file record is now written in the same format as the area identification fields were read in by EDITOR. (See GENDD 1.) The area id fields are concatenated together with a maximum record length of 45 characters.
2. The random large numbers appearing in the control summary reports were corrected by initializing the area in which the sums were stored.
3. In the report by edit command under system generated messages, the number of cases failed and the percentage failed values were changed to "NA" so as not to increase (incorrectly) the number of cases tested, failed, and percentage summaries.
4. Control area identification was missing on some continuation pages of reports. This has been fixed.
5. Depending on the mix of user and system defined messages, checking for bottom of page was not always done and therefore information was being written through page boundaries. This was in the report by edit command.

GENSRC/Models

1. The insertion marker characters were changed as follows:

VERSION 2.1VERSION 2.2

double word with sign \$\$
 5 digits without sign \$%
 alphabetic (6 char) \$;
 single word with sign \$/

/\$
 /%
 /
 //

2. The picture of two identifiers used in COMPUTED GOTOs were changed to PICTURE S9(4). The two variables are: ERROR-PTR and RECODED-REC-TYPE.
3. Code was added in WORKING-STORE for the new record described in GENDD. See 1. above.

ADDITIONAL CHANGES MADE TO CONCOR VERSION 2.2

1. A new program, LOADMOD, was incorporated into CONCOR for purposes of efficiency in generating the EDITOR program. This program reads the MODELS file and creates the MODELS-LONG file. The MODELS-LONG file is then read by the GENSRC program to build the EDITOR. Thus, LOADMOD is executed only during CONCOR installation, not during CONCOR application jobs. The MODELS-LONG file is a reflection of the MODELS file, but it contains additional information such as pointers to insert locations for frags so that GENSRC will not have to scan for these locations.
2. Associated with the inclusion of LOADMOD, the MODELS keys were re-numbered. This change made it necessary to modify GENSRC, GENDD and GENED.
3. A new program, DDLIST, was incorporated into CONCOR for debugging purposes. This program is used to list the contents of the data dictionary for those computers which do not have a utility program to list a relative file.

CONCOR Constants for NEC-500

1. Internal identifier values

ALLOCATION SYMBOL	-99999998
NOT-NUMERIC	-99999997
BLANK	-99999996
OUT-OF-RANGE	-99999995

2. DEFINE-RECORD Values

A. BINARY

	<u>LENGTH</u>	<u>MAX VALUE</u>
FULLWORD BINARY	2 bytes	9999
DOUBLEWORD BINARY	4 bytes	999999999
HALFWORD BINARY NOT ALLOWED		

B. NUMERIC

Numeric values are stored as packed decimal in the generated program. The length determines the size of the field in which they are stored as follows:

<u>Length</u>	<u>Bytes occupies</u>
1 - 7 digits	4
8 - 9 digits	8

3. NEW-DATA and ARRAY-DATA

Elements are stores as packed decimal in the generated program. The initial value determines the length and capacity of the packed decimal fields as follows:

<u>initial value</u>	<u>length of packed decimal field</u>	<u>min/max value</u>
1 - 7 digits *	4 bytes	+99999999
9 - 15 digits	8 bytes	+9999999999999999

* default

4. Other system limits

Maximum blocksize	32000 bytes
Maximum record size	32000 bytes
Maximum blocking factor	2100
Minimum blocking factor	1
Minimum record size	15 bytes
Minimum block size	15 bytes

Appendix N

SAS TO CDI

.

