(2)

NAVAL POSTGRADUATE SCHOOL

Monterey, California

THESIS

ADMINISRTATIVE SCIENCES DEPARTMENT
TRAVEL DATABASE SYSTEM

Matthew Curran Ragan

September, 1992

Thesis Advisor: Tung X. Bui

Approved for public release; distribution is unlimited

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School 6b OFFICE SYMBOL (*If applicable*) 37	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School
6c. ADDRESS (*City, State, and ZIP Code*) Monterey, CA 93943-5000	7b ADDRESS (*City, State, and ZIP Code*) Monterey, CA 93943 5000
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b OFFICE SYMBOL (*If applicable*)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (*City, State, and ZIP Code*)	10. SOURCE OF FUNDING NUMBERS Program Element No / Project No / Task No / Work Unit Accession Number
11. TITLE (*Include Security Classification*) Administrative Sciences Department Travel Database System	
12. PERSONAL AUTHOR(S)	
13a TYPE OF REPORT Master's Thesis 13b. TIME COVERED From To	14 DATE OF REPORT (*year, month, day*) 1992 September 24 15. PAGE COUNT 58
16. SUPPLEMENTARY NOTATION The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.	
17. COSATI CODES FIELD / GROUP / SUBGROUP	18 SUBJECT TERMS (*continue on reverse if necessary and identify by block number*)

19. ABSTRACT (*continue on reverse if necessary and identify by block number*)

The Administrative Sciences (AS) Department of the Naval Postgraduate School (NPS) produces a high volume of travel orders and travel claims for both civilian and military personnel. The data used in these documents consist of all departmental personnel and travel data. This database requires constant and labor intensive maintenance to ensure accurate, up-to-date personnel and travel information. This thesis defines, designs and implements a database application that the Administrative Sciences Department can use to manage the departmental travel order and travel claims requirements. This new prototype is named "Travel Database System (TDS), version 1.0. This document provides an in depth outline covering software requirements analysis, design and implementation. This system was written using OMNIS7 Integrated Development Environment, version 1.03. OMNIS7 is a Microsoft Windows based application generator.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS REPORT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Tung X. Bui	22b. TELEPHONE (*Include Area code*) (408) 646-2630 22c. OFFICE SYMBOL AS/BU

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

Approved for public release; distribution is unlimited.

ADMINISTRATIVE SCIENCES DEPARTMENT
TRAVEL DATABASE SYSTEM

by

Matthew Curran Ragan
Lieutenant, United States Navy
B.S., University of Washington, 1985

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN COMPUTER SYSTEMS MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
September 1992

Author: _____
Matthew C. Ragan

Approved by: _____
Tung X. Bui, Thesis Advisor

_____
Shu S. Liao, Second Reader

_____
David Whipple, Chairman
Department of Administrative Sciences

ABSTRACT

The Administrative Sciences (AS) Department of the Naval Postgraduate School (NPS) produces a high volume of travel orders for both civilian and military personnel. The data used in these documents consist of all departmental personnel and travel data. This database requires constant and labor intensive maintenance to ensure accurate, up-to-date personnel and travel information. This thesis defines, designs and implements a database application that the Administrative Sciences Department can use to manage the departmental travel order and travel claims requirements. This new prototype is named "Travel Database System (TDS)", version 1.0. This document provides an in depth outline covering software requirements analysis, design and implementation. This system was written using OMNIS7 Integrated Development Environment, version 1.03. OMNIS7 is a Microsoft Windows based application generator.

TABLE OF CONTENTS

I. INTRODUCTION

A. OBJECTIVE

The purpose of this thesis is to design and implement a Microsoft Windows-based database system. This will significantly decrease the labor hours consumed in the generation of travel orders and travel claims within the Administrative Sciences Department at the Naval Postgraduate School. The manual system currently in place will be replaced by a single point data entry system in which repetitive tasks will be automated to the greatest extent possible. The practice of reentering data for each travel order and travel claim will be eliminated. The system will produce computerized reports which meet external reporting requirements while providing the ability to generate custom internal reports on an ad-hoc basis. The Microsoft Windows-based system will require minimal computer knowledge by the end-user. The application is written using OMNIS7 Integrated Development Environment and is implemented on a Microsoft Windows-based personal computer.

Travel Database System is a Windows based application that allows the travel clerk to enter a complete record through the entry of multiple data fields in related windows. The application provides a method for retrieving, editing, deleting, inserting records. The system is tailored to produce the DD 1610, NAVPERS 1320 and the DD 1351.

B. TRAVEL DATABASE SYSTEM: AN OVERVIEW

The Travel Database System (TDS) is developed to enhance the ability of the Administrative Sciences Department to automate the generation of travel orders and travel claims for both civilian and military personnel. To accomplish this goal a detailed analysis of the required input forms and output reports was conducted. From this the flow of information as well as the unique attributes associated with each was determined. The DD 1610, NAVPERS 1320 and the DD 1351 forms were used as the basis for the initial data structure. User requirements were determined through extensive interviews. The requirements were transformed into a prototype system which was demonstrated to the prospective end-users. To meet specific user requirements, the advanced features of the development environment were taken advantage of.

The underlying structure of OMNIS7 eliminated the requirement of using common fields to create a link between objects. This system is developed using Blythe Software's OMNIS7 Integrated Development Environment, version 1.03.

II. DEFINITION PHASE

The first phase of an application development is to define what the project will do. The project may be to modify an existing application, develop a comprehensive set of applications around a common database, or automate a manual data related task. The definition can be determined by a team of experts working together or through a series of interviews or a combination of both of these. The scope of the project is determined during the definition phase (i.e., what will be included as necessary functions as well as what would be extraneous functionality) The final function of the definition phase is determining the feasibility of the project. Feasibility includes cost, technical and schedule. [Ref 3: pg. 75]

A. SCOPE OF THE PROJECT

The goal of this project was to automate and track Temporary Additional Duty orders and travel claims generation. A determination was made that all work could be accomplished on a single IBM-compatible 386 computer operating under Microsoft Windows using 4mb RAM. The project was scheduled to run from March 92 to June 92. An extension until September 92 was granted due to the complexity of the OMNIS7 Integrated Development Environment. System functionality requirements were determined during interviews with members of the Administrative Sciences Department as well as those members of the staff for whom the application was designed.

The requirements which were agreed upon included the following:

1. Microsoft Windows based application developed using the OMNIS7 Integrated Development Environment

2. A data structure was to be developed which would link the required reports to the personnel data file format.

3. The on-screen editor would resemble the actual form as closely as possible.

4. On-screen editing and updating of forms could be completed easily.

III. REQUIREMENTS PHASE

The requirements phase is the one during which the determination is made of exactly what it is that the system will do. The goals of the system are delineated. The methods for determining the scope of the user's requirements are varied. Interviews are sometimes ineffective as the users themselves do not have the knowledge to put forth pertinent questions. In this case it is up to the design team to sound the users for concepts of what it is they need. The design team may use a prototype which includes sample forms, reports and menus to give the end user an idea of the capabilities of the proposed system. [Ref. 3:pg 77]

A. METHODOLOGY

Interviews were conducted with the members of the Administrative Sciences Department for whom the application would be developed. The administrative assistant described functional requirements in great detail. The professors supervising the development provided the information related to the underlying data structure.

The process of producing a prototype system from the initial requirements and its first version was reviewed by the supervising professor. Minor changes in the screen displays were requested. This process required just one iteration. The final version was delivered and deemed acceptable both by the end user and the supervising professor. The prototype was installed, allowing enough time for the developer to make minor changes

in structure and report format. An in depth tutorial for the end user was provided by the system developer.

B. DATA REQUIREMENTS

In a relational database structure the underlying entity is an object. In the OMNIS7 Integrated Development Environment the individual objects are defined by file formats, as shown in Tables 1 through 5. It was determined that a total of four file formats would need to be developed. The formats which comprise the data structure of the TDS are PERSDATA.DF1, DD1610.DF1, NP1320.DF1 and DD1351.DF1. The file formats are linked using the Record Sequencing Number (RSN) feature.

The PERSDATA.DF1 file format is comprised of data and object properties, which comprise each personnel record in the personnel file. This is the information which is required for the personnel information portion of the DD forms 1610 and 1351 as well as the NAVPERS form 1320. The PERSDATA.DF1 represents the parent file format in the parent-child file format relationship as shown in Figure 1.

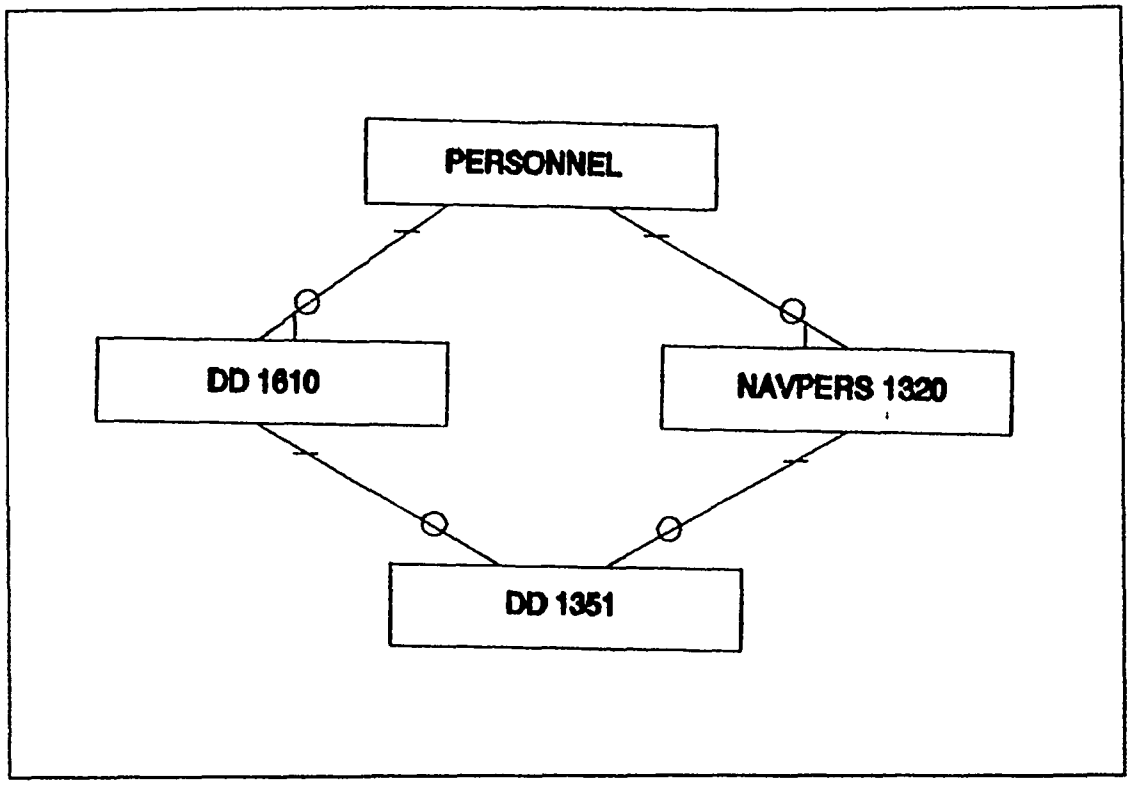


Figure 1. Relational Diagram

The file format DD1610.DF1 is a child file format. This format has an optional Many(DD1610)-to-One(PERSDATA) relationship. The file format NP1320.DF1 is also a child of PERSDATA and shares the same relationship as the DD1610 file format. The DD1351.DF1 file format is a child of both the DD1610 and the NP1320 file formats. This file format shares an optional One-to-One relationship with it's parent file formats. See Figure 2.

