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**COST AND OPERATIONAL
EFFECTIVENESS ANALYSIS (COEA)
FOR THE
LIGHTWEIGHT WATER PURIFIER
(LWP)**

**Coordinating Final Report
11 March 1996**

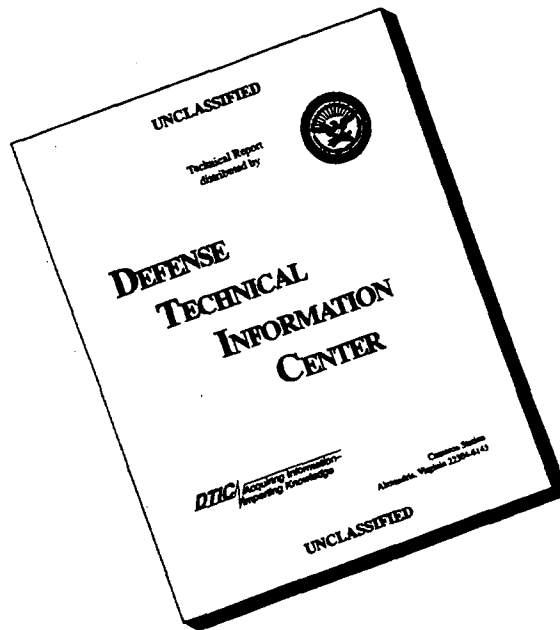
Prepared for US Army Tank-Automotive &
Armaments Command, Mobility Technology
Center-Belvoir under contract DAAK70-92-D-0003,
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INTRODUCTION

0.1 BACKGROUND

The US Army Quartermaster Center and School (USAQMC&S) has a requirement for a Cost and Operational Effectiveness Analysis (COEA) to determine the most effective and cost efficient alternative to meet the stated requirement for a Lightweight Water Purifier (LWP). Data and information from this COEA is intended to support a Milestone Decision Review (MDR I/II) planned for December 1995.

This COEA is based on the 6 October 1993 approved Mission Need Statement, CARDS No. 22-93 and the 7 April 1995 coordinating draft Operational Requirements Document (ORD). The approved MNS is attached at Appendix A. Also, a copy of the draft ORD is included as Appendix B to this report. The acquisition category (ACAT) for the system has not yet been determined. However, LWP is anticipated to be either ACAT III or IV, depending on the expected total value of the program in terms of procurement or Research, Development, Test, and Evaluation (RDT&E).

The purpose of this COEA is to assist the combat developer in refining the definition of the operational requirement and to aid decision makers at the Milestone Decision Review (MDR) with suitable information and analysis to enable them to:

- (1) Select from among the designated Lightweight Water Purifier (LWP) alternatives and establish those which offer the highest potential to best meet the stated operational requirement; and
- (2) Decide whether continuation of the LWP program is justified.

BRTRC, Incorporated was tasked to provide the required COEA under their existing operations research/systems analysis (ORSA) support contract with the US Army Belvoir Research, Development and Engineering Center (BRDEC), contract number DAAK70-92-D-0003, Delivery Order 0039. This COEA constitutes a portion of the Acquisition Management Document work performed under tasks 3.1 (draft report) and 3.2 (final report) of that Delivery Order.

0.2 FORMAT

This COEA uses the format prescribed for a Cost and Operational Analysis (COEA) by Department of Defense Manual DoD 5000.2-M, Defense Acquisition Management Documentation and Reports, dated February 1991, Part 8, Attachment 1.

0.3 GENERAL TECHNICAL APPROACH

The general technical approach employed during the preparation of this COEA is in accordance with the study process outlined in the US Army Training and Doctrine Command (TRADOC) Pamphlet 11-8 (Draft). In particular, the COEA utilizes the concept of Decision Cost developed in that TRADOC publication. The COEA was also conducted in accordance with the guidance set forth in the DoD 5000 series Directives and Instructions; relevant Army Regulations and Army Acquisition Executive, Department of the Army (DA), TRADOC, and Army Materiel Command (AMC) memoranda and guidance in effect on or before the information cutoff date for this study (31 October 1995). The COEA includes information derived from other current program management documents that apply to the Lightweight Water Purifier and references those documents.

