DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

OPNAVINST 9010.338
OP-03
05 FEB 1988

OPNAV INSTRUCTION 9010.338

Subj: AO 177 (JUMBO) CLASS (AMMO VARIANT) APPROVED TOP LEVEL REQUIREMENTS (TLR)

Encl: (1) AO 177 (JUMBO) Class (AMMO VARIANT) TLR

1. Purpose. To issue the approved Top Level Requirements for AO 177 (Jumbo) Class (Ammo Variant).

2. Applicability. These characteristics are applicable to the ships of the AO 177 Class. This document is in addition to the OPNAVINST C9010.304B which defines the AO 177 oil only variant.

3. Discussion. Changes to these Top Level Requirements must be kept to a minimum, and any change which would result in a costly or time consuming impact on the ship's construction must be fully justified. Proposed changes to the characteristics of this ship shall be submitted to the Chief of Naval Operations.

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

Top Level Requirements
Fleet Oiler AO 177 (Jumbo) Class
(Ammunition Variant)

1.0 OVERVIEW

This document delineates the Top Level Requirements (TLR) for the AO 177 (Jumbo) Class (Ammunition Variant) program, and provides an update of the original AO 177 Class Fleet Oiler characteristics. The intent of this document is to establish the requirements for the AO 177 jumboization program, which encompasses the design and development (construction) of the mid-bodies and new equipment to the standards and specifications of the existing AO 177 Class ships. Systems and equipment currently installed on the AO 177 Class ships will be utilized without change. This document includes the AO 177 (Jumbo) Class (Ammunition Variant) mission, operational requirements, major configuration constraints, characteristics, planned use, maintenance concept, supply support concept, manning and operational constraints.

1.1 Objectives and Scope

1.1.1 Objectives. The AO 177 (Jumbo) Class (Ammunition Variant) Fleet Oilers are programmed to satisfy the requirements for shuttle ships operating in support of Fleet units. The objective of the AO 177 Class jumboization program is to acquire (through the jumboization of existing AO 177 Class ships) replenishment shuttle ships capable of the rapid transfer of petroleum, oil and lubricants (POL) and ordnance/cargo to battle group replenishment ships by means of vertical and connected replenishment (VERTREP and CONREP) at sea. In the absence of a battle group station ship, the AO 177 (Jumbo) Class (Ammunition Variant) ships will be capable of operation with the battle group as an attrition filler.

The AO 177 (Jumbo) Class (Ammunition Variant) ships will incorporate additional mission critical capabilities such as expanded cargo fuel capacity, new cargo ammunition capacity, new dry cargo underway replenishment (UNREP) rigs, additional berthing, and cargo van tiedowns.

1.1.2 Scope. This document has been prepared per applicable portions of OPNAVINST 9010.300A (NOTAL), and provides ship system requirements including propulsion, payload, maintenance, and support parameters. Upon approval of the AO 177 (Jumbo) Class (Ammunition Variant) TLR, serialized changes will promulgate any additional requirements or changes to existing requirements.

1.2 Program Constraints

1.2.1 Thresholds and Goals. Chief of Naval Operations (CNO) memo Ser 00/6U300113 of 15 January 1986 (NOTAL) authorized Commander, Naval Sea Systems Command (NAVSEA) to proceed with AO 177 jumboization (Ammunition Variant), and approved recommended ships characteristics for the start of Contract Design. CNO also established a cost cap of $63.3M (FY87 $), with the intent of achieving the Ammunition Variant within this cost cap.

1.2.2 Initial Operational Capability (IOC). Since there is no published IOC requirement for the AO 177 (Jumbo) Class (Ammunition Variant) ships, the IOC for the FY88 AO 177 (Jumbo) Class (Ammunition Variant) ship is estimated to be January 1991, consistent with Fleet requirements, adequate funding, and conversion periods.

1.2.3 Program Constraints. The provisions of Sections 2.0, 3.0 and 4.0 of this TLR are to be regarded as specific requirements or constraints of the AO 177 Class jumboization program unless the direction is described as a goal with a stated range of flexibility.

1.2.4 Breach of Program Constraints. If any of the provisions of this TLR cannot be met, the Commander, Naval Sea Systems Command (NAVSEA) will so advise the Chief of Naval Operations (OP-03) to permit timely adjustments to the program or to this TLR.

1.3 Design Guidance. The AO 177 (Jumbo) Class (Ammunition Variant) design incorporates the addition of a 108' parallel mid-body, providing for increased POL capacity (from 120,000 barrels to a minimum of 150,000 barrels) and convertible cargo ammunition storage. The AO 177 (Jumbo) Class (Ammunition Variant) ships will be jumboized from existing AO 177 Class ships; therefore, systems, subsystems, components, etc., that have been installed and proven operationally suitable on the AO 177 Class Fleet Oilers will be utilized to the maximum extent practicable. New systems/equipment to be installed on the AO 177 (Jumbo) Class (Ammunition Variant) ships include a weapons elevator and Navy standard tensioned replenishment alongside method (STREAM) for underway replenishment (UNREP) of cargo. Construction techniques used in the jumboization process (i.e., construction of the mid-bodies) will be similar to the original AO 177 Class ships standards.