(CONSISTENCY AND CORRECTION)

RUN DATE 12/05/80

EDIT AND IMPUTATION SYSTEM

USER EXECUTION DIVISION SOURCE LISTING

RANGE Q4A,Q4B,Q4C VALUE 01,02 NOMATCH 99;
ASSERT Q4A = 01 IMPLIES Q4B = 02
FAIL

ALLOCATE Q4B = 02;
END-FAIL;
RANGE Q5A VALUE 01 TO 99;
RANGE Q5B VALUE 01 TO 99;

FILTER-ROUTINE (SECOND):

RANGE Q12 VALUE 00 TO 99;
LET TOT01 = Q13A + Q13B + Q13C;
ASSERT Q12 = TOT01
MESSAGE 180 '# OF CHILDREN IN 13A B AND C NOT = TO QUESTION 12'
DUMPR;

FILTER-ROUTINE (FOURTH):

RANGE Q22A1,Q22A2,Q22A3,Q22A4,Q22A5,Q22A6
VALUE 01 TO 06;
RANGE Q22B1,Q22B2,Q22B3,Q22B4,Q22B5,Q22B6
VALUE 01 TO 05;
ASSERT Q22A1 = BLANK IMPLIES Q22B1 = BLANK
MESSAGE 190 'FUNDING NOT SPECIFIED FOR EMPLOYEE' Q22A1 Q22B1;
ASSERT Q22A2 = BLANK IMPLIES Q22B2 = BLANK
MESSAGE 200 'FUNDING NOT SPECIFIED FOR EMPLOYEE' Q22A2 Q22B2;
ASSERT Q22A3 = BLANK IMPLIES Q22B3 = BLANK
MESSAGE 210 'FUNDING NOT SPECIFIED FOR EMPLOYEE' Q22A3 Q22B3;
ASSERT Q22A4 = BLANK IMPLIES Q22B4 = BLANK
MESSAGE 220 'FUNDING NOT SPECIFIED FOR EMPLOYEE' Q22A4 Q22B4;
ASSERT Q22A5 = BLANK IMPLIES Q22B5 = BLANK
MESSAGE 230 'FUNDING NOT SPECIFIED FOR EMPLOYEE' Q22A5 Q22B5;
ASSERT Q22A6 = BLANK IMPLIES Q22B6 = BLANK
MESSAGE 240 'FUNDING NOT SPECIFIED FOR EMPLOYEE' Q22A6 Q22B6;

FILTER-ROUTINE (CLASS-INFO):

LET PT07-CLASS-POINTER = PT07-CLASS-PCINTER + 1;
RANGE TYPEE VALUE 1,2 NOMATCH 2;
LET TOT02 = TOTAL-THREES + TOTALFOURS + TOTAL-FIVES;
ASSERT TOTAL-CHILDREN = TOT02
FAIL
ALLOCATE TOTAL-CHILDREN = TOT02;
NO-FAIL;

00001390
00001400
00001410
00001420
00001430
00001440
00001450
00001460
00001470
00001480
00001490
00001500
00001510
00001520
00001530
00001540
00001550
00001560
00001570
00001580
00001590
00001600
00001610
00001620
00001630
00001640
00001650
00001660
00001670
00001680
00001690
00001700
00001710
00001720
00001730
00001740
00001750
00001760
00001770
00001780
00001790
00001791
00001800
00001810
00001820
00001840