0.4 NATURE OF THIS REVISION

This document represents the final version of the LWP Cost and Operational Effectiveness Analysis. The final report incorporates recommended changes and revisions requested as a result of the Government review of the draft report. A summary of the most significant modifications is presented here:

- Revisions to the ORD have not impacted the operational analysis parameters or basic performance characteristics of the alternatives.
- Costs have been updated to reflect a change in the quantity of Lightweight Water Purifiers (LWP) to 50 total systems.
- Due to the delay in the approval of the ORD and the resulting slippage of the Milestone Decision, the decision costs have been adjusted to reflect FY96 Constant dollars.
- Other changes reflect editorial adjustments in requirements to agree with the current version of the ORD or minor adjustments in costs as a result of the review process or the issuance of new guidance on cost factors since the publication of the draft report.

0.5 SUMMARY

Section 4 presents a summary of the results and is intended as an Executive Summary of this Cost and Operational Effectiveness Analysis (COEA).

SECTION 1

THE ACQUISITION ISSUE

1.1 NEED

1.1.1 General

The U.S. Army has a need to provide a safe, potable water supply for small units and detachments, to include Special Operations Forces (SOF), engaged in early entry, long range surveillance, and contingency missions. Missions during Operations other than War (OOTW) may also include nation building, civil affairs assistance, and disaster relief. These units may operate independently for extended periods or at remote sites and at distances inconsistent with the established water distribution network. This need is identified as priority number 43 of the US Army Training and Doctrine Command Battlefield Development Plan (BDP 94-08). The need has been further documented in the Mission Need Statement (MNS) for the Lightweight Water Purifier (LWP) approved by Headquarters, Department of the Army (HQDA) on 6 October 1993 (Appendix A) and in the 7 April 1995 coordinating draft Operational Requirements Document (ORD) for the Lightweight Water Purifier (LWP) (Appendix B).

The Lightweight Water Purifier (LWP) responding to this requirement shall be capable of producing potable water from fresh, brackish, and sea water sources or water sources tainted with nuclear, biological, or chemical contaminants. Water produced by the LWP must meet the US Army and Tri- Service field water quality standards contained in Technical Bulletin, Medical (TB MED 577). The LWP falls within the Combat Service Support (CSS) mission area and shall be suitable for use by organic unit personnel in selected units with minimal training.

1.1.2 Background

Army Field Manuals recognize the importance of an adequate water supply. "Water is essential to the army in the field. Safe water ranks in importance with ammunition and food ... and often has a bearing on the success or failure of a mission. When in the field, soldiers must be supplied with sufficient water to drink and to maintain personal hygiene. The water for these purposes must be safe for human consumption and should be reasonably free of objectionable tastes, odors, turbidity, and color" (para 2-6a, FM 21-10-1).

Soldiers are encouraged to drink sufficient quantities of water to reduce the risk of heat injuries and dehydration. Planning estimates can reach 4 gallons per soldier per day in hot, arid climates for drinking alone. The addition of water for personal hygiene and cooking can increase this factor to 6 gallons per day. Water from surface, ground, or other sources must be treated to prevent the spread of disease caused by waterborne organisms. The Lightweight Water Purifier (LWP) is intended to provide a water treatment capability for small units, SOF, and detachments operating without normal quartermaster water support.

1.1.3 Responsibilities

The unit commander is ultimately responsible for water supply and treatment within the unit. Other responsibilities involve the Army Medical Department (AMEDD), Corps of Engineers (COE), and the Quartermaster Corps (QM). The AMEDD establishes water quality standards, inspects water sources and supply points, performs tests, advises on treatment methods, and approves water for consumption. The COE selects and establishes water points by drilling wells if necessary. And, the QM sets up and operates bulk water treatment equipment and water supply points.

"Military units deployed in a contingency area must initially secure water for themselves or carry sufficient water with them until engineers, quartermaster water units, and supply and services elements can establish water operations" (FM 5-104). Water support is normally provided by the Division Support Command (DISCOM), Corps Support Command (COSCOM), or Theater Army Area Command (TAACOM) structure. This structure will not normally be in-place during the early phases of a deployment or may not be available at all to smaller battalion or company sized units operating independently or engaged in certain limited objective operations of short duration (e.g. less than 90 days). Larger organizations have organic support built into their structure. Some of those organizations are cited below.