1.3.1 Specification Streamlining. The AO 177 (Jumbo) Class (Ammunition Variant) program has been nominated to participate in the Navy's specification streamlining program under the guidance

of the Navy's Specification Advocate General. In conformance with this requirement, all documentation (requests for proposals, specifications, contracts, etc.) shall be tailored to the specific requirements of the AO 177 (Jumbo) Class (Ammunition Variant) program.

1.4 Summary of Major Ship Characteristics. The performance characteristics, capabilities, and requirements of the AO 177 (Jumbo) Class (Ammunition Variant) ships are as follows:

Length, Overall	699'-6"
Length, Between Perpendiculars	658'-0"
Beam, Waterline	88' -1"
Draft (mean), Full Load	31' -6"
Displacement, Full Load	34,800 tons
Cargo Capacity	150,000 barrels (minimum)
Cargo Fuel Capacity	(20% convertible)
Ordnance Stowage	625 long tons nominal (8,000 ft **
VERTREP Helo Capability* (No on-board helos)	Level III, Class 3, 4
CONREP Stations	
Fueling-at-Sea (FAS) Stations	3 dbl port/2 single starboard
Replenishment-at-Sea (RAS) Stations	1 port/1 starboard (STREAM)
Combat Systems***	2 Close-In Weapons Systems (CIWS)
Propulsion	Steam turbine
Shaft Horsepower (SHP)	24,000
Sustained Speed	19 knots
Endurance	5,300 nm at 19 knots
Accommodations/Complement	246/TBD

* A Ship Alteration (SHIPALT) has been prepared by NAVSEA to upgrade current AO 177 Class helo facilities.

** Non-refrigerated break-bulk cargo may be carried in the ammunition holds when no ammunition is carried. Forty (40) tons of weapons handling equipment is carried as deck cargo in two 20' ISO containers.

*** CIWS to be installed by SHIPALT.

2.0 MISSION STATEMENT

2.1 Mission and Tasks

2.1.1 Mission. The mission of the AO 177 (Jumbo) Fleet Oiler Class (Ammunition Variant) shuttle ships is to deliver petroleum products and ordnance/cargo, either independently or with other Combat Logistics ships, to Fleet units in hostile and other environments. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of operating with the battle group as an attrition filler.

2.1.2 Primary Tasks. Per OPNAVINST C3501.2G (NOTAL), the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of conducting operations in the primary mission performance areas of Command, Control and Communications (CCC), Logistics (LOG), and Mobility (MOB).

To carry out its assigned mission, the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be able to transport, selectively issue, and deliver petroleum products and ordnance/cargo (including missiles and conventional ordnance) to underway battle group support ships servicing ships on both sides simultaneously and one or more ships using VERTREP. Specifically, the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of performing the following tasks:

(1) Transporting bulk petroleum and ordnance/cargo from shore depots to fast combat support ships (AOE), replenishment oilers (AOR), and fleet oilers (AO) effecting delivery and consolidation underway;

(2) Delivering bulk petroleum, oil and lubricants (POL) at satisfactory rates to combatants and support forces underway;

(3) Delivering and receiving by VERTREP and CONREP dry cargo, fleet freight, mail, and personnel;

(4) Providing in-port replenishment of POL; and

(5) Performing limited self-defense.

2.1.3 Secondary Tasks. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of conducting limited operations in the secondary mission performance areas of Warfare (AAW, ASU, and ELW), Fleet Support Operations (FSO), Intelligence

(INT) and Non-Combat Operations (NCO) per OPNAVINST C3501.2G (NOTAL). Secondary mission performance shall be provided as an adjunct to the primary mission tasks. Capabilities are to be provided only to the extent equipment are required for the primary mission and limited secondary mission capabilities.

3.0 TOTAL SHIP REQUIREMENTS AND CHARACTERISTICS

The AO 177 (Jumbo) Class (Ammunition Variant) program will consist of the jumboization of existing AO 177 Class Fleet Oilers, utilizing systems, subsystems, components, etc., that have been installed and proven operationally suitable on the AO 177 Class ships. Construction of the mid-bodies and the addition of new systems/equipment will be consistent with the requirements and specifications of the existing AO 177 Class ships standards. In order to fulfill the mission stated in Section 2.0, the following Required Operational Capabilities (ROCs) represent the minimum requirements and operational characteristics of the AO 177 (Jumbo) Class (Ammunition Variant) ships which will result from this TLR. An explanation of these ROCs is contained in OPNAVINST C3501.2G (NOTAL).

