

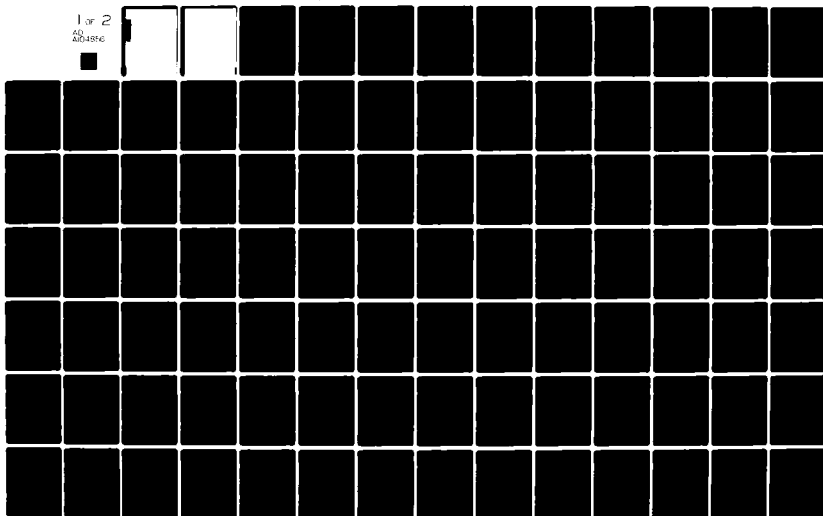
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DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/6 15/5
TRADES: A COMPUTER SIMULATION DEPICTING CARGO SHIPMENT AND TRAN--ETC(U)
SEP 81 P E FRIEDENBERG, R E MELTON, W GRAY
DTNSRDC-81/066

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER DTNSRDC-81/066	2. GOVT ACCESSION NO. AD-A104	3. RECIPIENT'S CATALOG NUMBER 856
4. TITLE (and Subtitle) TRADES: A COMPUTER SIMULATION DEPICTING CARGO SHIPMENT AND TRANSFER ASHORE.		5. TYPE OF REPORT & PERIOD COVERED Final
7. AUTHOR(s) Paul E. Friedenber Raymond E. Melton Michael Gray		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS David W. Taylor Naval Ship Research and Development Center Bethesda, Maryland 20084		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Work Unit 1800-002
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE September 1981
		13. NUMBER OF PAGES 127
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Shipping, simulation, over-the-beach, cargo, military		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) TRADES simulates cargo shipment between ports for two modes of operation, commercial and military over-the-beach cargo movement. This event-storing simulation, written in FORTRAN IV, accepts (as input data) ports, itineraries, cargo types and quantities, numbers of ship types, cargo transfer rates, and unit costs. The execution routines compute the time-distance-tonnage relationships for stated input data to establish cargo (Continued on reverse side)		

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This report describes the model's logic elements and all the inputs needed by the TRADES model.

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ABSTRACT

TRADES simulates cargo shipment between ports for two modes of operation, commercial and military over-the-beach cargo movement.

This event-storing simulation, written in FORTRAN IV, accepts (as input data) ports, itineraries, cargo types and quantities, numbers of ship types, cargo transfer rates, and unit costs. The execution routines compute the time-distance-tonnage relationships for stated input data to establish cargo loaded, transloaded, and off-loaded at each port; queue characteristics; utilization of ships; and system operating costs. The output can provide entire histogrammic summaries at specified simulation intervals in desired formats for information at port for the entire system.

This report describes the model's logic elements and all the inputs needed by the TRADES model.

ADMINISTRATIVE INFORMATION

The TRADES model was developed for use in the Merchant Shipping and Transfer Craft Requirements in Support of Amphibious Operations project, initiated by the Research and Technology Division of the Naval Supply Systems Command (NAVSUP 043). Technical guidance was provided by the Planning and Studies Division, Development Center, Marine Corps Development and Evaluation Command. The David W. Taylor Naval Ship Research and Development Center (DTNSRDC) undertook the project in FY 77. The Logistics Division (Code 187) of the Computation, Mathematics and Logistics Department was the performing organization.

INTRODUCTION

Current Department of Defense contingency military planning includes plans for amphibious operations involving the establishment of beachheads in overseas arenas. Once such a beachhead is established, U.S. Forces operating from the beachhead area, or Amphibious Operations Area (AOA), require continuing logistical support. Such support would be provided by the Military Sealift Command (MSC), utilizing ships directly under its command and merchant ships it has under contract which may be called into service when required under military contingencies as contractually specified.

The specific operational characteristics of the MSC fleet need to be defined as accurately as possible before its actual deployment. A digital computer simulation, TRADES, has been written for this purpose. Although TRADES can simulate all phases of cargo handling, including cargo generations, ship loading, overseas transport, ship unloading, ship-to-shore cargo transportation, and offloading of cargo at the beachhead, the emphasis is on the ship-to-shore phase of the operation.

BACKGROUND

At its start the project on Merchant Shipping and Transfer Craft Requirements for Support of Amphibious Operations used the Requirements Evaluated Against Cargo Transportation (REACT) model developed by Research Associates Incorporated for the Integrated Sealift Study. REACT simulates the movement of ships transporting cargo among a group of ports, and its use assumes that port facilities are available. However, it is possible that port facilities would be unavailable, necessitating the delivery of cargo over-the-beach. The ships would then have to be unloaded offshore and the cargo delivered ashore by transfer craft. The TRADES Model, developed for use in the Merchant Ship Project* to determine merchant ship and transfer craft force levels for various scenarios, was used to evaluate ship and transfer craft requirements by simulating their operations.

*Gray, M., "Merchant Shipping and Transfer Craft Requirements in Support of Amphibious Operations," DTNSRDC Report 77-0039 (Apr 1977).

MODEL DESCRIPTION

SHIPS

This simulation accepts as input ports, number of ships and their types, cargo types and quantities, cargo transfer rates, and unit costs. The output can provide entire histographic summaries depicting shipping activities and cargo movement at specified simulation intervals in desired formats.

The basic role of a ship in the simulation is to carry cargo from ports of origin to destinations. Each ship in the simulation has two characteristics, its type (physical description), and its mode of operation (transport pattern). Ship types and transport patterns (i.e, itinerary or non-itinerary port schedules) determine ship utilization and cargo delivery.

Ship Types

A ship's type is defined by its physical characteristics, cargo preferences, and berthing requirements. The following characteristics determine a ship type:

- o Speed
- o Shipping capacity - weight and volume
- o Draft
- o Transfer systems
- o Berthing facility preference

The ship types considered by TRADES are roll-on/roll-off (RORO) ships, barges or lighter carriers (LASH ships), tanker ships, break bulk (BB) ships, and container ships.

Itinerary Ships

An itinerary ship is one assigned to a predetermined (set by input) port schedule, called an itinerary, which is an ordered list of ports. Itinerary ships service all ports on their itinerary in the order in which the ports appear. Because cargo does not control the operation of itinerary ships, it is possible for a ship to enter and leave a port on its itinerary without transferring any cargo.

EXAMPLE: A ship has an itinerary of ports A, B, C, and D. The ship starts its service cycle at port A and services port B, C, and D in that order. When the ship has completed service at the last port on the itinerary, port D, it returns to port A, and continues its service cycle.

Non-Itinerary Ships

A non-itinerary ship is one whose operation in the simulation is determined by the quantity of cargo to be moved and the space required to move that cargo. Non-itinerary ships enter a ship pool at their respective availability times. These ships leave the pool only when they are needed to move cargo and return to the pool when they are not needed. The ship pool is discussed later. The schedule of a non-itinerary ship is determined by the destination ports of the cargo the ship can carry.

EXAMPLE: A ship is servicing port A and is equipped to handle the following waiting cargo:

CARGO	COMMODITY TYPE	DESTINATION PORT
1		B
2		C
3		D
4		E

The following table shows the distances in nautical miles between ports A, B, C, D, and E. The quantities of cargo waiting at a port determine the schedule of a non-itinerary ship.

DISTANCE TABLE

	A	B	C	D	E
A	-	100	10	50	150
B	100	-	50	75	100
C	10	50	-	100	110
D	50	75	100	-	105
E	150	100	110	105	-

The ship will travel to the nearest port for which it has cargo. The port schedule of this non-itinerary ship is thus A to C (distance 10), C to B (50), B to D (75), D to E (105). If there is cargo waiting for shipment at ports B through E, TRADES will adjust the schedule accordingly.

Theater Operations

A theater is a group of ports to be considered as a unit. An intratheater ship loads cargo only for those ports which are in the same theater as the port generating the cargo. The ship then sails for the nearest port for which it has cargo. If it has no cargo aboard and there is any intratheater cargo at any other port in the same theater, the ship will sail to the nearest port with the largest amount of waiting cargo. If no port has intratheater cargo awaiting shipment, the ship joins the ship pool at its home port.

Ships assigned to intertheater operation load cargo generated in one theater for delivery to another theater. If its home and delivery theaters are the same, an intertheater ship can operate as an intratheater ship. Intertheater ships have the following operation options which are set by input:

- o Load cargo in home theater for delivery in another theater and return to home theater for delivery in home theater
- o Load cargo in home theater for delivery in home theater
- o Load cargo in present theater for delivery in home theater.

Both intratheater and intertheater ships search for cargo to be loaded according to the following criteria:

- o Is the cargo acceptable for this ship?
- o Is the depth of the destination port compatible with the ship draft?
- o Does the destination port have acceptable berthing and transfer facilities?

Both intratheater and intertheater ships must maintain a minimum utilization of volume and weight. If the current percentage of utilized volume and weight is less than a minimum percentage set by input and no other acceptable cargo will be available at that port for delivery within a specified time, the ship searches the other ports in its home/present theater for cargo destined for the delivery theater. If it finds an amount of acceptable cargo greater than or equal to an

amount specified by input, the ship sails for that port to load that cargo. If no such port is found, a check is made to determine whether the ship has cargo aboard. If there is no cargo aboard, the ship retires from operations and joins the ship pool at a port determined by input. If the ship has any cargo at all, it sails to the ports for which it has cargo. The closest port for which the ship has cargo is selected as the next port of call.

Ship Pool

Ships enter the pool for one of the following reasons:

- o Ships are initially placed in the pool at their availability times.
- o Ships which have been previously in normal operation enter the pool because no acceptable cargo is available for delivery.
- o Enough ships are already in service to transport the backlogged cargo. Ships entering the pool for this reason must remain in the pool for a period of time set by input.

When a ship is selected from the pool to resume operations, it is made available at its present port. If the first demand port is not the present port, the ship is available at the current time plus the travel time to the first service port.

PORTS

A port is simulated by this model in terms of berths and transfer systems. Both import and export ships at the port utilize these systems in their cargo movement. Each berth in the simulation is described by its type. The berth or facility type is defined by the general type(s) of ships, such as general freighter, non-sustaining container ship, etc., that can be accommodated at the berth. Additional descriptors for each type of facility define the transfer systems available at the facility to perform cargo operations required by the ship. The cargo handling rates reflect physical characteristics of the berths and material handling equipment.

Berth and Queue Operations

When a ship reaches a port, it must determine which type of facility to enter. Since preferred facility types are input, a check determines whether a first or second preference is available for the ship. If the first preference is available, the ship enters. If the first preference is occupied and a second preference is given and is available, the ship enters the second preference facility. If the first and second preferences are not available, the ship joins the queue (waiting line) to await service.

When a ship is in a queue, it is waiting for a specific type of facility in a particular port. If more than one ship in the queue is waiting for the same type of port facility, the ships are removed in the order in which they entered the queue. As facilities become available, each ship in the queue leaves the queue and enters the first available facility which can accommodate it. Each time a ship leaves a port, a check determines whether any other ship in the queue is waiting for the facility type just vacated. If such a ship is found, it leaves the queue and moves into the facility and its cargo transfer operations begin. The ship queue is updated each time a ship enters or leaves a port.

Over-the-Beach Operations

When a ship arrives in the AOA, its unloading is simulated. The time taken to unload the cargo is computed. The numbers of transfer craft and unloading facilities needed are added to the total numbers currently in use and subtracted from the total numbers still available for use by newly arriving ships. If the required craft and facilities are not available, the ship is put into a queue until such time as it can be accommodated.

As the ship is unloaded, its cargo is added to the total amount of cargo previously unloaded, by type, and the total amount of cargo of all types is also calculated. Loading and unloading operations for each ship type considered by TRADES are described in the following paragraphs.

Roll-on/Roll-off Ships.

Roll-on/Roll-off (Ro/Ro) ships carry wheeled vehicles. Only causeway ferries are required for unloading Ro/Ro ships. When the Ro/Ro ship arrives in the AOA, it begins unloading as soon as the causeway ferries are available. If causeway ferries are not immediately available, the Ro/Ro ship waits in a queue until they

are. Wheeled cargo rolls off the ship onto the causeway ferries, is transported to shore, and there rolls off the causeway ferries.

Barge or Lighter Carriers. Barge or lighter carriers (LASH ships) carry their cargo prepacked aboard barges which the ship discharges into the water using its own unloading equipment. After the barges have been lowered into the water, the ship is considered to be unloaded and the cargo delivered. Since the LASH ship unloads independently of any external facilities, it begins unloading immediately on arrival in the AOA and is never required to wait in a queue prior to unloading.

Tanker Ships. Tanker ships transport bulk POL (petroleum, oil and lubricants). In order to unload, they must be attached to a pipeline leading ashore. The POL is then pumped from the ship to a storage area on shore. If a pipeline is not available upon arrival of the tanker in the AOA, the tanker will be put into a queue until a pipeline is available.

Break Bulk Ships. If the ship is a break bulk (BB) ship, unloading begins only if the required ship-to-shore transfer craft (lighters or causeway ferries) and the required shoreside unloading facilities (forklifts) are available. If the required transfer craft and shoreside unloading facilities are not available, the ship is put into a queue until transfer craft and unloading facilities are available. Throughout the simulation, all transfer craft and facilities are made available to queued ships on a first-come, first-served basis.

Container ships. When a container ship arrives in the AOA, a check is made on the availability of support equipment needed to unload the ship and transport its cargo ashore. An unloading platform, normally consisting of a crane mounted aboard a barge, is required to move containers from the ship onto a transfer craft. The transfer craft may be either a lighter or a causeway ferry. As the transfer craft arrive at the shore, shoreside cranes unload the containers. Unloading of the container ship begins only when the unloading platform, ship-to-shore transfer craft, and shoreside cranes are available; otherwise, the container ship is placed in a queue until the needed equipment becomes available.

After the ship is completely unloaded, it departs for its next port, and the transfer craft and unloading facilities which it used are deleted from the lists of crafts and facilities currently in use.

CARGO

Cargo Generation

Cargo generation means that a certain type and quantity of cargo is made available at a specific time and at a specific port to be delivered to some other specified port. Cargo requirements refer to the quantity of cargo that must be carried from port of embarkation to port of debarkation. In general, the simulation moves generated cargo using the transportation resources available.

To generate cargo, the user must translate cargo items (household goods, munition, etc.) into cargo generation terminology which includes:

- o Cargo type (e.g., ammunition, chill and freeze, general, vehicles, etc.)
- o Time interval and amount of cargo to be generated at each interval
- o Ports which generate cargo
- o Ports to which cargo is to be delivered

Cargo is generated for delivery by an input time-phased schedule. The input factors which control the schedule and the amount of cargo for each generation include:

- o Frequency of generation
- o Time of initial generation
- o Statistical distribution curve type which determines the quantity of cargo generated.

Cargo is generated at most once every simulation day.

Cargo Handling Rates

The rate at which cargo is loaded or discharged from a ship is a function of the type of berthing facility, the type of transfer system used, and the type of cargo being transferred. This rate is input for each combination allowed (maximum of six types of berthing facilities, six transfer systems, and eight cargo types).

In this simulation, provision is made for adjusting of transfer rates (base rates) by other factors which affect cargo handling. Even when all factors appear to be the same, ports may have different handling rates. The base rate is modified by the input factor associated with the port at which the ship is berthed. The loading and discharging operations are assumed to require the same amount of time for operations performed using the same berth type and transfer device type. After the correct rate has been determined for a given amount of cargo, the time required to complete cargo handling is computed as a function of that rate and the amount of cargo to be moved. This time represents only the time required to load/unload the cargo. The time required to move cargo between dock and holding area is not considered.

SIMULATION LOGIC

TRADES is an event storing simulation. Such a model is based on the sequential processing of a list of procedures, each of which occurs at a stated time. Such procedures are called events. Initial events are placed on the list (stored) at the beginning of the simulation, and they in turn store the same type of event or other events on the list.

EXAMPLE: The following initial events are placed on the list for processing:

- o Generate cargo at time = 1.00 day
- o Ship arrives at port at time = 1.50 days
- o Terminate run at time = 7.00 days

A Generate Cargo event is stored for each day of the simulation; the times at which the event will occur are thus 1.00, 2.00, 3.00, etc. Arrival of a ship at a port establishes the unloading and loading cycles and the selection of the next port of call. The following events are added to the event list:

TIME (Day) EVENT LIST

- 1.50 Arrival at port (.50 to enter)
- 2.00 Unloading of ship (if one day to unload)
- 3.00 Loading of ship
- 5.50 Arrival at next port if 1.00 day for load + .50 day for transit to next port

Table 1 shows a complete event list and Figure 1, Logic Flowchart, shows the inter-relation of events and their storing sequence.

TABLE 1 - COMPLETE EVENT LIST

TIME (DAYS)	EVENT
1.00	Cargo generation
1.50	Arrival of ship
2.00	Cargo generation
2.00	Unloading cycle for this ship
3.00	Cargo generation
3.00	Loading cycle for this ship
4.00	Cargo generation
5.00	Cargo generation
5.50	Arrival of ship at next port of call
6.00	Cargo generation
6.00	Unloading cycle for this ship
7.00	End game

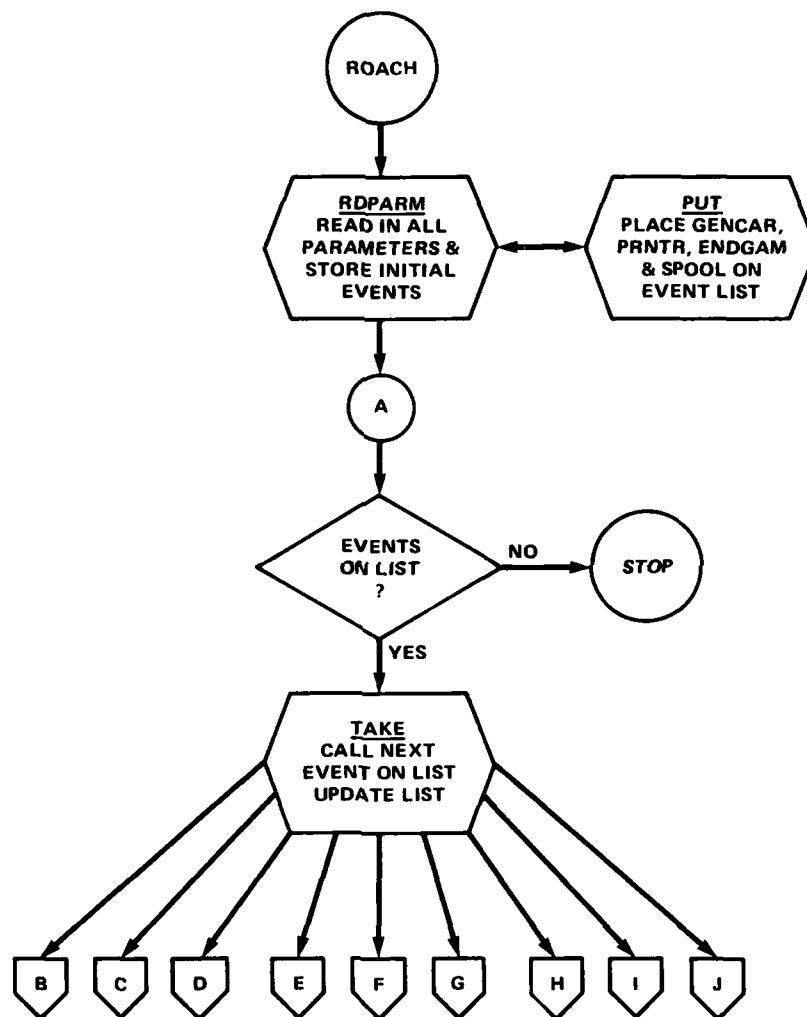
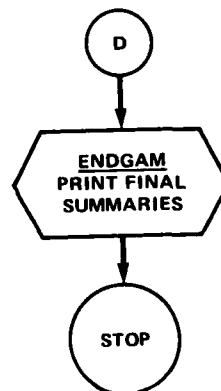
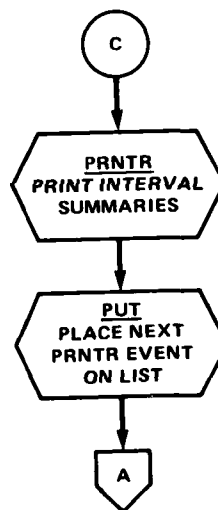
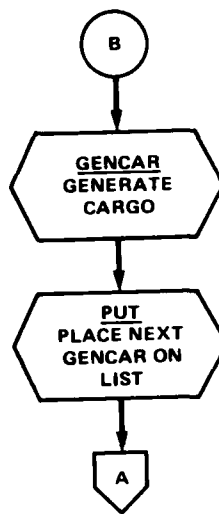
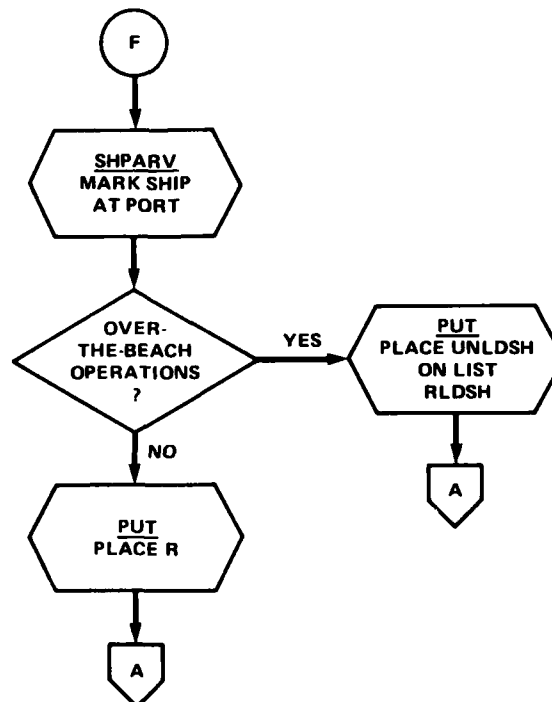
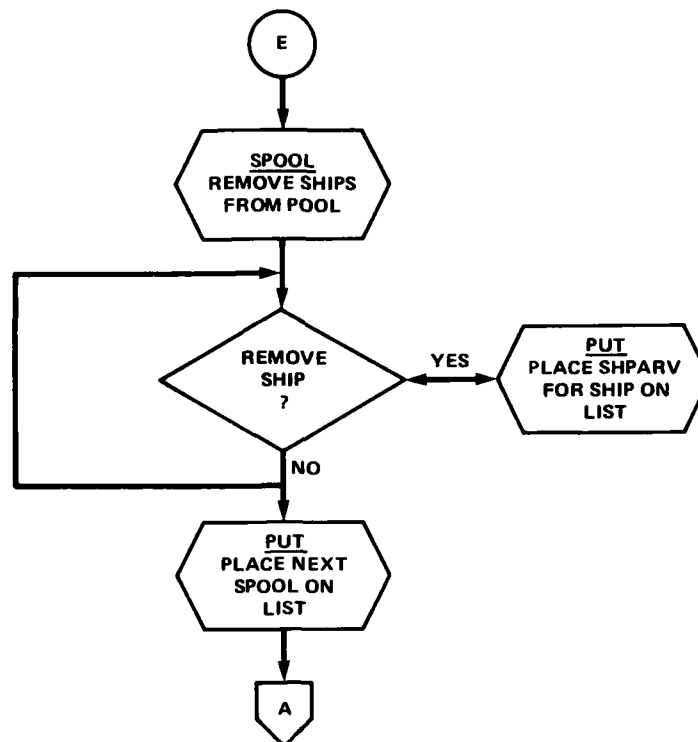
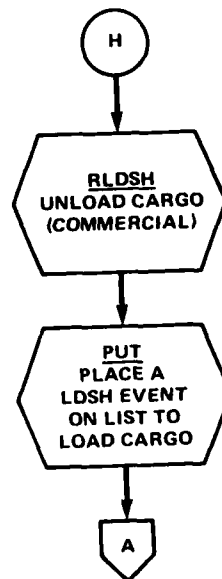
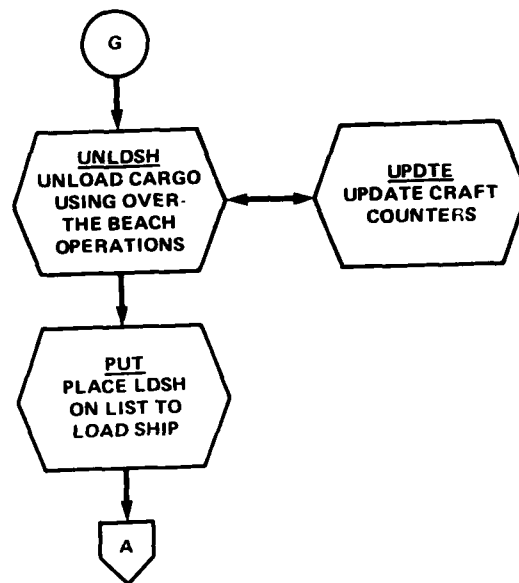
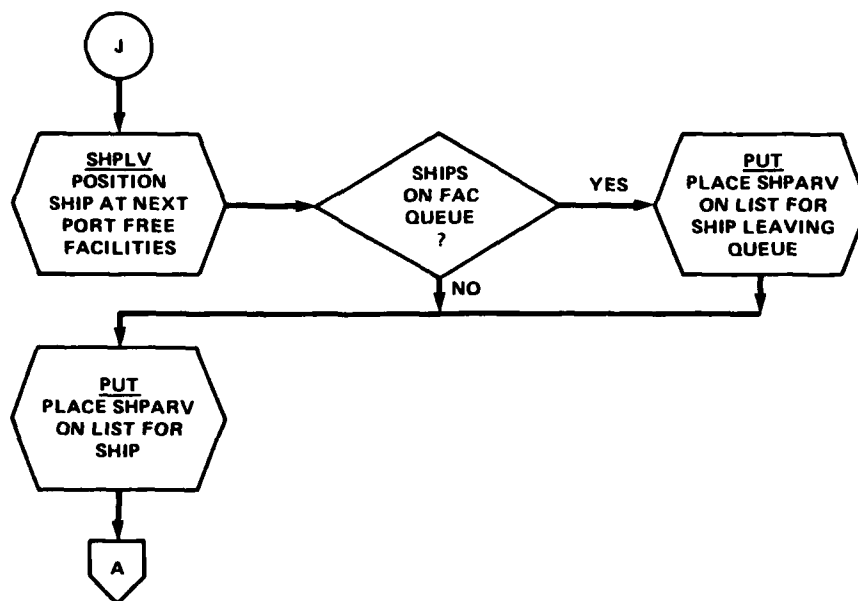
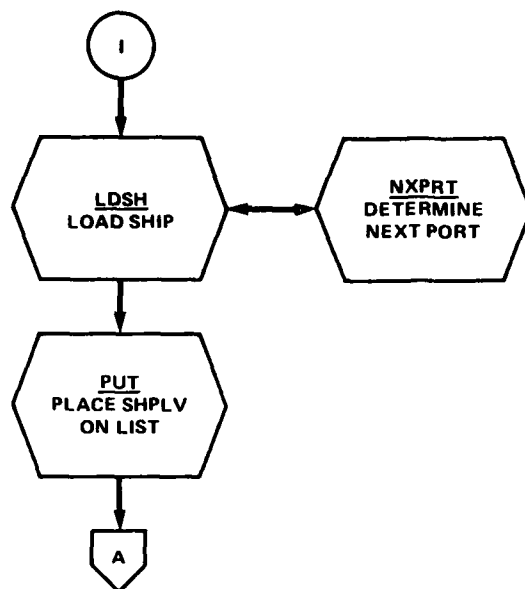


Figure 1 - Simulation Logic Flowchart









INPUT

This section describes the input necessary to run TRADES. Input parameters are grouped with respect to cargo, ship, and port descriptors.

Itinerary Card 1 (ITN1).

ITN1 indicates the numbers of itineraries to be used in the simulation. If ITN1 is blank, ITN2 cards are not used.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NITIN	1 - 3	I3	Number of itineraries in the simulation
KK	4 - 6	I3	If KK=1, only one iteration is made. If KK=7, the number of iterations is determined by SHTFLM

Itinerary Cards 2 (ITN2).

ITN2 gives the itineraries, i.e., lists of ports to be serviced in order of encounter. The maximum number of itineraries is 10, with a maximum of 10 ports per itinerary.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
PORT1,...,PORT10	1 - 30	10I3	Ports to be serviced in given order

Run Identification Card (RDENT).

RDENT is a 72-column alphanumeric code describing the run.

General Information Card (GEN).

GEN gives the values of variables necessary to execute the simulation.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NSHIPS	1 - 9	I9	Number of ships (1 to 400)
NSTYP	10 - 18	I9	Number of ship types (1 to 30)
NNPORT	19 - 27	I9	Number of ports (1 to 30)
NFACT	28 - 36	I9	Number of facility types (1 to 6)
NTEA	37 - 45	I9	Number of theaters (1 to 6)
IOUT	46 - 54	I9	Printing option indicator IOUT $\leq$ 0, landing craft summaries = 1, landing craft summaries and logic diagnostics > 1, status and final summaries only
TINVL	55 - 60	F6.0	Simulation days between status summaries
ENDTIM	61 - 66	F6.0	Time to end simulation (days)

Cargo Generation Card 1 (CARG1).

CARG1 cards give the number of cargo generations to be read (1 to 1000).

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NCARGN	1 - 10	I10	Number of cargo generations to be input (1 to 1000)

Cargo Generation Cards 2 (CARG2).