Appendix N

```

54 IF Q4A LT '01' OR Q4A GT '02' THEN Q4A = '02' ;
55 IF Q4B NE ' ' THEN
56 IF Q4B LT '01' OR Q4B GT '02' THEN Q4B = '02' ;
57 IF Q4C NE ' ' THEN
58 IF Q4C LT '01' OR Q4C GT '02' THEN Q4C = '02' ;
59
60 IF Q4A = '01' THEN Q4B = '02' ;
61
62 IF Q5A LT '01' OR Q5A GT '99' THEN Q5A = ' ' ;
63 IF Q5B LT '01' OR Q5B GT '99' THEN Q5B = ' ' ;
64
65 IF Q12 LT 0 OR Q12 GT 99 THEN Q12 = -9 ;
66 IF Q12 NE (Q13A+Q13B+Q13C) THEN PUT @1 N +5
67 ' # OF CHILDREN IN Q12 NE Q13A + Q13B + Q13C'
68 / @25 Q12= @50 Q13A= @75 Q13B= @100 Q13C= ;
69
70 IF (Q22A1 LT '01' OR Q22A1 GT '06') AND Q22A1 NE ' '
71 THEN Q22A1 = '-9' ;
72 IF (Q22A2 LT '01' OR Q22A2 GT '06') AND Q22A2 NE ' '
73 THEN Q22A2 = '-9' ;
74 IF (Q22A3 LT '01' OR Q22A3 GT '06') AND Q22A3 NE ' '
75 THEN Q22A3 = '-9' ;
76 IF (Q22A4 LT '01' OR Q22A4 GT '06') AND Q22A4 NE ' '
77 THEN Q22A4 = '-9' ;
78 IF (Q22A5 LT '01' OR Q22A5 GT '06') AND Q22A5 NE ' '
79 THEN Q22A5 = '-9' ;
80 IF (Q22A6 LT '01' OR Q22A6 GT '06') AND Q22A6 NE ' '
81 THEN Q22A6 = '-9' ;
82
83 IF (Q22B1 LT '01' OR Q22B1 GT '05') AND Q22B1 NE ' '
84 THEN Q22B1 = '-9' ;
85 IF (Q22B2 LT '01' OR Q22B2 GT '05') AND Q22B2 NE ' '
86 THEN Q22B2 = '-9' ;
87 IF (Q22B3 LT '01' OR Q22B3 GT '05') AND Q22B3 NE ' '
88 THEN Q22B3 = '-9' ;
89 IF (Q22B4 LT '01' OR Q22B4 GT '05') AND Q22B4 NE ' '
90 THEN Q22B4 = '-9' ;
91 IF (Q22B5 LT '01' OR Q22B5 GT '05') AND Q22B5 NE ' '
92 THEN Q22B5 = '-9' ;
93 IF (Q22B6 LT '01' OR Q22B6 GT '05') AND Q22B6 NE ' '
94 THEN Q22B6 = '-9' ;
95
96 IF Q22A1 = ' ' THEN DO ;
97 PUT @1 'FUNDING NOT SPECIFIED FOR EMPLOYEE' @75 Q22A1=
98 @100 Q22B1= ;
99 Q22B1 = ' ' ; END ;
100 IF Q22A2 = ' ' THEN DO ;
101 PUT @1 'FUNDING NOT SPECIFIED FOR EMPLOYEE' @75 Q22A2=
102 @100 Q22B2= ;
103 Q22B2 = ' ' ; END ;
104 IF Q22A3 = ' ' THEN DO ;
105 PUT @1 'FUNDING NOT SPECIFIED FOR EMPLOYEE' @75 Q22A3=
106 @100 Q22B3= ;
107 Q22B3 = ' ' ; END ;
108 IF Q22A4 = ' ' THEN DO ;