3.1 Primary Mission Area Capabilities

3.1.1 Command, Control and Communication (CCC) Area. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of conducting operations in primary mission areas of CCC. The existing CCC suite of the AO 177 Class ships shall be utilized on the AO 177 (Jumbo) Class (Ammunition Variant) ships. The design of the AO 177 (Jumbo) Class (Ammunition Variant) provides for the functions that are necessary to plan, coordinate and control the operations of own unit, task organization, or functional force to carry out assigned missions (replenishment operations and/or search and rescue missions).

3.1.1.1 Required Operational Capabilities. The following ROCs shall be provided.

CCC 2	CCC 3.6	CCC 6.4	CCC 7
CCC 2.6	CCC 4	CCC 6.5	CCC 7.2
CCC 2.8	CCC 4.7	CCC 6.6	CCC 7.4
CCC 3	CCC 6	CCC 6.9	CCC 9
CCC 3.1	CCC 6.1	CCC 6.10	CCC 9.1
CCC 3.3	CCC 6.2	CCC 6.18	CCC 9.3
CCC 3.4	CCC 6.3		

3.1.2 Logistics (LOG) Area. Logistics shall be a primary mission of the AO 177 (Jumbo) Class (Ammunition Variant) ships.

3.1.2.1 Required Operational Capabilities. The following ROCs shall be provided.

LOG 1	LOG 1.10	LOG 2.3	LOG 4
LOG 1.2	LOG 1.11	LOG 2.4	LOG.4.1
LOG 1.4	LOG 1.12	LOG 2.5	LOG 4.2
LOG 1.6	LOG 2	LOG 3	LOG 4.4
LOG 1.8	LOG 2.2	LOG 3.1	

3.1.2.2 Cargo Capacities. Cargo capacities for the AO 177 (Jumbo) Class (Ammunition Variant) ships are as follows:

Liquid Fuel Capacity	150,000 barrels (minimum) 50% Diesel Fuel Marine (DFM) 30% JP-5 20% convertible
Cargo Ammunition Capacity	625 long tons of nominal load
Deck Cargo (in containers):	
Non-Refrigerated	
Break-bulk Cargo	16-20'ISO Containers-320 tons
Weapons Handling Equipment	2-20' ISO Containers-40 tons
Refrigerated	3-20' ISO Containers-60 tons
Lubricants	125-55 gallon drums

3.1.2.3 Transfer-At-Sea Facilities. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall have the following transfer-at-sea facilities:

Dry Cargo STREAM	1 port/1 starboard
Fuel STREAM Stations	3 port/2 starboard

Fuel Hose Rigs (Auxiliary or Spanline Rigs)	2 port/2 starboard
Pumping Capacity	15,000 GPM/DFM 9,000 GPM/JP-5
Elevator Service	One weapons capable elevator, 25'long and 6 1/2' wide
Ammunition Hold	One - 3 levels

3.1.3 Mobility (MOB) Area. Mobility shall be a primary mission of the AO 177 (Jumbo) Class (Ammunition Variant) ships.

3.1.3.1 Required Operational Capabilities. The following ROCs shall be provided.

MOB 1	MOB 6.3	MOB 10.1
MOB 1.1	MOB 7	MOB 10.2
MOB 3	MOB 7.1	MOB 10.3
MOB 3.1	MOB 7.2	MOB 10.4
MOB 3.2	MOB 7.3	MOB 10.5
MOB 3.3	MOB 7.6	MOB 12
MOB 3.5	MOB 7.7	MOB 12.1
MOB 5	MOB 7.8	MOB 12.2
MOB 6	MOB 10	MOB 12.3

3.1.3.2 Tactical. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of conducting task force tactical maneuvers in formation within the limits of ships speed and tactical turning circle, and shall be capable of functioning in an open ocean environment. The tactical diameter shall not exceed 1,000 yards at 19 knots.

3.1.3.3 Navigation and Maneuverability. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of conducting all normal piloting and conning tasks, and of navigating and maneuvering in coastal waters.

3.1.3.4 Endurance. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall have a minimum endurance range of 5,300 nautical miles at a sustained speed of 19 knots.

3.1.3.5 Automation. Automation of main propulsion and auxiliary equipments, replenishment stations, cargo handling

equipment, bridge, communication center, and other control spaces has been incorporated in the basic design of the AO 177 Class ships.

3.2 Secondary Mission Area Capabilities

3.2.1 Warfare Area (AAW, ASU, ELW). The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be capable of conducting operations in secondary mission areas of Anti-Aircraft Warfare (AAW), Anti-Surface Warfare (ASU), and Electronic Warfare (ELW). Limited anti-missile and anti-surface self-defensive capabilities are provided, with no offensive capabilities required.