The CARG2 cards describe cargo entering the simulation, giving cargo type, origin and destination ports, and frequency of generation.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
ENDDAY	1 - 3	I3	Final day of generation
STRDAY	4 - 5	I3	First day of generation
FREQ	7 - 8	I2	Days between generations
DISTRI	9	I1	Distribution curve type indicator =1, constant =2, uniform =3, normal
TYPE	10	I1	Cargo type
ORIG	11 - 12	I2	Origin port
DEST	13 - 14	I2	Destination port
PAR1 & PAR2	15 - 24	2I5	Parameters, used with distribution curve, DISTRI

Port Information Cards (PRT).

PRT cards give the physical characteristics of each port, as well as costing factors for ships using the facility. One card is input for each port.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
FAC(I), I = 1,6	1 - 18	6I3	Number of berths of facility Type I
ITHR	19	I1	Theater
DELAY	20 - 25	F6.0	Delay time (days) in port
ADJPRT	26 - 31	F6.0	Port adjustment factor
CSTHL	32 - 37	F6.0	Handling cost (\$/day) for each day ship is at the port
DRAFT	38 - 43	F6.0	Maximum draft (ft), determines largest ship allowed to berth at the port.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
PRTNAM	44 - 55	A12	Port Name
IOVBCH	56	I1	= 1, port considered over-the-beach position and will involve over-the-beach operations. Otherwise, commercial operations are assumed.

Ship Type 1 CARDS (STYP1).

STYP1 cards give physical characteristics of classes of ships. These cards also input cost and delay factors associated with the vessel.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
SPEED	1 - 8	F8.1	Speed (knots)
CAPACW	9 - 15	F8.2	Maximum load (long tons)
CAPACV	17 - 24	F8.3	Maximum volume (measurement tons)
CSTSEA	25 - 32	F8.4	Cost per day at sea (\$/day)
CSTPRT	33 - 40	F8.5	Cost per day in port (\$/day)
DRAFT	41 - 48	F8.6	Ship draft (ft)
ADJTRN	49 - 56	F8.7	Multi-transfer system interference factor
NTRNS1 - NTRNS6	57 - 64	6I1	Transfer system type indicators = 1, ship equipped with corresponding transfer system type
NTYP	65 - 66	I2	Total number of transfer system types aboard ship
CPRF1 - CPRF5	67 - 72	6I1	Cargo type that ship is able to carry (cargo type input by user)
FAC1	73	I1	First transfer facility type preference
FAC2	74	I1	Second transfer facility type preference

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
KCHNG	75	I1	Intertheater/intratheater operations indicator = 0, ship can change both origin and delivery theaters = 1, ship can change only delivery theater = 2, ship can change neither origin nor delivery theaters

Ship Type 2 Cards (STYP2).

STYP2 cards are continuations of the STYP1 cards. They give over-the-beach characteristics of the ship type.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NLDC	1 - 6	I4	Number of landing craft required (BB ship) or number of causeway ferries required (container ship or Ro/Ro)
NTRKS	7 - 12	I4	Number of trucks required (container ship)
NFKLS	13 - 18	I4	Number of forklifts required (BB ship) or number of shoreside cranes required (container ship)
STYP	19 - 24	I4	Ship operation type indicator = 1, Breakbulk 2, Container 3, Ro/Ro 4, LASH (barge or lighter carrier)
TTRNC	25 - 30	I4	Type of transfer craft
YNDV	31 - 36	I4	Shoreside unloading device indicator =1, Forklift 2, Crane

Ship Cards (SHP).

SHP cards give ship type information, location, and mission of each individual ship to be considered in the simulation.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
TAV	1 - 3	I3	Time at which ship will be available (days)
IPRT	4 - 5	I2	Initial port at which ship will enter simulation
ITN	6 - 7	I2	Itinerary number, if ship is to follow an itinerary; otherwise, blank
OWR	9	I1	Operator of ship = 1, berth liner 2, long-term charter 3, friendly foreign
TYPE	10 - 11	I2	Ship type number
DTH	15	I1	Delivery theater
HOME	16 - 17	I2	Home port

Ship Card Modification Card 1 (MOD1).*

MOD1 gives the number of ship types to be modified.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NCT	1 - 3	I3	Number of ship types to be modified

If equal zero or blank, MOD2 and MOD4 are omitted.

Ship Cards Modification Card 2 (MOD2).

MOD2 cards give the ship types (1 to 30) to be modified.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NNTYPE(1) - NNTYPE(30)	1 - 60	30I2	Ship type number of ships to be modified

*The MOD cards allow the user to change the availability times for a specified ship type.

Ship Cards Modification Card 3 (MOD3).

MOD3 gives ship type availability times to be tested for entrance into the simulation. This option allows the modification of ship availability times by ship type. The ship availability time (TAV) given on the ship cards SHP is changed by the parameters given on the Ship Cards Modification Card 4.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NNAVAIL	1 - 3	I3	Availability time (days) to test for above ship types

Ship Cards Modification Card 4 (MOD4).

MOD4 gives the number of days to be subtracted from the ship's availability time if it is less than or equal to NNAVAIL given on MOD3.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NNNA	1 - 3	I3	Number of days by which availability time is to be decreased

Initial Supply (INSUP).

INSUP gives the amount of each type of cargo (days of supply) initially carried ashore by the assault follow-on echelon.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
XIS(I)	1 - 10	F10.0	Amount of type I cargo (measurement tons) initially carried ashore by the assault follow-on echelon. I = 1, 6

Craft and Facility Card 1 (CF1).

CF1 gives the number of ship-to-shore transfer craft, the number of shoreside unloading facilities available to unload the transfer craft, and an option for receiving buildup ashore data on punched cards as program output. See Over-the-Beach Operations, page 7.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
NTCFT	1 - 5	15	Number of types of transfer craft available
NSUFAC	6 - 10	15	Number of types of shoreside unloading facilities available
KPNCH	11 - 15		KPNCH = 1, punch output data; otherwise, no punched output

Punch Identification Card (PNCHID).

PNCHID gives the identifying information to be punched onto cards containing the buildup ashore output data.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
IDPNCH	1 - 10	A10	Identifying information to be punched onto the cards containing the buildup ashore output data.

Card and Facilities Card 2 (CF2).

CF2 gives the names of the transfer craft.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
MCFT(1), I = 1, 5	1 - 50	5(A10)	Name of transfer craft I

Craft and Facilities Card 3 (CF3).

CF3 gives the total number of transfer craft of each type that are available.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
ITCFT(I) I = 1,5	1 - 50	10I5	Number of transfer craft of type I that are available

Craft and Facilities Card 4 (CF4).

CF4 gives the capacity of each type of transfer craft, in short tons.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
XTCFT (I,1) i = 1,5	1 - 25	4F5.0	Capacity of transfer craft type I

Craft and Facilities Card 5 (CF5).

CF5 gives the speed of each type of transfer craft.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
XTCFT(I,2) I = 1,5	1 -25	5F5.0	Speed of transfer craft type I in knots

Craft and Facilities Card 6 (CF6).

CF6 gives the total number of each type of shoreside unloading facilities.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
ISUFC(I,1) I = 1,5	1 - 25	5I5	Total number of shoreside unloading facilities of type I that are available

Craft and Facilities Card 7 (CF7).

CF7 gives the unloading rate for each type of shoreside unloading facility.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
XSUFA(I) I = 1,5	1 - 25	5F5.0	Unloading rate for shoreside unloading facility type I in measurement tons per hour

Craft and Facilities Card 8 (CF8).

CF8 gives rates for offshore unloading facilities and delay times for each type of transfer craft.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
IUP(I)	1 - 5	I5	Number of offshore unloading platforms available
XUP	6 - 10	F5.0	Unloading rate for the offshore unloading platforms in measurement tons per hour
TBKRT	11 - 20	F10.0	Unloading rate for a pipeline unloading a tanker in measurement tons per hour
DTME(I)	21 - 35	3F5.0	Delay time for transfer craft type I in hours. This delay time is added to the cycle time for each type of transfer craft.

Ship Pool Status Card (SPL).

SPL gives cargo quantity criteria for ship pool activities, and the distance from ship to shore in over-the-beach operations.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
DOFFSH	1 - 5	F5.0	Distance offshore (nautical miles) for over-the-beach operations
MTSHP	6 - 20	F15.0	Minimum measurement tons of cargo waiting at its service ports before a non-itinerary ship can leave the pool
MTSHLP	21 - 35	F15.0	Minimum measurement tons of cargo required for non-itinerary ship to change service port

Iteration Card (ITR).

ITR gives information necessary to rerun the program using modified input from the previous run.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
TIMIT	1 - 10	F10.0	Time (in days) at which shortfall is tested (see SHTFLM). If no iterations are requested, TIMIT is set greater than the simulation end time.
DECR(1)-DECR(4)	11 - 50	4F10.0	Number of craft to be decremented from the total number of landing craft of the four types for each iteration
SHTFLM	51 - 60	F10.0	Maximum shortfall (amount of cargo built up at shore) allowed for next iteration. The number of landing craft is adjusted until SHTFLM is reached. If SHTFLM < 0, DEC1 - DEC4 are decremented from the numbers of the four landing craft types and the simulation is iterated until the number of landing craft necessary to meet the cargo delivery requirement is a minimum. Otherwise, the numbers of landing craft are increased until the cargo requirement is met.

Productivity Cards (PROD).

PROD cards give the transfer rates for each of the six berth facility types, considering the six transfer system types and eight cargo types. Thirty-six cards are input.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
PRODUC(I,J,K)	1 - 48	8F6.0	Transfer rates (measurement tons per day) where I represents facility type, J represents transfer device, and K represents cargo type

Distance Table Cards (DIST).

DIST gives distances in nautical miles between ports. A 30x30 port table is read using three cards per port.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
XDIST(I,J) where J=1,30 and I=1,30	1 - 60	10F6.0	Distance in nautical miles between port I and port J

Cargo Conversion Factor Card (ADJ).

ADJ gives the values needed to convert from measurement tons to short tons for each of the eight cargo types.

<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
ADJCGO(I) where I=1,8 cargo types	1 - 48	8F6.0	Conversion factor for each cargo type, MT/LT

Table 2 gives the sequence of the input cards. Cards specified as input deck A are read from file 8. Cards with input deck B are read from file 5.

TABLE 2 - SEQUENCE OF INPUT DATA

CARD IDENTIFICATION	NUMBER OF CARDS	CARD DESCRIPTION	INPUT DECK
ITN1	1	Itinerary	A
ITN2	1 to 10	Itinerary	.
RDENT	1	Run Identification	.
GEN	1	General Information	.
CARG1	1	Cargo Generation	.
CARG2	1 to 1000	Cargo Generation	.
PRT	1 to 30	Port Information	.
STYP1	1 to 30	Ship Type I	.
STYP2	1 to 30	Ship Type II	.
SHIP	1 to 100	Ship Information	.
MOD1	1	Ship Cards Modification Card 1	.
MOD2	1	Ship Cards Modification Card 2	.
MOD3	1	Ship Cards Modification Card 3	.
MOD4	1	Ship Cards Modification Card 4	.
INSUP	1	Initial Supply	.
PNCHID	1	Punch Identification Card	.
CF1	1	Craft and Facilities Card 1	.
CF2	1	Craft and Facilities Card 2	.
CF3	1	Craft and Facilities Card 3	.
CF4	1	Craft and Facilities Card 4	.
CF5	1	Craft and Facilities Card 5	.
CF6	1	Craft and Facilities Card 6	.
CF7	1	Craft and Facilities Card 7	.
CF8	1	Craft and Facilities Card 8	.
SPL	1	Ship Pool Status	.
REQ	1	Cargo Delivery Requirement	.
EOR	1	End of Record Card	.
ITR	1	Iteration	B
PROD	36	Productivity	.
DIST	90	Distance Table	.
ADJ	1	Cargo Conversion Factor	.

COMPUTER SYSTEM/RUN INFORMATION

The TRADES Model is written in FORTRAN IV and is designed to run on the CDC 6600 computer. The model requires 135K of core memory. The deck setup is given in Figure 2; Figure 3 lists the control cards necessary to make a computer run.

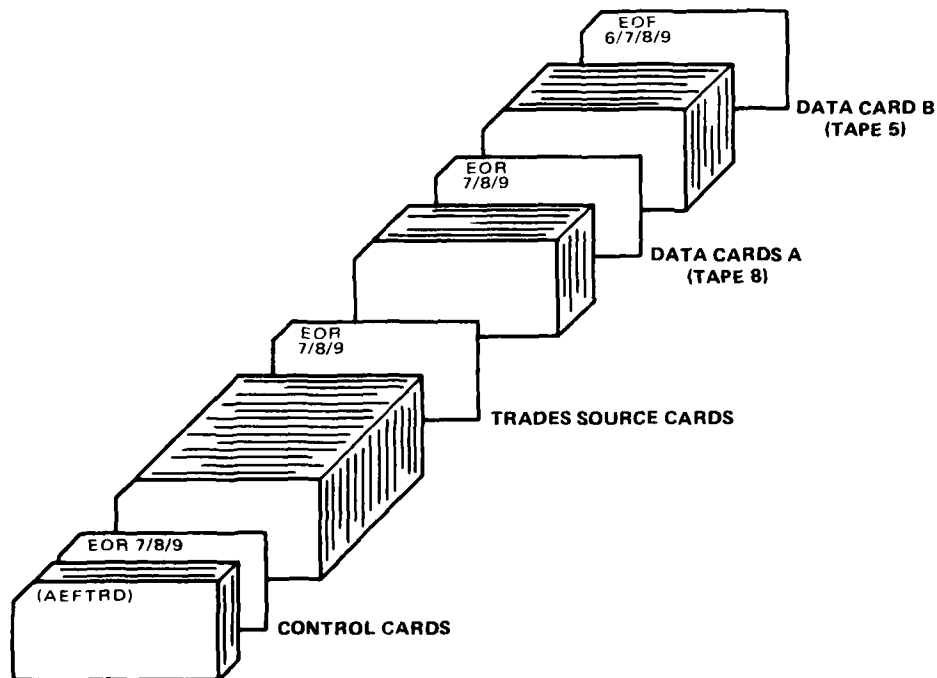


Figure 2 - Input Deck Setup

CAEFFTRD,CM135000,P2.
CHARGE,CAEF,ACCESS NO.
FTN.
CPRY CR(INPUT, TAPE()
LGO.
FOR -

FRIEDENBERG, CODE 187

TRADES/SOURCE DECK

FOR -

DECK A (DATA)

EOR

DECK B (DATA)

EOP-

Figure 3 - Control Cards

DESCRIPTION OF ROUTINES

This section gives a brief description of the TRADES routines. Flowcharts and program listings are also provided. Appendix A defines all major variables used in TRADES.

ROACH

Activity Performed: Initializes input/output files and begins execution of simulation

Type: Executive routine

Common Used: None

Called by: n/a

Stored by: n/a

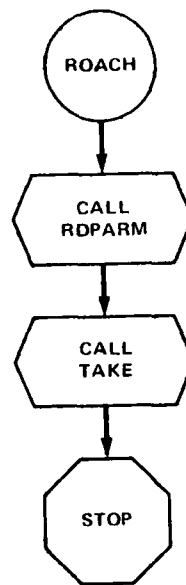
Subroutines Called: RDPARM, TAKE

Events Stored: None

Files used: Tape 5, Tape 6, Tape 8

Description

ROACH initializes input/output files to be used by the simulation. Execution of the simulation begins by calling RDPARM to input run parameters and to place initial events on the event list. ROACH calls TAKE to process events on the list.



PROGRAM ROACH 74/74 OPT=0 ROUND=+ / TRACE PAGE 1

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```

1      PROGRAM ROACH(INPUT,OUTPUT,PUNCH,TAPE6=INPUT,TAPE6=OUTPUT,
      1 TAPE5,TAPE30)
      CALL RDPARM
      CALL TAKE
      STOP
      END
5

```

```

PAU I      2
PAU I      3
PAU I      4
PAU I      5
PAU I      6
PAU I      7

```

RDPARM (ITERAT)

Activity Performed: Inputs necessary data and stores initial events

Type: Subroutine

Common Used: /CONTRL/, /SUMY/, /DONNA/, /GEN/, /CARGOG/, /SHIP/, /PORT/, /WATE/,
/B/, /BUSH1/, /BUSH2/, /PLT/

Called by: PRNTR, ROACH

Stored by: n/a

Subroutine Called: RNG

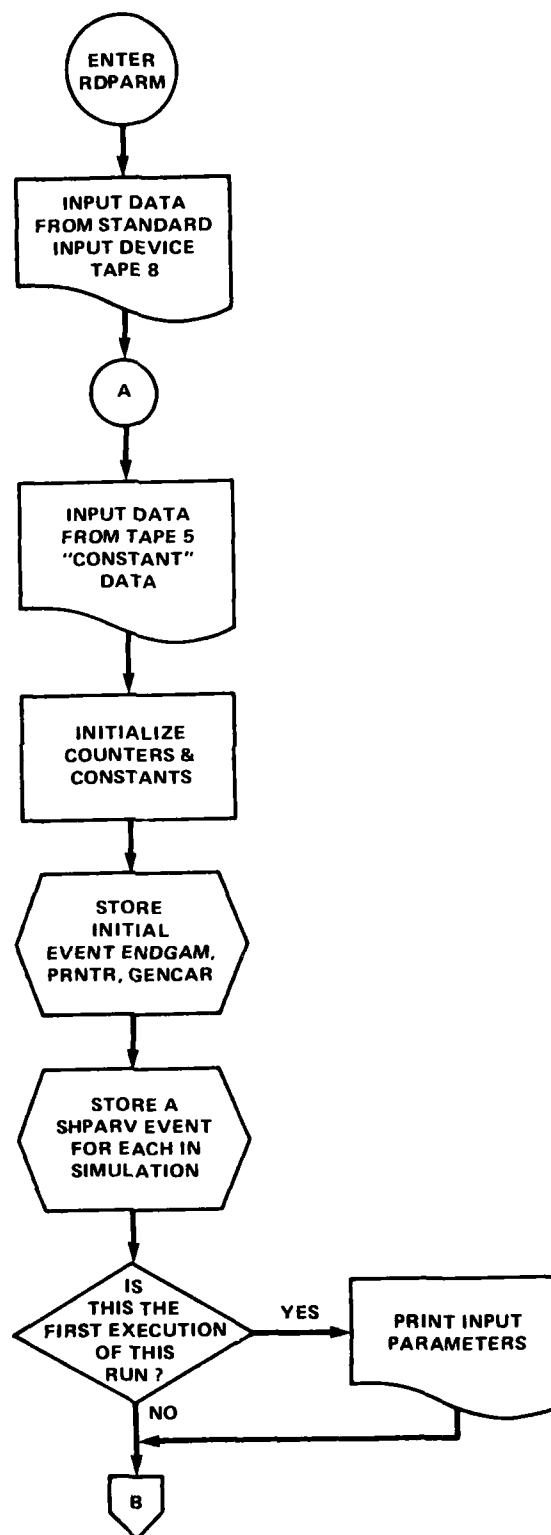
Events Stored: AVERAGE, ENDGAM, GENCAR, PRNTR, SHPARV, SPOOL

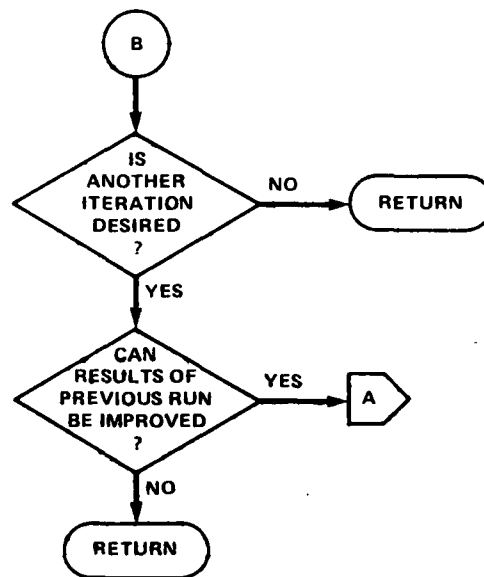
Files used: Tape 5, Tape 6, Tape 8

Description:

RDPARM inputs all data necessary to run the simulation. It starts the time/event processing by initializing control counters and placing events to be executed on the event list. Entries or events on the event list are ordered by occurrence in time.

Since TRADES is capable of simulating many cases by modifying initial input data in the same computer run, a second entry point, ITERAT, is provided. ITERAT is called from PRNTR. ITERAT initializes variables changed by the previous iteration, stores necessary events, and executes the next iteration using the modified data.





```

1      SUBROUTINE ROPARM
COMMON /CONTROL/ TINIT,SHTFL,DECR(4),XDIST(38,38),PRODUCT(6,6)
1      ACJCG(8),NTEST,LCCRF(4),MTEST,IMSAY,ICRF(4),SHTFLM
1      KX,TBT,KTBT
5      COMMON /SUMY/ SUMSHIP(30,10),SUMPT(30,10),ISMPT(30,6)
1      MSO(10,3),UTH(50),PERC(150),IAVAL(50)
1      DONNA/ ID6, IDR2, IDO, IDS, IDAFCE, IDADMN, ND
COMMON /A/ XARGC(19),YCARGO(40,9),IDSCGO(40,2),ZCARGC(19),TCARGO,
1      IOFFSH,KQUEUE(50),XQUEUE(50),QTINE(5),MQUE(5)
COMMON
10     /GEN/ TIME,TEVENT,NEVENT,KEVENT(50),RN,LVENT1,LVENT2,LVENT3,
2      NPORT,NSHIPS,TINVL,IOUT,NFACT,NSTYP,NITIN
3      IGEN,PUTL
15     /CARGO/ NCARGA,KARGEN(100,3),CARGEN(100)
2      JCARGC(100,3),CARGO(100),MSCGO,CARGC(2)
1      SHIP/NSHIP(40,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
1      PORT/PORT(30,6),IFAC(30,10)
3      IOUEUE(100,2),NQUEUE,MSE(30,30)
COMMON/MATE/ITCFT(4,2),XTCFT(4,2),ISUFAC(2,2),XSUFAC(2),IUP(2),XUP
1      KTCFT(4),XSUFAC(2),KUP,NTCFT,NSUFAC,IUPCFT(4),IUPSUF(2),IUPUP
2      INKTE
COMMON/BUISH1/DTIME(3),UNLTC(4),TTCS(4),ATTCS(4),TUNLTC(4)
COMMON /B/ KBLFT,KSSFAC,KCJUC,KCCF,KCSFAC,KCTEF,KCUP,IAVRGE
1      /PLT/ XAX(110),KY(110,7),IPLT,AA
25     COMMON/BUISH2/NMCT(5),KPMCH,XIS(9),IDPMCH
DIMENSION ITEMF(12),CARG(4),CMGTM(3),TEMP(10),PRTNAM(30,2)
1      XDENT(12),NNTYPE(40)
DATA (CARG(I),I=1,4) /6MINITIAL,6M CONST,6MUNIFCR,6MHNORMAL/
DATA (CMGTM(I),I=1,3) /4MBOIM,4MDOVR,4MNONE /
30     C READ AND WRITE ALL INPUT PARAMETERS
      REWIND 5
      REAC(R,500) TINIT,DECR,SHTFLM
5000  FORMAT(6F10.0)
      WRITE(6,5001) TINIT,DECR,SHTFLM
5001  FORMAT(1M1,4X,"TIME TO TEST SHORTFALL =",F10.0," DAYS",
1      " , LANDING CRAFT DECREMENT =",F10.0," , MAX SHORTFALL =",F10.0)
      READ(8,10) ((PRODUCT(I,J,K),K=1,8),J=1,6),I=1,6)
10     FORMAT(8F6.0,32X)
      READ(8,11) ((XDIST(I,J),J=1,30),I=1,30)
11     FORMAT(18F6.0,20X)
      READ(8,13) ACJCG
13     FORMAT(8F6.0)
      WRITE(6,101) ((PRODUCT(I,J,K),K=1,8),J=1,6),I=1,6)
101    FORMAT(77M1 PRODUCTIVITY RATES BASED ON CARGO TYPE, TRANSFER SYSTE
1M AND FACILITY TYPE / (8F12.0) )
      WRITE(6,102) ((XDIST(I,J),J=1,30),I=1,30)
102    FORMAT(17/30M DISTANCE MATRIX FOR 30 PORTS / (10F12.0) )
      WRITE(6,104) ACJCG
104    FORMAT(17/40M CONVERSION FACTORS FOR EACH CARGO TYPE (MT/LT) /
1      8F12.2//)
      GO TO 5002
      ENTRY ITERAT
      TEST FOR STOP AFTER CNE ITERATION
      IF(KX.EQ.7) STOP
5002  REAC(5,14) NITIN,KX,KTAV
      *B*=C.
      KTBT=0

```

```

        IF (INITIN.LE.0) GO TO 142
        READ(5,14) ((ITIN(J,K),K=1,10),J=1,NITIN)
        14 FORMAT(10I3)
        142 READ(5,17) (ROENT(I),I=1,12)
        17 FORMAT(12A6)
        2000 FORMAT(1M1,4X,12A6,24(/),
        151X,'REQUIREMENTS EVALUATED AGAINST'
        1 /51X,'CARGO TRANSPORTATION (REACT)')
        IF (INTTEST.LE.0) WRITE(6,2000) ROENT
        READ(5,48) NSHIPS,NSTYP,NMPORT,NFACT,NTEA,IOUT,TINVL,ENDTIM
        TINSAV=TINVL
        48 FORMAT(6I9,3F6.0)
        70 READ(5,1114) NCARGN
        1114 FORMAT(5I10,30X)
        DO 143 I=1,NCARGN
        READ(5,401) (ITEMP(J),J=1,3)
        KARGEN(I,1)=MOD(ITEMP(1)/10000,10)*MOD(ITEMP(1)/100,100)*10
        1+MOD(ITEMP(1),100)*1000+MOD(ITEMP(1)/10000,10)*10**5
        KARGEN(I,1)=KARGEN(I,1)+MOD(ITEMP(1)/10000,10)*10**9
        KARGEN(I,2)=MOD(ITEMP(2),10000)*ITEMP(2)/100000*10**7
        KARGEN(I,3)=(ITEMP(1)/10**11)*10**10+MOD(ITEMP(1)/10**8,1000)*1000
        143 CONTINUE
        1401 FORMAT(114,2I10)
        DO 1143 I=1,NMPORT
        READ(5,41) IFAC(I,3),IFAC(I,2),IFAC(I,1),IFAC(I,6),IFAC(I,5),
        1 IFAC(I,4),MPORT(I,1),TEMP(I),J=1,4),PRTNAM(I,1),PRTNAM(I,2)
        2,NPORT(I,5)
        41 FORMAT(6I3,11,4F6.0,2A6,11,24X)
        MPORT(I,2)=TEMP(I)*100.
        MPORT(I,3)=TEMP(I,3)
        MPORT(I,4)=TEMP(I,4)
        1143 MPORT(I,6)=TEMP(I,2)*1000
        DO 144 I=1,NSTYP
        READ(5,42) (TEMP(J),J=1,7),MTSHP2(I,6),MTSHP2(I,5),MTSHP2(I,4),
        2 MTSHP2(I,3),MTSHP2(I,2),MTSHP2(I,1),MTSHP2(I,7),MTSHP2(I,6),
        3 MTSHP2(I,5),MTSHP2(I,4),MTSHP2(I,3),MTSHP2(I,2),MTSHP2(I,1),
        4 MTSHP2(I,9),MTSHP2(I,10),MTSHP2(I,9)
        READ(5,1144) (MTSHIP(I,J),J=1,22)
        1144 FORMAT(6I4)
        MTSHIP(I,11)=TEMP(I,3)
        MTSHIP(I,12)=TEMP(I,2)
        MTSHIP(I,13)=TEMP(I,6)
        MTSHIP(I,14)=TEMP(I,1)
        MTSHIP(I,15)=TEMP(I,4)
        MTSHIP(I,16)=TEMP(I,5)
        MTSHP2(I,8)=TEMP(I,7)*1000.
        144 CONTINUE
        142 FORMAT(7F8.8,12,5I1,2X,6I1,3I1,5X)
        READ(5,43) (NSHIP(I,6),NSHIP(I,2),NSHIP(I,7),NSHIP(I,1),
        1 NSHIP(I,1),NSHIP(I,5),NSHIP(I,3),I=1,NSHIPS)
        43 FORMAT(4I3,2I2,1X,11,12,3X,11,12,12X)
        READ(5,501) NCT
        501 FORMAT(I3)
        502 FORMAT(40I2)
        READ(5,502) (NNTYPE(I),I=1,NCT)
        READ(5,501) NNAVAL
        READ(5,501) NNMA

```