```

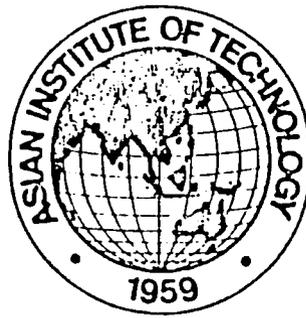
Appendix 0
RESULTS OF SPEED TESTS

NTS FURNISHED DATA CONCOR SPEED TESTS

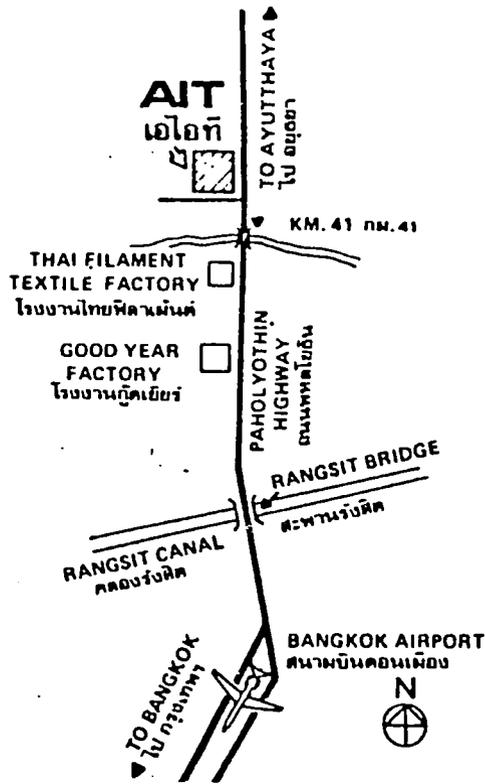
Questionnaire: Benchmark

DATASET	# OF QUESTION-NAIRES	# OF RECORDS	# OF CNTL AREAS	STATISTICS BY				VERSION 2.1 EXECUTION TIME			VERSION 2.2 EXECUTION TIME			DISK	TAPE
				USER ID	QUEST	EDIT-SPECS	COUNT-IMPUTES	CPU TIME	SRB	ELAPS TIME	CPU TIME	SRB	ELAPS TIME		
B3.DATA	270	1479	1	X	X	X	X	4.59	0.13		1.96	0.09	30		
								3.41	0.05		1.69	0.05	22		
				X				3.50	0.05		1.61	0.04	20		
					X			3.81	0.10		1.87	0.09	20		
						X		3.42	0.04		1.58	0.04	13		
							X	4.17	0.04		1.67	0.04	15		
BENCH-DATA	270	1479	2	X	X	X	X	4.59	0.16		1.90	0.08	27		
								3.40	0.04		1.59	0.03	8		
				X				3.45	0.04		1.59	0.04	15		
					X			3.86	0.04		1.62	0.08	23		
						X		3.49	0.05		1.14	0.05	25		
							X	4.34	0.08		1.67	0.04	17		
B9.DATA	1815	10,000	5					28.74	0.23		11.68	0.22	96	839	
								22.48	0.15		10.16	0.14	42	504	
								22.75	0.16		10.15	0.14	42	505	
								24.43	0.23		11.08	0.22	141	838	
								22.99	0.15		10.32	0.16	68	505	
								28.22	0.16		10.85	0.16	91	505	
TAPE	17,600	100,000	100					4:47.03	1.48		113.99	1.58	599		8344
								3:40.18	0.91		98.89	0.85	278		4984
								3:44.01	0.90		99.95	0.87	296		5003
								3:57.60	1.53		107.39	1.51	426		8324
								3:41.92	0.93		98.21	0.90	433		5003
								4:35.44	0.96		106.86	0.93	671		5004