3.2.1.1 AAW Required Operational Capabilities. The following ROCs shall be provided. (Capability provided by SHIPALT.)

AAW 1	AAW 6	AAW 6.6	AAW 9.5
AAW 1.2	AAW 6.2	AAW 9	

3.2.1.2 ASU Required Operational Capabilities. The following ROCs shall be provided.

ASU 1	ASU 4.1	ASU 4.7
ASU 1.6	ASU 4.4	
ASU 4	ASU 4.6	

3.2.1.3 ELW Required Operational Capabilities. The following ROCs shall be provided. (Capability provided by SHIPALT.)

ELW 1	ELW 1.3	ELW 4	ELW 4.3
ELW 1.1	ELW 1.4	ELW 4.1	ELW 4.4
ELW 1.2	ELW 1.5	ELW 4.2	ELW 5

3.2.2 Fleet Support Operations (FSO) Area. Fleet support operations consist of supporting services (other than logistics replenishment) rendered to other Fleet units. The mission of the AO 177 (Jumbo) Class (Ammunition Variant) ships limits participation in Fleet operations to transporting and delivering petroleum products and ordnance/cargo to operating forces at sea. Actual participation in Fleet or force operations is restricted only by the speed and maneuverability of the AO 177 (Jumbo) Class (Ammunition Variant) ships.

3.2.2.1 Required Operational Capabilities. The following ROCs shall be provided.

FSO 3	FSO 6.8	FSO 9.6	FSO 20.1
FSO 3.13	FSO 6.9	FSO 9.9	FSO 20.6
FSO 6	FSO 6.10	FSO 9.10	FSO 20.10
FSO 6.2	FSO 6.11	FSO 10	FSO 20.11
FSO 6.4	FSO 9	FSO 10.1	
FSO 6.5	FSO 9.1	FSO 10.2	
FSO 6.7	FSO 9.5	FSO 20	

3.2.3 Intelligence (INT) Area. A modest capability for collection of intelligence-supporting activities exists in the AO 177 Class Ships, and since the AO 177 (Jumbo) Class (Ammunition Variant) ships will utilize existing AO 177 Class systems, subsystems and components, the same capabilities will be present.

3.2.3.1 Required Operational Capabilities. The following ROCs shall be provided.

INT 1	INT 1.5	INT 2.1	INT 4.1
INT 1.1	INT 1.11	INT 2.2	INT 4.2
INT 1.3	INT 2	INT 4	INT 4.3

3.2.4 Non-Combat Operations (NCO) Area

3.2.4.1 Required Operational Capabilities. The following ROCs shall be provided.

NCO 2	NCO 2.6	NCO 3.1	NCO 10.4
NCO 2.1	NCO 2.7	NCO 3.2	NCO 11
NCO 2.2	NCO 2.8	NCO 5	NCO 11.1
NCO 2.3	NCO 2.9	NCO 5.1	NCO 11.2
NCO 2.4	NCO 2.11	NCO 10	NCO 11.4
NCO 2.5	NCO 3	NCO 10.1	

3.3 Operating Environment. The Projected Operational Environment (POE) for the AO 177 (Jumbo) Class (Ammunition Variant) ships, as defined by the Chief of Naval Operations (OP-375), is delineated below:

1. At sea in wartime.

2. Capable of performing all defensive functions simultaneously while in Readiness Condition I.

3. Capable of performing other functions which are not required to be accomplished simultaneously.

4. Continuous Readiness Condition III at sea. Self-defense Close-In Weapons System (CIWS) may be manned during underway replenishment.

5. Conduct underway replenishment in support of operating forces by providing POL from 5 stations (2 starboard and 3 port); and/or personnel, cargo, or ordnance from 2 cargo STREAM stations (one starboard and one port). A maximum of five stations will be manned simultaneously for periods not to exceed 12 hours per week. This includes rigging, unrigging and actual replenishment.

6. Conduct vertical replenishment in support of operating forces by providing personnel, cargo or ordnance from one helicopter platform with helicopters from other units for periods normally not to exceed 10 hours per week.

7. Capable of performing all maintenance for which ship's company is responsible.

3.3.1 Wartime Use. In wartime, the AO 177 (Jumbo) Class (Ammunition Variant) ships are expected to operate as a shuttle unit of an UNREP group or independently to Fleet units to deliver petroleum products and ordnance/cargo to battle group station ships.

3.3.2 Peacetime Use. In peacetime, the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be employed as they would be in time of war, but at a lower tempo of operation. A substantial portion of the at-sea time will be applied to training exercises.

3.3.3 Seakeeping Requirements. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be fully operational in Sea State 5 and survive without serious damage in Sea State 9. Table 3-1 provides performance requirements for the AO 177 (Jumbo) Class (Ammunition Variant) ships at various sea states.

3.3.4 Temperature and Humidity. The performance requirements within various ranges of temperature and humidity have been previously defined for the existing AO 177 Class ships and are set forth in Table 3-2. Ammunition stowage spaces incorporated in the mid-body design of the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be climate controlled to the requirements of OP-4.