```

115      READ(5,503) (XIS(I),I=1,7)
116      FORMAT(8F10.0)
117      READ(5,1006) ITCFT,NSUFAC,KPNCH
118      READ(5,1118) IOPNCH
119      READ(5,1118) (NMCFT(I),I=1,NTCFT)
120      FORMAT(7A10)
121      1006 FORMAT(10I5)
122      IF(NTEST.LE.0) READ(5,1006) (ITCFT(I),I=1,NTCFT)
123      IF(NTEST.GT.0) READ(5,1006) (ITEMP(I),I=1,4)
124      READ(5,802) XTCFT(I,1),I=1,NTCFT)
125      READ(5,802) (XTCFT(I,2),I=1,NTCFT)
126      802 FORMAT(10F5.0)
127      IF(NTEST.LE.0) GO TO 8888
128      ISAVE=0
129      DO 8887 II=1,4
130      ITCFT(II,1)=LOORF(II)
131      IF(NTEST.NE.1) GO TO 8886
132      GO TO 8887
133      8886 ITCFT(II,1)=ITCFT(II,1)-DECR(II)
134      IF(ITCFT(II,1).GT.0) GO TO 8887
135      ISAVE=ISAVE+1
136      ITCFT(II,1)=0
137      8887 CONTINUE
138      IF(ISAVE.EQ.4) STOP
139      READ(5,1006) (XSUFAC(I,1),I=1,NSUFAC)
140      READ(5,802) (XSUFAC(I),I=1,NSUFAC)
141      READ(5,803) IUP(1),XUP,TNKRT,OTME
142      803 FORMAT(15,F5.0,F10.0,3F5.0)
143      READ(5,1010) DOFFSH,(CARGC(J),J=1,2)
144      1010 FORMAT(F5.0,2F15.0)
145      READ(5,2001) IGEN,PUTL
146      2001 FORMAT(15,F10.2)
147      READ(5,100) IDP,IDR2,IMD,IDS,IDAFOE,IDAOWN,ND
148      100 FORMAT(7I3)
149      C
150      COMPUTE UNLOADING TIME FOR EACH TYPE OF TRANSFER CRAFT (IN HOURS)
151      UNLTC(1)=XTCFT(1,1)/XSUFAC(1)
152      UNLTC(2)=XTCFT(2,1)/XSUFAC(1)
153      UNLTC(3)=XTCFT(3,1)/XSUFAC(2)
154      UNLTC(4)=XTCFT(3,1)/2718.
155      DO 3L4 I=1,NSUTYP
156      ITC=M*SHIP(I,21)
157      ITSUF=MTSHIP(I,22)
158      CHECK IF SHIP IS BREAK BULK
159      IF(MTSHIP(I,20).NE.1) GO TO 200
160      SHIP IS BREAK BULK
161      COMPUTE PRODUCTIVITY FOR TRANSFER CRAFT
162      X1=XTCFT(ITTC,1)/60.
163      X2=2.*DOFFSH/XTCFT(ITTC,2)
164      X3=XTCFT(ITTC,1)/XSUFAC(ITSUF)
165      PRORTE=XTCFT(ITTC,1)/(X1+X2+X3)
166      COMPUTE NUMBER OF TRANSFER CRAFT REQUIRED TO UNLOAD SHIP
167      MTSHIP(I,17)=240./PRORTE+1.
168      COMPUTE NUMBER OF SHORESIDE UNLOADING FACILITIES REQUIRED
169      X4=MTSHIP(I,17)
170      MTSHIP(I,19)=(X4*PRORTE)/XSUFAC(ITSUF)+1.
171      GO TO 300
172      C
173      CHECK IF SHIP IS CONTAINERSHIP

```

```

175      200 IF(MTSHIP(I,20).NE.2) GO TO 210
          C SHIP IS CONTAINERSHIP
          C COMPUTE PRODUCTIVITY FOR TRANSFER CRAFT
          X1=XTCFT(IITTC,1)/XUP
          X2=2.*DOFFSM/XTCFT(IITTC,2)
          X3=XTCFT(IITTC,1)/XSUFAC(IISUF)
          PRORTE=XTCFT(IITTC,1)/(X1+X2+X3)
          C COMPUTE NUMBER OF TRANSFER CRAFT REQUIRED TO UNLOAD SHIP
          MTSHIP(I,17)=XUP/PRORTE+1.
          C COMPUTE NUMBER OF SHORESIDE UNLOADING FACILITIES REQUIRED
          X4=MTSHIP(I,17)
          MTSHIP(I,19)=(X4*PRORTE)/XSUFAC(IISUF)+1.
          GO TO 300
185      C CHECK IF SHIP IS RO/RO
          C 210 IF(MTSHIP(I,20).NE.3) GO TO 300
          C SHIP IS RO/RO
          C COMPUTE PRODUCTIVITY FOR TRANSFER CRAFT
          X1=XTCFT(IITTC,1)/2714.
          X2=2.*DOFFSM/XTCFT(IITTC,2)
          X3=XTCFT(IITTC,1)/2718.
          PRORTE=XTCFT(IITTC,1)/(X1+X2+X3)
          C COMPUTE NUMBER OF TRANSFER CRAFT REQUIRED TO UNLOAD SHIP
          MTSHIP(I,17)=2710./PRORTE+1.
195      C 300 CONTINUE
          C INITIALIZE VARIABLES
          CALL RNG1
          C STORE INITIAL EVENTS
          TEVENT=1.0
          LVENT=1.0
          CALL PUT
          TEVENT=5.0
          LVENT=5.0
          CALL PUT
          TEVENT=ENDTIM
          LVENT=0
          CALL PUT
          LVENT=1.0
          TSP=999.
          DO 20 I=1,NSHIPS
            NSHIP(I,6)=NSHIP(I,6)+100
            TEVENT=FLOAT(NSHIP(I,6)).*-.01
            IP=NSHIP(I,3)
            NSHIP(I,4)=NPORT(IP,1)
            IF(TSP.GT.TEVENT) TSP=TEVENT
            IF(NSHIP(I,15).NE.2) GO TO 3333
            TEVENT=TEVENT+NNNA
            GO TO 403
          3333 DO 4033 J=1,NCT
            IF(NSHIP(I,1).EQ.NNT NPE(J)) GO TO 4333
          4033 CONTINUE
            GO TO 40333
          43333 IF(TEVENT.LE.NNAVAL) GO TO 4031
          40333 TEVENT=200.
            GO TO 403
          4031 IF(NSHIP(I,15).NE.3) TEVENT=TEVENT+NNNA
          403 NSHIP(I,6)=TEVENT+100.
            LVENT=2.0

```

07/23/81 09:54:22

FTN 4.8+508

74/74 OPT=8 ROUND=0/ TRACE

SUBROUTINE ROPARM

```

230      LVENT3=NSHIP(I,2)
231      LVENT1=2
232      CALL PUT
233      ITYPE=NSHIP(I,1)
234      NSHIP(I,9)=FLOAT(MTSHIP(ITYPE,11))*PUTL
235      NSHIP(I,8)=MTSHP2(ITYPE,9)
236      NSHIP(I,10)=MTSHIP(ITYPE,12)
237      NSHIP(I,11)=1
238      20 CONTINUE
239      IF (ND.GT.0) TSP=NO
240      TEVENT=TSP+.001
241      CALL PUT
242      LVENT1=7
243      CALL PUT
244      TEVENT=1.
245      LVENT1=10
246      CALL PUT
247      IF (NTEST.GT.0) GO TO 6666
248      WRITE(6,60) (ROENT(I),I=1,12),NSTYP,NSHIPS,NTEA,NMPORT,NFACT,
249      1NITIN,TINVL,ENDTIM,TINVL
250      60 FORMAT (32H1 G E N E R A L I N P U T S //16X,25HDATA IDENTIFI
251      1CATION IS 12A6//6X,2HNUMBER OF SHIP TYPES IN GAME 8X,1H=,17/
252      26X,23HNUMBER OF SHIPS IN GAME 13X,1H=,17/6X,26HNUMBER OF THEATRES
253      3IN GAME 10X,1H=,17/6X,23HNUMBER OF PORTS IN GAME 13X,1H=,17/6X,32HNU
254      4MBER OF FACILITY TYPES IN GAME 4X,1H=,17/6X,29HNUMBER OF ITINERARIES
255      5IN GAME 7X,1H=,17/6X,68HTIME INTERVAL BETWEEN PERIODIC SYSTEM STA
256      6TUS PRINTOUT (IN DAYS) IS 7.0//6X,44HTIME FOR MAXIMUM LENGTH OF
257      7PLAY IN DAYS IS 7.0 // 6X,45H FIRST SYSTEM STATUS PRINTOUT (+N D
258      8AYS) IS AT 7.0 //)
259      IF (NITIN)
260      621.621.6101
261      6101 WRITE(6,611)
262      611 FORMAT(6X,16HITINERARY INPUTS//,10X,13HITINERARY NO., 8X,28HPORTS
263      1ON ITINERARY(IN ORDER) / )
264      DO 615 I=1,NITIN
265      615 I=1,NITIN
266      WRITE(6,614) I,(ITIN(I,J),J=1,10)
267      614 FORMAT(15X,12, 14X,10I6)
268      615 CONTINUE
269      621 WRITE(6,63)
270      63 FORMAT(36H1...P O R T I N F O R M A T I O N //10X,4HPORT,11X,
271      17HTHEATRE,4X,4HPORT,6X,6HADJUST,4X,5HCARGO,5X,4HMAX.,5X, 9X,
272      234HNO. FACILITIES AVAILABLE (BY TYPE) / 25X,7HOF PORT,4X,5HDELA Y,
273      36X,3HFOR,6X,6HPANOLE,4X,5HSDRAFT /36X,4HTIME,6X,6HPRODUC
274      4X,6HCST/DA,4X,4HIFT),5X, 9X,2H 1,4X,2H 2,4X,2H 3,4X,2H 4,
275      5X,2H 5,4X,2H 6/36X,6H(DAYS)5X,4HHRATE,5X,5H( $ ) //)
276      DO 65 I = 1,NMPORT
277      65 I = 1,NMPORT
278      TEMP(1)=FLOAT(NMPORT(I,2))*01
279      TEMP(2)=FLCAT(NMPORT(I,6))*011
280      TEMP(3)=NMPORT(I,4)
281      TEMP(4)=NMPORT(I,3)
282      WRITE(6,66) I,PRTNAM(I,1),PRTNAM(I,2),NMPORT(I,1)
283      1,('TEMP(J),J=1,4),(IFAC(I,J),J=1,6)
284      66 FORMAT( 6X, 12, 2X,2A6,5X,13,7X,F4.1,5X,F5.3,3X,F8.0,4X,F5.0,9X,
285      1 6(3X,13)/)
286      65 CONTINUE
287      WRITE (6,70)
288      70 FORMAT(//47H ...S H I F T Y P E I N F O R M A T I O N //6X,
289      14HSHIP,3X,5HSPEDN,X,5HCARGO,X,5HCARGO,X,4HCOST,X,4HCOST,X,4HSHIP,

```

```

297 25X,SHMULTI5X,3MNO,3X,12H 8Y TYPE 4X,11MCARGO TYPES3X,8HFACILIT ROPARM
298 3Y 3X,4HTHR /6X,4MYPE , ROPARM
299 4X,5HKT515X,2MWTX,3HVOL5X,6HAT SEAX,7HIN PORT4X,5HORAFT4X, ROPARM
300 5SHTRANS5X,5HTRANS,1X,12H 1 2 3 4 5 617X,18MPREFERENCE,2X,4HCHNG / ROPARM
301 622X,4H(LT)6X,4H(MT)4X,6H(8/DA) ROPARM
302 7 5X,6H(8/DA)4X,4H(F7)5X,6HADJUST4X,4HVSYSY 3X,12H(8=NO,1=YES) / ROPARM
303 8 70X,6HFACTOR / ) ROPARM
304 DO 71 I=1,NSITY ROPARM
305 TEMP(1)=MTSHIP(I,14) ROPARM
306 TEMP(2)=MTSHIP(I,12) ROPARM
307 TEMP(3)=MTSHIP(I,11) ROPARM
308 TEMP(4)=MTSHIP(I,15) ROPARM
309 TEMP(5)=MTSHIP(I,16) ROPARM
310 TEMP(6)=MTSHIP(I,13) ROPARM
311 TEMP(7)=FLCAT(MTSHMP2(I,8))*0.001 ROPARM
312 JTEMP=MTSHMP2(I,9) ROPARM
313 DISTR = CHNGTH(JTEMP+1) ROPARM
314 71 WRITE(6,72) I,(TEMP(J),J=1,7),MTSHMP2(I,7),(MTSHMP2(I,J),J=1,6), ROPARM
315 1 (MTSHIP(I,J),J=1,5),MTSHIP(I,9),MTSHIP(I,10),DISTR ROPARM
316 72 FORMAT(9X,12,3X,F5.1,3X,F7.8,2X,F8.0,2X,F6.0,5X,F5.0,4X, ROPARM
317 1 F6.3,5X,12,3X,6(1X,11),4X,5(1X,11),6X,11,4X,11 ,3X,A4 / ) ROPARM
318 WRITE(6,4422) ROPARM
319 PRINT 1215 ROPARM
320 1215 FORMAT(3X,*SHIP TYPE CF NUMBER OF SHORESIDE NUMBER OF ROPARM
321 1 SHIP TYPE*/3X,*TYPE TRANSFER TRANSFER UNLOADING SHORES ROPARM
322 2IDE INDICATOR*/11X,*CRAFT CRAFT DEVICE UNLOADI ROPARM
323 3NG 1=88,2=CONT,*/33X,*1=FORKLIFTS DEVICES 3=R/6,4=LASH,*/ ROPARM
324 433X,*2=CRANES*/19X,*5=TANKER*//) ROPARM
325 DO 1216 I=1,NSITY ROPARM
326 1216 I=1,NSITY ROPARM
327 1216 PRINT 1217, I,MTSHIP(I,21),MTSHIP(I,17),MTSHIP(I,22),MTSHIP(I,19), ROPARM
328 1MTSHIP(I,20) ROPARM
329 1217 FORMAT(16,19,5X,16,7X,15,8X,16,8X,15) ROPARM
330 WRITE (6,740) ROPARM
331 740 FORMAT (37H1... C A R G O G E N E R A T E D // 99H NO. ROPARM
332 1 TYPE ORIGIN DESTIN FREQ DISTR1- PARAMETER PARA ROPARM
333 2METER START END /22X,4HPORT6X,4HPORT14X,6HOUTION4X,1H12X, ROPARM
334 3H28X,2(*TIME*,6X)///) ROPARM
335 DO 745 I=1,NCARGN ROPARM
336 ITEM(1)=MOD(KARGEN(I,1),10) ROPARM
337 ITEM(2)=MOD(KARGEN(I,1),10,100) ROPARM
338 ITEM(3)=MOD(KARGEN(I,1),100,100) ROPARM
339 FR=FLOAT(KARGEN(I,1)/1000000)*.001 ROPARM
340 JTEMP=MOD(KARGEN(I,1)/100000,10)+1 ROPARM
341 DISTR=CARG(JTEMP) ROPARM
342 ITEM(5)=MOD(KARGEN(I,2),10000000) ROPARM
343 ITEM(6)=KARGEN(I,2)/1000000 ROPARM
344 TS=FLOAT(MOD(KARGEN(I,3),10000000))*0.001 ROPARM
345 YE=FLOAT(KARGEN(I,3)/1000000)*.001 ROPARM
346 WRITE(6,744) I,(ITEMP(J),J=1,3),F.P,DISTR,(ITEMP(J),J=5,6),TS,TE ROPARM
347 744 FORMAT(2(5X,13),2(8X,12),F8.3,6X,A6,2X,10,6X,15,2F10.3) ROPARM
348 745 CONTINUE ROPARM
349 WRITE(6,75) ROPARM
350 75 FORMAT(56H1 S H I P I N I T I A L I Z A T I O N V A L U E S ROPARM
351 1// ,6X,4HSHIP4X,4HSHIP4X,4HSHIP6X,4HSHIP7X,8HDELIVERY4X,4HHOME4X, ROPARM
352 27HINITIAL,5X,4HTIME / ROPARM
353 3 6H,3MNO,5X,4HONNR4X,4HTYPE4X,9HITINERARY4X,7HTEATRE5X, ROPARM
354 4HPORT5X,4HPORT,7X,5HVAAIL //) ROPARM

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07/23/81 09.54.22

FTN 4.84508

TRACE

74/74

SUBROUTINE RDPARM

OPT=0

ROUND=*

```

345      ISAVE=NSHIP(I,2)
      NSHIP(I,4)=NPORT(ISA,1)
      DO 76 I=1,NSHIPS
        ITEM(1)=NSHIP(I,15)
        ITEM(2)=NSHIP(I,1)
        ITEM(3)=NSHIP(I,7)
        ITEM(4)=NSHIP(I,5)
        ITEM(5)=NSHIP(I,3)
        ITEM(6)=NSHIP(I,2)
      TAV=FLOAT(NSHIP(I,6))*0.01
      IF (KTAV.EQ.7.AND.TAV.LT.199.5) TAV=7.
      WRITE(6,77) I,(ITEM(N),N=1,6),TAV
355      77 FORMAT(19,218,110,113,110,112,F12.2 )
      76 CONTINUE
      6666 KTEST=NTEST+1
      IF (NTEST.EQ.1) KTEST=KTEST+1
      WRITE(6,423) KTEST,SWTFL
      423 FORMAT(1M1,4X,' ITERATION =',I4,' MIN. SWTFL =',F10.0///
        1 21X,'TRANSFER CRAFT INFORMATION')
      422 FORMAT(1M1)
      PRINT 1101
      1101 FORMAT(1M0,6X,'TYPE',7X,'NAME',6X,'NUMBER',3X,'CAPACITY',3X,
        1'SPEC(KTS)')
      DO 1102 I=1,NTCFT
      1102 PRINT 1103, I,MCFT(I),ITCFT(I,1),XTCFT(I,1),XTCFT(I,2)
      1103 FORMAT(4X,I6,5X,A10,17,4X,F8.0,F10.0)
      PRINT 1104
      1104 FORMAT(1M-,20X,'MATERIAL HANDLING FACILITIES')
      PRINT 1105
      1105 FORMAT(1M0,13X,'NAME',18X,'NUMBER',5X,'UNLOADING/LOADING RATE (MT/
        1HR)')
      PRINT 1106, ISUFAC(1,1),XSUFAC(1)
      1106 FORMAT(10X,'FORKLIFTS',15X,I6,15X,F8.0)
      PRINT 1107, ISUFAC(2,1),XSUFAC(2)
      1107 FORMAT(7X,'SHORESIDE CRANES',11X,I6,15X,F8.0)
      PRINT 1108, IUP(1),XUP
      1108 FORMAT(1X,'CONTAINER UNLOADING PLATFORMS',4X,I6,15X,F8.0)
      PRINT 1109, ITCT(4,1),TNKRT
      1109 FORMAT(7X,'TANKER PIPELINES',11X,I6,15X,F8.0)
      PRINT 1771, DOFFSH
      1771 FORMAT(1M-,5X,'DISTANCE OFFSHORE =',F7.1,' MILES')
      PRINT 422
      WRITE(6,2002) CARGC
      2002 FORMAT(//5X,'MTS REQUIRED FOR SHIP TO LEAVE POOL =',F12.2/
        15X,'MTS REQUIRED FOR SHIP TO CHANGE LOAD PORT =',F12.2)
      WRITE(6,2003) IGEN,PUTL
      2003 FORMAT(5X,'CARGO GENERATION CHECK OPTION =',I3/
        15X,'SHIP VOLUME UTILIZATION =',F7.3)
      IF (IOUT.EQ.1) WRITE(6,999)
      999 FORMAT(1M1,'TIME (DAYS)',5X,'PORT',5X,'SHIP',5X,
        1'TRANSACTION DESCRIPTION')
      RETURN
      END
395

```

AVRAGE

Activity Performed: Keeps track of the numbers of transport craft and cargo transfer facilities in use.

Type: Event

Common Used: /CONTRL/, /A/, /B/, /GEN/, /CARGOG/, /SHIP/, /PORT/, /PLT/, /WATE/

Called by: TAKE

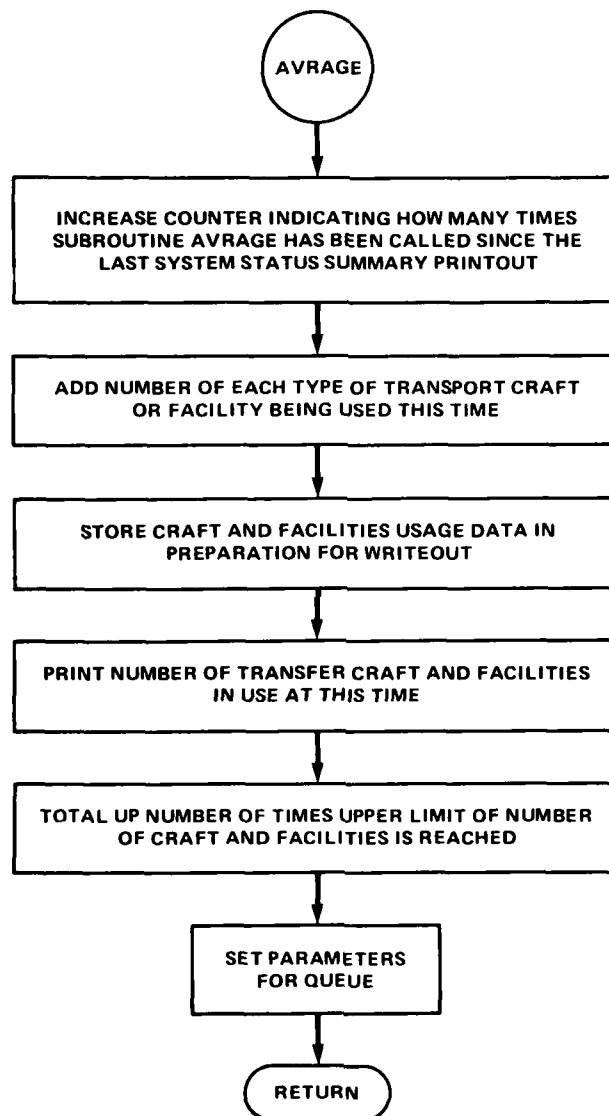
Stored by: RDPARM

Subroutines Called: PUT, MAXO

Events Stored: AVRAGE

Description:

AVRAGE stores data on transport craft and transfer facilities to be used later by PRNTR in calculating the average numbers in use. It prints current craft and facilities usage data and writes these data on a disk file. AVRAGE keeps track of the total number of times the upper limits (input) on the number of available craft and facilities are reached.



```

1  SUBROUTINE AVRAGE
COMMON /CONTROL/ TIME, SMFL, DECR(4), XOST(30,30), PRODC(16,6,8)
1  ACJGGO(18), NTEST, LDCR(4), MTEST, TMSAV, ICRF(4)
COMMON /XARGO(9), YCARGO(48,9), ICSGO(48,2), ZCARGO(19), TCARGO,
1  COFFSM, KQUE(58), KQUE(50), QTIME(5), NQUE(5)
COMMON /KELCFT, KCSFAC, KCJUC, KCCF, KCSFAC, KCTFK, KCUP, IAVRGE
COMMON
1  GEN/ TIME, TEVENT, KEVENT(500), RN, LVENT1, LVENT2, LVENT3,
2  NPORT, NSHIPS, INVL, IOUT, NFACT, NSTYP, NTIN
1  CARGOG/ NCARGO, KARGEN(1000,3), CARGEN(1000)
7, JCARGO(1000,3), CARGO(1000), NSCGO
1  SHIP/NSHIP(400,15), NTSHP(30,22), MTSHP2(30,10), ITIN(16,10)
1  PORT/PORT(30,6), IFAC(30,10)
2, IQUE(1000,2), NQUE
1  PLT/XAX(110), KY(110,7), IPLT
COMMON /MATE/ITCFT(4,2), XTCFT(4,2), XSUFAC(2,2), IUP(2), XUP
1, KTCFT(4), KSUFAC(2), KUP, NTCFT, NSUFAC, IUPCFT(4), IUPSUF(2), IUPUP
2, INKPT
C INCREASE COUNTER INDICATING HOW MANY TIMES SUBROUTINE AVRAGE HAS 8
C CALLED SINCE THE LAST SYSTEM STATUS SUMMARY PRINTOUT
C IAVRGE=IAVRGE+1
C ADD NUMBER OF EACH TYPE OF TRANSPORT CRAFT OR FACILITY BEING USED
C THIS TIME
DO 10 I=1,NTCFT
10 XTCFT(I)=XTCFT(I)+ITCFT(I,2)
DO 20 I=1,NSUFAC
20 KSUFAC(I)=KSUFAC(I)+ISUFAC(I,2)
C KUP=KUP+IUP(2)
C STORE CRAFT AND FACILITIES USAGE DATA IN PREPARATION FOR WRITEOUT
IF(NTEST.GT.0) GO TO 300
DO 200 I=1,4
200 ICRF(I)=MAX0(ICRF(I),ITCFT(I,2))
300 CONTINUE
IPLT=IPLT+1
XAX(IPLT)=TIME
KY(IPLT,1)=ITCFT(1,2)
KY(IPLT,2)=ITCFT(2,2)
KY(IPLT,3)=ITCFT(3,2)
KY(IPLT,4)=ITCFT(4,2)
KY(IPLT,5)=ISUFAC(1,2)
KY(IPLT,6)=ISUFAC(2,2)
KY(IPLT,7)=IUP(2)
IF(IOUT.GT.1) GO TO 111
PRINT NUMBER OF TRANSPORT CRAFT AND FACILITIES IN USE AT THIS TIME
PRINT 100, TIME, ITCFT(1,2), ITCFT(2,2), ITCFT(3,2), ITCFT(4,2),
1  ISUFAC(1,2), ISUFAC(2,2), IUP(2)
130 FORMAT(5X,F9.3,10X,I10)
C TOTAL UP NUMBER OF TIMES UPPER LIMIT OF NUMBER OF CRAFT AND FACILI
C IS REACHED
111 DO 110 I=1,NTCFT
110 IF(ITCFT(I,2).EQ.ITCFT(1,1)) IUPCFT(I)=IUPCFT(I)+1
DO 120 I=1,NSUFAC
120 IF(ISUFAC(I,2).EQ.ISUFAC(1,1)) IUPSUF(I)=IUPSUF(I)+1
IF(IUP(2).EQ.IUP(1)) IUPUP=IUPUP+1
C SET PARAMETERS FOR QUEUE
TEVENT=TIME*0.1
LVENT1=1C

```

CALL PUT
RETURN
END

AVRAGE 59
AVRAGE 60
AVRAGE 61

DISTRI (TYPE, PAR1, PAR2, RESULT)

Activity Performed: Computes a value, RESULT, derived from a specified distribution curve.

Type: Subroutine

Common Used: /GEN/

Called by: GENCAR

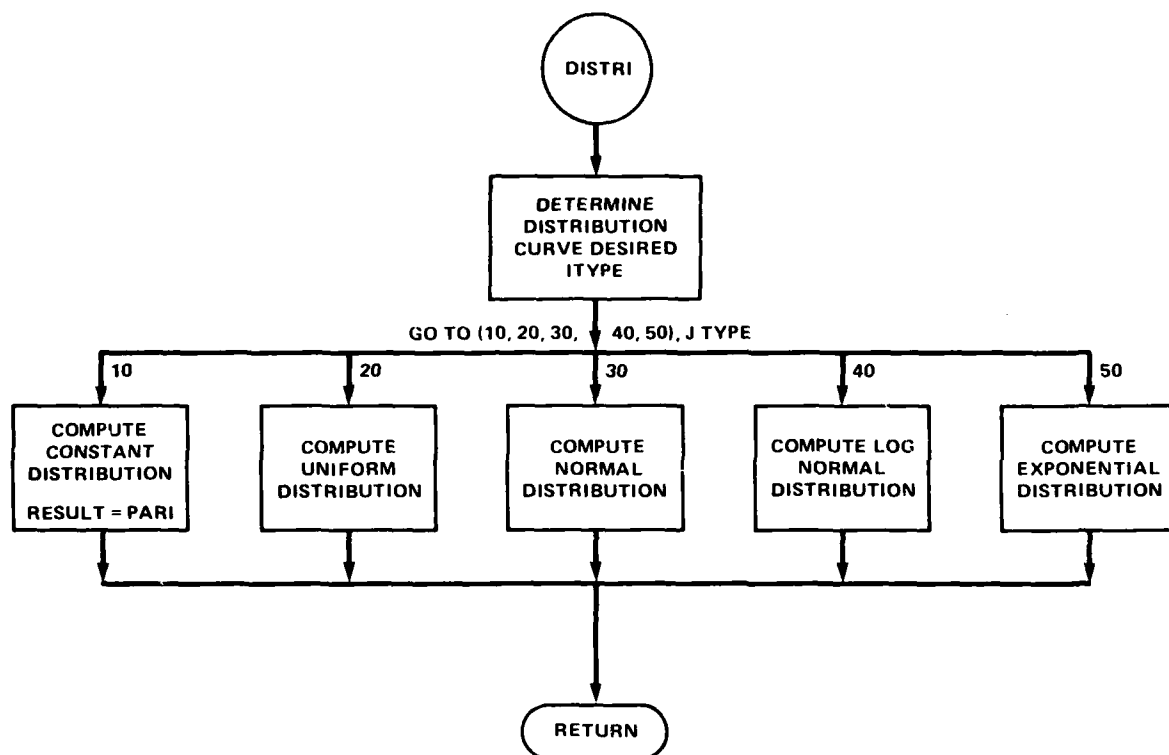
Event Stored: none

Description:

DISTRI uses the variance information given by DISTRI's calling event to compute a value derived from a specified distribution curve.

The following distributions are considered by DISTRI:

<u>Distribution Type</u>	<u>Parameter 1</u>	<u>Parameter 2</u>	<u>Random Variable</u>
Constant	Fixed value	Not used	Parameter 1
Uniform	Upper limit	Lower limit	Parameter 2 + RN* (parameter 1 - parameter 2) where RN is a random number between zero and one.
Normal	Mean	Standard deviation	



```

1      SUBROUTINE DISTRI(I,TYPE,PAR1,PAR2,RESULT)
C-----
C      DISTRI COMPUTES THE DEPENDENT VARIABLE GIVEN ONE OF THE
C      FOLLOWING DISTRIBUTION CURVES.
C-----
5      COMMON
1/GEN/ TIME,TEVENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
2      NNPORT,NSHIPS,TINVL,IOUT,NFACT,NSTYP,NITIN
10     GO TO (10,20,30,40,50),I,TYPE
10     RESULT=PAR1
    RETURN
20     CALL RNG
    RESULT=PAR2+RM*(PAR1-PAR2)
    RETURN
30     SUM=0
    DO 100 I=1,12
    CALL RNG
100    SUM=SUM+RN
    RESULT=PAR1+(SUM-6.)*PAR2
    IF (RESULT.LT.0.0) RESULT=0.
    RETURN
40     CALL RNG
    SAVE=1./(1-RN)
    SAVE=ALOG(SAVE)
    RESULT=SAVE/PAR1
    RETURN
50     SAVE=1.+(PAR2*PAR2/(PAR1*PAR1))
    SAVE2=PAR1/SQRT(SAVE)
    XMU=ALOG(SAVE2)
    VARSOR=ALOG(SAVE)
    SUM=0
    DO 200 I=1,12
    CALL RNG
200    SUM=SUM+RN
    RESULT=EXP(XMU*(SUM-6.)*SQRT(VARSOR))
    RETURN
    END

```

FORDER (IARRAY, NUM, INDEX, XRRAY, IPTR)

Activity Performed: Updates an array by eliminating non-essential entries

Type: Subroutine

Common Used: none

Called by: SPOOL

Events Stored: none

Description:

FORDER eliminates all unused locations of a given array and adjusts the item entry counter.