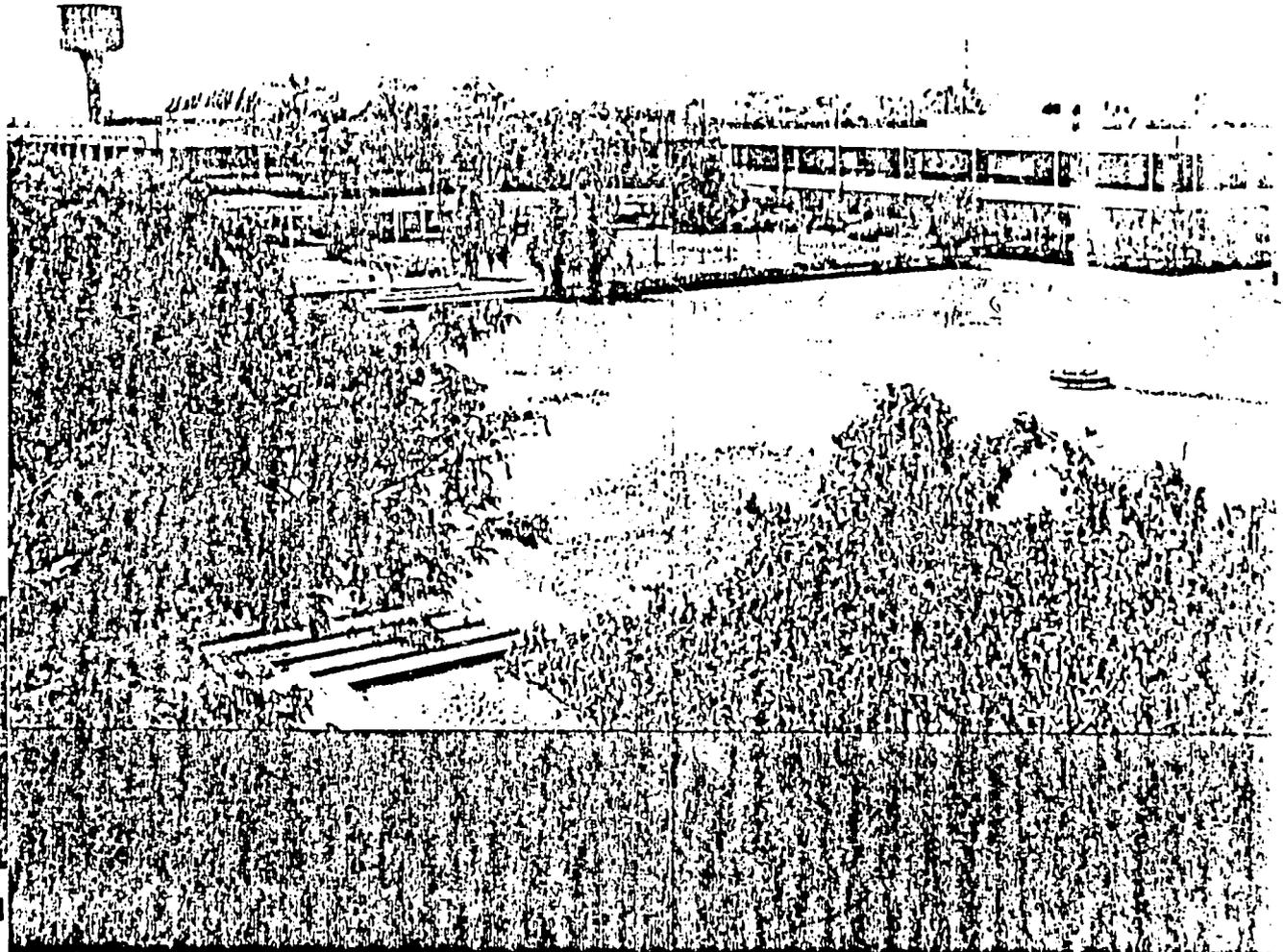
Appendix P
FACTSHEET ON AIT



facts
about
AIT



AIT's growing achievements are based on the belief that academic excellence can be successfully combined with the resolve to seek appropriate solutions to Asian problems. AIT's regional student body and international faculty work towards the realization of these goals.



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5168331 to 5 • 5168416 to 9

Who administers the Institute ?

Responsibility for policy direction of the Institute rests with the Board of Trustees, which is international in character and composition. At the present time, the Board of Trustees consists of more than 40 members from Asia, Australia, Europe and North America.

What are the Institute's physical facilities ?

The Institute's complex of buildings, built at a cost of approximately US\$20 million, includes:

- Administration and Academic buildings — providing classrooms, a library, laboratories and faculty offices. The Institute's well-equipped laboratories are among the best in the region.
- Conference Center — providing a 600-seat auditorium, simultaneous translation facilities, audio-visual facilities, dining rooms, recreational facilities and hotel rooms.
- Regional Computer Center — providing the latest IBM 3031 computer system and offering educational programs for AIT students and public agencies in the region. The powerful computer was installed in June 1980 to meet the increased demands of the Asian Remote Sensing Training Center at AIT.
- Energy Technology Building — Scheduled to be completed in 1981, this building will house the Division of Energy Technology.

- Energy Park — This park has on display solar water heaters, photo voltaic cells, solar refrigerators, several types of wind mills, a solar rice dryer, vegetable dehydrators and various other devices which employ renewable sources of energy.

- Regional Engineering Experimental Center — providing 10,500 square meters of covered space for experimental research, and associated laboratories and offices.