3.3.5 Interface Requirements. MIL-STD-1399 (NOTAL), Section 301 provides interface standards and design constraints for shipboard systems imposed by ships' motion and attitude, and Section 302 provides interface standards for shipboard systems exposed to or affected by weather environmental conditions. These standards were incorporated in the AO 177 and shall be utilized in the development

TABLE 3-1. AO 177 (JUMBO) CLASS (AMMUNITION VARIANT) PERFORMANCE REQUIREMENTS FOR VARIOUS SEA STATES

Performance Requirements	Environmental Conditions
Operation of helicopters.	Sea State 5 (average significant wave height of 10.7 feet, wind velocity of 24.5 knots).
Maintenance of capability for underway replenishment and cargo handling.	Sea State 5 (average significant wave height of 10.7 feet, wind velocity of 24.5 knots).
Maintenance of required operational capability except for replenishment.	Sea State 6 (average significant wave height of 16.4 feet, wind velocity to 37.5 knots).
Limited operations, but with capability of continuing mission without returning to port for repairs after sea subsides.	Sea State 8 (average significant wave height of 37.7 feet, wind velocity to 59.5 knots).
Survival without serious damage to mission-essential subsystems	Sea State 9 (significant wave heights above 45.9 feet, wind velocity above 63 knots).

of interface requirements for the AO 177 (Jumbo) Class (Ammunition Variant) mid-body design, including new system/equipment design, production/jumboization, and installation.

3.4 Utilization and Operational Availability. The AO 177 (Jumbo) Class (Ammunition Variant) ships may be used in the Continental United States (CONUS) or overseas. Overseas deployments for indefinite periods may be required.

3.4.1 Speed and Time Profile. The AO 177 (Jumbo) Class (Ammunition Variant) projected speed and time profiles (peacetime and wartime) are shown in Figures 3-1 and 3-2.

TABLE 3-2. AO 177 (JUMBO) CLASS (AMMUNITION VARIANT) PERFORMANCE REQUIREMENTS FOR VARIOUS TEMPERATURE AND HUMIDITY RANGES DURING CONCEPT OPERATIONS

Performance Requirements	Environmental Conditions
All equipment and machinery installed in exposed locations: full system capability.	-20° F to 120° F air temperature with concurrent winds up to 40 knots.
All ship systems: full system capability.	28° F to 85° F sea temperature.
All electronic systems: full system capability.	28° F to 95° F sea temperature.
All ship systems, electronics: reduced system capability, but without reduced availability.	85° F to 95° F sea temperature.
All systems: full capability.	0 to 95 percent relative humidity.

3.4.2 Reliability, Maintainability, and Quality Assurance (R,M&QA). R,M&QA for the design and construction of the mid-bodies and the associated systems/equipment to be installed on the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be per NAVSEAINST 3900.2A (NOTAL) and NAVSEAINST 9070.5A (NOTAL). Contract quality requirements for the detail design and jumboization will include MIL-I-45208 (NOTAL), Inspection System Requirements.

Only two major changes are being made to the AO 177 Class mission essential equipment as a result of this jumboization program. The Operational Availability (A_O) and reliability (Mean Time to Repair (MTTR)) thresholds for these mission essential systems/equipment are specified as follows:

	A_O	MTTR
Replenishment-at-Sea (RAS) Stations[1]	.95	8 hours
Cargo/Weapons Elevator[2]	.95	8 hours