GENCAR

Activity Performed: Initializes all cargo scheduled to enter a port for overseas delivery.

Type: Event

Common Used: /CARGOG/, /GEN/, /SUMY/

Called by: TAKE

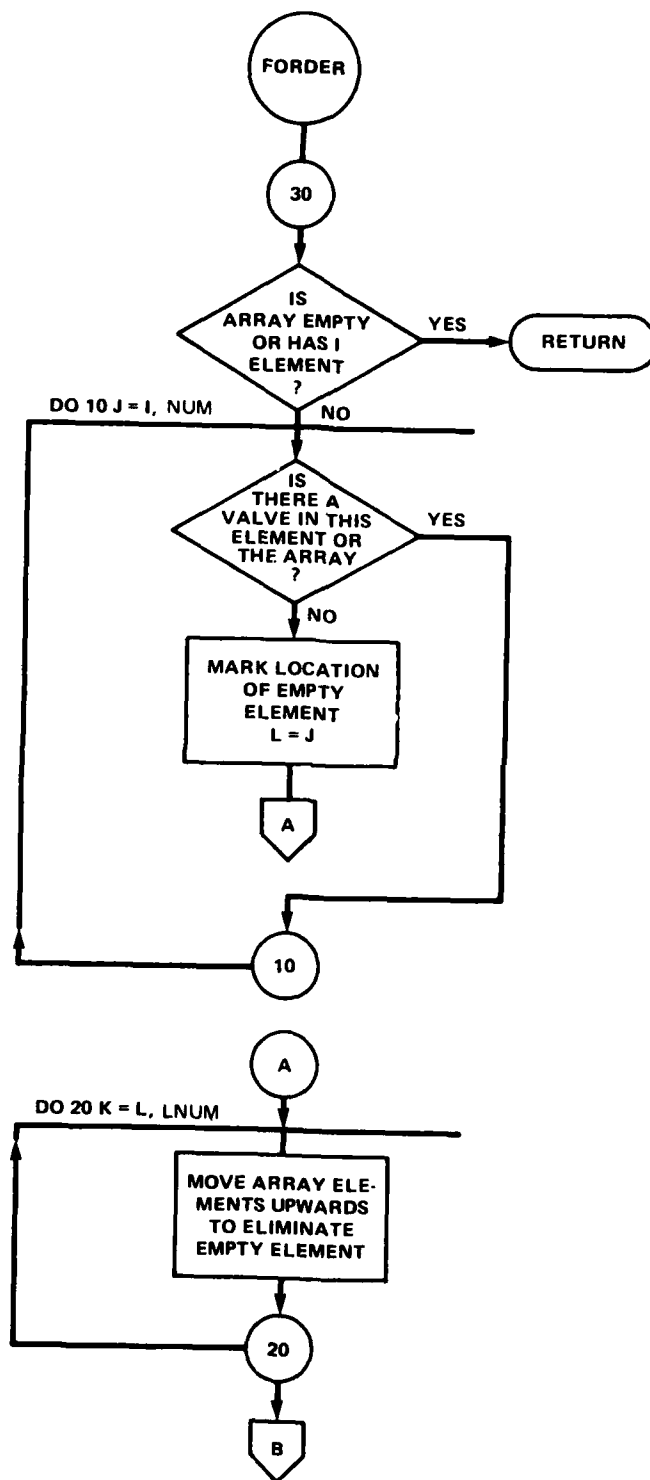
Stored by: GENCAR, RDPARM

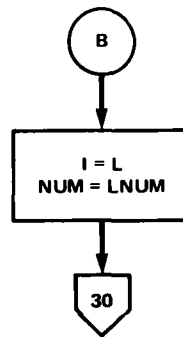
Subroutines Called: DISTRI, PUT

Events Stored: GENCAR

Description:

GENCAR generates, on a day-by-day basis, cargo scheduled to enter a port for overseas delivery. Input specifies cargo type to be generated, origin, destination, and quantity variance information. Each cargo generation specifies a time interval between generations.





```

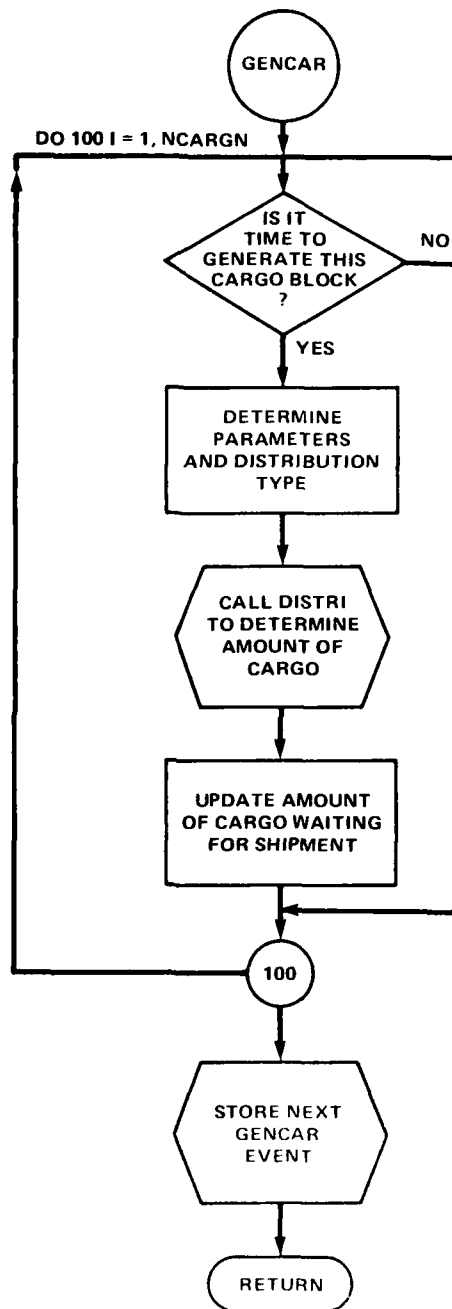
1  SUBROUTINE FORDER(IARRAY,NUM,INDEX,XRRAY,IPTR)
   DIMENSION IARRAY(1000,3),XRRAY(1000)
   I=1
   30 IF(NUM.LE.1) RETURN
   DO 10 J=1,NUM
   IF(IARRAY(J,1).NE.0) GO TO 10
   LNUM=NUM-1
   L=J
   GO TO 40
10  CONTINUE
   RETURN
40  DO 20 K=L,LNUM
   IF(IPTR.EQ.1) XRRAY(K)=XRRAY(K+1)
   DO 20 KK=1,INDEX
   20 IARRAY(K,KK)=IARRAY(K+1,KK)
   I=L
   NUM=LNUM
   GO TO 30
   END

```

```

PF0424 17
PF0424 18
FORDER 4
FORDER 5
FORDER 6
FORDER 7
FORDER 8
FORDER 9
FORDER 10
FORDER 11
FORDER 12
FORDER 13
PF0424 19
FORDER 14
FORDER 15
FORDER 16
FORDER 17
FORDER 18
FORDER 19

```



```

1      SUBROUTINE GENCAR
C-----
C      GENCAR GENERATES CARGO AT THE BEGINNING OF EACH SIMULATION DAY
C      USING A SPECIFIED CARGO QUANTITY DISTRIBUTION CURVE.
C-----
COMMON /SUMV/ SUMSHIP(30,10),SUMPR*(30,10),ISMPT(30,6)
COMMON
1/GEN/ TIME,TEVENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
2 NNPORT,NSHIPS,TINVL,ICUT,NFACT,NSTYP,NITIN
1/CARGO/ NCARGN,KARGEN(1000,3),CARGEN(1000)
2, JCARGO(100,3),CARGO(1000),NSC50
DO 100 I=1,NCARGN
IF (FLOAT(MOD(KARGEN(I,3),10**7))* .001.NE.TIME) GO TO 100
IF (FLOAT(KARGEN(I,3)/10**7)* .001.LT.TIME) GO TO 100
ITYPE=MOD(KARGEN(I,1)/100000,10)
IF (ITYPE.LE.0) ITYPE=1
IDPORT=MOD(KARGEN(I,1)/10,100)
PAR1=FLOAT(MOD(KARGEN(I,2),1000000))
PAR2=FLOAT(KARGEN(I,2)/1000000)
CALL DISTRI(ITYPE,PAR1,PAR2,VAR)
CARGEN(I)=CARGEN(I)+VAR
SUMPR(IDPORT,I)=SUMPR(IDPORT,I)+VAR
KARGEN(I,3)=KARGEN(I,3)+KARGEN(I,1)/1000000
IF (ICUT.NE.1) GO TO 100
WRITE(6,1000) TIME,IDFORT,I,VAR,CARGEN(I)
1000 FORMAT(4X,F8.3,5X,I4,14X,
1
113,*,CARGO GEN =*,F8.2,*,MT, TOTAL =*,F10.2,*,MT*)
100 CONTINUE
TEVENT=TIME+1.0
LVENT1=1
LVENT2=0
LVENT3=0
CALL PUT
RETURN
END

```

LDSH

Activity Performed: Simulates the loading of cargo.

Type: Event

Common Used: /CARGOG/, /CONTRL/, /GEN/, /PORT/, /SHIP/

Called by: TAKE

Stored by: RLDSH

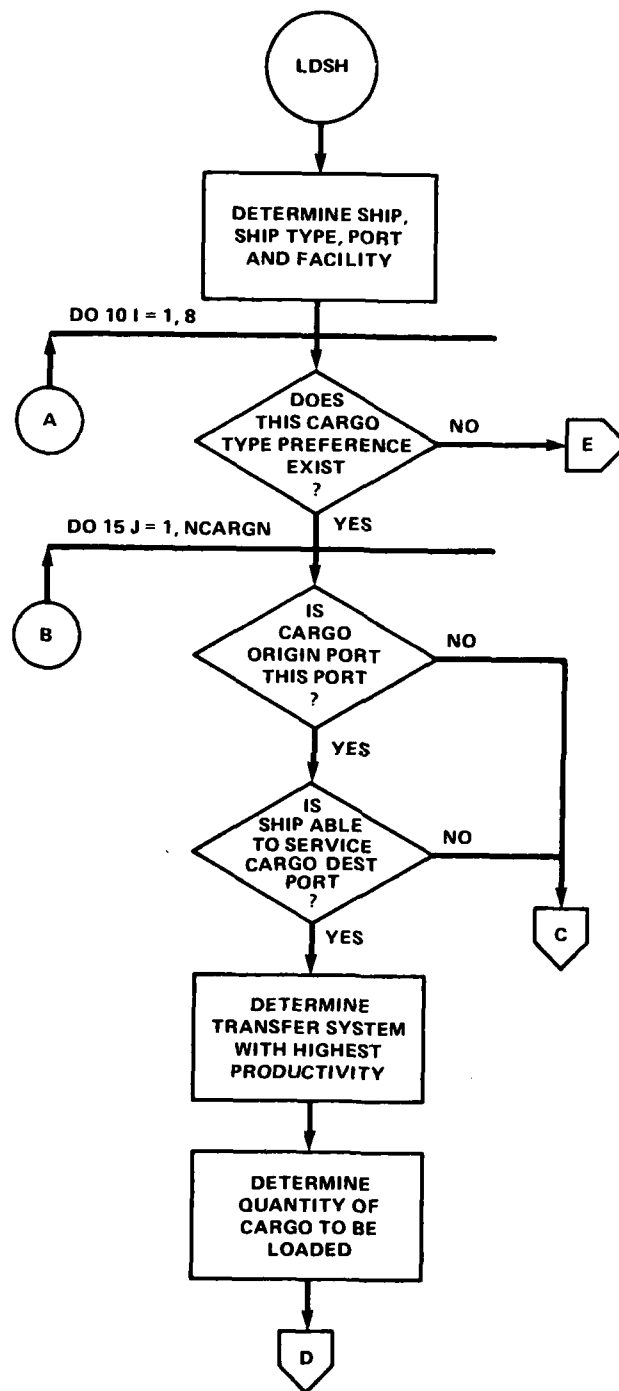
Subroutines Called: PUT, ENDGAM

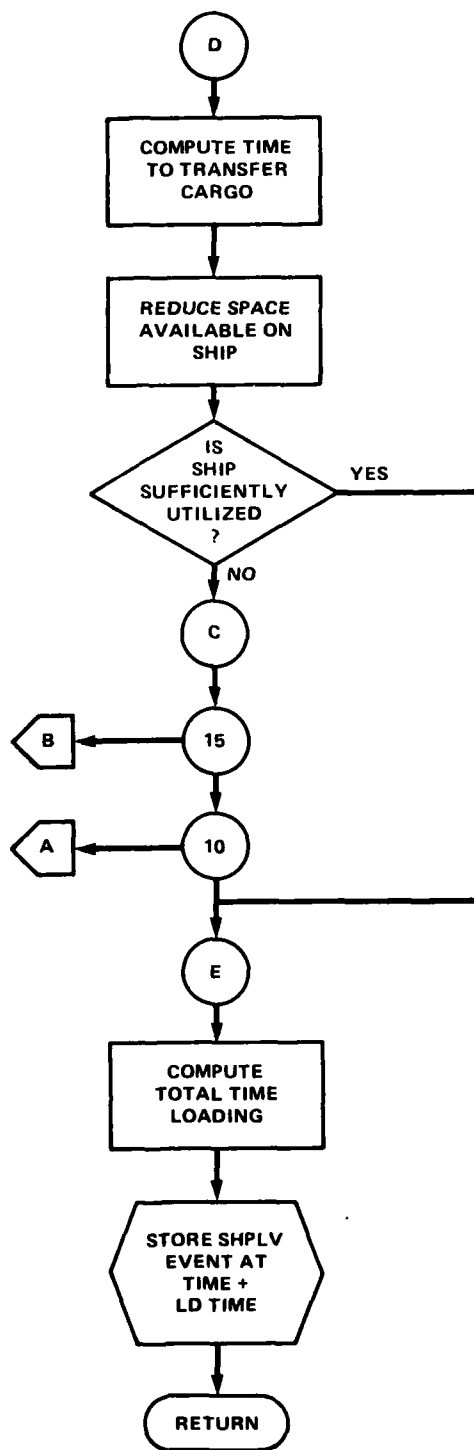
Events Stored: SHPLV

Description:

After the cargo has been unloaded, the simulation of the loading cycle begins. The remaining ports on the ship's schedule are determined and all cargo bound for those ports is loaded aboard the ship.

LDSH specifies the cargo to be loaded and determines the time of loading, using available transfer systems. After loading is complete, LDSH stores a SHPLV event. SHPLV releases facilities no longer needed and repositions the ship at its next service port.





```

1  SUBROUTINE L0SH
COMMON /CONTROL/ TIMEIT,SMTFL,DECR(4),XDIST(30,30),PRODUC(6,6,0)
1  *ADJCGO(81),NTEST
COMMON /SUMY/ SUMSHP(30,10),SUMPR(30,10),TSMPT(30,6)
COMMON
1/GEN/ TIME,TEVENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
2  NNPORT,NSHIPS,TINVL,IOUT,MFACT,NSIYP,NITIN
3,IGEN,PUTL
1/CARGO/ NCARGN,KARGEN(1000,3),CARGEN(1000)
2, JCARGO(1000,3),CARGO(1000),NSCGO
1/SHIP/ NSHIP(400,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
1/PORT/NPORT(30,6),IFAC(30,10)
2,IQUEUE(1000,2),NOQUEUE
IDSHIP=LVENT2
IDPORT=LVENT3
ITYPE=NSHIP(IDSHIP,1)
IFAC1=NSHIP(IDSHIP,13)
IDRAFT=MTSHIP(ITYPE,13)
IF(IOUT.EQ.1) WRITE(6,1000) TIME,IDPORT,IDSHIP,IFAC1
1000 FORMAT(5X,F7.3,5X,I4,5X,I4,5X,*LOAD SHIP AT FACILITY TYPE =*,
114)
SUM=0
TEVENT=0
DO 10 I=1,8
ICT=MTSHIP(ITYPE,I)
IF(ICT.LE.0) GO TO 20
IF(NSHIP(I,SHIP,9).LE.0.OR.NSHIP(IDSHIP,10).LE.0) GO TO 20
JSAVE=ICT+IDPORT+10
DO 15 J=1,NCARGN
IF(CARGEN(J).LE.0) GO TO 15
IF(JSAVE.NE.MOD(KARGEN(J,1),1000)) GO TO 15
NKPORT=MOD(KARGEN(J,1)/1000,100)
MITN=NSHIP(IDSHIP,7)
IF(MITN.LE.0) GO TO 30
DO 40 II=1,10
IF(NKFORT.EQ.ITININITN,II) GO TO 45
40 CONTINUE
GO TO 15
30 IF(NPORT(NXPORT,1).EQ.NSHIP(IDSHIP,4).OR.NPORT(NKFORT,1).EQ.
1NSHIP(IDSHIP,5)) GO TO 46
GO TO 15
46 IF(IDRAFT.GT.NPORT(NXPORT,3)) GO TO 15
45 XMT=NSHIP(IDSHIP,9)
IF(NSHIP(IDSHIP,10)*ADJCGO(1CT).LE.XMT)XMT=NSHIP(IDSHIP,10)*ADJCGO
1(1CT)
IF(XMT.GT.CARGEN(J)) XMT=CARGEN(J)
CARGEN(J)=CARGEN(J)-XMT
NSHIP(IDSHIP,9)=NSHIP(IDSHIP,9)-XMT
NSHIP(IDSHIP,10)=NSHIP(IDSHIP,10)-(XMT/ADJCGO(1CT))
NSCGO=NSCGO+1
JCARGO(NSCGO,1)=IDSHIP
JCARGO(NSCGO,2)=NXPORT
JCARGO(NSCGO,3)=ICT
CARGO(NSCGO)=XMT
50
55
SUMPT(IDPORT,2)=SUMPT(IDPORT,2)+XMT
IF(IOUT.EQ.1) WRITE(6,1002) ICT,NXPORT,XMT
1002 FORMAT(35X,1CT=*,I4,* DEST PORT=*,I4,* MT=*,F10.2)

```

```

SUMPROJTIME L0SH      74/74      OPT=0  ROUND=0/  TRACE      FTM 4.0+500      07/23/81      09.54.22
60      SUM=SUM+XMT      L0SH      99
      ISAVE=0      L0SH      60
      SAVE=0      L0SH      61
      DO 35 I=1,6      L0SH      62
      IF (MTSHP2(I,TYPE,II).LE.0) GO TO 35      L0SH      63
      IF (SAVE.GE.PRODUC(IFAC1,II,ICT)) GO TO 35      L0SH      64
      SAVE=PRODUC(IFAC1,II,ICT)      L0SH      65
      ISAVE=II      L0SH      66
      ISAVE=II      L0SH      67
      35 CONTINUE      L0SH      68
      IF (ISAVE.GT.0) GO TO 55      L0SH      69
      WRITE(6,1003) IOPORT,IOSHIP      L0SH      70
1003  FORMAT(51,'ERROR',I11,I9,5X,'NO TRANSFER DEVICES FOR SERVICE')      L0SH      71
      GO TO 55      L0SH      72
      CALL ENOGAM      L0SH      73
      STOP      L0SH      74
      55 FACTOR=1.      L0SH      75
      IF (ISAVE.LE.0) GO TO 666      L0SH      76
      IF (MTSHP2(I,TYPE,0).GT.1) FACTOR=FLOAT(MTSHP2(I,TYPE,0))*0.001      L0SH      77
      TEVENT=TEVENT+XMT/(PRODUC(IFAC1,ISAVE,ICT)*FLOAT(IOPORT,6))      L0SH      78
      1*.001*FACTOR)      L0SH      79
      666 CONTINUE      L0SH      80
      IF (NSHIP(IOSHIP,9).LE.0.OR.NSHIP(IOSHIP,10).LE.0) GO TO 20      L0SH      81
      15 CONTINUE      L0SH      82
      10 CONTINUE      L0SH      83
      20 SUM=FLCAT(MTSHP(I,TYPE,11)-NSHIP(IOSHIP,9))/FLOAT(MTSHP(I,TYPE,11))      L0SH      84
      SUM=(SUM-1.0)*UTL)*100.      L0SH      85
      IF (IOUT.EQ.1) WRITE(6,1801) SUM,TEVENT      L0SH      86
1801  FORMAT(35X,'VOL PERCENT UTILIZED=',F10.2,' TIME TO LOAD=',F7.3)      L0SH      87
      TEVENT=TEVENT+TIME      L0SH      88
      IF (NSHIP(IOSHIP,14).EQ.1) GO TO 25      L0SH      89
      IF (NSHIP(IOSHIP,9).LE.0.OR.NSHIP(IOSHIP,10).LE.0) GO TO 26      L0SH      90
      IF (IGEN.NE.1) GO TO 54      L0SH      91
      DO 50 I=1,MCARGN      L0SH      92
      IF (MOD(KARGEN(I,1)/10,100).NE.IOPORT) GO TO 50      L0SH      93
      IF (TIME.GT.FLOAT(KARGEN(I,3)/10**7)*.001) GO TO 50      L0SH      94
      XTIME=FLOAT(KARGEN(I,1)/10**6)*.001-FLOAT(MOD(KARGEN(I,3),10**7))      L0SH      95
      1*.001      L0SH      96
      IF (FLOAT(MOD(KARGEN(I,3),10**7))*0.001.GT.TIME)      L0SH      97
      1 XTIME=FLOAT(MOD(KARGEN(I,3),10**7))*0.001-TIME      L0SH      98
      IF (XTIME.GT.1.5) GO TO 50      L0SH      99
      ICT=MOD(KARGEN(I,1),10)      L0SH      100
      DO 53 J=1,5      L0SH      101
      IF (ICT.EQ.MTSHP(I,TYPE,J)) GO TO 52      L0SH      102
      53 CONTINUE      L0SH      103
      GO TO 50      L0SH      104
      52 TEVENT=TEVENT+XTIME      L0SH      105
      GO TO 54      L0SH      106
      50 CONTINUE      L0SH      107
      54 NSHIP(IOSHIP,14)=1      L0SH      108
      TEVENT=TEVENT+FLOAT(MPORT(IOPORT,2))*0.01      L0SH      109
      CALL PUT      L0SH      110
      RETURN      L0SH      111
      26 TEVENT=TEVENT+FLOAT(MPORT(IOPORT,2))*0.01      L0SH      112
      25 LVENT1=5      L0SH      113
      LVENT2=IOSHIP      L0SH      114
      LVENT3=IOPORT      L0SH      115
      100 CALL PUT      L0SH      116
      RETURN      L0SH      117
      END      L0SH      118

```

NXPRT(IDSHIP, IDPORT, NXPORT)

Activity Performed: Determines next port to be visited by non-itinerary ship.

Type: Subroutine

Called by: SHPARV, SHPLV

Common Used: /GEN/, /CARGOG/, /SHIP/, /PORT/

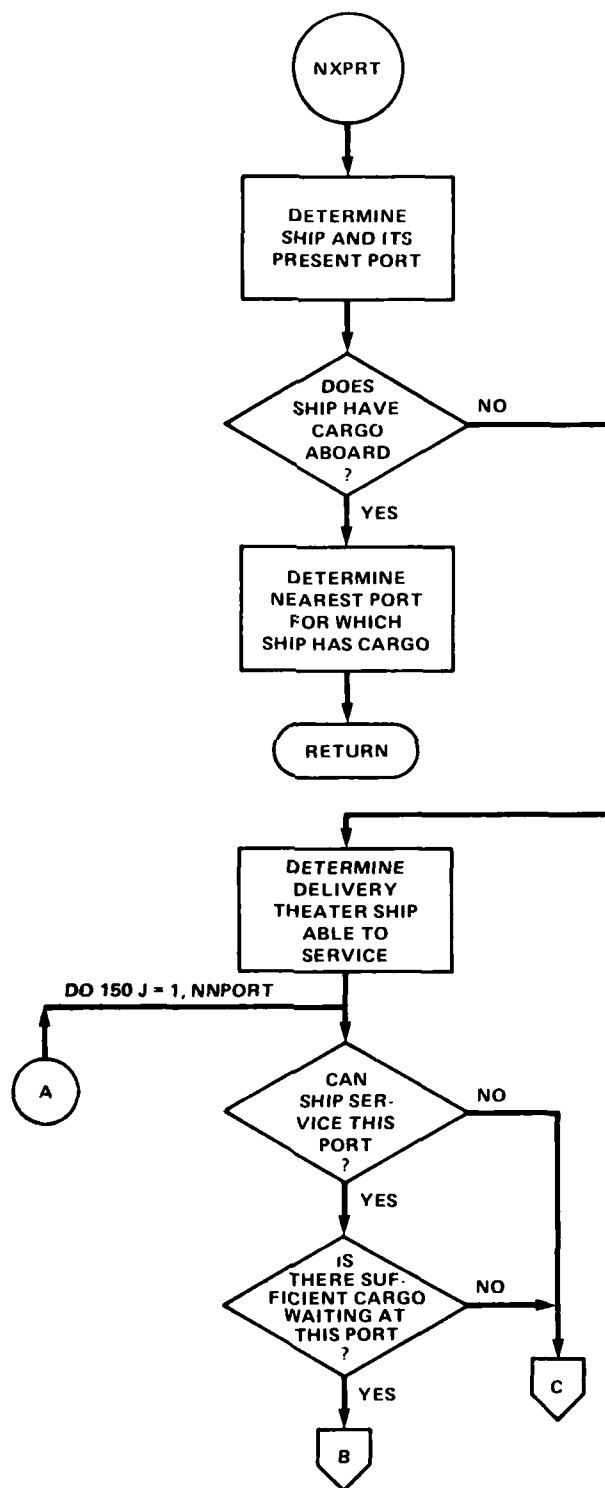
Stored by: n/a

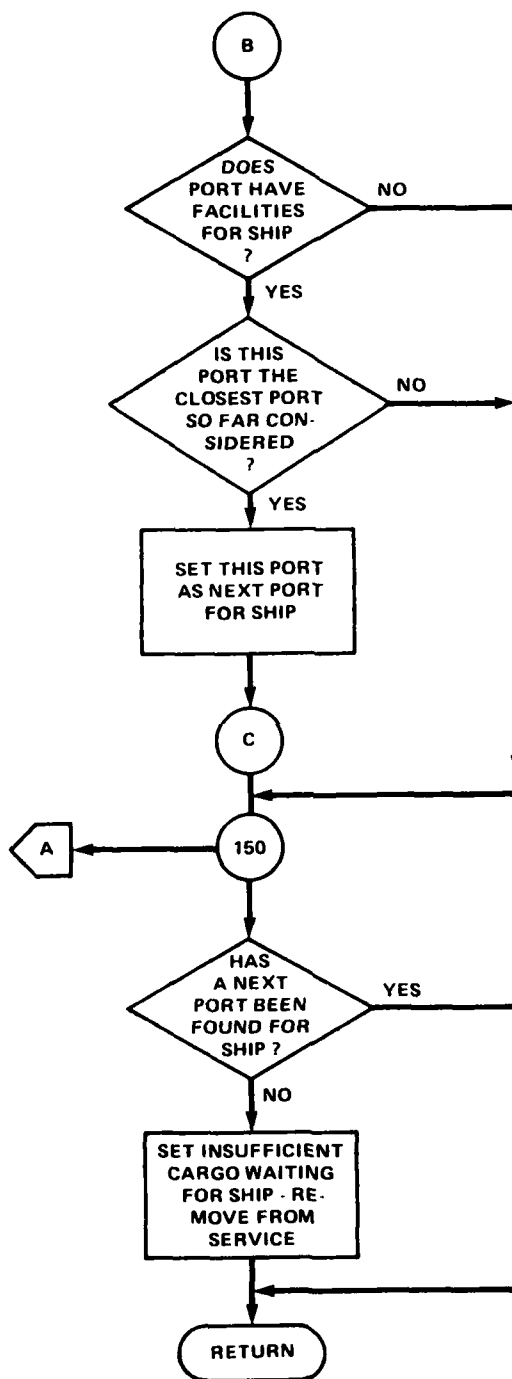
Subroutines Called: none

Events Stored: none

Description:

NXPRT determines the next port to be serviced by a non-itinerary ship. Only ports which can physically receive the ship are considered. Selection is made with respect to quantity of cargo waiting at the port, quantity of cargo aboard ship to be delivered, and transit time between ship's present port and destination port.





```

1  SUBROUTINE NXPR(IDSHIP, IDPORT, NXPORT)
COMMON /CONTRL/ LIMIT, SHIFL, DECR(4), XDIST(30,30), PFODUC(6,6,8)
1  ADJCGO(8), NTEST
COMMON
5  1/GEN/ TIME, TEVENT, NEVENT, KEVENT(500), RN, LVENT1, LVENT2, LVENT3,
2  NNPORT, NSHIP, INVL, IOUT, NFACT, NSTYP, NITIN
1/CARGO/ NCARGN, KARGEN(1000,3), CARGEN(1008)
2/JCARGC(1000,3), CARGO(1000), NSCGO, CARGC(2)
1/SHIP/ NSHIP(400,15), MTSHP(30,22), MTSHP2(30,10), ITIN(10,10)
1/PORT/ NPORT(30,6), IFAC(30,10)
3/IOQUEU(1000,2), NQUEUE, NSE(30,30)
DIMENSION NXPT(50)
ITYPE=NSHIP(IDSHIP,1)
IDRAFT=MTSHIP(ITYPE,13)
IFAC1=MTSHIP(ITYPE,9)
IFAC2=MTSHIP(ITYPE,10)
IORIG=NPORT(IDPORT,1)
IF(IORIG.NE.NSHIP(IDSHIP,4)) GO TO 10
IOFLY=NSHIP(IDSHIP,5)
GO TO 15
10 IOELY=NSHIP(IDSHIP,4)
15 JTMEA=IORIG
NTHEA=IDELY
165 JDIST=99999
NXPORT=0
DO 140 I=1, NSCGO
IF(CARGO(I).LE.0) GO TO 140
IF(JCARGO(I,1).NE.IDSHIP) GO TO 140
NKP=JCARGO(I,2)
IF(NPORT(NKP,1).NE.JTMEA) GO TO 140
LDIST=XDIST(IDPORT, NXPT)
IF(LDIST.GE.JDIST) GO TO 140
JDIST=LDIST
NXPT=NKP
140 CONTINUE
IF(NXPORT.GT.0) RETURN
IF(NSHIP(IDSHIP,9).LE.0.OR.NSHIP(IDSHIP,10).LE.0) GO TO 171
GO TO 172
171 JTMEA=IDELY
NTHEA=IORIG
GO TO 165
172 DO 150 I=1, NNPORT
NXPT(I)=0
IF(I.EQ.IDPORT) GO TO 150
IF(NPORT(I,1).NE.JTMEA) GO TO 150
IF(IDRAFT.GT.NPORT(I,3)) GO TO 150
IF(NPORT(I,5).EQ.1) GO TO 161
IF(IFAC(I,IFAC1).GT.0) GO TO 161
IF(IFAC2.LE.0) GO TO 150
IF(IFAC(I,IFAC2).LE.0) GO TO 150
161 DO 160 J=1,8
ICT=MTSHIP(ITYPE,J)
IF(ICT.LE.0) GO TO 150
ISAVE=ICT+I*10
DO 170 K=1, NCARGN
IF(CARGEN(K).LE.0) GO TO 170
IF(MOD(KARGEN(K,1),100).NE.ISAVE) GO TO 170

```

```

        NXP=MOD(KARGEN(K,1)/1016,160)
        IF(NPORT(NXP,1).NE.NTHEA) GO TO 170
        IF(NPORT(NXP,3).LT.IDRAET) GO TO 170
        IF(NPORT(NXP,5).EQ.1) GO TO 162
        IF(IFAC(NXP,IFAC1).GT.0) GO TO 162
        IF(IFAC2.LE.0) GO TO 170
        IF(IFAC(NXP,IFAC2).LE.0) GO TO 17C
        162 NXPT(I)=NXPT(I)+CARGEN(K)
        170 CONTINUE
        168 CONTINUE
        150 CONTINUE
        IF(NTHEA.NE.IDRIG) GO TO 151
        NXPORT=NSHIP(IDSHIP,3)
        IF(NXPT(NXPORT).GE.CARGC(2)) RETURN
        151 JDIST=0
        VOIST=0
        DO 160 I=1,NNPORT
        IF(1.EQ.IDPORT) GO TO 160
        IF(NXPT(I).LT.CARGC(2)) GO TO 160
        SUM=0
        DO 65 J=1,NSTYP
        65 SUM=SUM+FLOAT(MTSHIP(J,11))*FLCAT(NSE(J,I))
        PPM=9999.
        IF(XDIST(IDPORT,I).LE.0) GO TO 161
        PPM=FLOAT(NXPT(I))/XDIST(IDPORT,I)
        IF(VOIST.GE.PPM) GO TO 160
        161 JDIST=I
        VOIST=PPM
        180 CONTINUE
        NXPORT=JDIST
        IF(NXPORT.GT.0) RETURN
        IF(JTHEA.EC.IDELY) RETURN
        JTHEA=IDRIG
        GO TO 165
        END

```

59 NXPT
 60 NXPT
 61 NXPT
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 86 NXPT
 87 NXPT
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 90 NXPT
 91 NXPT
 92 NXPT
 93 NXPT
 94 NXPT
 95 NXPT

PRNTR

Activity Performed: Prints the output generated by the simulation.