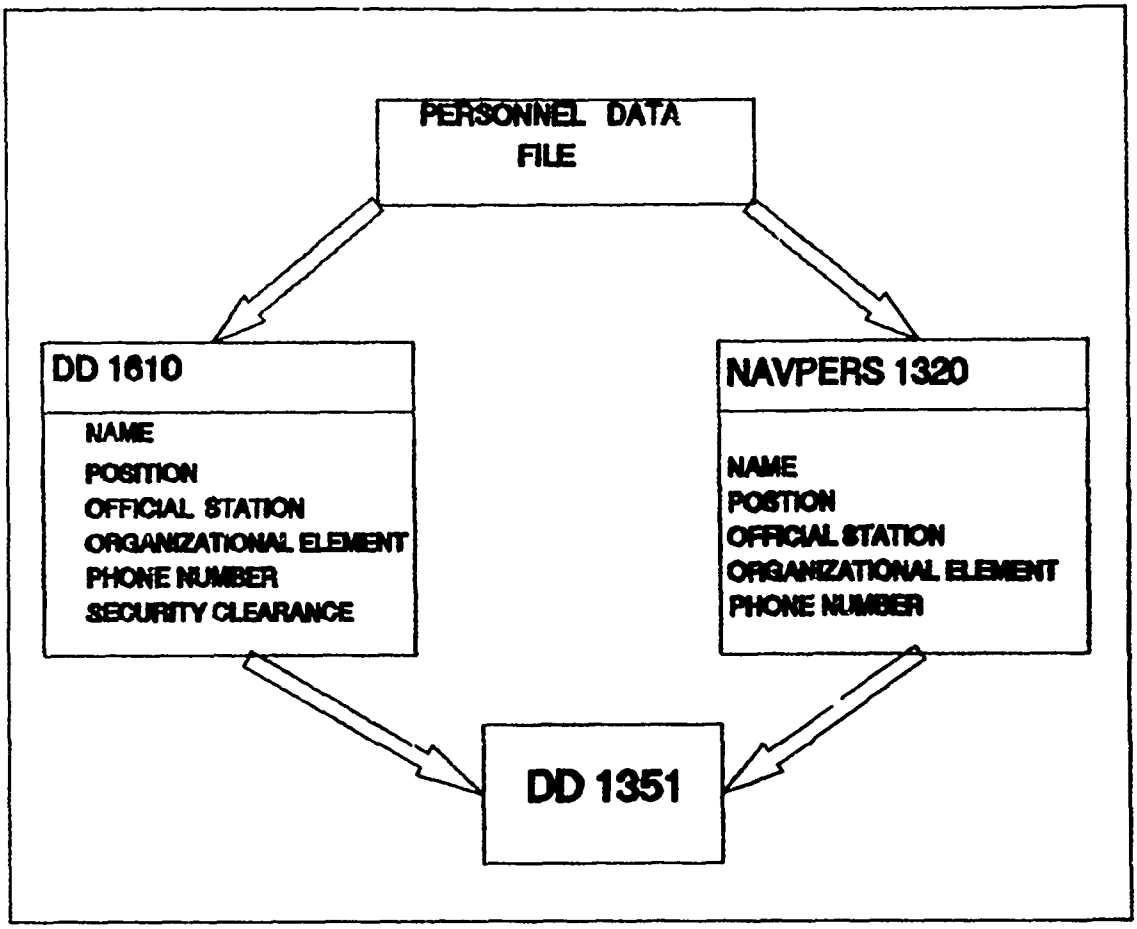


Figure 2. File Format Relationship

C. UPDATE, DISPLAY AND CONTROL MECHANISMS

In order to complete the development of a database application the user-system interactions must be delineated. In the case of TDS this meant developing a plan for the user to make his/her way through a series of data display windows while manipulating the required data. (See Data Flow Diagrams depicted in Figures 3 and 4).

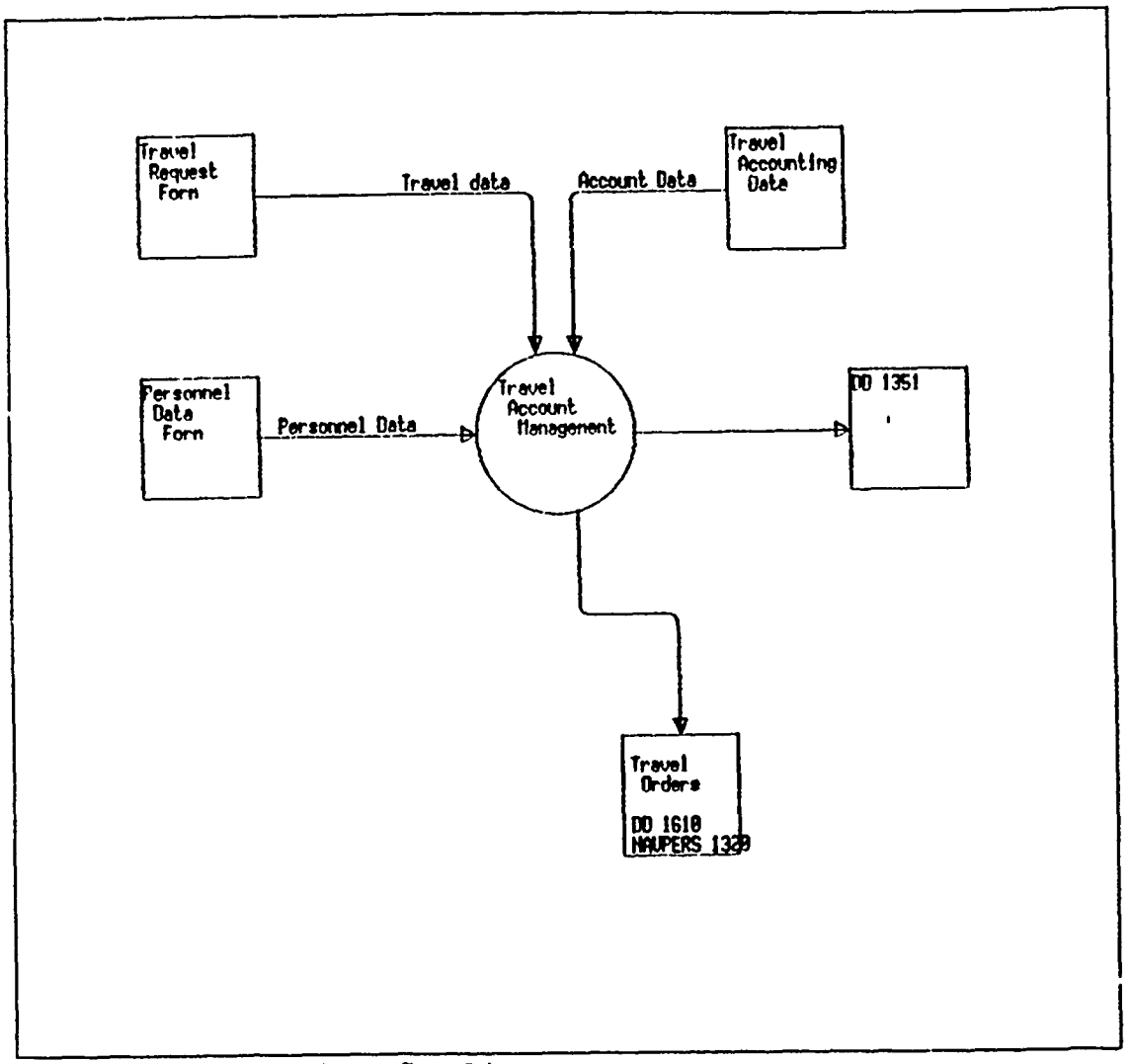


Figure 3. Context Level Dataflow Diagram

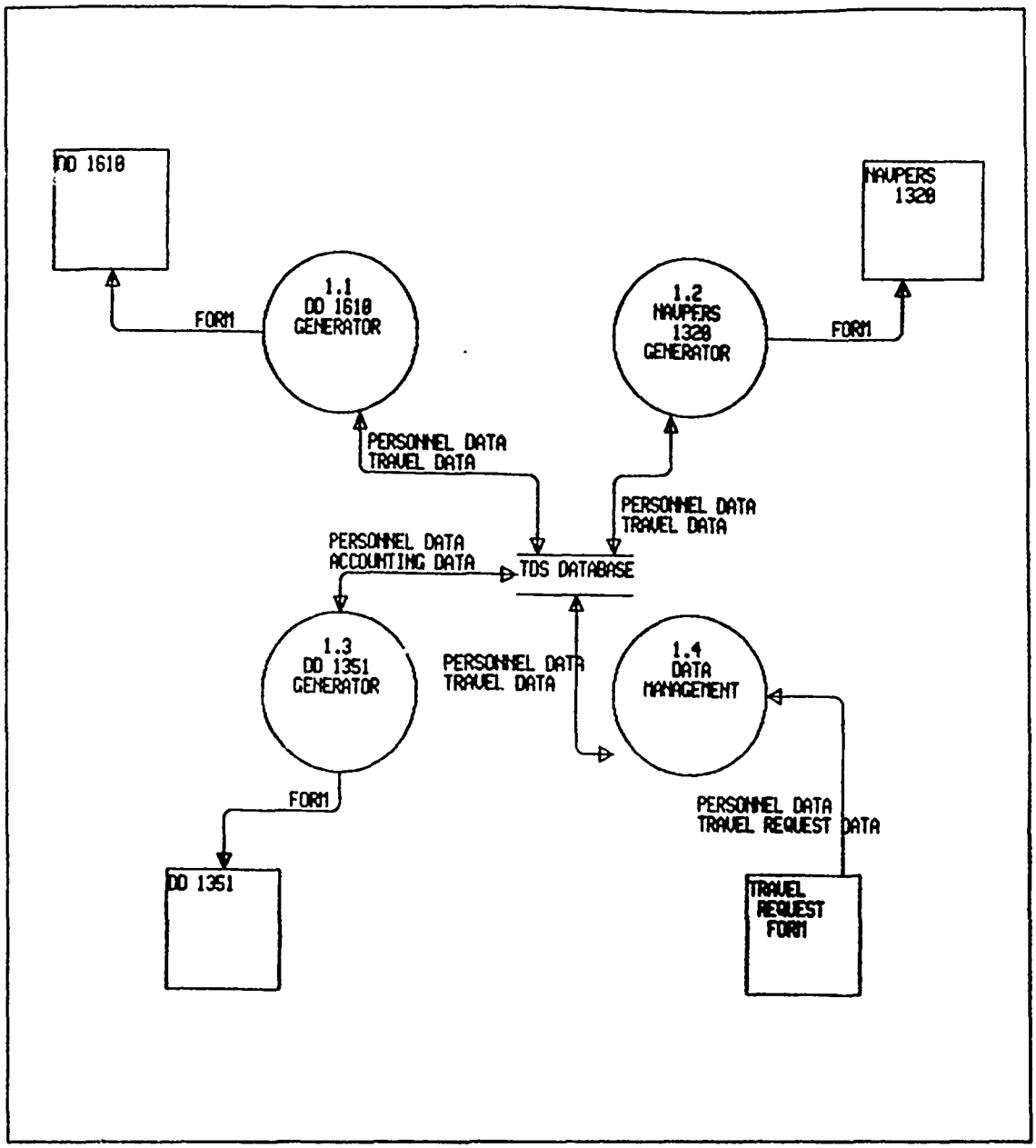


Figure 4. System Level Dataflow Diagram

The data flow begins with a government traveler submitting a travel request form. The Administrative Assistant will open the Personnel Data Window and search the database for the member using either the member's Social Security Number or the