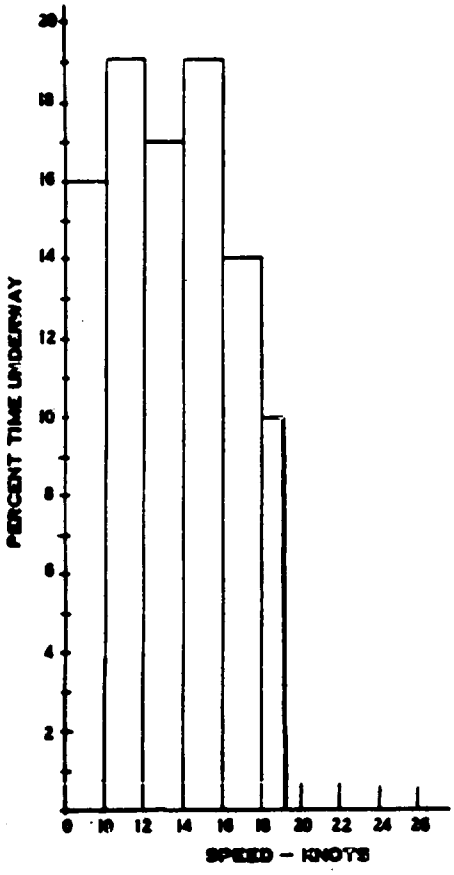

FIGURE 3-1. AO PEACETIME SPEED-TIME DISTRIBUTION

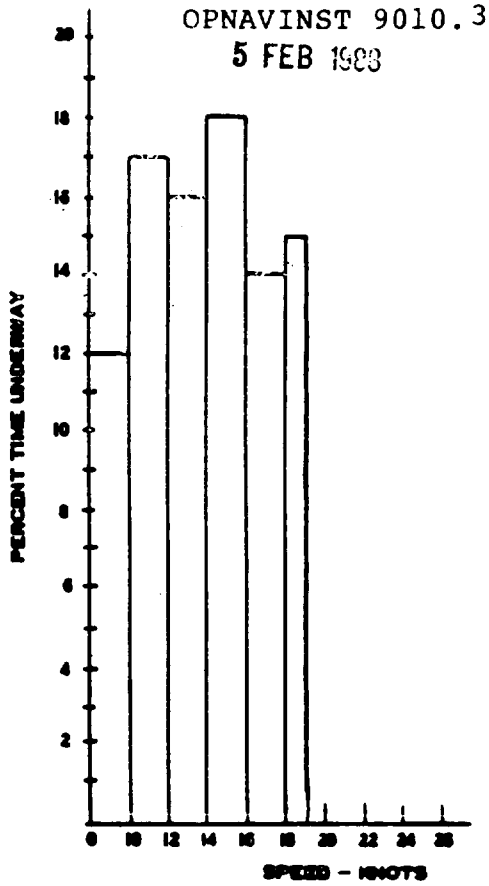

FIGURE 3-2. AO WARTIME SPEED-TIME DISTRIBUTION

[1] Two new missile/cargo STREAM RAS stations will replace the existing non-tensioned cargo stations. The equipment used on RAS stations shall be Navy standard and shall be contractor furnished per the non-deviation equipment drawings. This equipment is presently under evaluation by Commander, Operational Test and Evaluation Force (OPTEVFOR) as a part of Test and Evaluation Master Plan (TEMP) #327. Based on test results to date, this equipment has received Approval for Limited Production (ALP) through FY87. Approval for Full Production (AFP) is expected in FY88 based on the successful completion of 120 hours of operational testing as specified in TEMP #327.

[2] The Navy Standard Cargo/Weapons Elevator is comprised of existing standardized equipment/components arranged and sized in a standard configuration for this Class. This program is a Detection Action Response Technique (DART) Program, and is also being monitored by a Senior Navy Steering Board. Reliability and maintainability testing is being conducted by Naval Ship Systems Engineering Station (NAVSSES), Philadelphia (the In-Service Engineering Agent) at the land based engineering site.

To ensure that these mission essential systems/equipment are adequate from the reliability and maintainability standpoint, Navy approved non-deviation drawings and specifications will be used to ensure that these systems/equipment can be logistically supported and maintained in the Fleet operating environment. It shall be the Contractor's responsibility to ensure that interfaces with these systems/equipment do not degrade the integrity of these or existing AO 177 (Jumbo) Class (Ammunition Variant) systems/equipment.

3.5 Logistics Support. Petroleum products, supplies, and ordnance/cargo shall be maintained onboard at levels sufficient for extended operations. In-port replenishment from pier or harbor craft alongside, and UNREP using both helicopter transfer and ship-to-ship replenishment (VERTREP and CONREP) shall also be maintained. Strike down materials to appropriate storage spaces for ready access shall be available.

3.5.1 Maintenance Planning. Maintenance planning has been developed for the existing AO 177 Class ships and the new UNREP equipment and weapons elevator for the AO 177 (Jumbo) Class (Ammunition Variant) through Logistics Support Analysis (LSA) and is documented in a Class Maintenance Plan (CMP). Maintenance concepts support mission requirements, and the maintenance subsystems provide the ship with a capability for maintenance including miniature/micro-miniature (2M) repair and onboard calibration of own ship's gages and thermometers. Maintenance strategies employed include the use of Planned Maintenance System (PMS) requirements based on Reliability Centered Maintenance (RCM) logic.

The maintenance concept for the AO 177 (Jumbo) Class (Ammunition Variant) ships emphasizes self-sufficiency of the ship between availabilities and considers the same three levels of maintenance as previously defined for the existing AO 177 Class ships.

3.5.2 Supply Support Concept. The supply support concept of the AO 177 (Jumbo) Class (Ammunition Variant) ships is to provide sufficient repair parts, equipage and consumables to a level and depth that will enable the ship to fulfill its assigned missions. Range, depth, and storage periods of repair parts, consumables, provisions, etc., will be consistent with OPNAVINST 4441.12B (NOTAL) and OPNAVINST 4442.1E (NOTAL).

3.6 Manning. The existing AO 177 Class ships were designed for operation with the smallest possible crew and are Navy-manned. Automation of the main propulsion and auxiliary equipments, replenishment stations, cargo handling equipment, etc., was incorporated in the basic design of the AO 177 Class ships.