In the light divisions, water is provided by the water supply section of the DISCOM Supply and Transport Battalion (S&T), Headquarters and Supply Company (SRC 42026L000). This company is organized for purification, storage (up to 27,000 gallons), issue (up to 72,000 gallons per day), and unit distribution of water to the light infantry battalion trains. The water section operates up to three water points in the Division Support Area (DSA) and the Brigade Support Areas (BSA).

In the airborne division, potable water is similarly provided by the water supply section of the DISCOM S&T Battalion, Headquarters and Supply Company (SRC 42056L000). This company is organized for purification, storage (up to 24,000 gallons), issue (up to 96,000 gallons per day), and limited unit distribution of water. The water section operates up to four water points in the DSA and BSAs.

Logistical support, including water purification, for components of the Army Special Operations Command (SOCOM) is provided by the 528th Special Operations Support Battalion (Airborne). The 528th is a one-of-a-kind unit responsible for air delivery of supplies to special operations troops. Fuel and water drums/bladders are rigged for airdrop and can be delivered by C-130 or slingloaded by the CH-47. The battalion has two water teams each equipped with two 600 GPH ROWPUs. These teams can operate up to four water points as required and are normally task organized to support specific missions. Although the water section can perform limited distribution, delivery and rigging; this is usually accomplished by other elements in the battalion organization.

1.1.4 Current Water Purification Capabilities

Current US Army capabilities to produce potable water for soldiers in the field range from individual measures to bulk purification methods. Individual measures may be classified as emergency procedures used when soldiers are on patrol or when the only source of water is raw or unapproved. They are not intended for large volumes for extended periods.

▶ Iodine Tablets. The most common of the individual measures is the use of iodine tablets. Typically, one iodine tablet is added to a 1-quart canteen of fresh water to disinfect the water. A minimum of thirty minutes contact time is required for disinfection. Two tablets are required for turbid or cold water at or below 40° F.

▶ Calcium Hypochlorite Ampules. Use of these ampules is generally a 2-step process. First, a concentrated solution is made by dissolving one ampule in one-half canteen cup of water (about 8 ounces). Then, one-half canteen capful of concentrated solution is added to each canteen of fresh water. As with iodine treatment, a minimum of thirty minutes contact time is required for disinfection. Larger batches of water may be purified using the 36 gallon Lyster bag or the 400 gallon water trailer if available according to the procedures in FM 21-10-1.

▶ Survival Straws. Emergency Drinking Straws, such as the Aquastraw 2 manufactured in the UK, allow individuals to drink directly from untreated sources and provide a reduction in biological organisms. The straws are light and discarded after 24 hours of use.

▶ Boiling. When disinfecting compounds are not available, water may be brought to a rolling boil for 5 to 10 minutes to kill most organisms. However, this method provides no residual protection against reinfection.

▶ Hand Operated Watermakers. Recovery Engineering Inc., Minneapolis, Minnesota manufactures a hand operated purifier known as the "Survivor". Jane's Military Vehicles and Logistics, 1991-1992, Twelfth edition indicates that this item is in service with the US Army, Navy, and Coast Guard. The system was designed for use as an emergency water supply for use on lifeboats or for units separated from central water supplies. Operation of the hand pump forces pressurized water through a reverse osmosis membrane producing pure drinking water from fresh, brackish, or saltwater. Three models of the "Survivor" are available as shown in Figure 1-1:

	Survivor 06	Survivor 35	Survivor 35CS
Production Rate	0.29 GPH	1.43 GPH	1.69 GPH
Weight	3.53 lbs	7.05 lbs	8.15 lbs

Figure 1-1 Hand Operated Water Purifiers

Current US Army bulk water production methods include:

- Reverse Osmosis Water Purification Unit (ROWPU), 600 GPH
- Reverse Osmosis Water Purification Unit (ROWPU), 3000 GPH

1.1.4 Deficiencies

While the individual methods of water purification described above are appropriate to provide for the needs of the soldier or small groups in an emergency situation, they are not intended to meet the sustained requirements for small units. For instance, in order to provide the estimated 6 gallons per day in the extreme case, the largest of the hand operated systems would require nearly 4 hours of constant pumping per soldier. Similarly, using tablets or ampules, a soldier would need to purify 24 full canteens over a period of six hours (assuming 2 canteens per soldier) to meet the maximum planning demand. Obviously, the considerable amount of time devoted to these efforts would impact on the primary mission. In addition, only the "Survivor" can use brackish or saltwater sources. Therefore, none of the individual methods is considered a viable alternative to meet the needs of the LWP and are disqualified from further consideration.