member's Last Name. If the member is not in the database the member will be entered. If the member is in the database the record will be checked for validity and updated if required. If the member is in the Navy then the NAVPERS 1320 window is opened from within the Personnel Data Window. If the member is not in the military the DD1610 Window is opened from within the Personnel Data Window. At this point all the data entry fields of the forms pertaining to Personnel Data are automatically filled in. The Administrative Assistant is then tasked with completing the form. The completed form is then printed out and delivered.

In order to complete the DD form 1351, the user enters the database through the Personnel Data Window, finds the member, then opens either the DD 1610 window or the NAVPERS 1320 window whichever is appropriate. The travel order which corresponds to the requested DD1351 must be displayed on the screen. The user then selects DD 1351 and the data entry window is opened with all previously entered data automatically displayed. The administrative assistant then enters the remaining data, prints the report, and submits it to the appropriate office.

The diagram depicted in Figure 5 is a representation of the menu hierarchy. In this database application the menu hierarchy is a direct representation of the underlying data structure.

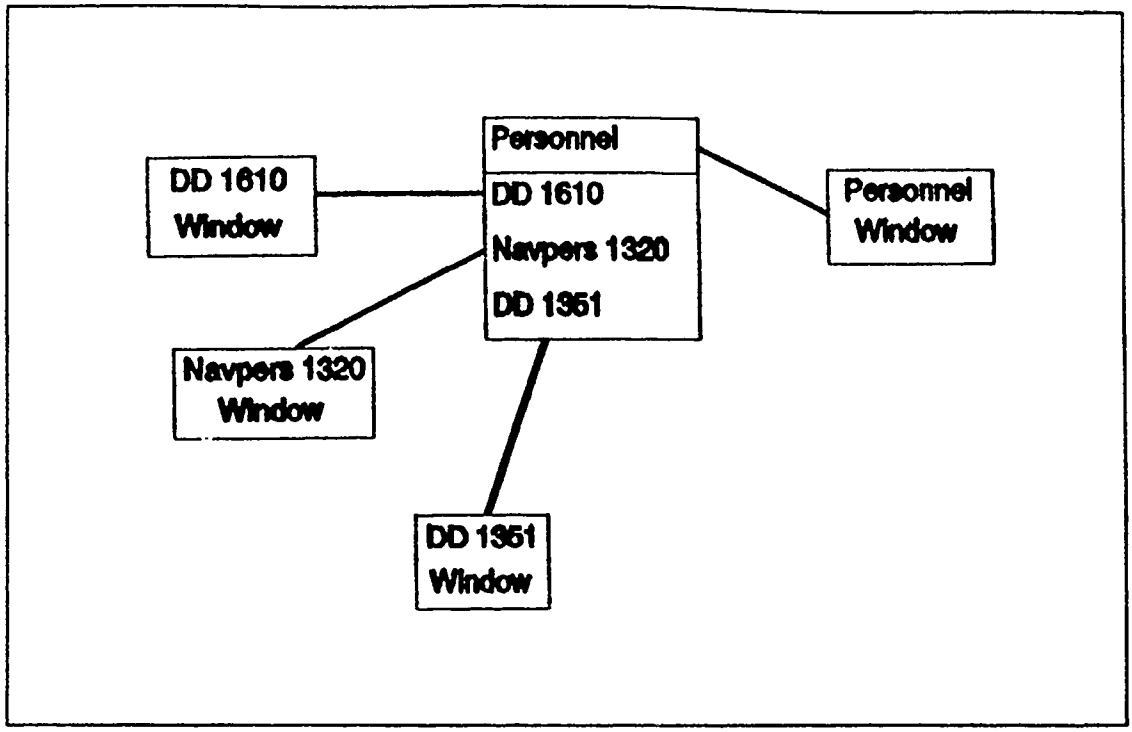


Figure 5. Menu Hierarchy

DATA DICTIONARY

TABLE 1. DATA FILES

FILE NAME	TYPE	DESCRIPTION
PERSDATA.DF1	DATA	ATTRIBUTES OF PERSONNEL DATA FILE
DD1610.DF1	DATA	ATTRIBUTES OF DD 1610
NP1320.DF1	DATA	ATTRIBUTES OF NAVPERS 1320\B
DD1351.DF1	DATA	ATTRIBUTES OF DD 1351

TABLE 2. FILE FORMAT PERSDATA.DF1

Element	Type	Width		Description
LAST_NAME	Character	15	IND	last name
FIRST_NAME	Character	15	IND	first name
MIDDLE_INITIAL	Character	1		middle initial
POSITION	Character	35		
SSN	Character	11	IND	
PHONE_NUMBER	Character	13		
DEPARTMENT	Character	15		
CLEARANCE	Character	15		Security clearance
OFF_STA	Character	30		Official Station
ORG_ELE	Character	30		Organizational Element
TYPE_TRAVELER	Character	10		
DESIGNATOR	Character	4		
STREET_ADDRESS	Character	30		
CITY	Character	10		
STATE	Character	2		
ZIP_CODE	Character	5		
RANK_1	Character	6		
SERVICE_1	Character	6		

Record length is between 26 and 338 bytes

1000 records may use between 141000 and 615000 disk bytes

TABLE 3. FILE FORMAT DD1610.DF1

Element	Type	Width	Description
REQUEST_DATE	Date	D m Y	Block 1
PROCEED_DATE	Date	D m Y	Block 10b
PURPOSE	Character	280	Block 9
ITINERARY	Character	42	Block 11
RETURN_DATE	Date	D m Y	Included in Block 11
APPOX_DAYS	Character	10	Block 10a
TYPE_ORDERS	Character	5	Block 7
VAR_AUTH	Character	1	Included in Block 11 Variation Authorized
COM_RAIL	Character	1	Block 12 Commercial Rail
COM_AIR	Character	1	Block 12 Commercial Air
COM_BUS	Character	1	Block 12 Commercial Bus
COM_SHIP	Character	1	Block 12 Commercial Ship
GOV_AIR	Character	1	Block 12 Government Air

TABLE 3, cont.

GOV_VEH	Character	1	Block 12 Government Vehicle
GOV_SHIP	Character	1	Block 12 Government Ship
RATE_PER_MILE	Number	2 dp	Block 12 Rate Per Mile
ADV_GOVT	Character	1	Block 12 Advantage Gov't
REIMBURS	Character	1	Block 12 Reimbursement
PER_DIEM_AUTH	Character	1	Block 13 Per Diem Authorized
OTHER_PER_DIEM	Character	1	Block 13 Other Per Diem Rate
AS_DET	Character	1	Block 12 Overseas travel only
EST_PER_DIEM	Number	2 dp	Block 14 Estimated Per Diem
EST_TRV_COST	Number	2 dp	Block 14 Est. Travel Cost
EST_OTHER	Number	2 dp	Block 14 Other Expenses
EST_TOTAL	Number	2 dp	Block 14 Estimated Total
ADV_AUTHORIZED	Character	5	Block 14 Advance Authorized
REMARKS	Character	420	Block 16

TABLE 3, cont.

REQ_OFF	Character	30	Block 17
			Requesting Official
APP_OFF	Character	30	Block 17
			Approving Official
APP_SUB_1	Character	16	Block 19
APP_SUB_2	Character	16	Appropriation
APP_SUB_3	Character	16	and Subhead
OBJ_CLASS_1	Character	4	Block 19
OBJ_CLASS_2	Character	4	Object Class
OBJ_CLASS_3	Character	4	
BUNO_1	Character	6	Block 19
BUNO_2	Character	6	Bureau Control
BUNO_3	Character	6	Number
SUB_AUTH_1	Character	3	Block 19
SUB_AUTH_2	Character	3	Sub-auth
SUB_AUTH_3	Character	3	
AUTH_ACCT_1	Character	8	Block 19
AUTH_ACCT_2	Character	8	Authorizing
AUTH_ACCT_3	Character	8	Acct. Activity
TYPE_1	Character	4	Block 19
TYPE_2	Character	4	Type
TYPE_3	Character	4	

TABLE 3, cont.

TANGO_NO_1	Character	6	Block 19
TANGO_NO_2	Character	6	Travel Order
TANGO_NO_3	Character	6	Number
COST_CODE_1	Character	15	Block 19
COST_CODE_2	Character	15	Cost Code
COST_CODE_3	Character	15	
ORD_AUTH_OFF	Character	15	Block 20 Order Authorizing Official
ISSUE_DATE	Date	D m Y	Block 21 Date Issued
TRAVEL_ORD_NO	Character	20 IND	Block 22 Travel Order Number

Record length is between 136 and 1720 bytes

1000 records may use between 226000 and 2527000 disk bytes

TABLE 4. FILE FORMAT NP1320.DF1

Element	Type	Width	Description
FROM_1	Character	60	Block 1
STAN_DOC_NO	Character	12 IND	Block 2 Standard Document Number
TANGO_NO	Character	12	Block 4
DATE	Date	D m	Block 6
REF_A	Character	40	BLOCK 7
INDIVIDUAL	Character	1	BLOCK 8 Individual Travel
GROUP	Character	1	BLOCK 8 Group Travel
PROCEED_ON	Date	D m Y	Block 9
AUTH_PROCEED	Date	D m Y	Block 10
APPROX_DAYS	Character	10	Block 11
EST_RETURN_DATE	Date	D m Y	BLOCK 12
ITINERARY	Character	240	Block 13
TEMADD	Character	1	BLOCK 14 TEMADD
TEMADDCON	Character	1	BLOCK 14 TEMADDCON
TEMADDINS	Character	1	Block 14 TEMADDINS
REASON	Character	120	BLOCK 15
AUTH_VISIT	Character	1	Block 16
APP_SYM_1	Character	7	Block 17

TABLE 4, cont.