Based upon the AO 177 (Jumbo) Class Manning Impact Analysis Report for the Ammunition Variant (NAVSEA Technical Note No. 088-55W52-TN-0027 dated November 1986 (NOTAL)), approximately fifteen (15) additional personnel will be required as a result of AO 177 Class jumboization.

3.6.1 Accommodations. The existing AO 177 Class ships were designed to minimize watchstanding and maintenance requirements, and have accommodations for 221 personnel. Accommodations for an additional 25 enlisted personnel will be added to the AO 177 (Jumbo) Class ships during the jumboization process for a total of 246 accommodations.

3.6.2 Habitability. Habitability standards shall be consistent with the standards invoked at the time of the original ship construction.

3.7 Flexibility for Change. Although the existing AO 177 Class design incorporated space and weight allowances for the addition of 2 CIWS (which are incorporated in the AO 177 (Jumbo) Class (Ammunition Variant) design), the AO 177 (Jumbo) Class (Ammunition Variant) ships shall have no special provisions for future change incorporated into the design.

3.8 Personnel Training. For new systems/equipment (i.e., weapons elevator, UNREP equipment, etc.) in the mid-body spaces, skills and manpower requirements will be defined and training requirements identified in a change to the existing AO 177 Navy Training Plan (NTP).

4.0 SUBSYSTEM REQUIREMENTS AND CHARACTERISTICS

4.1 Structure. Hull structure/mid-body design and welding practices to be utilized in the jumboization of the AO 177 Class ships shall be per Navy standards for Auxiliary ships. In keeping with the design and construction practices of the AO 177 Class ships, upon which this program is based, equivalent commercial design practices may be employed during the jumboization process in the interest of achieving economy in construction. Commercial equipment which would result in a degradation of readiness or ship safety shall not be used. Deviations from Military Specifications (MIL-SPECs) in ammunition storage spaces and handling equipment shall be fully justified.

4.1.1 Helo Deck. The helo deck structure meets certification requirements of the latest NAVAIR Bulletin 1 (NOTAL). The AO 177 (Jumbo) Class (Ammunition Variant) ships will not have organic helo support.

4.2 Propulsion System. The existing AO 177 Class ships' propulsion systems will be the AO 177 (Jumbo) Class (Ammunition Variant) propulsion system and incorporate a single screw propulsion plant of 24,000 SHP full power design. The plant consists of two boilers, a cross compound main propulsion turbine and a double reduction gear, propulsion auxiliaries and associated equipment, piping, and electrical and control systems. The plant is highly automated to minimize watchstanding and maintenance requirements. Diesel Fuel Marine (DFM) is used as the primary fuel, and the ship is capable of using JP-5 as a secondary fuel with minimum reduction of performance. Primary controls for the propulsion plant are in an air conditioned Engineering Operating Station (EOS) located in the engine room. The ships are capable of transferring throttle control between the EOS and pilot house.

The existing rudder will be slightly enlarged, and a new propeller is being designed to maintain the maneuvering capability and powering performance of the AO 177 (Jumbo) Class (Ammunition Variant) ships at 19.0 knots sustained speed.

4.3 Electric Plant. The existing AO 177 Class ships incorporate three Ship Service (SS) generators. These are installed such that 90 percent of the aggregate continuous full load rating of two SS generators provide sufficient capacity to support the worst case electrical load following the jumboization. As part of the AO 177 Class jumboization, the ships shall have a second emergency diesel generator installed.

4.4 Command and Surveillance. Command and surveillance systems meet MIL-SPEC requirements. Interior communications on existing AO 177 Class ships, which meet Navy functional requirements, shall be utilized in the AO 177 (Jumbo) Class (Ammunition Variant) ships.

4.5 Auxiliary Systems

4.5.1 Piping Systems. Piping systems on the existing AO 177 Class ships have been designed to Navy criteria (bulkhead isolation, etc.) and materials are MIL-STD-777 (NOTAL) or American Society for Testing and Materials (ASTM) or American National Standards Institute (ANSI) equivalent. The firefighting systems are designed to Navy standards. Accordingly, piping systems associated with the jumboization (mid-body construction) to the AO 177 (Jumbo) Class (Ammunition Variant) ships shall also be designed to Navy criteria, and materials shall be MIL-STD-777 (NOTAL) or ASTM or ANSI equivalent.

4.5.2 Distilling Plant. Evaporators, in multiple units, are provided with sufficient total capacity to provide 30 gallons of water per man per day per the accommodations specified in paragraph 3.6.1, plus that required for make-up feed water and helicopter washdown.

4.5.3 Potable Water. Stowage capacity for a minimum of 40 gallons per man of total accommodations is provided for the accommodations specified in paragraph 3.6.1.