Type: Event

Common Used: /CONTRL/, /SUMY/, /DONNA/, /A/, /B/, /GEN/, /CARGOG/, /SHIP/,
/PORT/, /PLT/, WATE/, /BUSH1/, /BUSH2/

Called by: TAKE

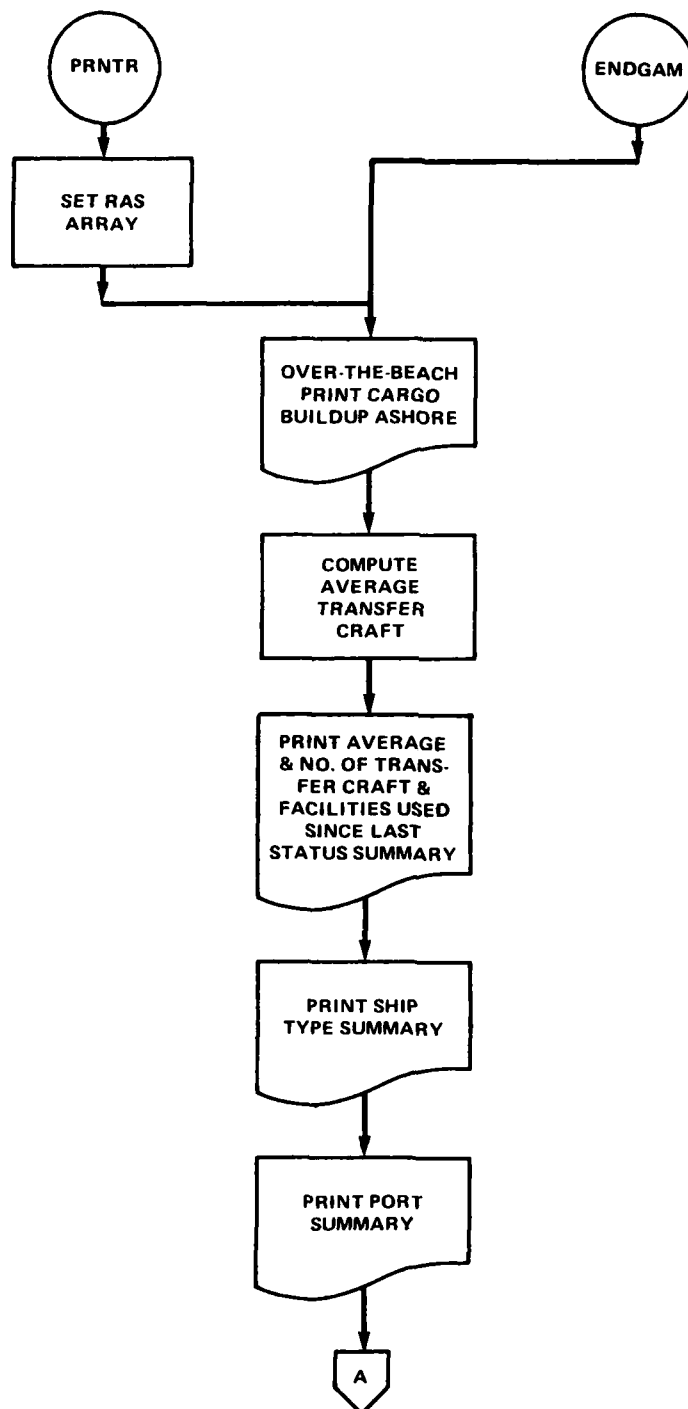
Stored by: RDPARM

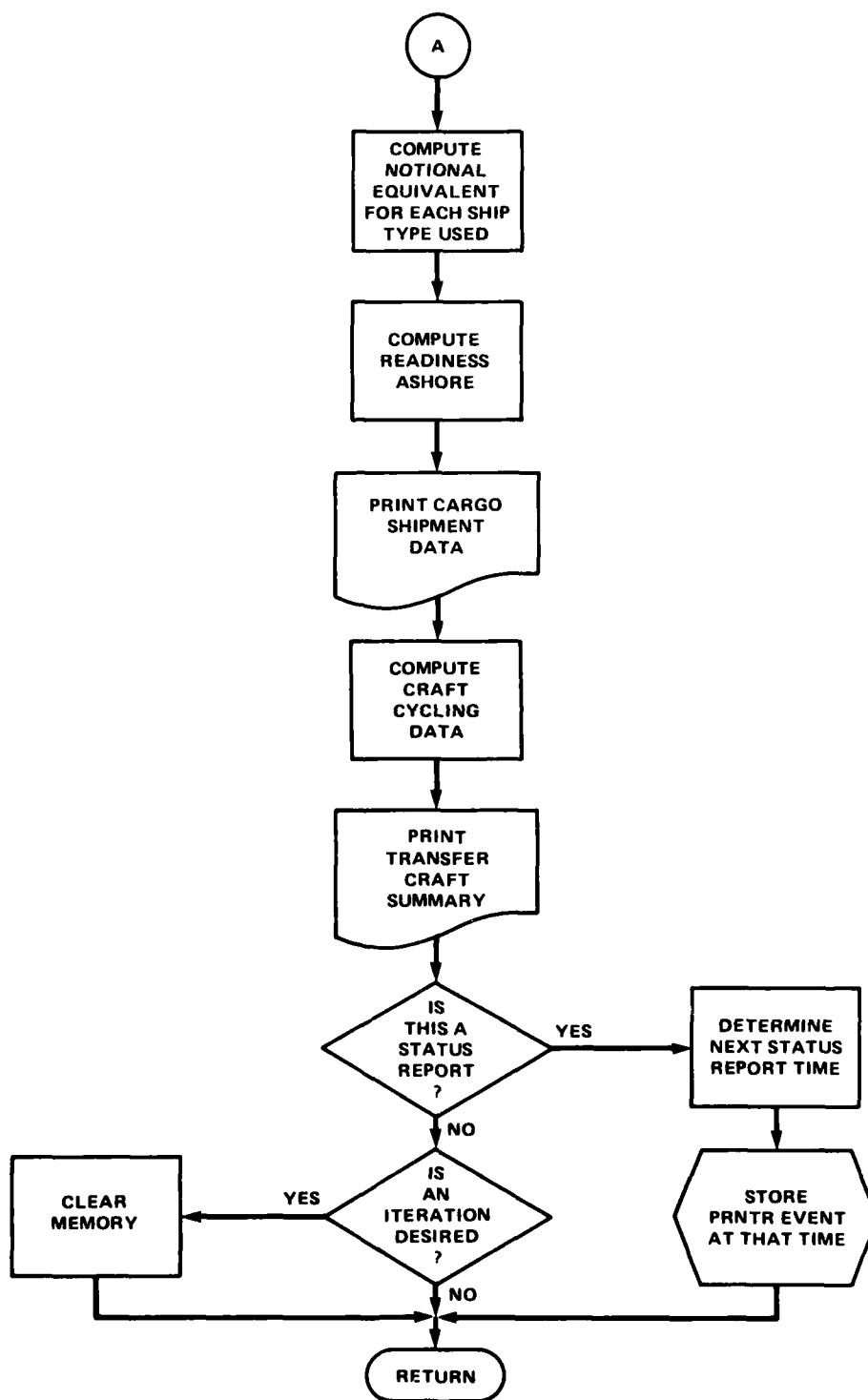
Subroutines Called: n/a

Events Stored: PRNTR

Description:

PRNTR controls the printing of all output generated by the simulation except the numbers of transport craft and unloading facilities currently in use, which are printed by AVRAGE.






```

      BLDUPA=XI*(ZCARGO(I)-XIS(I))/XOR(I)-(TIME-45.)
170 IF (I.EQ.3.OR.I.GE.7) BLDUPA=0.
180 CONTINUE
      SUMXIS=XIS(1)+XIS(4)+XIS(5)+XIS(6)
      TBA=FLOAT(IDRS)*(TCARGO-ZCARGO(2)-ZCARGO(3)-SUMXIS)/3070.-(TIME-45
1.)
65 IF (KPNCH.NE.1) GO TO 174
      IF (TIME.GT.49.5) PUNCH 172, TIME,BLOUP(1),BLOUP(2),BLOUP(4),
172 BLOUP(5),BLOUP(6),TBA,IDPNCH
174 PRINT 270
270 FORMAT(1H-4X,"CARGO",8X,"AMOUNT CARGO",9X,"BUILDUP ASHORE",8X,
1*REQUIRED ASHORE",7X,"EXCESS ASHORE")
      PRINT 272
272 FORMAT(5X,"TYPE",7X,"DELIVERED ASHORE",6X,"(DAYS OF SUPPLY)",7X,
1*(DAYS OF SUPPLY) (DAYS OF SUPPLY))
      PRINT 274
274 FORMAT(22X,"(MT)")
      AEXASH=0.
      DO 280 I=1,6
      EXASH=BLOUP(I)-RAS(I)
      IF (I.NE.3) AEXASH=AEXASH+EXASH
      IF (I.EQ.3) PRINT 290, I,ZCARGO(I),BLOUP(I),RAS(I),EXASH
280 IF (I.EQ.3) PRINT 290, I,ZCARGO(I)
290 FORMAT(10I0,2X,15,9X,F11.0,11X,F9.1,15X,F8.1,12X,F9.1)
      PRINT 300
300 FORMAT(1H-)
      PRINT 302, TCARGO
302 FORMAT(1H-10X,"TOTAL AMOUNT OF CARGO DELIVERED =",F10.0," MT")
      PRINT 304, TBA
304 FORMAT(1H-10X,"TOTAL BUILDUP ASHORE (LESS TYPES 2 AND 3) =",F7.1,
1*(DAYS))
      IF (TIME.GT.49.5) TBT=TBT+TBA
      IF (TIME.GT.49.5) KTBT=KTBT+1
      AEXASH=AEXASH/5.
      PRINT 306, AEXASH
306 FORMAT(1H-10X,"AVERAGE EXCESS ASHORE (LESS TYPE 3) =",F7.1," DAYS
1*)
50 FORMAT(4I10)
C COMPUTE AVERAGES FOR NUMBERS OF TRANSFER CRAFT AND FACILITIES USED
C LAST SYSTEM STATUS SUMMARY PRINTOUT
      X=IAVRGE
      DO 540 I=1,NTCFT
540 YTCFT(I)=KTCFT(I)/X
      DO 550 I=1,NSUFAC
550 YSUFAC(I)=KSUFAC(I)/X
      YUP=KUP/X
C COMPUTE FRACTION OF TIMES UPPER LIMIT OF NUMBER OF CRAFT AND FACIL
C IS REACHED
      AA=AA+FLOAT(IPLT)
      DO 552 I=1,NTCFT
552 ZTCFT(I)=FLOAT(IUPCFT(I))/AA
      DO 554 I=1,NSUFAC
554 ZSUFAC(I)=FLOAT(IUPSUF(I))/AA
      ZUPUP=FLOAT(IUPUP)/AA
C RESET PARAMETERS

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```

115 IAVRGE=0
    DO 560 I=1,NTCFT
120   560 KTCFT(I)=0
    DO 570 I=1,NSUFAC
125   570 KSUFAC(I)=0
    KUP=0
    C PRINT OUT AVERAGES FOR NUMBERS OF TRANSFER CRAFT AND FACILITIES
    C USED SINCE LAST CARGO STATUS SUMMARY PRINTOUT. ALSO PRINT OUT
    C FRACTION OF TIMES UPPER LIMIT OF NUMBER OF CRAFT AND FACILITIES
    C IS REACHED.
    PARC=TIME-5.
    PRINT 210, PARC, TIME
130 210 FORMAT(1H1,20X,'TRANSFER CRAFT / MATERIAL HANDLING EQUIPMENT UTILI
    1ZATION BETWEEN DAYS',F7.3,' AND',F7.3)
    PRINT 212
135 212 FORMAT(1H-,14X,'NAME',24X,'AVERAGE',9X,'FRACTION OF TIME',
    PRINT 214
140 214 FORMAT(43X,'NUMBER',12X,'UPPER LIMIT')
    PRINT 216
145 216 FOPMAT(44X,'USED',13X,'IS REACHED')
    PRINT 218, NMCFT(1), YTCFT(1), ZTCFT(1)
    PRINT 218, NMCFT(2), YTCFT(2), ZTCFT(2)
    PRINT 218, NMCFT(3), YTCFT(3), ZTCFT(3)
150 218 FORMAT(1H0,11X,A10,20X,F7.1,13X,F7.3)
    PRINT 220, YTCFT(4), ZTCFT(4)
155 220 FORMAT(1H0,12X,'PIPELINE',21X,F7.1,13X,F7.3)
    PRINT 222, YSUFAC(1), ZSUFAC(1)
160 222 FORMAT(1H0,12X,'FORKLIFTS',20X,F7.1,13X,F7.3)
    PRINT 224, YSUFAC(2), ZSUFAC(2)
165 224 FORMAT(1H0,8X,'SHORESIDE CRANES',17X,F7.1,13X,F7.3)
    PRINT 226, YUP,ZUPUP
170 226 FORMAT(1H0,2X,'CONTAINER UNLOADING PLATFORMS',10X,F7.1,13X,F7.3)
    C COMPUTE AND PRINT MEAN WAITING TIME TO UNLOAD
    DO 500 II=1,5
175 500 XT(II)=OTIME(II)/NQUE(II)
    PRINT 300
    PRINT 228
180 228 FORMAT(1H-,30X,'SHIP WAITING INFORMATION')
    PRINT 230
185 230 FORMAT(1H-,11X,'SHIP TYPE',9X,'NUMBER OF SHIPS',9X,'MEAN WAITING T
    TIME')
    PRINT 232
190 232 FORMAT(
    DO 234 II=1,5
195 234 PRINT 236, K8(II), NQUE(II), XT(II)
    236 FORMAT(1H0,10X,A10,13X,I5,20X,F7.2)
    C WRITE NUMBER OF CRAFT AND FACILITIES USED, AS A FUNCTION OF TIME,
    WRITE(30) IPLT
    WRITE(30) (XAX(II), I=1, IPLT)
    DO 530 J=1,7
200 530 WRITE(30) (KY(I,J), I=1, IPLT)
    C RESET COUNTER
    IPLT=0
    PRINT 999
205 13 WRITE(6,1002)
    6000 DO 20 I=1,10
    20 SUM(I)=0

```

```

175      NSD=NSD+1
1002     FORMAT(// 5X,'... S H I P T Y P F S U M A R Y //
15X,'SHIP',2(3X,'VOLUME MT',3X,'WEIGHT TON'),3X,'PERCENT',3X,
1 3X,
2*NO. IN',5X,'NO. IN',5X,'TYPE',3X,2('AVAILABLE',3X),2X,2('UTILIZED',
3,3X),2X,'VOL USED',5X,'POOL',6X,'SERVICE')
      DO 410 I=1,NSHIP
      PERC=0
      TEMP=0
      IF (SUMSHP(I,1).GT.0) PERC=SUMSHP(I,3)/SUMSHP(I,1)
      PERC=PERC*100.
      DO 15 II=1,6
15      SUM(II)=SUM(II)+SUMSHP(I,II)
      UTM(NSD)=SUM(1)
      IF (TIME.EQ.TINVL.OR.LVENT1.EQ.0)
1  WRITE(6,1003) I,(SUMSHP(I,J),J=1,4),PERC,SUMSHP(I,5),SUMSHP(I,6)
410     CONTINUE
1003     FORMAT(5X,I4,10F12.0)
      ISD(NSD,3)=SUM(5)
      PERC=0
      IF (SUM(1).GT.0) PERC=(SUM(3)/SUM(1))*100.
      PERC1(NSD)=PERC
      IAVL(NSD)=SUM(1)
      IF (TIME.EQ.TINVL.OR.LVENT1.EQ.0)  WRITE(6,1006)
1  (SUM(1),I=1,4),PERC,SUM(5),SUM(6)
1006     FORMAT(//4X,'TOTAL',10F12.0)
      DO 21 K=1,3
21      SUM(K)=0
      IF (TIME.EQ.TINVL.OR.LVENT1.EQ.0) WRITE(6,1004)
1004     FORMAT(1H1,4X,'... P O R T S U M A R Y //5X,'PORT',
2,3(8X,'CARGO'),5X,'QUEUE AT FACILITIES',9X,'MEAN WAIT',
3,' TIME (DAYS)') 6X,'NO.',6X,'GEMRD',8X,'SHPPD',8X,'DELVD',6X,
4*1 2 3 4 5 6*9X,'1',4X,'2',4X,'3',4X,'4',4X,'5',4X,'6')
      DO 420 I=1,NNPORT
      DO 22 K=1,3
22      SUM(K)=SUM(K)+SUMPT(I,K)
      ISD(NSD,2)=SUM(3)
      DO 430 J=1,6
      TEMP(J)=0
      IF (ISMPT(I,J).GT.0) TEMP(J)=SUMPT(I,J*3)/ISMPT(I,J)
430     CONTINUE
      IF (TIME.EQ.TINVL.OR.LVENT1.EQ.0)
1  WRITE(6,1005) I,(SUMPT(I,J),J=1,3),(ISMPT(I,J),J=1,6),TEMP
420     CONTINUE
      IF (TIME.EQ.TINVL.OR.LVENT1.EQ.0) GO TO 6001
      GO TO 6002
6001     CONTINUE
1005     FORMAT(I9,3F13.0,4X,6I3.8X,6F5.2)
      WRITE(6,1007) (SUM(I),I=1,3)
      WRITE(6,1009)
      JSUM(1)=0
      DO 630 I=1,NSHIP
      IF (MOD(I,50).EQ.0) WRITE(6,1009)
      IFMP(1)=NSHIP(I,1)
      ITEM(2)=MOD(NSHIP(I,15),100)

```

07/23/81 09:54.22

FTN 4.8+508

TRACE

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SUBROUTINE PRNTR

```

230      ITEM(3)=IANSW(2)
      IF(NSHIP(I,12).EQ.1) ITEM(3)=IANSW(1)
      IF(NSHIP(I,6).GT.IF(1X*TIME*100,J)) ITEM(3)=IANSW(1)
      ITEM(4)=MOD(NSHIP(I,2),100)
      ITEM(5)=MOD(NSHIP(I,2)/100,100)
      ITEM(6)=NSHIP(I,15)/100
235      C DETERMINE SHIP TYPE
      IDSHIP=LVENT2
      ISHPTP=NSHIP(IDSHIP,1)
      C CHECK SHIP TYPE
      C FOP BREAK BULK
      IF(MTSHIP(ISHPTP,20).EQ.1) EL=4
240      C FOR CONTAINERSHIP
      IF(MTSHIP(ISHPTP,20).EQ.2) EL=2
      C FOR RO/RO
      IF(MTSHIP(ISHPTP,20).EQ.3) EL=2
245      C FOP LASH
      IF(MTSHIP(ISHPTP,20).EQ.4) EL=1.6
      C DETERMINE SHIP TYPE (OTHER KIND OF SHIP TYPE)
      NST=ITEM(1)
      C DETERMINE SHIP SPEED IN KNOTS
      SS=MTSHIP(NST,14)
250      C DETERMINE SHIP VOLUME IN MT
      SV=MTSHIP(NST,11)
      C COMPUTE NOTIONAL EQUIVALENT
      EN1=FLOAT(ITEM(6))*SV
      EN2=9872./124.*SS)*EL
255      XNOTEQ=(EN1/EN2)/65%
      C COMPUTE SUBTOTALS FOR NOTIONAL SHIPS
      IF(ITEM(2).EQ.2) STNS1=STNS1+XNOTEQ
      IF(ITEM(2).EQ.1) STNS2=STNS2+XNOTEQ
      IF(ITEM(2).EQ.5) STNS2=STNS2+XNOTEQ
260      C SUM UP TOTAL NUMBER OF NOTIONAL SHIPS
      TNNS=TNNS+XNOTEQ
      IF(ITEM(6).LE.0) GO TO 630
      JSUM(1)=JSUM(1)+1
      JSUM(2)=ITEM(6)+JSUM(2)
265      WRITE(6,1010) I,(ITEM(J),J=1,6),XNOTEQ
      PRINT 626, TNNS
      PRINT 627, STNS1
      PRINT 628, STNS2
270      FORMAT(1H0,10X,'MSC CONTROLLED FLEET =',F9.2)
      628 FORMAT(1H0,10X,'SEALIFT READINESS PROGRAM =',F9.2)
      626 FORMAT(1H0,5X,'TOTAL NUMBER OF NOTIONAL SHIPS =',F10.2)
      TNNS=0
      STNS1=0
      STNS2=0
275      625 FORMAT(/5X,'TOTAL NUMBER OF SHIPS USE =', I4//5X,'TOTAL NUMBER OF
      1 DELIVERY CYCLES =', I4)
      1009 FORMAT(1H1,5X,'SHIP RESUME'//5X,2('SHIP',4X),*OWN--*,5X,*POOL*,5X,
      1'LAST',4X,*NEXT*,4X,*THREAT*,4X,*NOTIONAL*/
      26X,*NO--*,4X,*TYPE*,4X,*ER*,6X,*STATUS*,
      3 2(4X,*PORT*,15X,*CYCLES*,4X,*EQUIVALENT*//)
      1010 FORMAT(1X,3I0,4X,A6,3I0,4X,F9.2)
      SSAVE=SUM(1)
280      1007 FORMAT(/4X,'TOTAL',F13.0 )

```

```

C      ZNAF LIFT
C      MTAF0E=714*IDR2+2841*IDR+5351*(15+IDR)+270929
      IDPOL=10
      MTAF0E=KA(1)*IDR2+98*IDPOL+KA(2)*IDR+KA(3)*(IDPOL+15)+KA(4)*
      1 (IDR+15)+KA(5)
      MTADM=3304*(15+IDR)+215843
      IMAP=IMD+15*IDR-IDRS
      MAFA=IDADM+15*IDR-IDRS
      JD=IMAP+5
      LD=MAFA+5
      NTOTEX=NTOTSF=L=K=IDD=N=0
      IDSPOL =10
      IMAPOL=IMD+15*IDPOL-IDRSPOL
      JDPOL=IMAPOL+5
      NAVEX=NAVSF=NMD=0
      DO 120 I=1,NSD
      IDAY=5+I
      IF(IDAF0E.GT.IDAY) GO TO 611
      IDB=MTAF0E
      NMD=NMD+1
      611 IF(JD.GT.IDAY) GO TO 1611
      IF(JDPOL.LE.IDAY) GO TO 1612
      N=N+KA(6)
      GO TO 612
      1611 IF(JCPOL.GT.IDAY) GO TO 612
      N=N+KA(7)
      GO TO 612
      1612 N=N+KA(8)
      612 IF(IDADMN.GT.IDAY) GO TO 613
      K=MTACH
      613 IF(LO.GT.IDAY) GO TO 614
      L=L+16520
C      ZNAF LIFT
C      RIY(I)=IDD+N*KA(L
      614 RIY(I)=IDD+N
      IF(RIY(I).LT.ISD(I,2)) GO TO 616
      615 ISF(I)=(RIY(I)-ISD(I,2))
      IEXC(I)=0
      IF(IDAY.GE.IDAF0E) NTOTSF=NTOTSF+ISF(I)
      GO TO 120
      616 IEYC(I)=(ISD(I,2)-RIY(I))
      ISF(I)=0
      NTOTEX=NTOTEX+IEXC(I)
      IF(IDAY.GE.IDAF0E) NTOTEX=NTOTEX+IEXC(I)
      120 CONTINUE
      IF(NMD.LE.0) GO TO 121
      NAVSF=NTOTSF/NMD
      NAVEX=NTOTEX/NMD
      121 WRITE(6,1008)
      DO 53 I=1,NSD
      XSUM(I)=0
      IF(RIY(I).GT.0.0)
      1 XSUM(I)=FLOAT(ISD(I,2),RIY(I))
      53 WRITE(6,1110) (ISD(I,J),J=1,3),PERC(I),XSUM(2),ISF(I),IAVAL(I)
      1,RIY(I)
      WRITE(6,5001) NTOTSF,NAVSF