APP_SYM_2	Character	7	Appropriation symbol
APP_SYM_3	Character	7	
SUB_HEAD_1	Character	4	Block 17
SUB_HEAD_2	Character	4	Appropriation Subhead
SUB_HEAD_3	Character	4	
OBJECT_1	Character	3	Block 17
OBJECT_2	Character	3	Object Class
OBJECT_3	Character	3	
BU_CONT_1	Character	4	Block 17
BU_CONT_2	Character	4	BU CONT NUMBER
BU_CONT_3	Character	4	
SUB_ALLOT_1	Character	5	Block 17
SUB_ALLOT_2	Character	5	Sub-Allot Number
SUB_ALLOT_3	Character	5	
AUTH_ACCTG_1	Character	6	Block 17
AUTH_ACCTG_2	Character	6	Authorized ACCTG
AUTH_ACCTG_3	Character	6	Activity
TY_1	Character	2	Block 17
TY_2	Character	2	TYPE
TY_3	Character	2	
ACCTG_ACTY_1	Character	6	Block 17

TABLE 4, cont.

ACCTG_ACTY_2	Character	6	PROPERTY ACCTGACTY
ACCTG_ACTY_3	Character	6	
CC_1	Character	12	Block 17
CC_2	Character	12	Cost Code
CC_3	Character	12	
TRANSPORTATION	Number	2 dp	Block 18 Transportation
PERDIEM	Number	2 dp	Block 18 Per Diem
MISC_EXP	Number	2 dp	Block 18 Misc. Exp
TOTAL_EXP	Number	2 dp	Block 18 Total
CUST_ID_CODE	Character	18	Block 19
ITEM	Character	120	Block 20
COMMENTS	Character	400	Block 21
AUTH_SIG	Character	40	Block 23
TRANS_REQUEST	Character	240	Block 24
COPY_TO	Character	40	Block 25

Record length is between 122 and 1780 bytes

1000 records may use between 199000 and 2598000 disk bytes

TABLE 5. FILE FORMAT DD1351.DF1

Element	Type	Width	Description
PRIOR_PAY	Character	40	Prior travel payments or advances under these orders
DEP_1	Date	D m Y	Block 1: Dates
ARR_1	Date	D m Y	
DEP_2	Date	D m Y	
ARR_2	Date	D m Y	
DEP_3	Date	D m Y	
ARR_3	Date	D m Y	
DEP_4	Date	D m Y	
ARR_4	Date	D m Y	
DEP_5	Date	D m Y	
ARR_5	Date	D m Y	
DEP_6	Date	D m Y	
ARR_6	Date	D m Y	
DEP_7	Date	D m Y	
ARR_7	Date	D m Y	
TIME_1	Short time		Block 1: Times
TIME_2	Short time		
TIME_3	Short time		
TIME_4	Short time		
TIME_5	Short time		
TIME_6	Short time		
TIME_7	Short time		
TIME_8	Short time		
TIME_9	Short time		
TIME_10	Short time		
TIME_11	Short time		
TIME_12	Short time		
TIME_13	Short time		
TIME_14	Short time		
PLACE_1	Character	15	Block 1: Place
PLACE_2	Character	15	
PLACE_3	Character	15	
PLACE_4	Character	15	
PLACE_5	Character	15	
PLACE_6	Character	15	
PLACE_7	Character	15	
PLACE_8	Character	15	

TABLE 5, cont.

MODE_1	Character	2	Block 1: Mode of travel
MODE_2	Character	2	
MODE_3	Character	2	
MODE_4	Character	2	
MODE_5	Character	2	
MODE_6	Character	2	
MODE_7	Character	2	
STOP_1	Character	2	Block 1: Reason for stop
STOP_2	Character	2	
STOP_3	Character	2	
STOP_4	Character	2	
STOP_5	Character	2	
STOP_6	Character	2	
STOP_7	Character	2	
COL_1	Number	2 dp	Block 2: Cost of lodging
COL_2	Number	2 dp	
COL_3	Number	2 dp	
COL_4	Number	2 dp	
COL_5	Number	2 dp	
COL_6	Number	2 dp	
COL_7	Number	2 dp	
MEALS_G_1	Integer	(0 to 255)	Block 3: Meals\Govt
MEALS_G_2	Integer	(0 to 255)	
MEALS_G_3	Integer	(0 to 255)	
MEALS_G_4	Integer	(0 to 255)	
MEALS_G_5	Integer	(0 to 255)	
MEALS_G_6	Integer	(0 to 255)	
MEALS_G_7	Integer	(0 to 255)	
MEALS_D_1	Integer	(0 to 255)	Block 3: Meals\Ded
MEALS_D_2	Integer	(0 to 255)	
MEALS_D_3	Integer	(0 to 255)	
MEALS_D_4	Integer	(0 to 255)	
MEALS_D_5	Integer	(0 to 255)	
MEALS_D_6	Integer	(0 to 255)	
MEALS_D_7	Integer	(0 to 255)	
OM_1	Integer	(0 to 255)	Block 3: Open Mess
OM_2	Integer	(0 to 255)	
OM_3	Integer	(0 to 255)	

TABLE 5, cont.

OM_4	Integer	(0 to 255)	
OM_5	Integer	(0 to 255)	
OM_6	Integer	(0 to 255)	
OM_7	Integer	(0 to 255)	
POC_MILES_1	Number	0 dp	Block 4: POC Miles
POC_MILES_2	Number	0 dp	
POC_MILES_3	Number	0 dp	
POC_MILES_4	Number	0 dp	
POC_MILES_5	Number	0 dp	
POC_MILES_6	Number	0 dp	
POC_MILES_7	Number	0 dp	
DATE_1	Date	D m Y	Block 5: Date
DATE_2	Date	D m Y	
DATE_3	Date	D m Y	
DATE_4	Date	D m Y	
N_E_1	Character	20	Block 5: Naure & Explanation
N_E_2	Character	20	
N_E_3	Character	20	
N_E_4	Character	20	
AMT_CLAIM_1	Number	2 dp	Block 5: Amt. Claimed
AMT_CLAIM_2	Number	2 dp	
AMT_CLAIM_3	Number	2 dp	
AMT_CLAIM_4	Number	2 dp	
ALLOWED_1	Number	2 dp	Block 5: Allowed
ALLOWED_2	Number	2 dp	
ALLOWED_3	Number	2 dp	
ALLOWED_4	Number	2 dp	
APPR_OFFICER	Character	15	Block 6: Approving Officer
NUMBER_1	Character	20	Block 7: Number
NUMBER_2	Character	20	
FROM1	Character	20	Block 7: From
FROM2	Character	20	
TO1	Character	20	Block 7: To
TO2	Character	20	

TABLE 5, cont.

LEAVE	Integer	0 to 255	Block 8: Leave days
HOURS	Integer	0 to 255	Block 8: Leave hours
DATE_8	Date	D m Y	Block 8: Start date
DATE_9	Date	D m Y	Block 8: End date
POC_OWNER	Character	1	Block 9: POC Owner
POC_PASS	Character	1	Block 9: Passenger
CHECK	Character	1	Block 11: Check
CASH	Character	1	Block 11: Cash
PER_DIEM_REQ	Character	1	Block 12: Per Diem Requested

Record length is between 436 and 966 bytes.

1000 records may use between 518000 and 1408000 disk bytes.

IV. EVALUATION PHASE

The evaluation phase actually consists of three tasks, all focused on redefining the scope and feasibility of the entire project. The first phase is determining alternatives to the proposed solution. Secondly the feasibility of the project is re-evaluated based on the more detailed specifications which are now available to the designers. Finally all user requirements are evaluated within the scope of the alternative solutions. [Ref. 3:pg. 78]

The evaluation phase will be effective only if a thorough understanding of the system requirements is achieved during the earlier phases of development. It was decided early on that using the OMNIS7 Integrated Development Environment would provide for the development of a graphical user interface which would facilitate learning by end users. The hardware requirements were determined to be of minimal concern as there is an ample supply of personal computers within the Administrative Sciences Department.

It was decided that the choice of printer would be delayed until the TDS prototype was installed. This would allow the developer to evaluate the printers available in the Administrative Sciences Department and select the one best suited for the application.

The application is designed using a structured approach. The only possible obstacle foreseen was the process of learning how to manipulate a very powerful database development environment. Otherwise it was still well within the realm of possibility for this project to be completed within the expanded time constraints.

development environment. Otherwise it was still well within the realm of possibility for this project to be completed within the expanded time constraints.

V. DESIGN PHASE

The objective of the design phase is to develop a blueprint for the database and its associated applications. During this phase the development team establishes the database schema, the application sub-schema, formats for forms, reports, menus as well as the underlying logic. The mechanisms for update display and control are also determined at this time. After the database has been designed the team can design each application which consists of a collection of menus, forms reports and programs which meet the specific user needs. [Ref. 3:pg. 79]

A. NORMALIZATION

The goal of a logical database is to represent objects in the database using relations. The construction of user objects so that rows of data can be inserted, deleted, and modified without resulting inconsistencies or errors is paramount. The deletion anomaly occurs when one object is deleted and has the effect of deleting data from another object instance. The insertion anomaly occurs when data cannot be inserted into one entity until data is known about another entity. These conditions can cause serious problems in database design. The current design has all its relationships , as defined in Tables 1 - 5, in Boyce-Codd Normal Form.

B. PHYSICAL DATABASE DESIGN

The four file formats involved in the Travel Database system are delineated in Tables 1 through 5. The key attributes (SSN, TRAVEL_ORD_NO, and STAN_DOC_NO) are noted with an asterisk. Their relationship to one another is graphically represented in Figure 2. In the OMNIS7 environment the unique key attribute is used to functionally define each relation, in other words, the remaining attributes of an object are associated in that file format to that unique key. As an illustration, only one record may have a particular SSN in the PERSDATA file. Likewise only one travel order may be linked to a unique Travel Order Number, although several travel orders may belong to one SSN. The relations are linked using OMNIS7's record sequencing number (RSN) feature.

The RSN feature takes care of the requirement to carefully arrange relational joins to avoid anomalies. For instance, if a personnel record is deleted, all of that person's travel orders and travel claims are still available. Likewise, a travel claim or travel order can be deleted without affecting the associated personnel record.

VI. IMPLEMENTATION PHASE

The final phase of the process is implementation. The details of the implementation depend a great deal on the DBMS being used. OMNIS7 is a very powerful program and nearly all of the requirements could be generated by the automatic code generation features of the development environment. This feature reduced the amount of effort required in the initial phase of implementation. Testing and installation are the final two stages of the implementation phase. [Ref. 3:pg 81]

A. PROGRAMMING

The goal of this phase is to construct the system as designed. The powerful nature of the OMNIS7 Development Environment did not require a great deal of custom coding (creating procedures in OMNIS7 parlance). Those custom procedures which were coded are included in Tables 6 through 9. The majority of the code is generated automatically by OMNIS7 and is therefore transparent to the developer. Procedures can be initiated for any field on any window or custom pushbuttons can be generated. The code written for this application facilitated report printing.