Existing 600 and 3000 GPH ROWPUs are assigned primarily to division, corps, and echelon above corps quartermaster supply and service units which operate water points in the DSA, BSAs, Corps Rear, and Communication Zone (COMMZ). Except in cases where limited distribution is provided, units are required to travel to the water point for resupply. For SOF missions, the 528th Support Battalion uses 600 GPH ROWPUs to produce water for air delivery to remote teams. These ROWPU units are sized and allocated to QM units meet the water point needs of brigade sized elements (approximately 3300 personnel with associated equipment) with large volumes of purified water. Flow rates produced by these systems require reasonably large sources and far exceed the requirements of small units, detachments, and SOF elements. In addition, these systems are skid-mounted or packaged in a special 8x8x20 foot ISO container and are normally transported on a 5 ton, 4 wheel tandem flatbed cargo trailer (600 GPH) or an M871A1 22.5 ton flatbed semi-trailer (3000 GPH) and represent a significant movement consideration for small or light units. The 600 GPH systems weighs about 3.7 tons skid mounted (USMC version) and about 8.5 tons with trailer (Army version). Figures for the 3000 GPH ROWPU are 7.6 tons (ISO van only) and 19.0 tons (mounted on trailer), respectively. Neither system is compatible with the missions and types of vehicles available to units requiring a Lightweight Water Purification capability.

In summary, the deficiencies of current water purification methods can be characterized by:

- Inability of all individual methods to treat brackish or sea water.
- Insufficient flow rates or excess water production capacity.

- Potential adverse mobility impact on non-Quartermaster using units. Sizes and weights of existing ROWPU equipment are not compatible with vehicles typically found in the target SOF or medical units.

1.1.5 Opportunities

The Lightweight Water Purifier (LWP) offers the possibility of overcoming these deficiencies in current water purification capabilities and presents the following opportunities:

- The opportunity to improve the responsiveness of water support to early entry, highly mobile forces throughout the spectrum of conflict.
- The opportunity to provide quality water support to small units and detachments during LIC or contingency operations where distribution of bulk water is not feasible or practical.
- The opportunity to provide such water support without committing outsized production assets or specially trained personnel from the division or corps support structure.
- The opportunity to tailor water production flow rates to the demands of independent Special Operations Forces, detachments, and other units typically engaged in remote site missions or in Operations other than War.
- The opportunity to use state-of-the-art technology in reducing the size, weight, and deployment features of existing water purification equipment.
- The opportunity to improve water production efficiency and flow rates from sources with high salt contents (e.g. > 45,000 milligrams per liter Total Dissolved Solids (TDS)).
- The opportunity to employ emerging water purification technology to improve quality of water regardless of source contamination.
- The opportunity to extend the lightweight water purification capability to other units with similar needs.

1.2 THREAT

1.2.1 Threat to be Encountered

The Lightweight Water Purifier (LWP) ... "does not counter a specific threat. An LWP capability and its associated personnel are vulnerable to the spectrum of threat destruction and/or disruption capabilities at all levels of conflict along the operational continuum. Though unlikely, the LWP capability also may be attacked as a target of opportunity. Destructive capabilities such as direct and indirect fires, small arms fire and sabotage can harm the system and associated personnel. This capability is will also be susceptible to contamination. The NBC operations and weapons effects may render the system temporarily unusable or may destroy it." (MNS, paragraph 2.b). The reliance on host nation or suspect sources of water poses a threat to the health and safety of soldiers operating outside normal water supply channels. Since water is an essential commodity, the LWP is intended to eliminate the health threat by providing an organic means to produce potable water within the unit.

1.2.2 Projected Threat Environment

The LWP will be used by units involved in low intensity conflict (LIC) environments, contingency operations, special operations and other scenarios where the distribution of bulk water is not feasible or practical. "Special operations occur frequently in hostile, denied, or politically sensitive areas across the full range of operations. ... Special operations during war and in other hostile environments usually occur deep in the enemy's rear area or in other areas void of conventional maneuver forces." (FM 100-5, page 2-20). During peacetime, Army SOF units may perform missions relating to foreign internal defense efforts, special reconnaissance, counterterrorism and counterdrug operations, humanitarian assistance, civic assistance, and demonstrations of US presence.