```

```

345 5001 FORMAT(//5X,*TOTAL SHORTFALL =*,I10/ 5X,*AVERAGE SHORTFALL =*,I10) PRNTR
      T8X=T8T/FLCAT(T8T) PRNTR
      PRINT 5002, T8X PRNTR
5002 FORMAT(I10,5X,*AVERAGE BUILDUP ASHORE OVER MISSION (LESS TYPE 3) = PRNTR
      1*,F7.1,* DAYS*) PRNTR
1000 FORMAT(I11,4X,*... C A R G O / S H I P S U M A R Y* PRNTR
      1 //5X,*TIME*,5X,*CARGO DELIVERED*,5X,*SHIPS IN POOL* PRNTR
      2,5X,*VOL UTILIZATION*,5X,*VOL AVAILABLE*,5X,*REQUIREMENT*) PRNTR
      3,5X,*SHORTFALL*,5X,*CARGO DEL/REQ* PRNTR
1110 FORMAT(5X,I4,5X,I15,5X,I10,5X,F15.5,5X,F15.5,2I14,F16.0) PRNTR
      PRINT 5000, IDR,IMD, IDR2, IDAFOE, IDPOL, IDADMN, IDRS, IDRSFOL PRNTR
5000 FORMAT(//5X,*DAYS OF SUPPLY*/10X,*ALL GROUPS (EXC II+III)*,I7, PRNTR
      15X,*C-DAY (M-SCALE)*,I10/I1X,*GROUP II*,I22,5X,*DAY AFOE REQ*,I10 PRNTR
      2/I0X,*GROUP III*,I21,5X,*DAY ADMIN REQ*,I17/I0X,*BUILD UP ASHORE ( PRNTR
      3EXC I11)*,I5,5X,*BUILD UP ASHORE (GR I11)*,I5) PRNTR
      C COMPUTE AND PRINT PERCENT OF CYCLE TIME A TRANSFER CRAFT IS BEING PRNTR
      C UNLOADED AT BEACH FOR EACH TYPE OF TRANSFER CRAFT PRNTR
      X=XTCT(1,1)/15.*DOFFSH/XTCT(1,2)*OTME(1)+XTCT(1,1)/XSUFAC(1)+ PRNTR
      1DOFFSH/XTCT(1,2) PRNTR
      Y(1)=(XTCT(1,1)/XSUFAC(1))/X PRNTR
      Y(1)=Y(1)*100. PRNTR
      X=XTCT(1,2,1)/15.*DOFFSH/XTCT(2,2)*OTME(2)+XTCT(2,1)/XSUFAC(1) PRNTR
      1DOFFSH/XTCT(2,2) PRNTR
      Y(2)=(XTCT(2,1)/XSUFAC(1))/X PRNTR
      Y(2)=Y(2)*100. PRNTR
      X=XTCT(3,1)/XUP*DOFFSH/XTCT(3,2)*OTME(3)+XTCT(3,1)/XSUFAC(2)+ PRNTR
      1DOFFSH/XTCT(3,2) PRNTR
      Y(3)=(XTCT(3,1)/XSUFAC(2))/X PRNTR
      Y(3)=Y(3)*100. PRNTR
      X=XTCT(3,1)/2710.*DOFFSH/XTCT(3,2)*OTME(3)+XTCT(3,1)/2710.* PRNTR
      1DOFFSH/XTCT(3,2) PRNTR
      Y(4)=(XTCT(3,1)/2710.)/X PRNTR
      Y(4)=Y(4)*100. PRNTR
      PRINT 999 PRNTR
      DO 972 M=1,4 PRNTR
      MM=TTCS(M)+5 PRNTR
972 TTCS(M)=MM PRNTR
      C COMPUTE AVERAGE NUMBER OF TIMES EACH TYPE OF CRAFT COMES TO SHORE PRNTR
      ATTCS(1)=TTCS(1)/FLOAT(ITCFT(1,1)) PRNTR
      ATTCS(2)=TTCS(2)/FLOAT(ITCFT(2,1)) PRNTR
      ATTCS(3)=TTCS(3)/TTCS(4)/FLOAT(ITCFT(3,1)) PRNTR
      C COMPUTE TOTAL UNLOADING TIMES FOR EACH TYPE OF CRAFT PRNTR
      TUNLTC(1)=TTCS(1)*UNLTC(1) PRNTR
      TUNLTC(2)=TTCS(2)*UNLTC(2) PRNTR
      TUNLTC(3)=TTCS(3)*UNLTC(3)+TTCS(4)*UNLTC(4) PRNTR
      TTCS(3)=TTCS(3)+TTCS(4) PRNTR
      PRINT 890 PRNTR
890 FORMAT(40X,*TRANSFER CRAFT UNLOADING INFORMATION*/) PRNTR
      PRINT 892 PRNTR
892 FORMAT(I10,5X,*NAME*,I7X,*PERCENT*,I7X,*AVERAGE*,I1X,*TOTAL*,9X, PRNTR
      1*AVERAGE*,I1X,*TOTAL*) PRNTR
      PRINT 894 PRNTR
894 FORMAT(25X,*CYCLE TIME UNLOADING TIME UNLOADING TRIPS PRNTR
      1ASHORE TRIPS*) PRNTR
      PRINT 896 PRNTR
896 FORMAT(26X,*UNLOADED*,8X,*PER CRAFT*,I1X,*TIME*,8X,*PER CRAFT*, PRNTR
      110X,*ASHORE*) PRNTR

```

```

400      PRINT 898
      898 FORMAT(4X,*(HOURS)*,9X,*(HOURS)*,
      PRINT 900, NMCFT(1),Y(1),UNLTC(1),TUNLTC(1),ATTCS(1),ITCS(1)
      PRINT 906, NMCFT(2),Y(2),UNLTC(2),TUNLTC(2),ATTCS(2),ITCS(2)
405      900 FORMAT(1H-2X,A10.10X,F10.2,6X,F9.3,7X,F10.2,7X,F8.2,8X,F9.0)
      PRINT 902, Y(3),UNLTC(3)
      902 FORMAT(1H-3X,*CAUSEWAY FERRY*,5X,F10.2,8X,F9.3,7X,F10.2,7X,F8.2,
      10X,F9.0)
      PRINT 904
      904 FORMAT(1X,*(CONTAINERIZED CARGO)*,
      PRINT 902, Y(4),UNLTC(4)
      PRINT 906
      906 FORMAT(4X,*(FO/R/C CARGO)*,
      PRINT 908, TUNLTC(3),ATTCS(3),ITCS(3)
410      908 FORMAT(1H-3X,*CAUSEWAY FERRY*,39X,F10.2,7X,F8.2,8X,F9.0)
      PRINT 910
      910 FORMAT(1X,*(CONTAINERIZED CARGO)*,
      PRINT 912
      912 FORMAT(2X,*AND R/O/R CARGO*)
      PRINT 914
420      914 FORMAT(4X,*COMBINED)*,
      6002 IF(MTEST.EQ.1) GO TO 888
      IF(TIME.NE.TIMEIT) GO TO 888
      IF(MTEST.GT.0) GO TO 883
      DO 777 I=1,4
425      777 ITCT(I,1)=ICRF(I)
      WRITE(6,7000) ICRF
      7000 FORMAT(5X,*MAX LANDING CRAFT USED ON FIRST ITERATION =*,4I6)
      GO TO 887
430      883 IF(SHTFLM.LE.0.0) GO TO 881
      IF(MTOTSF.GT.SHTFLM) GO TO 886
      GO TO 887
      881 IF(MTOTSF.GT.SHTFL) GO TO 886
      887 SHTFL=MTOTSF
      MTEST=MTEST+1
      DO 885 JJ=1,4
435      885 LOGRF(JJ)=ITCT(JJ,1)
      GO TO 884
      886 MTEST=1
      884 DO 9999 I=1,21576
440      9999 SUMSHR(I)=0
      REWIND 5
      CALL ITERAT
      RETURN
445      888 CONTINUE
      IF(LVENT1.EQ.0.0R.TIME.EQ.TINVL) PRINT 999
      999 FORMAT(1H1)
      IF(TIME.EQ.TINVL) TINVL=TINVL+TIMSAV
      TEVENT=TIME+5.0
      LVENT1=6
      CALL PUT
      RETURN
450      889
      END

```

PUT

Activity Performed: Places events on event list in order of encounter.

Type: Subroutine

Common Used: /GEN/

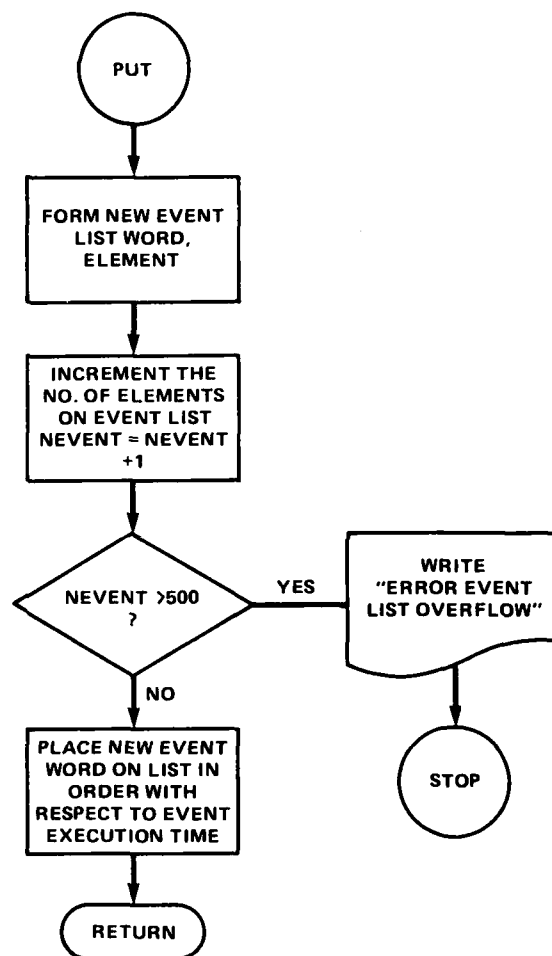
Called by: AVRAGE, GENCAR, LDSH, PRNTR, RDPARM, RLD SH, SHPARV, SHPLV, SPOOL,
UNLDSH

Subroutines Called: none

Events Stored: none

Description:

PUT enters an event on the event list, KEVENT, and orders the list according to increasing event execution times.



RLDSH

Activity Performed: Simulates the unloading of cargo at commercial ports.

Type: Event

Common Used: /CARGOG/, /CONTRL/, /GEN/, /PORT/, /SHIP/

Called by: TAKE

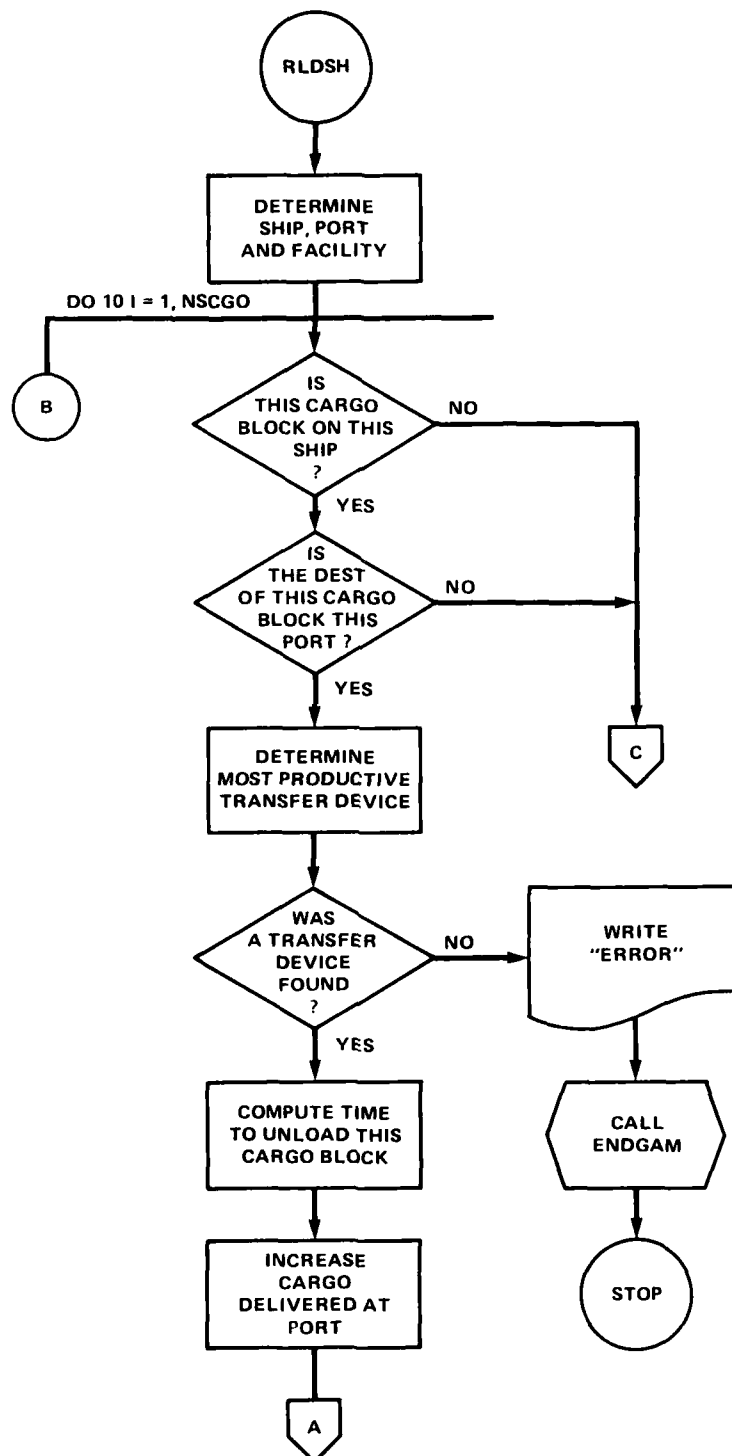
Stored by: SHPARV

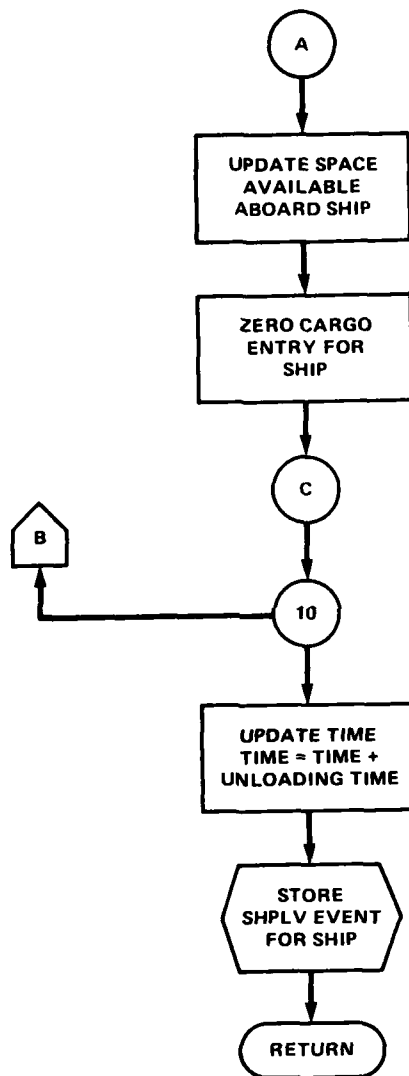
Subroutines Called: ENDGAM, PUT

Events Stored: LDSH

Description:

RLDSH simulates cargo unloading at a commercial port. It assigns berth/ship transfer systems suitable for cargo movement. When unloading is completed, a LDSH event is stored to perform loading operations.





```

1  SUBROUTINE RLOSH
COMMON /CONTRL/ TIMIT,SHTFL,DECR(4),XDIST(30,30),PRODC(6,6,8)
1  .ADJGGO(8),NTEST
5  COMMON /SUNY/ SUMSHP(30,10),SUMPR(30,10),ISMPT(30,6)
COMMON
1  GEN/ TIME,TEVENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
2  NPORT,NSHIPS,TINVL,IOUT,INFAC,NSTYF,NITIN
1  /CARGO/ NCARGN,KARGN(1000,3),CARGEN(1000)
2, JCARGO(1000,3),CARGO(1000),NSCGO
1  /SHIP/ NSHIP(400,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
1  /PORT/ NPORT(30,6),IFAC(30,10)
2,IOQUEUE(1000,2),NOQUEUE
IDSHIP=LVENT2
IDPORT=LVENT3
IFAC1=NSHIP(IDSHIP,13)
ITYPE=NSHIP(IDSHIP,1)
IF(IOUT.EQ.1) WRITE(6,1000)TIME,IDPORT,IDSHIP,IFAC1
1000 FORMAT(5X,F7.3,5X,I4,5X,I4,5X,*SHIP UNLOAD AT FACILITY=*,I4)
TEVENT=0
DO 10 I=1,NSCGO
IF(CARGO(I),LE.0) GO TO 10
IF(IDSHIP.NE.JCARGO(I,1)) GO TO 10
IF(IDPORT.NE.JCARGO(I,2)) GO TO 10
ICT=JCARGO(I,3)
JCARGO(I,1)=0
NSHIP(IDSHIP,9)=NSHIP(IDSHIP,9)+CARGO(I)
NSHIP(IDSHIP,10)=NSHIP(IDSHIP,10)+CARGO(I)/ADJGGO(ICT)
ISAVE=0
SAVE=0
DO 20 II=1,6
IF(MTSHP2(ITYPE,II).LE.0) GO TO 20
IF(SAVE.GE.PRODC(IFAC1,II,ICT)) GO TO 20
ISAVE=II
SAVE=PRODC(IFAC1,II,ICT)
20 CONTINUE
IF(ISAVE.GT.0) GO TO 30
WRITE(6,1003) IDPORT,IDSHIP
1003 FORMAT(5X,*ERROR*,I11,I9,5X,*NO TRANSFER DEVICES FOR SERVICE*)
CALL ENOGAN
STOP
30 FACTOR=1.0
IF(MTSHP2(ITYPE,7).GT.1) FACTOR=FLOAT(MTSHP2(ITYPE,8))*-.001
TEVENT=TEVENT+CARGO(I)/(PRODC(IFAC1,ISAVE,ICT)+FLCAT(NPORT(IDPORT
1,6))*-.001*FACTOR)
SUMPR(IDPORT,3)=SUMPR(IDPORT,3)+CARGO(I)
IF(IOUT.EQ.1) WRITE(6,1001) ICT,CARGO(I)
1001 FORMAT(35X,*ICT=*,I4,* MTS=*,F10.2)
CARGO(I)=0
10 CONTINUE
IF(IOUT.EQ.1) WRITE(6,1002) TEVENT
1002 FORMAT(35X,*TIME TO UNLOAD AT PORT =*,F7.3)
LVENT1=4
LVENT2=IDSHIP
LVENT3=IDPORT
TEVENT=TEVENT+TIME
CALL PUT
RETURN
END

```

RNG1(RNG)

Activity Performed: Computes a random number between zero and one.

Type: Subroutine

Common Used: /GEN/

Called by: DISTRI, RDPARM

Stored by: n/a

Routines Called: none

Events Stored: none

Description:

RNG1, (RNG) computes a random number between 0 and 1. This random number is used to compute a dependent variable from a specified distribution curve.

07/23/81 09.54.22

FTN 4.8+508

OPT=0 ROUND=4/ TRACE

74/74

SUBROUTINE RNG1

```

1      SUBROUTINE PNG1                                2
C-----RNG1-----RNG1                               3
C   RNG/RNG1 COMPUTES A RANDOM NUMBER BETWEEN ZERO AND ONE  4
C-----RNG1-----RNG1                               5
5      COMMON                                          6
1/GEN/ TIME,TEVENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3, 7
2 NNPORT                                             8
          SAVE=37.*.37843                             9
          SAVE=SAVE-AINT(SAVE)                       10
          DO 100 I=1,100                              11
            100 SAVE=SAVE*37.-AINT(SAVE*37.)           12
              GO TO 115                                 13
          ENTRY PNG                                     14
115 SAVE=SAVE*37.-AINT(SAVE*37)                      15
          RN=SAVE                                       16
          RETURN                                        17
          END                                           18

```

SHPARV

Activity Performed: Assigns an incoming ship to an appropriate berth.

Type: Event

Common Used: /CARGOG/, /CONTRL/, /GEN/, /PORT/, /SHIP/, /SUMY/

Called by: TAKE

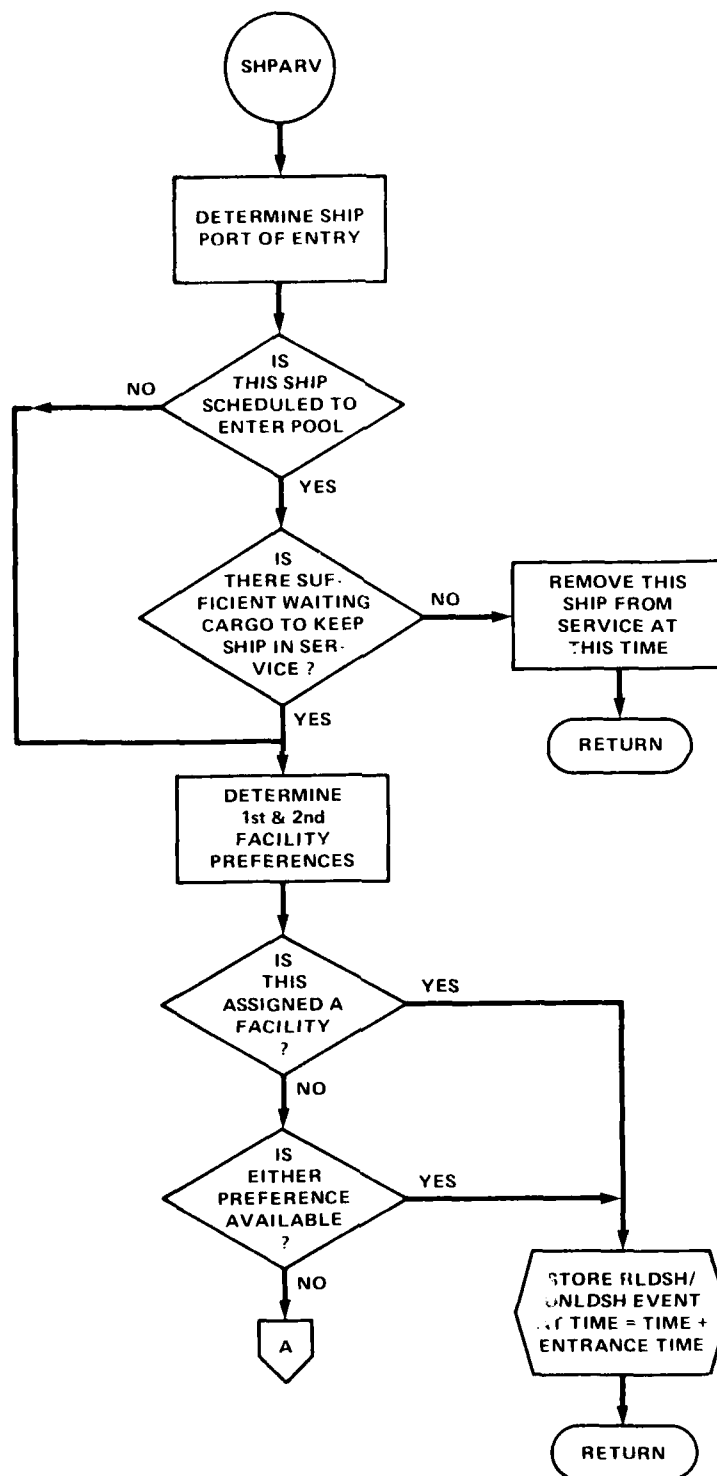
Stored by: RDPARM, SHPLV, SPOOL

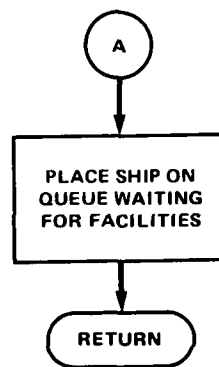
Subroutines Called: ENDGAM, PUT

Events Stored: RLDSH, SHPLV, UNLDSH

Description:

SHPARV assigns a ship to a berth according to the berth types preferred by the ship. Only berths immediately available at the time the ship enters the port are considered. If no appropriate berth is available, the ship enters a berth queue until a preferred berth type is free. All berths accept ships for cargo transfer on a first come, first-served basis.





```

1 SUBROUTINE SHPARV
COMMON /COMTRL/ TIMIT,SHTFL,DECR(4),XOIST(30,30),PRODUC(6,6,0)
1,ADJCGO(8),NTESI
COMMON /SUMY/ SUMSH(30,10),SUMPR(30,10),ISMFR(30,6)
COMMON
1/GEN/ IIME,IWENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
2 NIMPORT,NSHIPS,TINVL,IOUT,MPACT,NSTYP,NITIN
1/CARGO/ NCARGEN,KARGEN(1000,3),CARGEN(1000)
2,JCARGO(1000,3),CARGO(1000),NSCGO
1/SHIP/ NSHIP(400,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
1/PORT/NPORT(30,6),IFAC(30,10)
3,IQUEUE(1000,2),NQUEUE,NSE(30,30)
IDSHIP=LVENT2
IDPORT=LVENT3
NSHIP(IDSHIP,2)=IDPORT
ITYPE=NSHIP(IDSHIP,1)
IF(NSHIP(IDSHIP,12).NE.2) GO TO 100
IF(NSHIP(IDSHIP,7).GT.0) GO TO 101
NSHIP(IDSHIP,12)=1
SUMSH(ITYPE,5)=SUMSH(ITYPE,5)+1
RETURN
101 NSHIP(IDSHIP,6)=SUMSH(ITYPE,6)+1
NSHIP(IDSHIP,12)=0
100 CONTINUE
IF(IOUT.EQ.1) WRITE(6,1000) TIME,IDPORT,IOSHIP
1000 FORMAT(5X,F7.3,5X,I4,5X,I4,5X,*SHIP HAS ARRIVED AT PORT*)
C CHECK MODE OF OPERATION, LOAD/UNLOAD
IF(NSHIP(IDSHIP,12).NE.1) GO TO 120
DO 60 I=1,NCARGEN
IF(CARGEN(I).LT.500.) GO TO 60
IF(MOD(KARGEN(I,1)/10,100).NE.IDPORT) GO TO 60
DO 61 II=1,5
IF(MTSHIP(ITYPE,II).NE.MOD(KARGEN(I,1),100)) GO TO 61
NSHIP(IDSHIP,12)=0
GO TO 120
60 CONTINUE
61 CONTINUE
NXPORT=0
CALL NXPR*(IDSHIP,IDPORT,NXPORT)
IF(NXPORT.LE.0) GO TO 15
LVENT1=5
CALL PUT
NSHIP(IDSHIP,12)=NXPORT
RETURN
15 IF(IOUT.EQ.1) WRITE(6,1003)
1003 FORMAT(35X,*SHIP ENTERING POOL*)
SUMSH(ITYPE,5)=SUMSH(ITYPE,5)+1
SUMSH(ITYPE,6)=SUMSH(ITYPE,6)-1
RETURN
120 IF(NPORT(IDPORT,5).EQ.1) GO TO 10
C LOAD- DETERMINE FACILITIES TO BE USED BY SHIP
IF(NSHIP(IDSHIP,13).GT.0) GO TO 40
IFAC1=MTSHIP(ITYPE,9)
IFAC2=MTSHIP(ITYPE,10)
C DETERMINE FACILITIES AVAILABLE
IF(IFAC1.LE.0.AND.(IFAC2.LE.0)) GO TO 20
IF(IFAC1.IDPORT,IFAC1).GT.0) GO TO 30

```

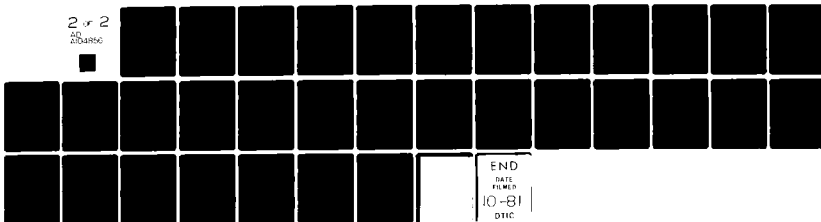
AD-A104 856

DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/6 15/5
TRADES: A COMPUTER SIMULATION DEPICTING CARGO SHIPMENT AND TRAN--ETC(U)
SEP 81 P E FRIEDENBERG, R E MELTON, M GRAY
DTNSRDC-81/066

UNCLASSIFIED

NL

2 of 2
AD-A104 856



END
DATE
FILMED
10-81
DTIC

07/23/81 09.54.22

FTN 4.0+500

SUBROUTINE SHPARV 74/74 OPT=0 ROUND=0/ TRACE

```

60      IF(IFAC2.LE.0) GO TO 50
        IF(IFAC(IDPORT,IFAC2).LE.0) GO TO 50
        NSHIP(IDSHIP,13)=IFAC2
        GO TO 40
30      NSHIP(IDSHIP,13)=IFAC1
40      TEVENT=TIME
        LVENT1=9
        LVENT2=ICSHIP
        LVENT3=IDPORT
        CALL PUT
        IFAC1=NSHIP(IDSHIP,13)
        IFAC(IDPORT,IFAC1)=IFAC(IDPORT,IFAC1)-1
        NSE(I1TYPE,IDPORT)=NSE(I1TYPE,IDPORT)-1
        RETURN
10      TEVENT=TIME+FLCAT(INPORT(IDPORT,2))* .01
        NSE(I1TYPE,IDPORT)=NSE(I1TYPE,IDPORT)-1
        LVENT1=3
        LVENT2=IDSHIP
        LVENT3=IDPORT
        CALL PUT
        RETURN
20      WRITE(6,1001) TIME,IDPORT,IDSHIP
1001      FORMAT(' ERROR',5X,F7.3,5X,I4,5X,I4,5X,*SHIP CAN NOT BERTH,NO FA
              'CILITY TYPE GIVEN FOR SHIP')
        CALL ENDGAM
        RETURN
50      NQUEUE=NQUEUE+1
        IQUEUE(NQUEUE,1)=IDSHIP
        IQUEUE(NQUEUE,2)=IDPORT
        IF(IOUT.EQ.1) WRITE(6,1002)
1002      FORMAT(35X,*FACILITIES NOT AVAIL,ENTER QUEUE*)
        RETURN
        END

```

SHPLV

Activity Performed: Releases all berth facilities used by a departing ship.