TABLE 6. CUSTOM PROCEDURES - PERSONEL WINDOW, W_PERS DATA

0. Initial Control Procedure

Set Main File {FPERS DATA}

Prepare for insert

24. DD 1610 (pushbutton)

Open window W_DD1610

25. NAVPERS 1320 (pushbutton)

Open window NAVPERS 1320

TABLE 7. CUSTOM PROCEDURES - NAVPERS 1320 WINDOW, NAVPERS 1320

66. PRINT NAVPERS 1320 (pushbutton)

Set report name RD_NAVPERS 1320

YES/NO message (Large size) {Print Standard Document Number [STAN_DOC_NO] for [FIRST_NAME] [LAST_NAME] ?}

If flag true

Prepare for print

Print record

Print totals

End if

67. DD 1351 (pushbutton)

Open window W_DD1351

TABLE 8. CUSTOM PROCEDURES - DD 1610, W_DD1610

72. PRINT DD 1610 (pushbutton)

Set report name DD_1610

YES/NO message (Large size) {Print Travel Order Number [TRAVEL_ORD_NO] for [FIRST_NAME] [LAST_NAME] ?}

If flag true

Prepare for print

Print record

Print totals

End if

73. DD 1351 (pushbutton)

Open window W_DD1351

TABLE 9. CUSTOM PROCEDURES - DD 1351, W_DD1351

72. PRINT DD 1351 (pushbutton)

Set report name DD_1351

YES/NO message (Large size) {Print DD 1351 for [FIRST_NAME] [LAST_NAME] ?}

If flag true

Prepare for print

Print record

Print totals

End if

B. TESTING AND INSTALLATION

The TDS was tested as a complete unit, although it consists of three separate modules. The system was installed on an Administrative Sciences Department PC and test data was entered. Some format errors were discovered on the data input screens, which were corrected immediately. Some errors were also found in connection with report output. Upon careful examination of these errors it was concluded that the existing printer could not support the application. A new printer was therefore procured and all errors were subsequently eradicated from the system.

VII. CONCLUSION

The Travel Database System is currently installed in the Administrative Sciences Department Support Staff Office and is running in accordance with the design specifications. The users have indicated satisfaction with the system although it is not being used to the fullest. The result of maximizing the use of this system would undoubtedly be an increased productivity and a more uniform output from the office.

The integration of an accounting system with TDS would further the department's dependency upon these applications. This would improve user acceptance of the computer in the work space. The generation of future applications using OMNIS7 is highly recommended.

Future upgrades to the existing system can be readily determined as well. A series of reports highlighting accounting data and travel as well as further automation of data retrieval are just two examples.

APPENDIX A.
USER'S GUIDE TO THE ADMINISTRATIVE SCIENCE DEPARTMENT'S TEMADD DATABASE SYSTEM

A. INTRODUCTION

The purpose of this manual is to familiarize the user with the Administrative Sciences Department's TEMADD Database System (TDS). The system is linked through a series of windows or, for more experienced users, a series of pull down menus. The system is designed to be easy to use but does require some familiarity with Microsoft Windows and the use of a mouse.

B. GETTING STARTED

Before running TDS, the OMNIS7 Integrated Development Environment and Microsoft Windows must be installed as specified in their respective user's manuals. The application file TRAVEL.APP must be loaded onto the hard drive. The hard disk storage space required is 4 MB. The data files can be maintained on a floppy. To run the application from the prototype software the user must first initialize Microsoft Windows. The following steps will guide the user to the PERSONNEL window.

1. From PROGRAM MANAGER select the OMNIS7 Icon and initialize the OMNIS7 Integrated Development Environment.
2. From OMNIS7 Bar Menu select **FILE**. Select **OPEN APPLICATION** from the pull down menu. See Figure A-1.

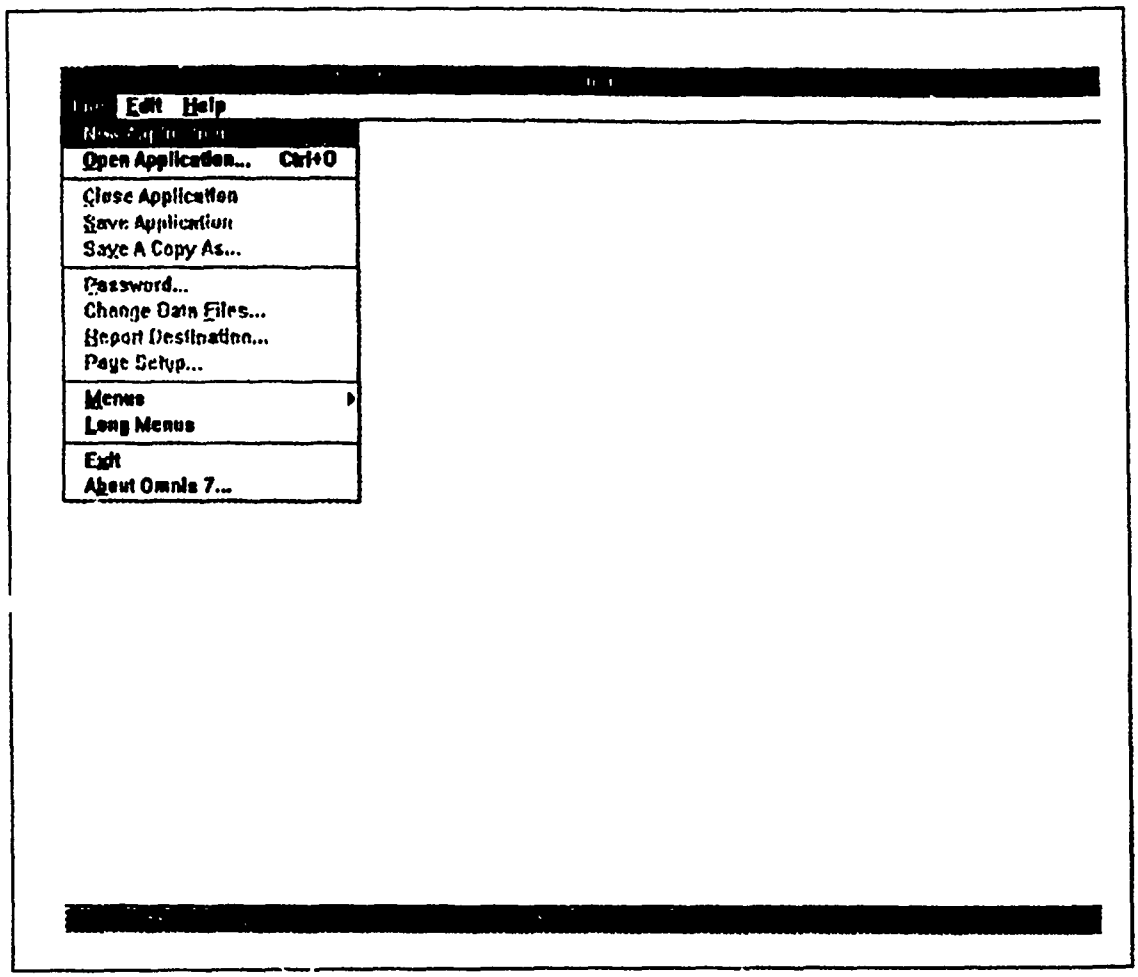


Figure A-1. Initialization Pull Down Menu

3. Highlight **TRAVEL.APP** from the pop-up menu and press **<enter>**. See Figure A-2.

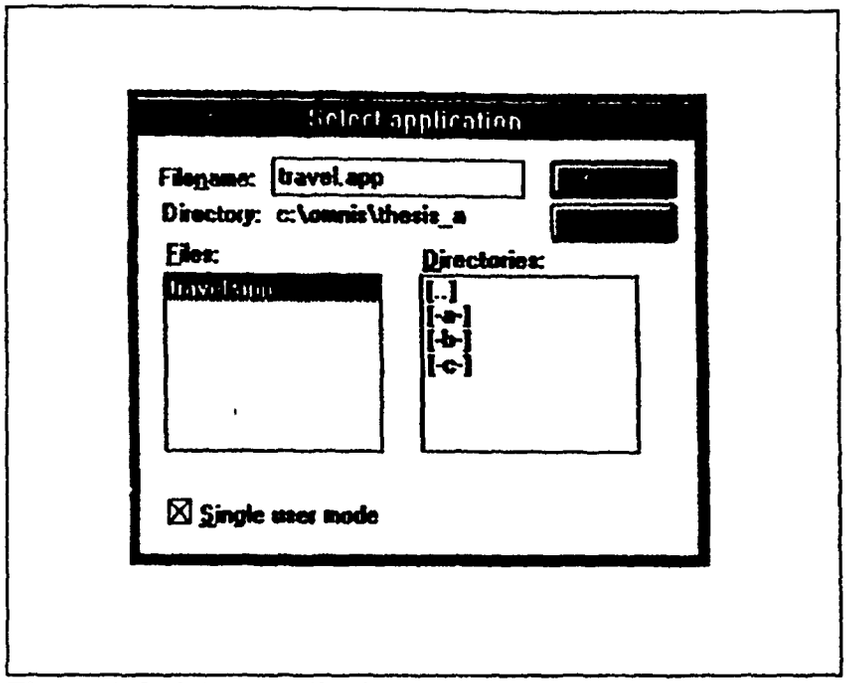


Figure A-2. Select Application Pop-Up Menu

4. Select **DESIGN** from the OMNIS7 bar menu. Next, select **MENU FORMATS...** from the pull down menu. See Figure A-3.

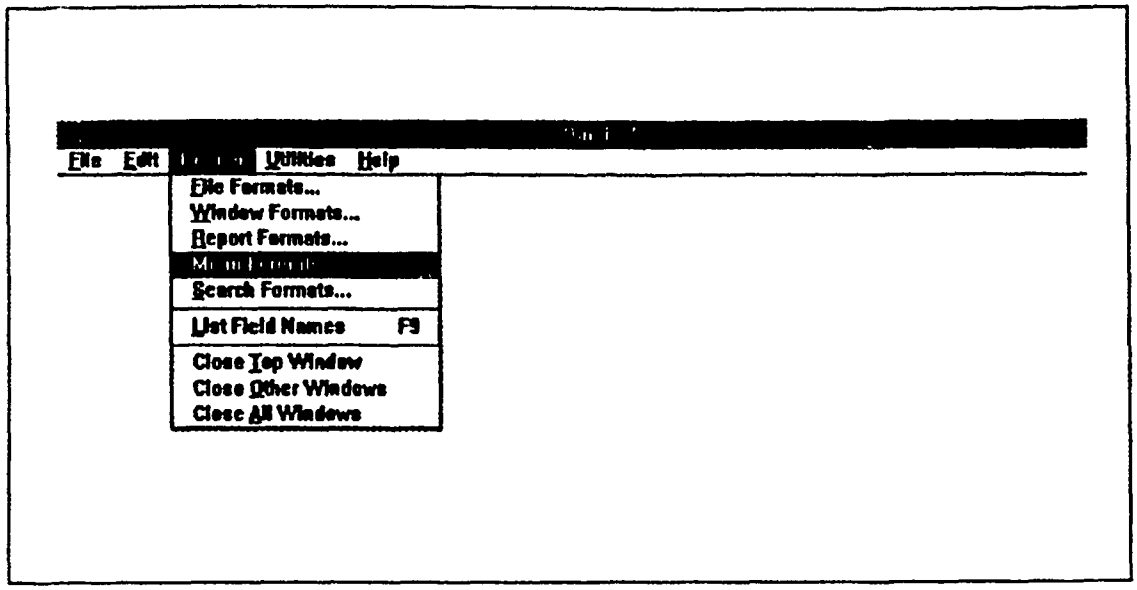


Figure A-3. Design Pull Down Menu

5. Highlight **TRAVEL** from the pop-up menu and Select the **INSTALL** option from the buttons on the right hand side of the pop-up menu. See Figure A-4.