- Library & Regional Documentation Center — the largest technical library in South East Asia, containing more than 120,000 volumes of books, technical reports, theses and conference proceedings, and receiving some 2,000 journals. The Library also houses the Regional Documentation Center, which now serves over 1,000 subscribers. The four specialized information centers are:

The Asian Information Center for Geotechnical Engineering (AGE) for Civil Engineering.

The International Ferrocement Information Center (IFIC) for the very versatile construction material called Ferrocement and related materials.

The Renewable Energy Resources Information Center (RERIC) for appropriate technologies in Solar Energy, Wind, Biofuels, and Small Scale Hydropower.

The Environmental Sanitation Information Center (ENSIC) for low cost options in the field of disposal and reuse of wastes.

(Library — Scheduled to be completed in mid 1981, the Library will house a library block with a capacity for 250,000 volumes, the Regional Documentation Center, the English Language Center, and the Office of Academic Services.)

- Sports Facilities — including a swimming pool, tennis courts, basketball court, football, cricket and hockey fields, and a nine-hole golf course.

- Medical Center — providing a well-equipped medical unit with a doctor and supporting staff.

- Physical Plant — providing workshops and maintenance facilities.

- Staff Housing — There are 14 houses on campus for faculty and senior staff and in January 1981 a staff dormitory with 18 apartments opened. During 1981 apartments to house eight staff families and dormitories to house 54 single staff members will be completed.

- Dormitories — providing single occupation units and accommodation for married students, giving a total of 616 student places.

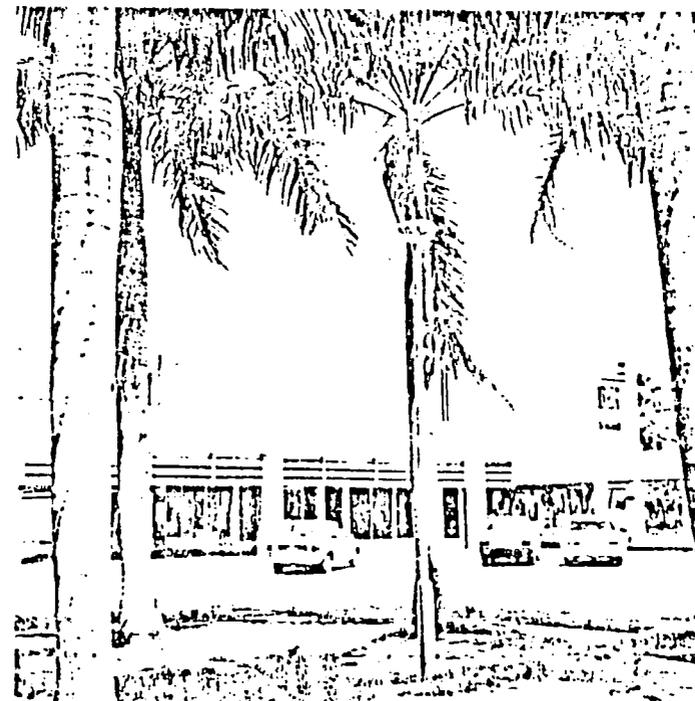
- Cafeteria — serving a wide variety of inexpensive meals.

What does the Institute publish ?

- AIT Review, the quarterly review of developments in the life of the Institute and miscellaneous information materials on various programs conducted by the Institute. Available from the Public Relations Office.

- The Prospectus (annual) provides information on the Institute's academic programs: description of fields of study, admission requirements, fees and information on financial aid, listing of faculty members, and general information. The Catalog of Courses (annual) lists the courses offered by the Institute. Many, but not all, courses are offered each year; some are offered every second year and a few are offered even less frequently. The Research Summary presents brief summaries of projects completed by faculty and students at the Institute. Available from the Academic Secretary's office.