Type: Event

Common Used: /CARGOG/, /CONTRL/, /GEN/, /PORT/, /SHIP/, /SUMY/

Called by: TAKE

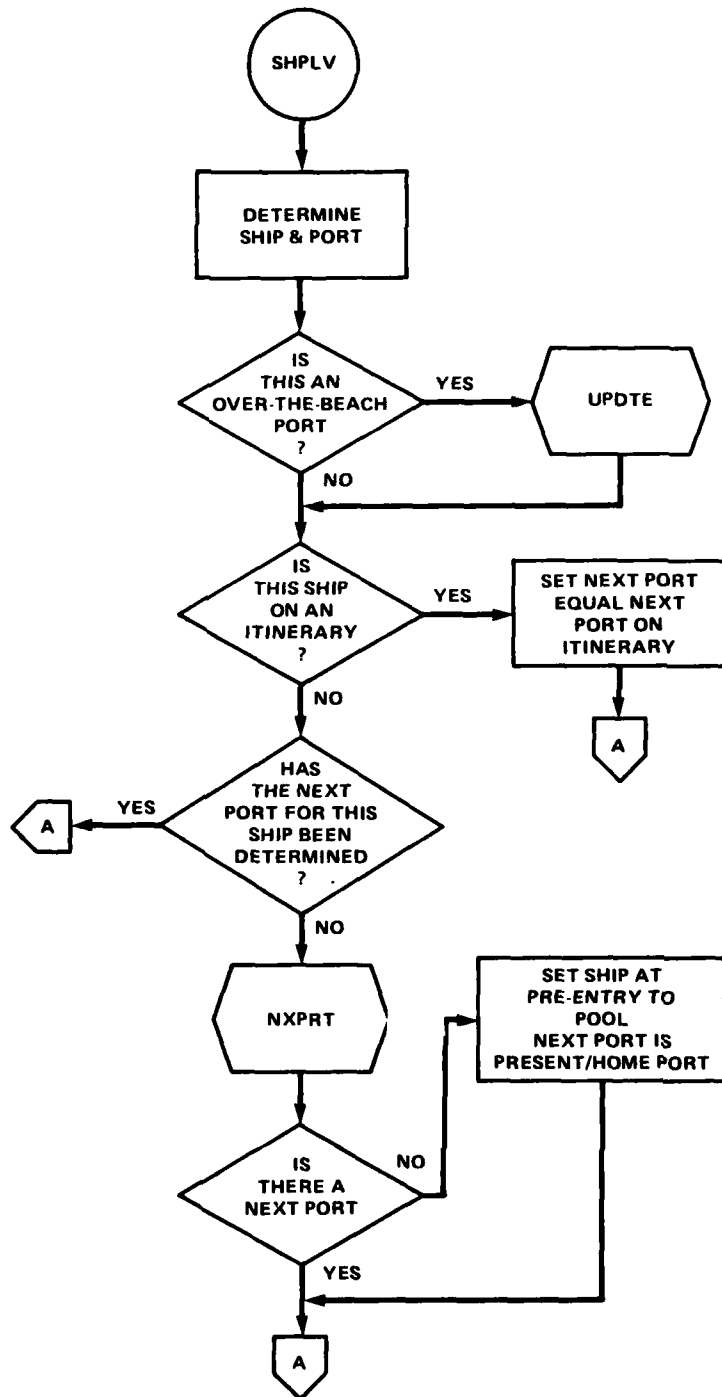
Stored by: LDSH, UNLDSH

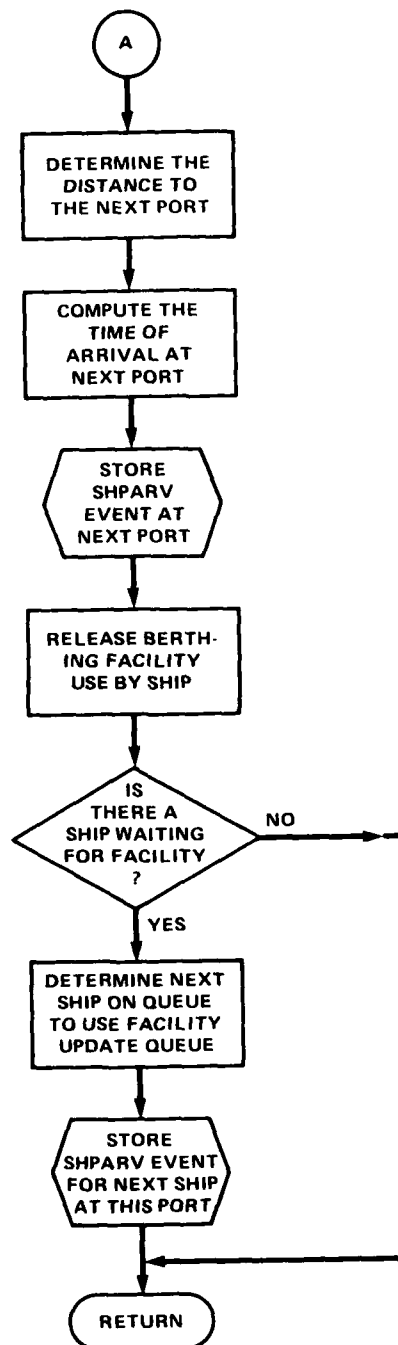
Subroutines Called: NXPRT, PUT, UPDTE

Events Stored: SHPARV

Description:

SHPLV frees all berth facilities used by the departing ship and determines the next port and the time necessary to sail to the next port. It determines whether any other ship is waiting to use the berth, removes the next waiting ship in the berth queue from the queue, and stores a SHPARV event for that ship.





```

1 SUBROUTINE SHPLV
COMMON /CONTRL/ TIMIT,SHITFL,DECR(4),XDIST(30,30),PRODUC(6,6,8)
1,ADJGGO(8),NTEST
COMMON /SUNY/ SUNSHIP(30,18),SUMPR(30,18),ISMPRT(30,6)
COMMON
1/GEN/ TIME,TEVENT,NEVENT,KEVENT(500),ARN,LVENT1,LVENT2,LVENT3,
2 NHPRT,NSHIPS,TINVL,IOUT,NFACT,NSTYP,NITIN
1,IGEN,PUTL
1 /CARGO/ NCARGN,KARGEN(1000,3),CARGEN(1000)
2,JCARGO(1000,3),CARGO(1000),NSCGO
1/SHIP/ NSHIP(400,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
1/PORT/ NPORT(30,6),IFAC(30,10)
3,IQUEUE(1000,2),NQUEUE,NSE(30,30)
IDSHIP=LVENT2
IDPORT=LVENT3
IF(NPORT(IDPORT,5).EQ.1) CALL UPDTE
ITYPE=NSHIP(IDSHIP,1)
NITN=NSHIP(IDSHIP,7)
IF(NITN.GT.0) GO TO 18
NXPRT=IABS(NSHIP(IDSHIP,12))
IF(MSHIP(IDSHIP,12).EQ.0) CALL NXPRT(IDSHIP,IOPORT,NXPRT)
NSHIP(IDSHIP,12)=0
IF(NXPRT.GT.0) GO TO 28
NXPRT=NSHIP(IDSHIP,3)
NSHIP(IDSHIP,12)=1
GO TO 26
18 IREL=NSHIP(IDSHIP,11)+1
IF(IRL.GT.18) IREL=1
IF(ITIN(NITN,IREL).LE.0) IREL=1
NXPRT=ITIN(NITN,IREL)
NSHIP(IDSHIP,11)=IREL
28 NSHIP(IDSHIP,2)=NXPRT+18+IOPORT
NSHIP(IDSHIP,14)=0
IF(NPORT(IDPORT,1).EQ.NSHIP(IDSHIP,5).AND.NPORT(NXPRT,1).EQ.
1 NSHIP(IDSHIP,4)) NSHIP(IDSHIP,15) = NSHIP(ICS+IP,15)+100
DIST=XDIST(IDPORT,NXPRT)
TEVENT=TIME*(DIST/IOPORT*(MTSHIP(ITYPE,14))/24.
IF(IOUT.EQ.1) WRITE(6,100)TIME,IOPORT,IOSHIP,NXPRT,TEVENT
NSHIP(IDSHIP,6)=TEVENT*100.
IF(NPORT(IDPORT,1).NE.NSHIP(IDSHIP,4)) GO TO 100
IF(NPORT(NXPRT,1).NE.NSHIP(IDSHIP,5)) GO TO 100
SUNSHIP(ITYPE,1)=SUNSHIP(ITYPE,1)+MTSHIP(ITYPE,11)
SUNSHIP(ITYPE,2)=SUNSHIP(ITYPE,2)+MTSHIP(ITYPE,12)
SUNSHIP(ITYPE,3)=SUNSHIP(ITYPE,3)+FLOAT(MTSHIP(ITYPE,11))*PUTL
1-NSHIP(IDSHIP,9)
SUNSHIP(ITYPE,4)=SUNSHIP(ITYPE,4)+MTSHIP(ITYPE,12)
1 -NSHIP(IDSHIP,10)
100 LVENT1=2
LVENT2=IOSHIP
LVENT3=NXPRT
CALL PUT
NSE(ITYPE,NXPRT)=NSE(ITYPE,NXPRT)+1
NSE(ITYPE,IOPORT)=NSE(ITYPE,IOPORT)-1
IF(NPORT(IDPORT,5).EQ.1) RETURN
IFAC1=NSHIP(IDSHIP,13)
IF(ITAC1.GT.0) IFAC(IDPORT,IFAC1)=IFAC(IDPORT,IFAC1)+1
NSHIP(IDSHIP,13)=0

```

```

30 IF (NQUEUE.LE.0) RETURN
   IF (IFAC1.LE.0) RETURN
   GO 40 I=1,NQUEUE
   IF (IQUEUE(I,2).NE.IDPORT) GO TO 40
45 IDSHIP=IQUEUE(I,1)
   ITYPE=NSHIP(IDSHIP,1)
   IF (MTSHIP(ITYPE,9).NE.IFAC1.AND.MTSHIP(ITYPE,10).NE.IFAC1) GO TO 40
   LVENT=2
   LVENT2=IDSHIP
   LVENT3=IDPORT
   TEVENT=TIME
   CALL PUT
   NSHIP(IDSHIP,13)=IFAC1
50 IQUEUE(I,1)=0
   IQUEUE(I,2)=0
   SUMPT(IDPORT,IFAC1+3)=SUMPT(IDPORT,IFAC1+3)+TEVENT
   1-FLOET(NSHIP(IDSHIP,6))*.01
75 ISMPT(IDPORT,IFAC1)=ISMPT(IDPORT,IFAC1)+1
   IF (IOUT.EQ.1) WRITE(6,1002) IDSHIP
   RETURN
40 CONTINUE
   RETURN
1000 FORMAT(5X,F7.3,5X,I4,5X,I4,5X,I4,5X,*SHIP LEAVING PORT,NEXT=*,I4,
1 * ETA =*,F7.3)
1002 FORMAT(35X,*NEXT SHIP =*,I4,* ENTERING FROM QUEUE*)
END

```

SPOOL

Activity Performed: Reactivates unused ships into service.

Type: Event

Common Used: /CARGOG/, /CONTRL/, /GEN/, /PORT/, /SHIP/, /SUMY/

Called by: TAKE

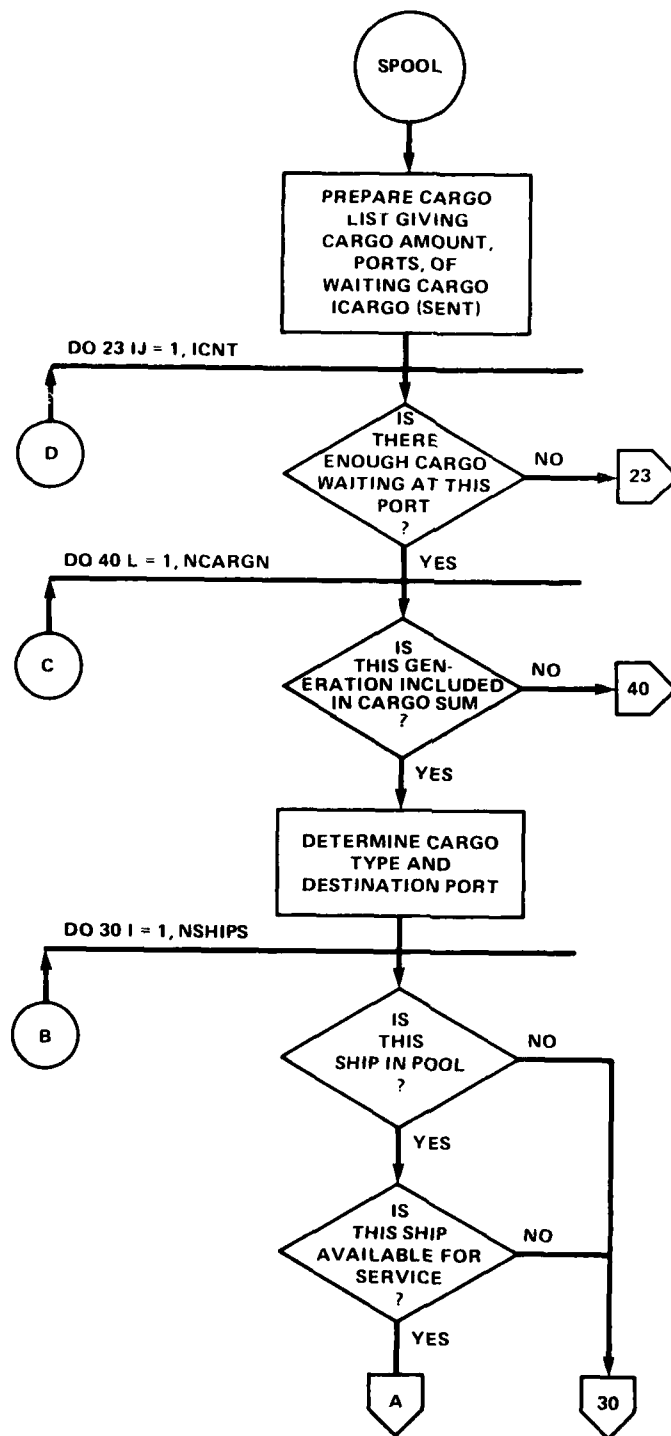
Stored by: RDPARM, SHPARV, SPOOL

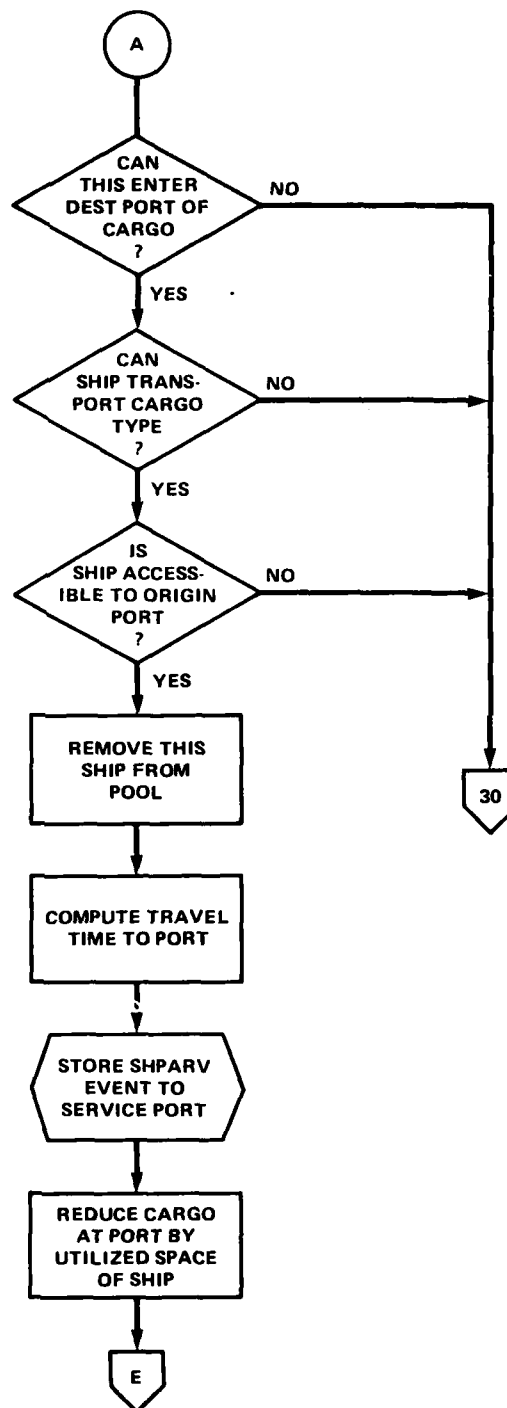
Subroutines Called: FORDER, PUT

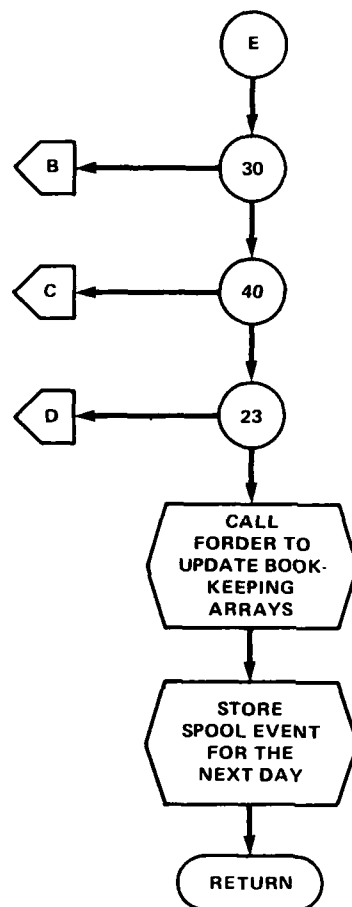
Events Stored: SPOOL, SHPARV

Description:

SPOOL activates the ships assigned to the ship pool and positions them at ports having excess cargo. After all ports with excess cargo have been determined, ships which satisfy the transfer and berthing criteria are assigned to service ports with backlogged cargo. SPOOL stores a SHPARV event for each ship scheduled to leave the ship pool.








```

        60      IF(MTSHIP(ITYPE,NN).EQ.1CT) GO TO 50
        45      CONTINUE
        50      GO TO 30
        50      CONTINUE
        IF(MTSHIP(ITYPE,13).GT.NPORT(J,3)) GO TO 30
        IFAC1=MTSHIP(ITYPE,9)
        IFAC2=MTSHIP(ITYPE,10)
        IF(IFAC(K,IFAC1).GT.0) GO TO 35
        IF(IFAC2.LE.0) GO TO 30
        IF(IFAC(K,IFAC2).LE.0) GO TO 30
        35      IF(NPORT(J,5).EQ.1) GO TO 36
        IF(IFAC(J,IFAC1).GT.0) GO TO 36
        IF(IFAC2.LE.0) GO TO 30
        IF(IFAC(J,IFAC2).LE.0) GO TO 30
        36      IORIG=NSHIP(I,4)
        IDELY=NSHIP(I,5)
        IF(NSHIP(I,8).LE.0) GO TO 37
        IF(NSHIP(I,8).EQ.1.AND.IORIG.NE.NPORT(K,1)) GO TO 30
        IF(NSHIP(I,8).EQ.2.AND.IORIG.NE.NPORT(K,1).OR
        1.IGELY.NE.NPORT(J,1)) GO TO 30
        37      DIST=0
        IF(K.EQ.NSHIP(I,2)) GO TO 47
        IPOKT=NSHIP(I,2)
        DIST=XDIST(IPOKT,K)
        47      SPEED=MTSHIP(ITYPE,14)
        TEVENT=FLOAT(NSHIP(I,6))*0.01*(DIST/SPEED)/24.
        IF(TIME.GT.TEVENT) TEVENT=TIME
        IPT=NSHIP(I,2)
        IF(SUM(IPT).LT.500) GO TO 51
        IF(TEVENT-TIME.GT.3.0) GO TO 30
        51      CGO(L)=CGO(L)-NSHIP(I,9)
        NSHIP(I,4)=NPORT(K,1)
        NSHIP(I,5)=NPORT(J,1)
        IF(IOUT.EQ.1) WRITE(6,1000) TIME,NSHIP(I,2),I,K,TEVENT
        1000  FORMAT(5X,F7.3,5X,I4,5X,I4,5X,"SHIP LEAVING POOL,BOUND FO PORT=",
        14," ETA=*,F10.2)
        NSHIP(I,2)=K
        NSHIP(I,12)=0
        NSHIP(I,14)=0
        LVENT1=2
        LVENT2=1
        LVENT3=K
        CALL PUT
        SUMSHP(ITYPE,6)=SUMSHP(ITYPE,6)+1
        SUMSHP(ITYPE,5)=SUMSHP(ITYPE,5)-1
        NSE(ITYPE,K)=NSE(ITYPE,K)+1
        ICARGO(II)=(ICARGO(II)/10000-NSHIP(I,9))*10000+MOD(ICARGO(II)
        1,10000)
        ISAVE=ICARGO(J)
        NSHIP(I,6)=TEVENT*100.
        SUM(K)=SUM(K)-NSHIP(I,9)
        IF(SUM(K).LT.CARGG(1)) GO TO 23
        IF(ICARGO(II)/10000.LE.CARGG(1)) GO TO 23
        30      CONTINUE
        40      CONTINUE
        23      CONTINUE
        48      CONTINUE

```

07/23/61 09.54.22

FTN 4.6+500

74/74 OPT=0 ROUND=0/ TRACE

SUBROUTINE SPCOL

SPCOL 116
SPCOL 117
SPCOL 118
SPCOL 119
SPCOL 120
SPCOL 121
SPCOL 122

TEVENT=TIME+1.0
LVENT=7
CALL PUT
CALL FORDER(IQUEUE, NQUEUE, 2, DUM, 0)
CALL FORDER(JCARGO, NSCGO, 3, CARGO, 1)
RETURN
END

115
120

TAKE

Activity Performed: Selects the next event to be executed with respect
to the current simulation time.

Type: Subroutine

Common Used: /CONTRL/, /GEN/

Called by: Main program ROACH

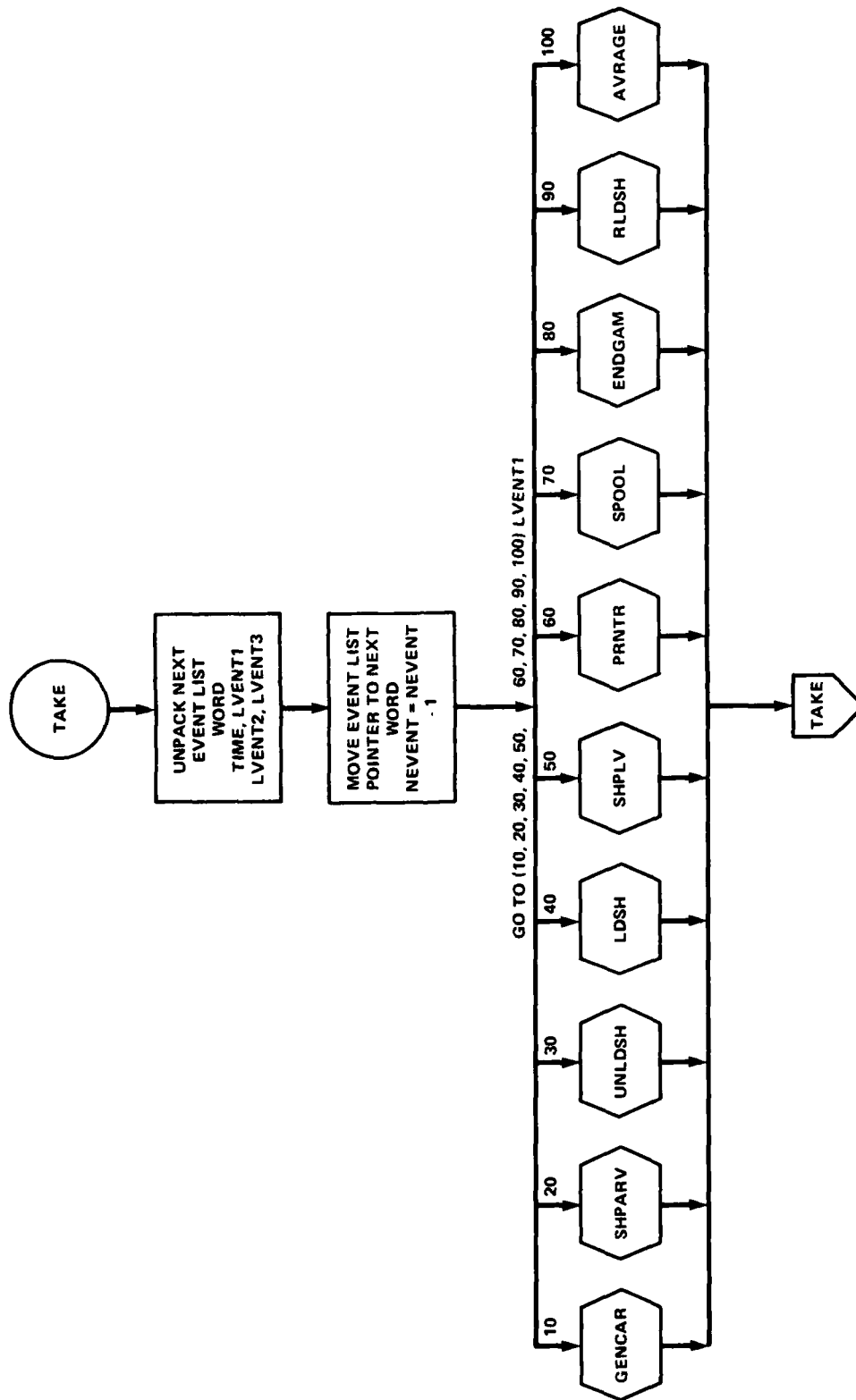
Stored by: n/a

Subroutines Called: All events

Events Stored: none

Description:

TAKE removes an event from the event list and calls it into execution.



```

1      SUBROUTINE TAKE
C-----
C      TAKE REMOVES THE NEXT EVENT FROM THE EVENT LIST AND CALLS IT INTO
C      EXECUTION
C-----
COMMON
1 /CONTROL/ GUM(1207),MTEST
1/GEN/ TIME,TEVENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
2 NNPORT
1000 TIME=FLOAT(KEVENT(NEVENT))/1000000000+.001
LVENT1=MOD(KEVENT(NEVENT),100)
LVENT2=MOD(KEVENT(NEVENT)/100,1000)
LVENT3=MOD(KEVENT(NEVENT)/100000,1000)
NEVENT=NEVENT+1
GO TO (10,20,30,40,50,60,70,80,90,100), LVENT1
15    10 CALL GENCAR
GO TO 1000
20    20 CALL SHPARV
GO TO 1000
20    30 CALL UNLCSH
GO TO 1000
40    40 CALL LDOSH
GO TO 1000
50    50 CALL SHPLV
GO TO 1000
60    60 CALL PRNTR
GO TO 1000
70    70 CALL SPOOL
GO TO 1000
90    90 CALL RLDSH
GO TO 1000
80    80 CALL ENDGAM
IF(MTEST.EQ.1) STOP
GO TO 1000
35    100 CALL AVRAVE
GO TO 1000
END

```

UNLDSH

Activity Performed: Unloads the cargo from each incoming ship at an over-the-beach port.

Type: Event

Common Used: /CONTRL/, /A/, /GEN/, /CARGOG/, /SHIP/, /PORT/, /WATE/, /BUSH1/

Called by: TAKE

Stored by: SHPARV

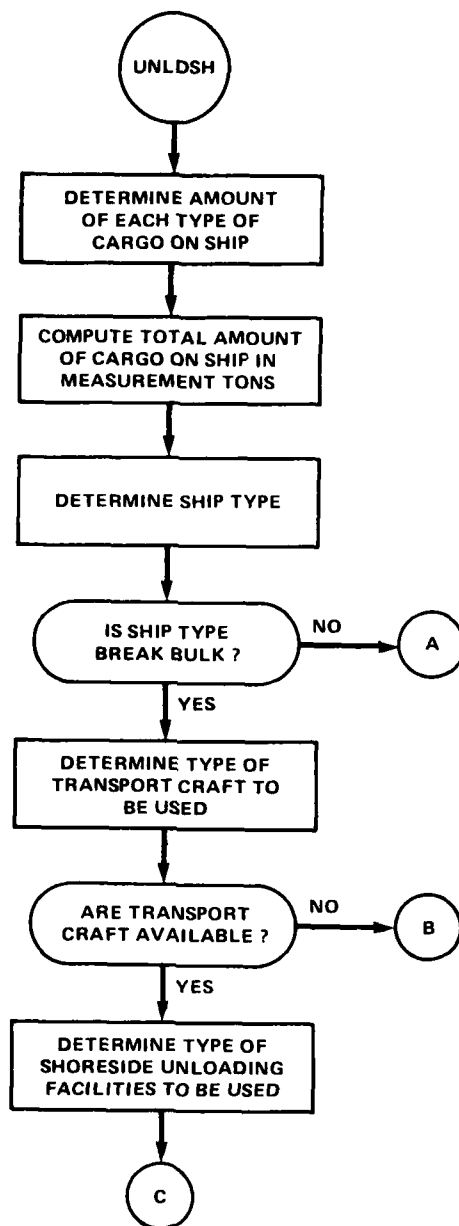
Subroutines Called: PUT

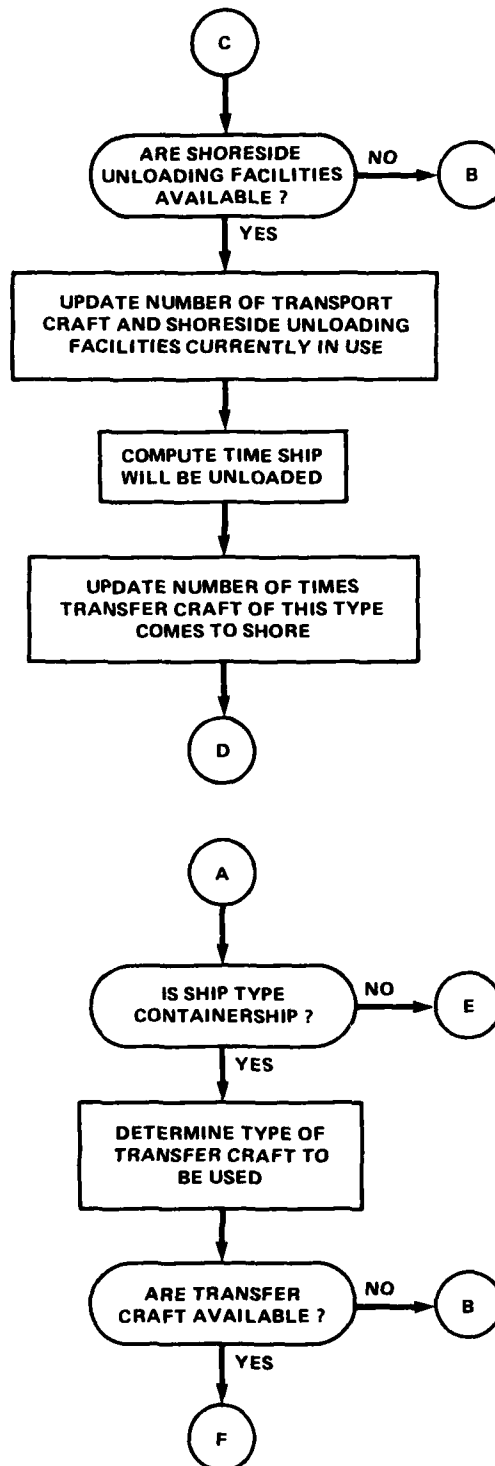
Events Stored: SHPLV

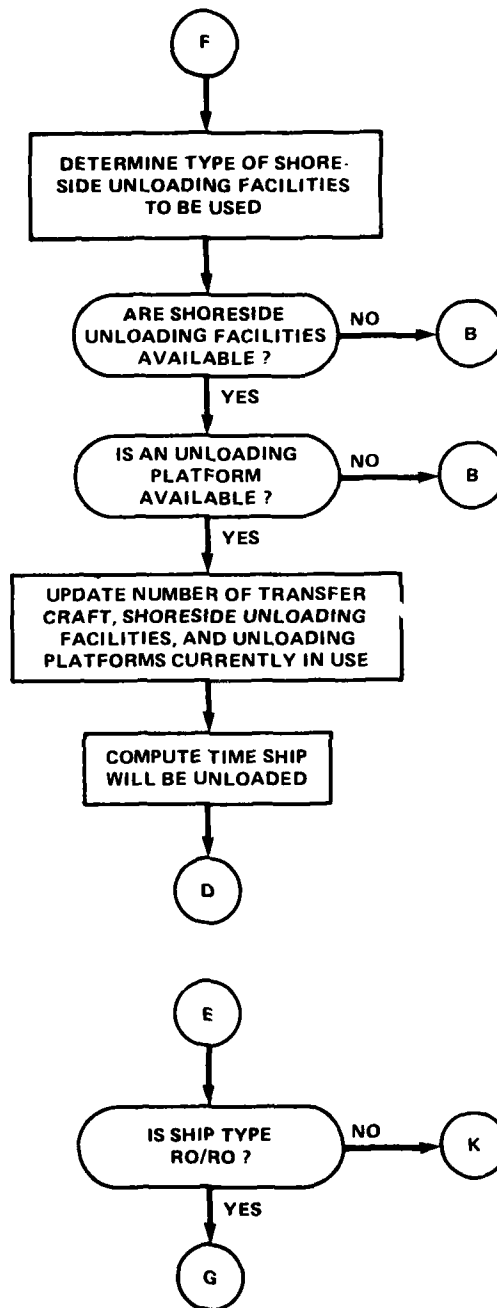
Description:

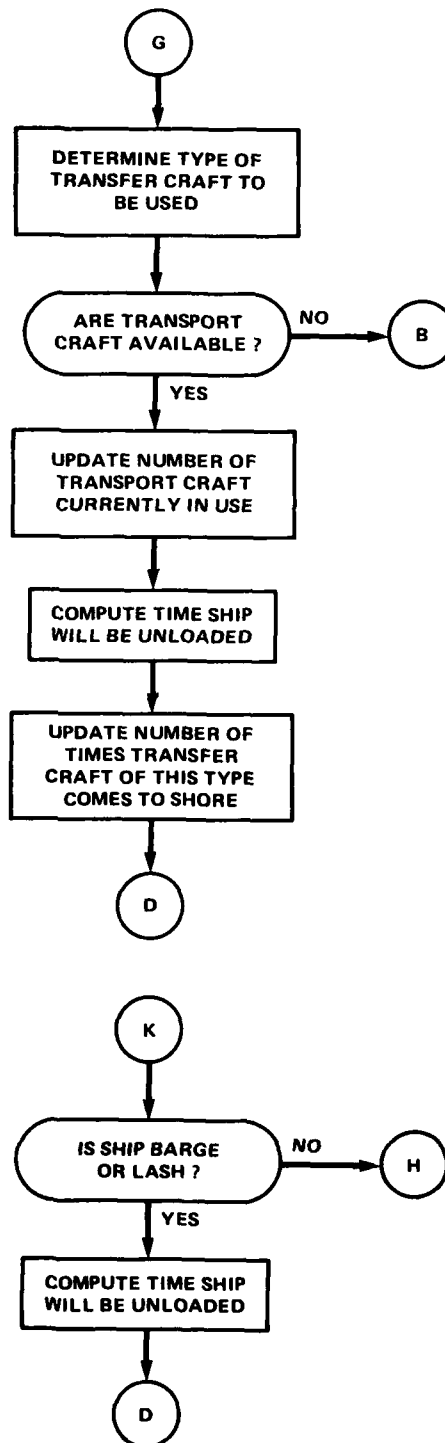
UNLDSH controls the unloading of ship cargo at the over-the-beach destination port. It checks on the availability of transport craft and unloading facilities. If facilities are available, the ship is unloaded. Otherwise, the ship is put into a queue until such time as craft and unloading facilities are available.