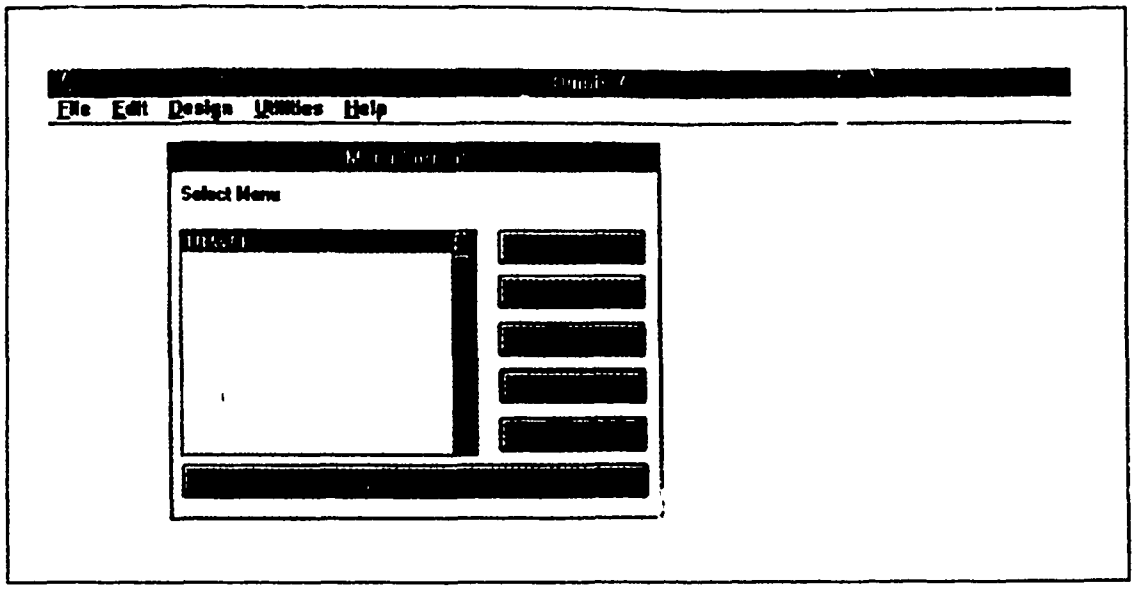


Figure A-4. Menu Formats Pop-Up Menu

6. The **TRAVEL** menu will now be installed in the bar menu.

7. Highlight the **TRAVEL** selection from the bar menu. The **PERSONNEL** option will be highlighted. See Figure A-5.

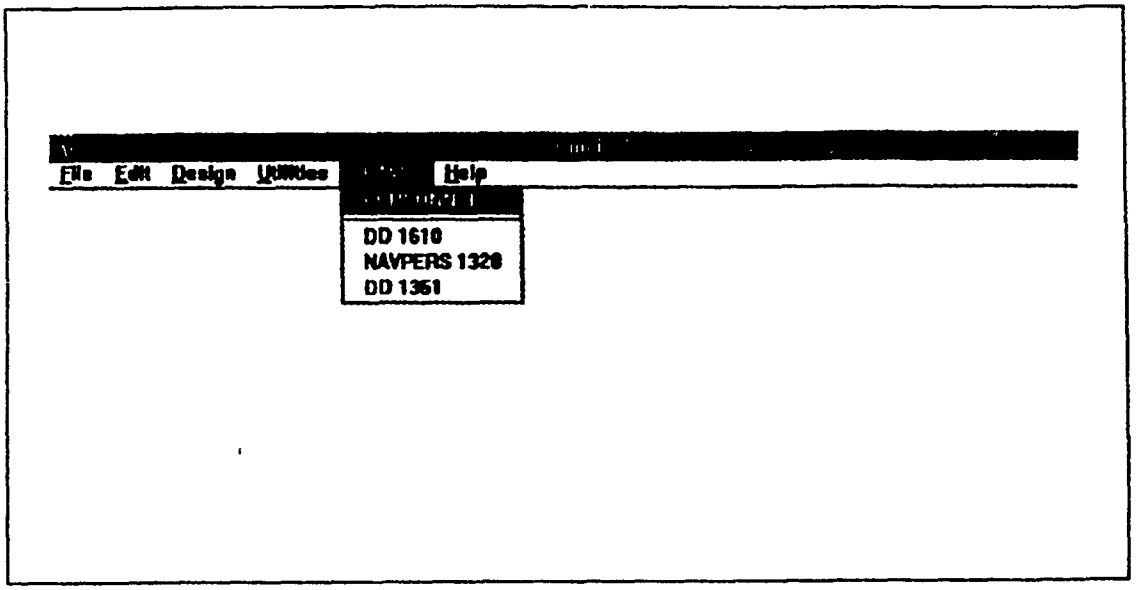


Figure A-5. Travel Database Pull Down Menu

8. Press **ENTER**. The **PERSONNEL** entry form will come up on the screen. See Figure 6. The **TDS** is now ready for data entry.

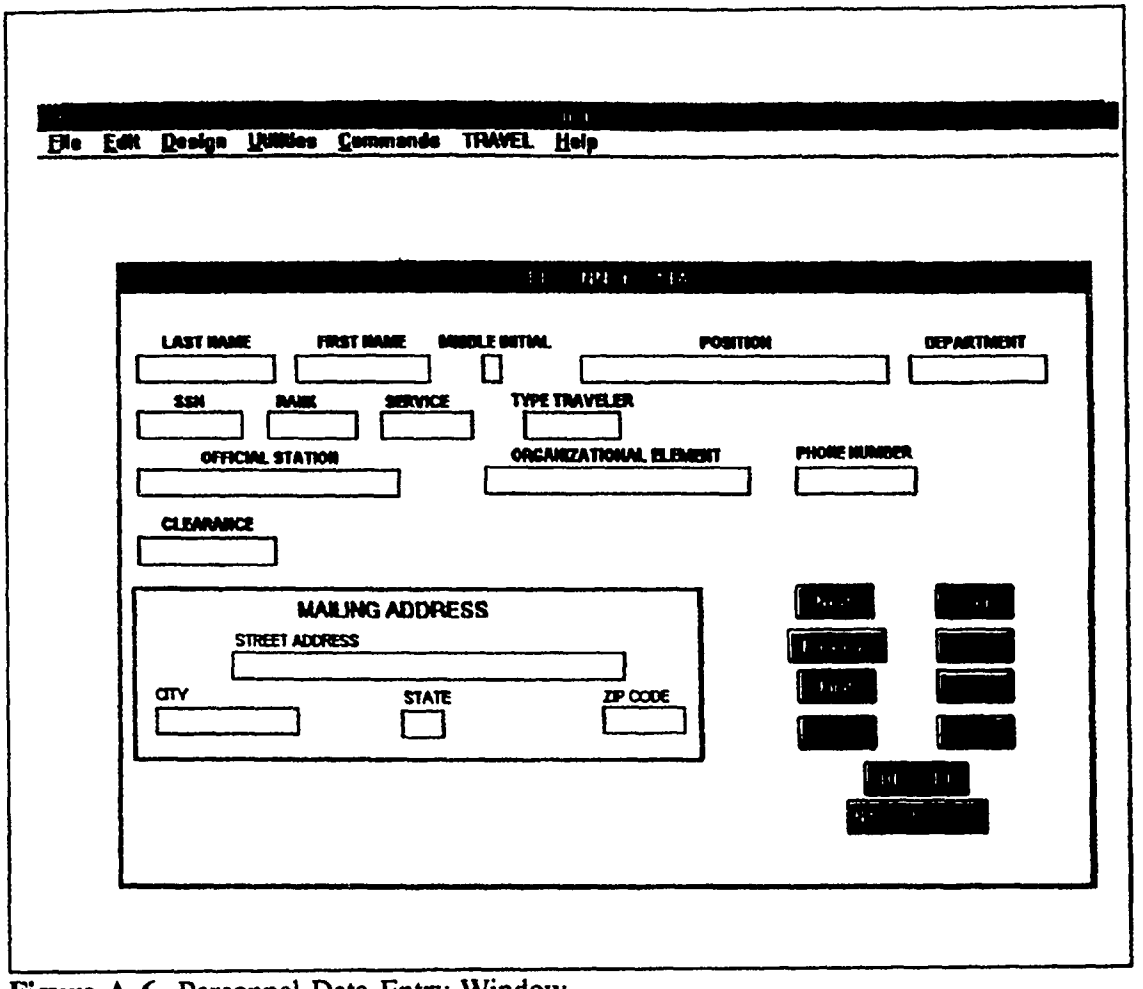


Figure A-6. Personnel Data Entry Window

C. PUSH BUTTONS

There are five push buttons common to all four data entry windows, the pushbuttons which are unique will be described in the data entry portion.

1. **FIND**. The **FIND** button will initialize a search on the file until the designated record is found. If the record is not found the user is told that no match exists. To use this feature place the mouse over the blue **FIND** button and depress the left mouse button. The cursor will be automatically in the data entry field against which the search will be conducted. Enter the value (name, travel order number, etc.) which is the unique value of the record you wish to find and press **ENTER** or press the **OK** push button. If the record exists it will be displayed. If you are told that the record does not exist, check the entry and try again.

2. **EDIT.** The **EDIT** pushbutton will prepare the record which is currently displayed for editing. The cursor will tab between fields, highlighting the active field. The user may also highlight the field by placing the mouse arrow directly on the field which is to be edited and pressing the left button. When the desired field is highlighted the editing may be completed. Once all of the desired fields are edited, the user must press the **OK** button.