- While supplies last individual numbers of Research Reports, Conference Proceedings and Technical Reports are obtainable from the Library & Regional Documentation Center. Further details can be obtained by writing to the Associate Director, LRDC, Asian Institute of Technology, P.O. Box 2754, Bangkok, Thailand.



Appendix Q

SUMMARY OF INFORMATION ON PARTICIPANTS

SUMMARY OF INFORMATION ON PARTICIPANTS

<u>Position</u>	<u>Area of Specialization/ Census Experience</u>	<u>NTS Rating of English Proficiency</u>		<u>CONCOR Test Scores</u>	
		<u>Reading</u>	<u>Speaking</u>	<u>Pretest (%)</u>	<u>Final (%)</u>
Computer Programmer* Census EDP Programmer National Census and Statistics Office (NCSO)	1* 1 - Census 3 - Surveys	4	3	100	97
Systems Analyst* Government Service	1* 2 - Census 10 - Surveys	3	3	81	81
Senior Programmer* Government Service Department of Census and Statistics	1* 2 - Census 100 - Surveys	3	2	88	75
Senior Statistical Clerk Population Division ESCAP	3	4	3	84	97

Appendix Q

<u>Class</u>	<u>English Proficiency</u>
1 = Programmer/Analyst	Excellent = 4
2 = DP Administrator	
3 = Subject Matter/Programmer	The consultants rated English ability at least one point less than NTS.
4 = Subject Matter	

* Prior CONCOR experience

<u>Position</u>	<u>Area of Specialization/ Census Experience</u>	<u>NTS Rating of English Proficiency</u>		<u>CONCOR Test Scores</u>	
		<u>Reading</u>	<u>Speaking</u>	<u>Pretest (%)</u>	<u>Final (%)</u>
Statistician Research Clerk Population Division ESCAP	4	4	3	84	97
Statistical Officer Government Service Statistics Division Ministry of Planning Bangladesh Bureau of Statistics	4 2 - Census	2	1	34	71
Systems Analyst Government Service Office of Registrar General	1	4	3	94	94
ESCAP Officer Regional Adviser on Data Preparation and Processing of Censuses and Surveys Bureau of Statistics Office of the Prime Minister	2 3 - Surveys	4	3	94	96
Statistician Research Clerk Population Division ESCAP	3	4	4	81	89
Programmer Government Officer Regional Computer Center Asian Institute of Technology (AIT)	1 1 - Survey	3	2	100	95

<u>Position</u>	<u>Area of Specialization/ Census Experience</u>	<u>NTS Rating of English Proficiency</u>		<u>CONCOR Test Scores</u>	
		<u>Reading</u>	<u>Speaking</u>	<u>Pretest (%)</u>	<u>Final (%)</u>
Family Planning Program Reporting and Evaluation BKKBN	4 1 - Survey	3	2	66	75
Coordinating Data Processing Activities Director (EDP) Registrar General's Office	2 1 - Census	4	4	78	82
Assistant Programmer Government Service Jahangirnagar University	1 2 - Census	2	2	78	75
Programmer Government Officer Computer Development and Training Division National Statistical Office	1 1 - Survey	3	2	84	93
Computer Personnel Systems Programmer/Analyst Data Processing Section ESCAP	1	4	4	84	90
System Analyst Government Official Chulalongkorn Computer Service Center	1 2 - Surveys	2	1	88	90
Programmer Government Officer Computer Service Center Chulalongkorn University	1	2	1	88	71
Analyst and Programmer Government Officer	1 1 - Census	3	2	81	81

Appendix R
LANGUAGE PROFICIENCY REPORT

DEPARTMENT OF STATE
FOREIGN SERVICE INSTITUTE
LANGUAGE PROFICIENCY REPORT

NAME Friberg, Norman		For Office Use Only
AGENCY AID	GRADE OR RANK CONTRACT	
SOCIAL SEC. NO. 360-38-1560	DATE OF BIRTH 10/28/46	
LANGUAGE FRENCH	LANGUAGE CODE FR	LINGUIST
TEST DATE 3/4/81	TESTING PLACE Washington, DC	TEST SCHEDULE 3/4/81 Wednesday 4:00
TEST RESULT S- 1+ R- 2+		