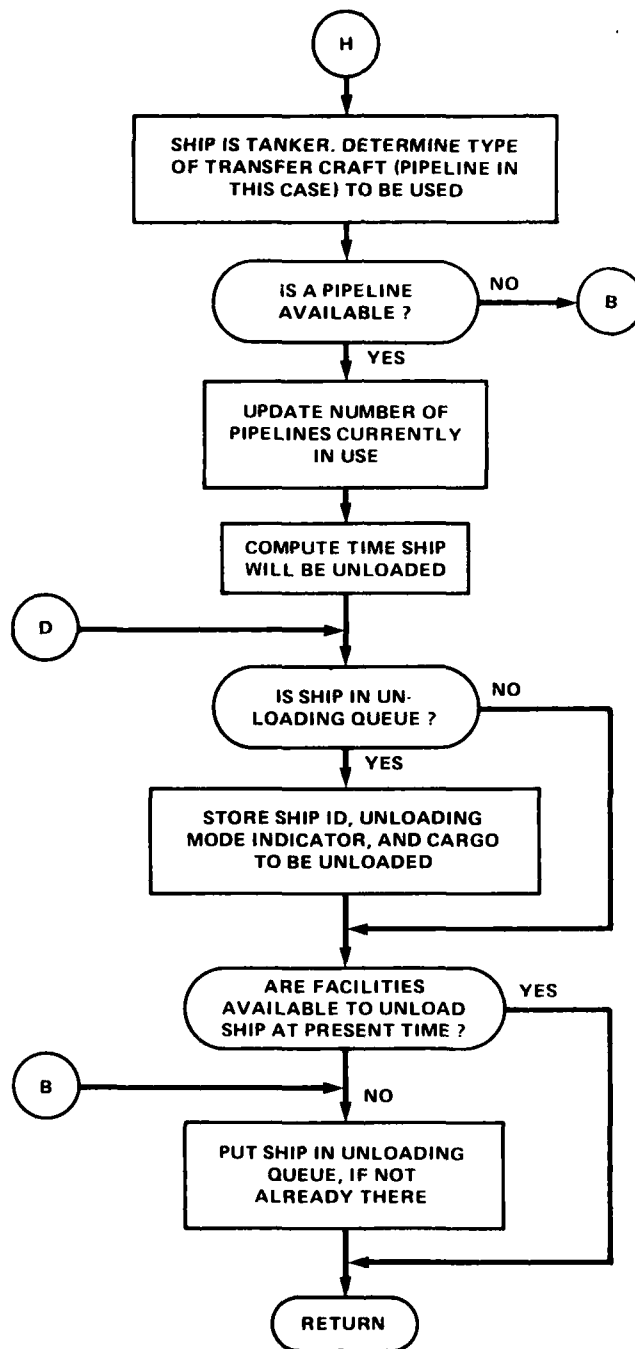
UNLDSH also updates the numbers of transport craft and unloading facilities currently in use by subtracting the number needed to unload the newly arrived ship from the number previously available.











```

1  SUBROUTINE UNLDSH
   COMMON /CONTROL/ TIMIT,SMFL,DECR(4),XDIST(30,30),PRODUC(6,6,0)
   1,ADJCGO(8),NTEST
   COMMON /A/XCARGO(9),VCARGO(40,9),IDSCGO(40,2),ZCARGO(9),TCARGO,
   5 100FSH,XQUEUE(50),XQUEUE(5),QTIME(5),MQUE(5)
   COMMON
   1,GEN/ TIME,TEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
   2 NPORT,NSHIPS,TINVL,IOUT,INFACT,NSTYP,NITIN
   1,CARGO67,NCARGM,KARGEN(1000,3),CARGEN(1000)
10 2, JCARGO(1000,3),CARGO(1000),NSCGO
   1/SHIP/NSHIP(400,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
   1/PORT/NPORT(30,6),IFAC(30,10)
   2,IOUEUE(1000,2),MQUEUE
   COMMON/NATE/ITCFT(4,2),XTCFT(4,2),ISUFAC(2,2),XSUFAC(2),IUP(2),XUP
15 1,KTCT(4),KSUFAC(2),KUP,NTCFT,NSUFAC,IUPCFT(4),IUPSUF(2),IUPUP
   2,THNRTE
   COMMON/BUSHI/DTIME(3),UNLTC(4),TTCS(4),ATTCS(4),TUNLTC(4)
   DETERMINE AMOUNT OF EACH TYPE OF CARGO ON SHIP
   DO 620 I=1,9
20 620 XCARGO(I)=0.
   DO 630 I=1,NSCGO
   IF(LVENT2.NE. JCARGO(I,1)) GO TO 630
   IF(LVENT3.NE. JCARGO(I,2)) GO TO 630
   J=JCARGO(I,3)
25 XCARGO(J)=XCARGO(J)+CARGO(I)
   630 CONTINUE
   C COMPUTE TOTAL AMOUNT OF CARGO ON SHIP IN MEASUREMENT TONS
   XTCRG0=0.
   DO 640 I=1,9
30 640 XTCRG0=XTCRG0+XCARGO(I)
   C DETERMINE SHIP TYPE
   ISHIP=LVENT2
   ISHPTP=NSHIP(ISHIP,1)
   C CHECK SHIP TYPE
   IF(MTSHIP(ISHPTP,20).NE.1) GO TO 200
35 SHIP IS BREAK BULK
   C DETERMINE TYPE OF TRANSPORT CRAFT TO BE USED
   ITTC=MTSHIP(ISHPTP,21)
   C CHECK IF TRANSPORT CRAFT ARE AVAILABLE
   IT1=ITCFT(ITTC,1)-ITCFT(ITTC,2)
   IF(MTSHIP(ISHPTP,17).LE.IT1) GO TO 100
   GO TO 1005
   C DETERMINE TYPE OF SHORESIDE UNLOADING FACILITIES TO BE USED
   ITSUF=MTSHIP(ISHPTP,22)
40 ITSUF=MTSHIP(ISHPTP,22)
   C CHECK IF SHORESIDE UNLOADING FACILITIES ARE AVAILABLE
   IT1=ISUFAC(ITSUF,1)-ISUFAC(ITSUF,2)
   IF(MTSHIP(ISHPTP,19).LE.IT1) GO TO 110
   GO TO 1005
   C UPDATE NUMBER OF TRANSPORT CRAFT AND SHORESIDE UNLOADING FACILITIES
   CURRENTLY IN USE
50 ITCFT(ITTC,2)=ITCFT(ITTC,2)+MTSHIP(ISHPTP,17)
   ISUFAC(ITSUF,2)=ISUFAC(ITSUF,2)+MTSHIP(ISHPTP,19)
   C COMPUTE TIME SHIP WILL BE UNLOADED
   X1=XTCRG0
   TEVENT=TIME+(X1/240.)/24.+(X1/XTCFT(ITTC,1))*(DTIME(ITTC)/24.)
55 UPDATE NUMBER OF TIMES TRANSFER CRAFT OF THIS TYPE COMES TO SHORE
   TTCS(ITTC)=TTCS(ITTC)+X1/XTCFT(ITTC,1)

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60      GO TO 1000
      200 IF (MTSHIP(ISHPTP,20).NE.2) GO TO 300
      C   SHIP IS CONTAINERSHIP
      C   DETERMINE TYPE OF TRANSFER CRAFT TO BE USED
      C   ITTC=MTSHIP(ISHPTP,21)
      C   CHECK IF TRANSFER CRAFT ARE AVAILABLE
      C   IT1=ITCFT(ITTC,1)-ITCFT(ITTC,2)
      C   IF (MTSHIP(ISHPTP,17).LE.IT1) GO TO 210
      C   GO TO 1005
      C   DETERMINE TYPE OF SHORESIDE UNLOADING FACILITIES TO BE USED
      C   210 IT1=MTSHIP(ISHPTP,22)
      C   CHECK IF SHORESIDE UNLOADING FACILITIES ARE AVAILABLE
      C   IT1=ISUFAC(ITSUF,1)-ISUFAC(ITSUF,2)
      C   IF (MTSHIP(ISHPTP,19).LE.IT1) GO TO 220
      C   GO TO 1005
      C   CHECK IF AN UNLOADING PLATFORM IS AVAILABLE
      C   220 IT1=IUP(1)-IUP(2)
      C   IF (IT1.GE.1) GO TO 230
      C   GO TO 1005
      C   UPDATE NUMBER OF TRANSFER CRAFT, SHORESIDE UNLOADING FACILITIES, A
      C   UNLOADING PLATFORMS CURRENTLY IN USE
      C   230 ITTC(ITTC,2)=ITCFT(ITTC,2)+MTSHIP(ISHPTP,17)
      C   ISUFAC(ITSUF,2)=ISUFAC(ITSUF,2)+MTSHIP(ISHPTP,19)
      C   IUP(2)=IUP(2)+1
      C   COMPUTE TIME SHIP WILL BE UNLOADED
      C   X1=XTCRGO
      C   TEVENT=TIME*(X1/XUP)/24.*(X1/XTCFT(ITTC,1))+TIME(ITTC/24.)
      C   UPDATE NUMBER OF TIMES TRANSFER CRAFT OF THIS TYPE COMES TO SHORE.
      C   TTCS(3)=TTCS(3)+X1/XTCFT(3,1)
      C   GO TO 1000
      C   300 IF (MTSHIP(ISHPTP,20).NE.3) GO TO 400
      C   SHIP IS RO/RO
      C   DETERMINE TYPE OF TRANSFER CRAFT TO BE USED
      C   ITTC=MTSHIP(ISHPTP,21)
      C   CHECK IF TRANSFER CRAFT ARE AVAILABLE
      C   IT1=ITCFT(ITTC,1)-ITCFT(ITTC,2)
      C   IF (MTSHIP(ISHPTP,17).LE.IT1) GO TO 310
      C   GO TO 1005
      C   UPDATE NUMBER OF TRANSFER CRAFT CURRENTLY IN USE
      C   310 ITTC(ITTC,2)=ITCFT(ITTC,2)+MTSHIP(ISHPTP,17)
      C   COMPUTE TIME SHIP WILL BE UNLOADED
      C   X1=XTCRGO
      C   TEVENT=TIME*(X1/2718.)/24.*(X1/XTCFT(ITTC,1))+TIME(ITTC/24.)
      C   UPDATE NUMBER OF TIMES TRANSFER CRAFT OF THIS TYPE COMES TO SHORE.
      C   TTCS(4)=TTCS(4)+X1/XTCFT(3,1)
      C   GO TO 1000
      C   400 IF (MTSHIP(ISHPTP,20).NE.4) GO TO 800
      C   SHIP IS BARGE OR LIGHTER CARRIER (LASH)
      C   COMPUTE TIME SHIP WILL BE UNLOADED
      C   X1=XTCRGO
      C   TEVENT=TIME*(X1/2174.)/24.
      C   GO TO 1000
      C   SHIP IS TANKER
      C   DETERMINE TYPE OF TRANSFER CRAFT (A PIPELINE IN THIS CASE) TO BE U
      C   800 ITTC=MTSHIP(ISHPTP,21)

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115 C CHECK IF A PIPELINE IS AVAILABLE
    IF(I=ITCFT(IITC,1)-ITCFT(IITC,2))
    IF(MTSHIP(ISHPT,17).LE.IT1) GO TO 810
    GO TO 1005
120 C UPDATE NUMBER OF PIPELINES CURRENTLY IN USE
    810 ITCFT(IITC,2)=ITCFT(IITC,2)+MTSHIP(ISHPT,17)
    C COMPUTE TIME SHIP WILL BE UNLOADED
    XI=XTORGO
    TEVENT=TIME+(XI/TNKRT)/24.
    1000 LVEN*1=5
    CALL PUT
125 C CHECK IF SHIP IS IN UNLOADING QUEUE
    DO 410 II=1,50
    KK=II
    IF(KQUEUE(II).EQ.IDSHIP) GO TO 420
410 CONTINUE
    GO TO 480
130 C SHIP IS IN QUEUE
    420 M=MTSHIP(ISHPT,20)
    QTIME(M)=QTIME(M)+TIME-XQUEUE(KK)
    MQUEUE(M)=MQUE(M)+1
    KQUEUE(KK)=0
    C STORE SHIP ID, UNLOADING MODE INDICATOR, AND CARGO UNLOADED
    480 I=1
    490 IF(IDSCGO(I,1).NE.0) GO TO 510
    IDSCGO(I,1)=IDSHIP
    IDSCGO(I,2)=0
    IDSCGO(I,2)=0
    DO 500 J=1,9
    500 YCARGO(I,J)=YCARGO(J)
    510 RETURN
145 510 I=I+1
    IF(I.GT.40) GO TO 520
    GO TO 490
150 520 PRINT 530
    530 FORMAT(1H1,10X,*ERROR -- ARRAY YCARGO EXCEEDED*)
    STOP
    C SHIP CANNOT BE UNLOADED AT PRESENT TIME DUE TO UNAVAILABILITY OF P
    C FACILITIES
    1005 TEVENT=TIME+.05
    CALL PUT
155 C PUT SHIP IN UNLOADING QUEUE, IF NOT ALREADY IN QUEUE
    DO 740 II=1,50
    IF(KQUEUE(II).EQ.IDSHIP) RETURN
740 CONTINUE
    DO 750 II=1,50
    KK=II
    IF(KQUEUE(II).EQ.0) GO TO 770
750 CONTINUE
    PRINT 760
760 FORMAT(1H1,10X,*SIZE OF QUEUE EXCEEDED AT UNLOADING PORT*)
    STOP
770 KQUEUE(KK)=IDSHIP
    XQUEUE(KK)=TIME
    RETURN
170 END

```

UPDTE

Activity Performed: Keeps track of amount of cargo unloaded and updates numbers of craft and facilities currently in use.

Type: Subroutine

Common Used: /CONTRL/, /A/, /SUMY/, /GEN/, /CARGOG/, /SHIP/, /PORT/, /WATE/

Called by: SHPLV

Stored by; n/a

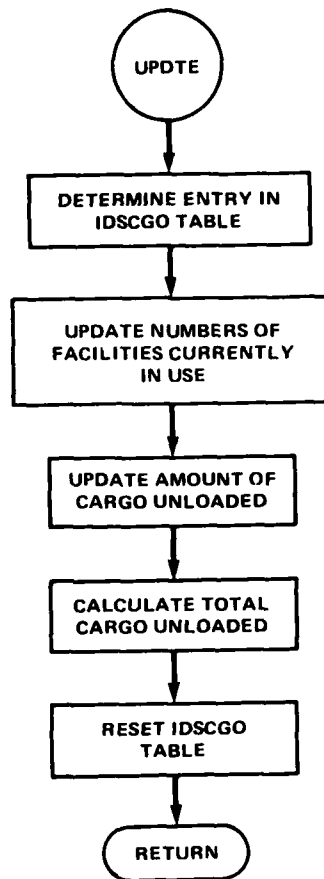
Subroutines Called: n/a

Events Stored: n/a

Description:

UPDTE updates the numbers of transport craft and unloading facilities currently in use by adding the number needed to unload the departing ship to the number previously available.

UPDTE also tabulates, in measurement tons, cargo unloaded by all ships, both by types of cargo and by total amount.



```

1  SUBROUTINE UPDTE
   COMMON /CONTROL/ IINIT,SMFL,DECR(4),XDIST(30,30),PRODUC(6,6,8)
   1. ADJCGO(8),NTEST
   COMMON/A/XCARGO(9),YCARGO(4,9),IDSCGO(4,0,2),ZCARGO(9),TCARGO,
5  100FISH,QUEUE(50),XQUEUE(50),QTIME(5),HQUE(5)
   COMMON /SUMY/ QUN(30,10),SUMPT(30,10)
   COMMON
10  1/GEN/ TIME,TEWENT,NEVENT,KEVENT(500),RN,LVENT1,LVENT2,LVENT3,
   2 NMPORT,NSHIPS,INVL,IOUT,NFACT,NSTYP,NITIN
   1/CARGO/ NCARGN,KARGEN(1000,3),CARGEN(1000)
15  2, JCARGO(1000,3),CARGO(1000),MSCGO
   1/SHIP/NSHIP(400,15),MTSHIP(30,22),MTSHP2(30,10),ITIN(10,10)
   1/PORT/NPORT(30,6),IFAC(30,10)
   2/QUEUE(1000,2),NQUEUE
   COMMON/MATE/ITDFT(4,2),XTCFT(4,2),XSUFAC(2,2),XSUFAC(2),IUP(2),XUP
20  1,KTCT(4),KSUFAC(2),KUP,NTCT,NSUFAC,IUPCFT(4),IUPSUF(2),IUPUP
   2,INKRTE
   C DETERMINE ENTRY IN IDSCGO TABLE
   DO 10 K=1,40
   IF(LVENT2-EQ.IDSCGO(K,1)) GO TO 20
25  10 CONTINUE
   C UPDATE NUMBERS OF FACILITIES CURRENTLY IN USE
   ISHPTP=NSHIP(LVENT2,1)
   ITTC=MTSHIP(ISHPTP,21)
   ITSUF=MTSHIP(ISHPTP,22)
   IF(MTSHIP(ISHPTP,20).NE.1) GO TO 30
   C SHIP IS BREAK BULK
   ITCT(ITTC,2)=ITCT(ITTC,2)-MTSHIP(ISHPTP,17)
30  ITCT(ITTC,2)=ITCT(ITTC,2)+ISUFAC(ITSUF,2)-MTSHIP(ISHPTP,19)
   ISUFAC(ITSUF,2)=ISUFAC(ITSUF,2)+1
   GO TO 110
   C IF(MTSHIP(ISHPTP,20).NE.2) GO TO 70
   C SHIP IS CONTAINERSHIP
   ITCT(ITTC,2)=ITCT(ITTC,2)-MTSHIP(ISHPTP,17)
35  ITCT(ITTC,2)=ITCT(ITTC,2)+ISUFAC(ITSUF,2)-MTSHIP(ISHPTP,19)
   ISUFAC(ITSUF,2)=ISUFAC(ITSUF,2)+1
   IUP(2)=IUP(2)+1
   GO TO 110
   C IF(MTSHIP(ISHPTP,20).NE.3) GO TO 80
   C SHIP IS RO/RO
   ITCT(ITTC,2)=ITCT(ITTC,2)-MTSHIP(ISHPTP,17)
40  ITCT(ITTC,2)=ITCT(ITTC,2)+ISUFAC(ITSUF,2)-MTSHIP(ISHPTP,19)
   ISUFAC(ITSUF,2)=ISUFAC(ITSUF,2)+1
   C SHIP IS TANKER
   ITCT(ITTC,2)=ITCT(ITTC,2)-MTSHIP(ISHPTP,17)
45  ITCT(ITTC,2)=ITCT(ITTC,2)+ISUFAC(ITSUF,2)-MTSHIP(ISHPTP,19)
   ISUFAC(ITSUF,2)=ISUFAC(ITSUF,2)+1
   C UPDATE AMOUNT OF CARGO UNLOADED
   DO 140 J=1,9
140  ZCARGO(J)=ZCARGO(J)+YCARGO(J)
   C CALCULATE TOTAL CARGO UNLOADED
   TCARGO=0.
   DO 150 I=1,9
150  TCARGO=TCARGO+ZCARGO(I)
   C RESET IDSCGO TABLE
   IDSCGO(K,1)=0
   DO 230 I=1,MSGO
   IF(LVENT2-NE.JCARGO(I,1)) GO TO 230
55  IF(LVENT3-NE.JCARGO(I,2)) GO TO 230
   ICT=JCARGO(I,3)
   JCARGO(I,1)=0
   SUMPT(LVENT3,3)=SUMPT(LVENT3,3)+CARGO(I)
   NSHIP(LVENT2,9)=NSHIP(LVENT2,9)+CARGO(I)
60  NSHIP(LVENT2,10)=NSHIP(LVENT2,10)+CARGO(I)/ADJCGO(1CT)
230  CONTINUE
   RETURN
   END

```

APPENDIX
LIST OF COMMON VARIABLES

<u>VARIABLE</u>	<u>COMMON</u>	<u>MODE</u>	<u>DESCRIPTION</u>
		= I - Input	
		= S - Storage	
		= * - Packed	
AA	PLT	S	Craft/facilities current status check indicator
ADJCGO(8)	CONTRL	I	Cargo type conversion factor (MT/LT)
ATTCS(4)	BUSH1	S	Average number of times each type of craft comes to shore
CARGC(2)	CARGOG	I	Cargo necessary for selection of next port (MT)
CARGEN(1000)	CARGOG	I	Cargo generation information
CARGO(1000)	CARGOG	S	Cargo in transit accumulators
DECR(4)	CONTRL	I	Number of landing craft to be decremented
DOFFSH	A	I	Distance offshore at which offloading of ships occurs
DTME(3)	BUSH1	I	Delay time to be added to cycle time for each transfer craft
IAVAL(50)	SUMY	S	Total ship volume available (MT)
IAVRGE	B	S	Internal counter for number of times subroutine AVRAGE has been called since last status summary printout
ICFT(4)	CONTRL	S	Number of each type of landing craft
IDSCGO(40,2)	A	S	Cargo to be unloaded from ships
IFAC(30,10)	PORT	I	Number of each type of facility at each port
IGEN	GEN	I	Cargo generation deck indicator
IOUT	GEN	I	Output option indicator
IPLT	PLT	S	Number of times craft and facilities usage data are output on TAPE30
IQUEUE(1000,2)	PORT	S*	Berth facility queue information
ISD(50,3)	SUMY	S	Cargo movement summary table
ISMPRT(30,6)	SUMY	S	Port facilities delay times

APPENDIX (Con't)

<u>VARIABLE</u>	<u>COMMON</u>	<u>MODE</u>	<u>DESCRIPTION</u>
ISUFAC(2,2)	WATE	S	Number of shoreside unloading facilities of type I currently for ISUFAC(1,2)
ITCFT(4,2)	WATE	S	Number of transfer craft currently in use
ITIN(10,10)	SHIP	I	Ship itineraries
IUP(2)	WATE	S	Number of unloading platforms currently in use
IUPCFT(4)	WATE	S	Number of times maximum number of transfer craft is reached
IUPSUF(2)	WATE	S	Number of times maximum shoreside unloading facilities used
IUPUP	WATE	S	Number of times upper limit of maximum unloading platforms used
JCARGO(1000,3)	CARGOG	S*	Cargo aboard ship information
KARGEN(1000,3)	CARGOG	I*	Cargo generation information
KEVENT(500)	GEN	S*	Event list
KPNCH	BUSH2	I	Option for punching build up ashore statistics
KQUEUE(50)	A	S	Table of ships waiting to be unloaded
KSUFAC(2)	WATE	S	Total number of shoreside unloading facilities
KTCFT(4)	WATE	S	Total number of transfer craft
KUP	WATE	S	Total number of unloading platforms
KY(110,7)	PLT	S	Number of transfer craft and unloading facilities currently in use
LD CRF(4)	CONTRL	S	Current number of landing craft (by type)
LVENT1	GEN	S	Event list parameter
LVENT2	GEN	S	Event list parameter
LVENT3	GEN	S	Event list parameter
MQUE(5)	A	S	Number of ships currently in unloading queue
MTEST	CONRL	S	Optimum iteration check
MTSHIP(30,22)	SHIP	I	Ship type information
MTSHP2(30,10)	SHIP	I	Ship type information
NCARGN	CARGOG	I	Number of cargo generations

APPENDIX (Con't)

<u>VARIABLE</u>	<u>COMMON</u>	<u>MODE</u>	<u>DESCRIPTION</u>
NEVENT	GEN	S	Number of event list entries
NFACT	GEN	I	Number of berthing facility types
NITIN	GEN	I	Number of ship itineraries
NMFT(5)	BUSH2	I	Names of transfer craft 1-5
NNPORT	GEN	I	Number of ports
NPORT(30,6)	PORT	I*	Port information
NQUEUE	PORT	S	Number of entries on facility queue list
NSCGO	CARGOG	S	Number of entries of cargo aboard ship
NSD	SUMY	S	Day of summary information
NSE(30,30)	PORT	S	Number of ships of each type scheduled to enter port
NSHIP(400,15)	SHIP	I	Individual ship information
NSHIPS	GEN	I	Number of ships in simulation
NSTYP	GEN	I	Number of ship types
NSUFAC	WATE	I	Number of available shoreside unloading facilities
NTCFT	WATE	I	Number of available transfer craft
NTEST	CONTRL	S	Number of iterations
PERC1(50)	SUMY	I	Fractional portion of ship's total volume to be used for cargo
PRODUC(6,6,8)	CONTRL	I	Productivity rates (MT/day)
PUTL	GEN	I	Minimum percentage of ship volume in use before ship is allowed leave port
RN	GEN	S	Random number
SHTFL	CONTRL	S	Last computed shortfall
SHTFLM	CONTRL	I	Maximum shortfall allowed
SUMPRT(30,10)	SUMY	S	Port information summary table
SUMSHP(30,10)	SUMY	S	Ship information summary table
TCARGO	A	S	Total amount of cargo unloaded
TEVENT	GEN	S	Time of event
TIME	GEN	S	Simulation time
TIMIT	CONTRL	I	Time check for (SHTFLM) shortfall
TIMSAV	CONTRL	S	Time interval between summary outputs

APPENDIX (Con't)

<u>VARIABLE</u>	<u>COMMON</u>	<u>MODE</u>	<u>DESCRIPTION</u>
TINVL	GEN	I	Summary time interval
TNKRTE	WATE	I	Tanker unloading rate (barrels/day)
TTCS(4)	BUSH1	S	Total number of times each type of transfer craft comes ashore
TUNLTC(4)	BUSH1	S	Total (aggregate) unloading time for all craft of a given type
UNLTC(4)	BUSH1	S	Unloading time for one craft of a given type
UTM(50)	SUMY	S	Ship utilization summary table
XAX(110)	PLT	S	Time of craft and facilities usage summary
XCARGO(°)	A	I	Amount of each type of cargo on ship (MT's)
XDIST(30,30)	CONTRL	I	Table of Distance between ports (nautical miles)
XQUEUE(50)	A	S	Time ship enters unloading queue
XSUFAC(2)	WATE	I	Unloading rate for shoreside unloading facility units
XCFT(4,2)	WATE	I	Speed of transfer craft (knots)
XUP	WATE	I	Unloading rate of unloading platform (MT/day)
YCARGO(4,9)	A	S	Cargo unloaded from ships in queue
ZCARGO(9)	A	S	Amount of each type of cargo unloaded from a given ship (MT/day).

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