4.6 Outfit and Furnishings. Outfit and furnishings for the AO 177 (Jumbo) Class (Ammunition Variant) ships shall be provided per standard Navy practices.

4.7 Armament. The existing AO 177 Class armament will be employed on the AO 177 (Jumbo) Class (Ammunition Variant) ships without change and will be per programmed SHIPALTs.

4.8 Other

4.8.1 Cargo Handling Systems. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall employ highly reliable, easily operable and maintainable systems/equipment in the loading, internal movement and delivery of petroleum products, provisions, general stores, and ordnance/cargo to permit efficient downloading and replenishment operations. UNREP equipment shall be Navy standard design.

4.8.1.1 Liquid Cargo Capacity. POL capacity shall be a minimum of 150,000 barrels (50 percent Diesel Fuel Marine (DFM), 30 percent JP-5, and 20 percent convertible to either JP-5 or DFM without contaminating the other product). Tank cleaning and gas freeing systems are provided. The ship is capable of carrying approximately 125 drums of POL and 125 cylinders of bottled gas. Consolidation of POL will be effected with Navy, Military Sealift Command (MSC) and merchant ships.

4.8.1.2 Liquid Cargo Transfer Capability. The AO 177 (Jumbo) Class (Ammunition Variant) ships have three fuel STREAM double hose (DFM/JP-5) stations to port and two fuel STREAM single hose stations to starboard. Four 2 1/2" hose rigs (2 port/2 starboard) for use as either an auxiliary hose rig at the after port and starboard fueling stations or as a spanline rig at the port and starboard cargo stations are provided. Pumping capability for transferring 900,000 gallons per hour of DFM and 540,000 gallons per hour of JP-5 simultaneously is also provided. Piping for 7" hose outlets for both DFM and JP-5 is provided at all delivery stations. The ship is capable of emergency delivery of potable or feed water from one station per side (not simultaneously). The AO 177 (Jumbo) Class (Ammunition Variant) ships shall be jumboized to provide optimum reliability, maintainability and accessibility for cargo piping and valves.

4.8.1.3 Liquid Cargo Receive Capability. The AO 177 (Jumbo) Class (Ammunition Variant) ships have three 7" double probe receivers to starboard. Hose connections can accommodate all types of fittings. Piping for 7" hose outlets for both DFM and JP-5 are provided at all receiving stations.

4.8.1.4 Dry Cargo Capacity. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall have stowage for a nominal load of 625 tons of conventional weapons on three levels (about 8,000 ft) in a cargo hold with 8'6" of clear overhead. A 25' elevator to serve all levels of the Hold, the Main Deck and the 01 Level shall be provided. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall have the capability to carry a total of twenty-one 20' International Standards Organization (ISO) containers (no more than 3 shall have refrigeration capability).

4.8.1.5 Dry Cargo/Personnel Capability. The AO 177 (Jumbo) Class (Ammunition Variant) has 1 send/receive station per side that can be rigged for cargo STREAM and burton. Each dry cargo station is provided with a 10 ton boom for in-port cargo loading. Manning of stations is subject to the overall constraint that not more that 5 stations be manned simultaneously. The ships are provided with standard mail stowage.

4.8.2 Aviation Features. Aviation features of the AO 177 (Jumbo) Class (Ammunition Variant) ships encompass Level III Class 3 and Level III Class 4 (day visual flight rules (VFR) only flight operations) for landing area without support facilities. VERTREP pick-up and drop for H1, H2, H3, H46 and H53 helicopters is provided. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall have no organic helo support.

4.8.3 Damage Control. The AO 177 (Jumbo) Class (Ammunition Variant) ships in the damaged condition shall have sufficient stability and reserve buoyancy to withstand the flooding caused by a 12.5% length between perpendiculars (LBP) opening of the shell anywhere along its length, in the presence of 40 knot winds combined with rolling. The ships shall be capable of meeting this damage stability condition from full load displacement to minimum operating displacement.

Standard protection against nuclear, biological and chemical (NBC) agents is provided. A Shipboard Toxicological Operational Protective System is not required.

4.8.4 Pollution Control. The AO 177 (Jumbo) Class (Ammunition Variant) design shall limit the level of environmental pollution emanating from the ship to the standards and requirements of OPNAVINST 5090.1 (NOTAL). The latest approved pollution abatement systems and equipment for handling oily wastes, sewage, solid refuse, and industrial and chemical wastes shall be provided. These provisions include:

(1) A clean ballast system to permit the ship to ballast to safe operating drafts in any loading condition.

(2) A Navy approved sewage system with capacity based on total installed accommodations.

4.8.5 Boats. The AO 177 (Jumbo) Class (Ammunition Variant) ships shall have one Rigid Inflatable Boat (RIB) with a slewing arm davit, and one 40 foot personnel boat. There shall also be sufficient encapsulated lifeboats for the total installed accommodations plus 10%.

4.8.6 Mock-up/Model Requirements. None required.