3. **INSERT.** The **INSERT** pushbutton places the cursor in the first field into which data may be entered. Once a record is completed the user must press **ENTER** or **OK**.

4. **OK** and **CANCEL**. These pushbuttons are active during the EDIT and INSERT operations and are used to end the process. **OK** allows the data to be written to the file. **CANCEL** simply ends the data entry process without writing to the data file.

D. PERSONNEL DATA FORM

1. Data Entry

1. Move the mouse over the **INSERT** pushbutton. After the button has been pressed the cursor will be in the **LAST NAME** data entry field.

2. Enter the required data and **<TAB>** to the next field. Once all the required data is entered press the **OK** button in the same fashion described in step one.

3. To insert another record repeat step one.

2. Find\View\Edit Record

1. Position the mouse over the find button and depress the left mouse button.

2. The cursor will automatically move to the **LAST NAME** field.

3. At this point, if the last name is known, enter it and press **<ENTER>**. The desired record will appear in the data entry form.

4. If the last name is unknown, enter the first initial of the last name and press **<ENTER>**.

   a. At this point, the first record beginning with the desired letter will appear. To scroll through the records position the mouse over the **NEXT** pushbutton and click with the left mouse button. Each click will put the next record into the data entry window. Continue clicking until the desired record is found.

5. To **EDIT** the record simply position the mouse over the **EDIT** pushbutton and depress the left mouse button. The first data entry field will be highlighted. To move from field to field press **<TAB>**.

6. Edit fields as desired. When the editing is complete position the mouse over the **OK** pushbutton and depress the left mouse button, or press **<ENTER>**.

3. Delete Record

1. Find the Personnel Record which is to be deleted.

2. Position the mouse over the **COMMANDS** selection from the bar menu.

3. Highlight **DELETE**.

4. A confirmation window will pop-up in the bottom left hand corner of the screen. If the record is to be deleted, select "YES." If a different record is to be deleted, select "NO" and find the proper record.

5. This option will permanently remove the selected record from the data base. It is recommended that extreme caution be used when exercising this option.

4. DD 1610 Data Entry Form

a. Data Entry

1. Initiate the DD 1610 Data Entry form the Personnel Data entry Form. The method for doing this is as follows:

   a. Once the desired Personnel Record has been entered or found position the mouse over the **DD 1610** pushbutton and depress the left mouse button. The DD 1610 Data Entry Form will come up on the screen with the personnel data fields already filled.

2. In order to initiate a new DD 1610, position the mouse over the **INSERT** pushbutton and depress the left mouse button. The database is now ready to accept a new record.

3. The cursor will be positioned in the **TYPE ORDER** data entry field. As the data is entered, tab from field to field.

4. When all the required data is filled in press **<ENTER>** or position the mouse over the **OK** pushbutton and depress the left button.

b. Find\View\Edit Record

1. In order to find a DD 1610 for viewing or editing position the mouse over the **FIND** button and depress the left mouse button.

2. The cursor will be positioned in the **TRAVEL ORDER NUMBER** field. Enter the travel order number which is associated with the record to be viewed or edited. Press **<ENTER>** and the desired record will be brought to the screen.

3. To **EDIT** the record, position the mouse over the field to be edited and depress the left mouse mountain. **<TAB>** between fields and complete the required editing. When all the editing is completed press **<ENTER>**.

c. Delete a Record

1. If a record is to be deleted, it must be brought into the data entry form as described in the Find\View\Edit section. Delete as described in the Personnel section.

2. Exercise extreme caution when using this option. The record will be permanently removed from the database if the option is completed.

d. Print a DD 1610

1. Complete the data entry for the DD 1610.

2. Position the mouse over the **PRINT DD 1610** pushbutton. Depress the left mouse button.

3. A confirmation window will appear asking the user to confirm the name and travel order number.

4. If the information in the confirmation window is correct, select **YES**. If not, select **NO**.

5. Once the form has been printed, position the transparency over the data sheet and create a copy. This is the original.

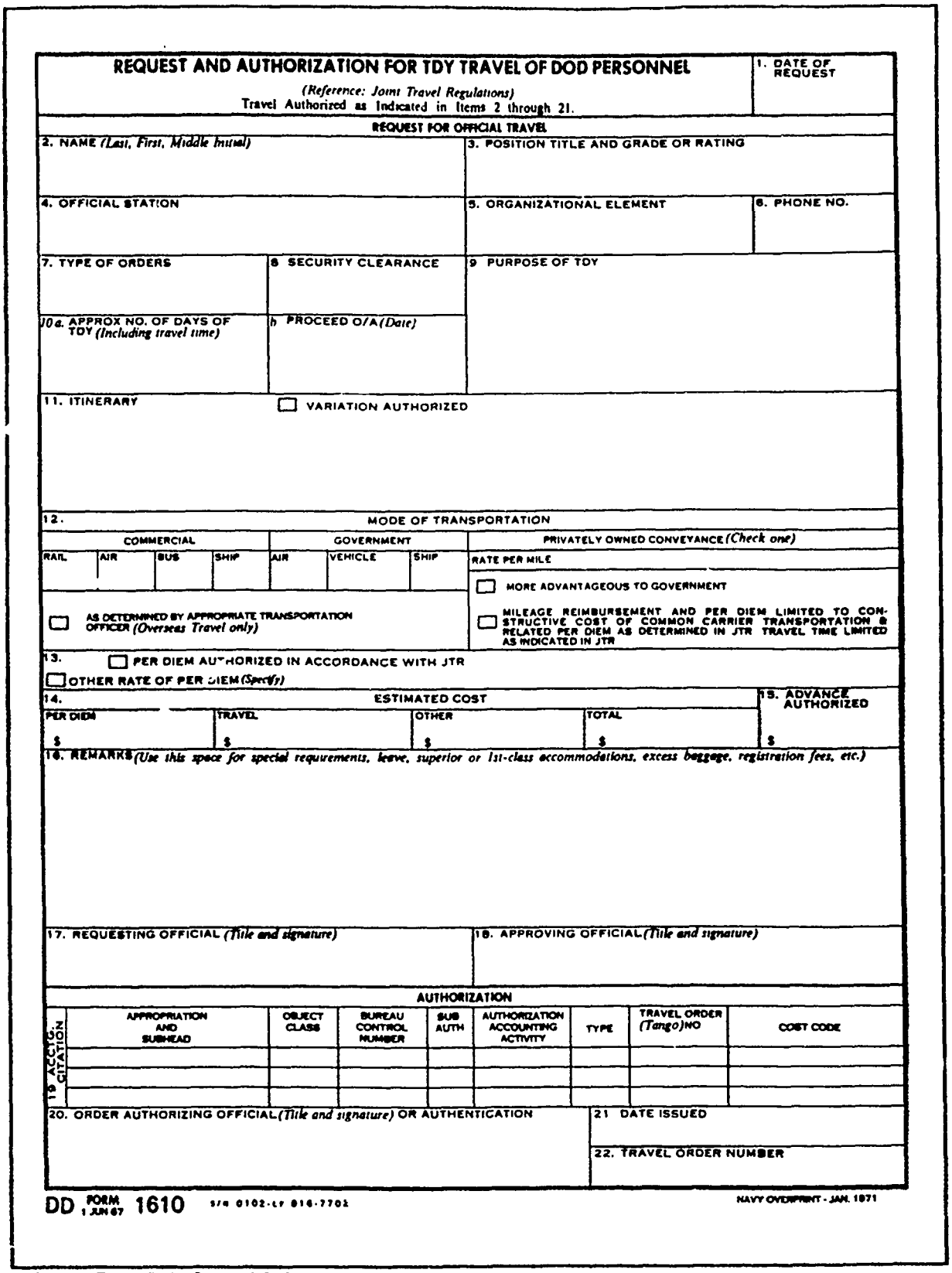
e. NAVPERS 1320

The procedures for manipulating this form are the same as for the DD 1610.

f. DD 1351

The procedures for manipulating this form are the same as for the DD 1610 and NAVPERS 1320.

APPENDIX B
REQUIRED FORMS



REQUEST AND AUTHORIZATION FOR TDY TRAVEL OF DOD PERSONNEL

(Reference: Joint Travel Regulations)
Travel Authorized as Indicated in Items 2 through 21.

1. DATE OF REQUEST

REQUEST FOR OFFICIAL TRAVEL

2. NAME *(Last, First, Middle Initial)*
3. POSITION TITLE AND GRADE OR RATING
4. OFFICIAL STATION
5. ORGANIZATIONAL ELEMENT
6. PHONE NO.
7. TYPE OF ORDERS
8. SECURITY CLEARANCE
9. PURPOSE OF TDY
10a. APPROX NO. OF DAYS OF TDY *(Including travel time)*
b. PROCEED O/A *(Date)*
11. ITINERARY ☐ VARIATION AUTHORIZED
12. MODE OF TRANSPORTATION

COMMERCIAL				GOVERNMENT			PRIVATELY OWNED CONVEYANCE *(Check one)*
RAIL	AIR	BUS	SHIP	AIR	VEHICLE	SHIP	RATE PER MILE

☐ AS DETERMINED BY APPROPRIATE TRANSPORTATION OFFICER *(Overseas Travel only)*
☐ MORE ADVANTAGEOUS TO GOVERNMENT
☐ MILEAGE REIMBURSEMENT AND PER DIEM LIMITED TO CONSTRUCTIVE COST OF COMMON CARRIER TRANSPORTATION & RELATED PER DIEM AS DETERMINED IN JTR TRAVEL TIME LIMITED AS INDICATED IN JTR

13. ☐ PER DIEM AUTHORIZED IN ACCORDANCE WITH JTR
☐ OTHER RATE OF PER DIEM *(Specify)*

14. ESTIMATED COST

PER DIEM	TRAVEL	OTHER	TOTAL
$	$	$	$

15. ADVANCE AUTHORIZED $

16. REMARKS *(Use this space for special requirements, leave, superior or 1st-class accommodations, excess baggage, registration fees, etc.)*

17. REQUESTING OFFICIAL *(Title and signature)*
18. APPROVING OFFICIAL *(Title and signature)*

AUTHORIZATION

19 ACCTG. CITATION	APPROPRIATION AND SUBHEAD	OBJECT CLASS	BUREAU CONTROL NUMBER	SUB AUTH	AUTHORIZATION ACCOUNTING ACTIVITY	TYPE	TRAVEL ORDER *(Tango)* NO	COST CODE

20. ORDER AUTHORIZING OFFICIAL *(Title and signature)* OR AUTHENTICATION
21. DATE ISSUED
22. TRAVEL ORDER NUMBER

DD FORM 1 JUN 67 1610 S/N 0102-LF-016-7702 NAVY OVERPRINT - JAN. 1971

Figure B-1. DD form 1610

TEMPORARY ADDITIONAL DUTY (TEMADD) TRAVEL ORDERS

1. FROM.	2. STANDARD DOCUMENT NO.
3. TO.	4. TANGO NO. 5. SSN/DESIGNATOR 6. DATE
7. REF (A)	8. ☐ INDIVIDUAL TRAVEL ☐ GROUP TRAVEL