Regardless of the level of conflict, SOF forces are trained to operate independently with minimal external direction and support and are typically isolated from traditional forces and lines of communication. Their ability to operate in remote areas and hostile environments for protracted periods of time is one of their primary capabilities.

The threat environment in which SOF operates may be characterized by enemy rear area defense forces and local security teams organized to protect critical operational or command and control facilities. These defense forces may be part of a well-equipped and organized conventional army or regional police forces. They may also include lightly equipped local militia or insurgent elements configured for rear area security missions. These forces are generally equipped with small arms weapons and may possess a limited to moderate number of crew served weapons. Sabotage of equipment or supplies is also a potential threat when operating with indigenous personnel or local nationals. The threat from heavier weapons, artillery, or rocket fire is less of a consideration for these types of units due to the nature of the operations.

1.3 ENVIRONMENT

The LWP and the approaches evaluated as potential candidates must be capable of undegraded performance in a variety of environmental and climatic conditions. Specifically, the requirement includes the following environmental conditions as LWP system characteristics:

- The LWP must produce, store, and distribute potable water ... from all surface and ground water sources of fresh, brackish, and sea water, including NBC-contaminated water... (ORD, para 4.a.(2)).
- The LWP must also produce water ... while operating in an NBC environment and/or drawing water from NBC contaminated sources. Processed potable water shall be protected against NBC contamination/recontamination. (MNS, para 5).
- The LWP will be operated in basic and hot climate conditions as defined in Army Regulation 70-38, including NBC-contaminated environments when the systems is contained in an NBC-safe structure. (ORD, para 1.c.(1)).
- The LWP will not be NBC Survivable since it is not a mission essential item. (ORD, para 1.c.(1)).
- The LWP must be capable of storage and transportation in basic climates and be capable of operation in basic and hot climates (see AR 70-38). (ORD, paragraph 4.c.(2)).
- The LWP operation must operate with no observable deleterious effects due to blowing rain, blowing sand, or blowing soil. (ORD, paragraph 4.c.(1)).

1.4 CONSTRAINTS AND ASSUMPTIONS

1.4.1 Constraints

The Lightweight Water Purifier (LWP) must be capable of operating 24 hours per day in all geographic environments likely to be encountered during low intensity conflict, contingency or special operations during war or peacetime. This includes undegraded operation various weather and climates, day or night, and in the presence of natural or man-made battlefield obscurants.

The LWP must also be capable of undegraded operation in Nuclear, Biological, and Chemical (NBC) environments when housed in an NBC-safe structure and must be able to purify NBC-contaminated source water. In addition:

- The size and weight of the LWP must be such that it is readily transportable to the tactical area of operations (AO) by sea, rail, or air; and within the AO by ground transport modes available to the using units.
- The LWP must be tactically mobile and suitable for rapid deployment during early entry, contingency, and special operations.
- The LWP system must be transportable by an M1097A High Mobility Multi-Purpose Wheeled Vehicle (HMMWV). It must also be transportable inside an 8 foot x 8 foot x 20 foot ISO frame.
- The LWP system must be air transportable and air droppable by C-130 or C-141 medium lift aircraft using current air delivery containers. Additionally, the LWP must be capable of internal air transport by UH-60 Blackhawk aircraft.
- The LWP and associated equipment must not generate a requirement for additional manpower nor produce a need for additional military occupational specialties (MOS) or special skills.
- The LWP must be supportable by the standard supply and maintenance systems. Unit level and DS maintenance will be accomplished with common tools and/or those in the general automotive mechanics tool kit.

1.4.2 Assumptions

- The FY2001 force structure validated requirements are valid for the purposes of this Cost and Operational Effectiveness Analysis (COEA).
- Doctrine as outlined in FM 5-100, Operations, drives operational requirements and requires that all units (including LWP equipped units) be capable of operating in NBC contaminated environments.
- Operational and Support costs include maintenance and field support requirements and are identified by the decision cost element codes. The decision costs contained in this analysis do not contain "sunk costs" nor costs associated with military personnel per TRADOC Pamphlet 11-8.
- None of the alternatives examined in this COEA analysis will create (or generate) a requirement for any new military occupational specialties.
- Daily water production is based on 2-4 hours operation per day.