REMARKS

RATED BY Marie Francoise Swanner Certified Examiner Elizabeth C. De Maynadier Certified Interviewer	REVIEWED BY Marianne L. Adams, Head  Testing and Publications Office School of Language Studies
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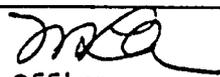
ABSOLUTE RATING

"S" SPEAKING PROFICIENCY	"R" READING PROFICIENCY
NO PRACTICAL PROFICIENCY	
S-0 No practical speaking proficiency.	R-0 No practical reading proficiency.
ELEMENTARY PROFICIENCY	
S-1 Able to satisfy routine travel needs and minimum courtesy requirements.	R-1 Able to read elementary lesson material or common public signs.
LIMITED WORKING PROFICIENCY	
S-2 Able to satisfy routine social demands and limited office requirements.	R-2 Able to read intermediate lesson material or simple colloquial texts.
MINIMUM PROFESSIONAL PROFICIENCY	
S-3 Able to speak the language with sufficient structural accuracy and vocabulary to satisfy representation requirements and handle professional discussions within a special field.	R-3 Able to read non-technical news items or technical writing in a special field.
FULL PROFESSIONAL PROFICIENCY	
S-4 Able to use the language fluently and accurately on all levels pertinent to foreign service needs.	R-4 Able to read all styles and forms of the language pertinent to foreign service needs.
NATIVE OR BILINGUAL PROFICIENCY	
S-5 Speaking proficiency equivalent to that of an educated native speaker.	R-5 Reading proficiency equivalent to that of an educated native speaker.

DEPARTMENT OF STATE
FOREIGN SERVICE INSTITUTE
LANGUAGE PROFICIENCY REPORT

NAME Trottier, Dorace A.		For Office Use Only
AGENCY AID	GRADE OR RANK CONTRACT	
SOCIAL SEC. NO. 044-52-0928	DATE OF BIRTH 2/16/56	LINGUIST
LANGUAGE FRENCH	LANGUAGE CODE FR	TEST SCHEDULE
TEST DATE 3/4/81	TESTING PLACE Washington, DC	3/4/81 Wednesday 3:30
TEST RESULT S- 2 R- 3		

REMARKS

<p>RATED BY</p> <p>Monique Cossard Certified Examiner</p> <p>Catherine B. Swanner Certified Examiner</p>	<p>REVIEWED BY</p> <p>Marianne L. Adams, Head  Testing and Publications Office School of Language Studies</p>
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ABSOLUTE RATING

"S" SPEAKING PROFICIENCY

"R" READING PROFICIENCY

- | | |
|--|---|
| NO PRACTICAL PROFICIENCY | |
| S-0 No practical speaking proficiency. | R-0 No practical reading proficiency. |
| ELEMENTARY PROFICIENCY | |
| S-1 Able to satisfy routine travel needs and minimum courtesy requirements. | R-1 Able to read elementary lesson material or common public signs. |
| LIMITED WORKING PROFICIENCY | |
| S-2 Able to satisfy routine social demands and limited office requirements. | R-2 Able to read intermediate lesson material or simple colloquial texts. |
| MINIMUM PROFESSIONAL PROFICIENCY | |
| S-3 Able to speak the language with sufficient structural accuracy and vocabulary to satisfy representation requirements and handle professional discussions within a special field. | R-3 Able to read non-technical news items or technical writing in a special field. |
| FULL PROFESSIONAL PROFICIENCY | |
| S-4 Able to use the language fluently and accurately on all levels pertinent to foreign service needs. | R-4 Able to read all styles and forms of the language pertinent to foreign service needs. |
| NATIVE OR BILINGUAL PROFICIENCY | |
| S-5 Speaking proficiency equivalent to that of an educated native speaker. | R-5 Reading proficiency equivalent to that of an educated native speaker. |