9. PROCEED ON OR ABOUT	10. AUTHORIZED PROCEED ON OR ABOUT	11. APPROXIMATE NUMBER OF DAYS	12. ESTIMATED DATE OF RETURN

13. ITINERARY *(Activity/activities and Place/places indicated below)*	14. ☐ TEMAJD ☐ TEMADDCON ☐ TEMADDINS 15. REASON FOR TRAVEL: 16. ☐ AUTHORIZED VISIT SUCH ADDITIONAL PLACES AS MAY BE NECESSARY

17. FISCAL DATA ACCOUNTING CLASSIFICATION

APPROPRIATION SYMBOL AND SUB-HEAD (1) (2)	OBJECT CLASS (3)	BU CONT NUMBER (4)	SUB-ALLOT NUMBER (5)	AUTHORIZED ACCTG ACTY (6)	TYPE (7)	PROPERTY ACCTG ACTY (8)	COST CODE (9)
(7 SYM) (4 SYM)	(3 SYM)	(5 SYM)	(1 SYM)	(6 SYM)	(2 SYM)	(6 SYM)	(12 SYM)

18. ESTIMATED COST				19. CUSTOMER IDENTIFICATION CODE
TRANSPORTATION $	PER DIEM $	MISC. EXP. $	TOTAL $	

20. ITEM *(Use applicable item numbers as shown on reverse side of this form)*

"Report to a Disbursing Officer within 10 days after completion of travel to settle your travel expenses."

21 ADDITIONAL COMMENTS AND INSTRUCTIONS:	22. SECURITY CLEARANCE IT IS CERTIFIED THAT YOU HOLD A _____ BASED _____ COMPLETED _____. _____ BY _____. _____ (PLUS _____ YEARS SERVICE)

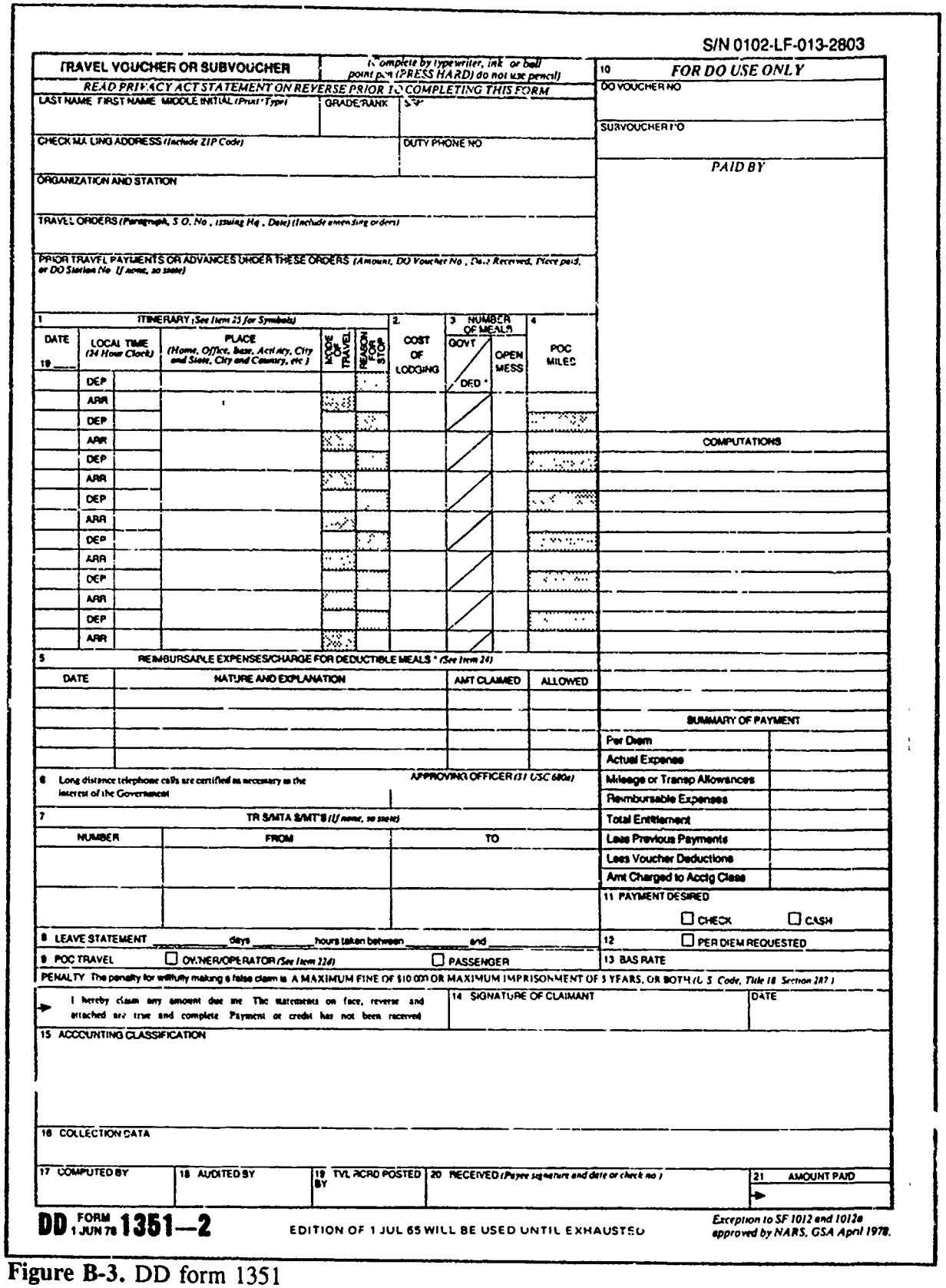
23 AUTHENTICATING SIGNATURE

24 TRANSPORTATION REQUEST/MAC TRANSPORTATION AUTHORIZATION FURNISHED.

25 COPY TO *(Include Operating Budget fund manager in all cases)*

NAVPERS 1320/16 (Rev. 11-87) S/N 0106-LF-013-2082

Figure B-2. NAVPERS 1320/16



S/N 0102-LF-013-2803

TRAVEL VOUCHER OR SUBVOUCHER — (Complete by typewriter, ink or ball point pen (PRESS HARD) do not use pencil)

READ PRIVACY ACT STATEMENT ON REVERSE PRIOR TO COMPLETING THIS FORM

LAST NAME FIRST NAME MIDDLE INITIAL (Print/Type) | GRADE/RANK | SSN

CHECK MAILING ADDRESS (Include ZIP Code) | DUTY PHONE NO

ORGANIZATION AND STATION

TRAVEL ORDERS (Paragraph, S O No , issuing Hq , Date) (Include amending orders)

PRIOR TRAVEL PAYMENTS OR ADVANCES UNDER THESE ORDERS (Amount, DO Voucher No , Date Received, Place paid, or DO Station No (If none, so state)

10 FOR DO USE ONLY

DO VOUCHER NO

SUBVOUCHER NO

PAID BY

1 ITINERARY (See Item 23 for Symbols)

DATE 19__		LOCAL TIME (24 Hour Clock)	PLACE (Home, Office, Base, Activity, City and State, City and Country, etc)	MODE OF TRAVEL	REASON FOR STOP	2. COST OF LODGING	3 NUMBER OF MEALS GOVT	3 NUMBER OF MEALS DED *	3 NUMBER OF MEALS OPEN MESS	4 POC MILES
	DEP									
	ARR									
	DEP									
	ARR									
	DEP									
	ARR									
	DEP									
	ARR									
	DEP									
	ARR									
	DEP									
	ARR									
	DEP									
	ARR									

COMPUTATIONS

5 REIMBURSABLE EXPENSES/CHARGE FOR DEDUCTIBLE MEALS * (See Item 24)

DATE	NATURE AND EXPLANATION	AMT CLAIMED	ALLOWED

SUMMARY OF PAYMENT

Per Diem	
Actual Expense	
Mileage or Transp Allowances	
Reimbursable Expenses	
Total Entitlement	
Less Previous Payments	
Less Voucher Deductions	
Amt Charged to Acctg Class	

6 Long distance telephone calls are certified as necessary in the interest of the Government — APPROVING OFFICER (31 USC 680a)

7 TR S/MTA S/MT'S (If none, so state)

NUMBER	FROM	TO

11 PAYMENT DESIRED ☐ CHECK ☐ CASH

8 LEAVE STATEMENT _____ days _____ hours taken between _____ and _____

12 ☐ PER DIEM REQUESTED

9 POC TRAVEL ☐ OWNER/OPERATOR (See Item 22d) ☐ PASSENGER

13 BAS RATE

PENALTY The penalty for willfully making a false claim is A MAXIMUM FINE OF $10 000 OR MAXIMUM IMPRISONMENT OF 5 YEARS, OR BOTH (U S Code, Title 18 Section 287)

I hereby claim any amount due me The statements on face, reverse and attached are true and complete Payment or credit has not been received

14 SIGNATURE OF CLAIMANT — DATE

15 ACCOUNTING CLASSIFICATION

16 COLLECTION DATA

17 COMPUTED BY	18 AUDITED BY	19 TVL ACRD POSTED BY	20 RECEIVED (Payee signature and date or check no)	21 AMOUNT PAID

DD FORM 1 JUN 78 1351—2 EDITION OF 1 JUL 65 WILL BE USED UNTIL EXHAUSTED

Exception to SF 1012 and 1012a approved by NARS, GSA April 1978.

Figure B-3. DD form 1351

LIST OF REFERENCES

1. Blythe Software, *Integrated Development Environment Series*, OMNIS SEVEN, 1991.

2. Ditri, T. A., *Upgrade and Enhancement of the A.S. Department Financial Management Information System; Development of the FMIS Property Management Module*, Master's Thesis, Naval Postgraduate School 1991.

3. Kroenke, M. and Dolan, A., *Database Processing*, 3rd ed., Macmillan, Inc., 1988.

4. Saunders, K. M , *The Relational Database Advisor, Elements of PC Database Design*, Windcrest/McGraw-Hill, 1992.

5. Whitten, Bentley and Barlow, *Systems Analysis and Design*, 2nd ed., Irwin 1989.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Library, Code 52 Naval Postgraduate School Monterey, CA 93943-5002	2
2.	Computer Technology Programs, Code 37 Naval Postgraduate School Monterey, CA 93943-5000	2
3.	Department of Administration Sciences, Code AS Naval Postgraduate School Monterey, CA 93943-5002	1
4.	Professor Tung X. Bui, Code AS/BU Naval Postgraduate School Monterey, CA 93943-5002	1
5.	Professor Shu Liao, Code ASLC Naval Postgraduate School Monterey, CA 93943-5002	1
6.	LT Matthew C. Ragan 17205 S.E. 238th St. Kent, WA 98042	1