1.5 OPERATIONAL CONCEPT

Current water distribution capabilities are found within the support structure of the Division or Corps Support Commands (DISCOM or COSCOM). Quartermaster S&S or S&T companies establish and operate water distribution points to support units as far forward as the Brigade Support Area (BSA). Separate brigades or regiments have a similar capability in their organic service units. The 528th Special Operations Support Battalion provides water purification and other support to components of the Army's Special Operations Command on an as needed basis. Distribution of water and supplies to special operations, ranger, etc. units on the move is accomplished by air delivery at extended ranges.

This structure has proven satisfactory to support conventional deployments for brigade sized elements or larger. However, increasing emphasis on contingency operations, peacekeeping missions, humanitarian assistance and other special operations in remote and possibly hostile regions often requires flexibility in the tailoring of water support to smaller task forces or detachments with limited transportation assets. Such units must rely on local water support, individual low capacity purification methods, or the task organization of heavy, high capacity assets and personnel from the parent organization's support command.

The Lightweight Water Purifier (LWP) is not intended to replace the existing support structure; but rather to supplement it in situations where it is not feasible or practical to employ traditional water purification and distribution methods or equipment. Individual purification methods would presumably continue to be used during long range reconnaissance patrols (LRRP) and most covert operations of relatively short duration. However, the LWP will probably be used most frequently in situations where SOF elements are supporting missions involving organization, instruction, or training of popular guerilla type forces or local resistance units. Peacetime support may include training support to isolated units, humanitarian assistance, or disaster assistance where limited potable water supplies are available to support small portions (50-100 persons) of the local populace.

- The LWP shall be used by Special Operations Forces (SOF) down to detachment level and by selected medical units organized to, and engaged in, wartime and peacetime contingency operations or in Operations Other Than War (OOTW).
- The LWP may be issued to the support battalion or to the Service Company, SF Group on the Basis of three (3) per Special Forces Group. Each LWP will have adequate production capacity to support the consumption (drinking, cooking, and personal hygiene) demands of an estimated task force of about 100-125 persons. The Service Company will support deployments based on mission needs through attachment or task organization of LWP assets.
- Additional LWP systems will be allocated to selected medical units.

- The LWP shall be capable of producing potable water from fresh, brackish, and salt water sources and NBC contaminated sources at rates of 75 to 125 GPH (a maximum demand of 750 gallons per day in hot, arid climates is based on a population of 125 persons and 6 gallons of water per individual).
- The LWP will be airlanded in the area of operations by C-130 tactical or C-141 strategic airlift assets depending on distances and aircraft availability. Remote delivery will also be possible by Low Velocity AirDrop (LVAD) using air delivery containers. In theater movement on the ground will be accomplished by organic transportation assets. Short haul air movement in theater will be accomplished using CH-47 Chinook or UH-60 Blackhawk aircraft.
- The LWP shall be carried in or towed by vehicles organic to SOF or medical organizations. The target organic transport vehicle cited in the coordinating draft ORD include the M1097A HMMWV. Supporting units may also use:
 - Heavy Expanded Mobility Tactical Trucks (HEMTT).
 - Truck, Cargo 5 Ton (M923-M928 series).
 - Trailer, Cargo 1½ Ton, 2 wheel (M104, M105 series).
 - Truck, Cargo 16½ ton, Palletized Load System flatrack.
- Upon arrival at the designated site, the LWP unit (or modules) are downloaded from the transport vehicle by a team of two to four soldiers (two desired). One soldier assembles the LWP and prepares it for operations in less than 45 minutes. Water production begins immediately upon completion of set-up and check-out. Purified water is pumped to storage tanks or bladders (maximum 800 gallon capacity) which serve to replenish unit and individual supplies.
- The LWP produces water in one shift up to 10 hours per day and allows 30 minutes/per four hours operation for periodic inspection, maintenance, cleaning, and filter replacement.
- The LWP shall be operated and maintained by unit personnel as an additional duty. The LWP requires minimal training and will not introduce a requirement for added personnel or for any new Career Management Field (CMF), Military Occupational Specialty (MOS), or Additional Skill Identifier (ASI).
- Upon completion of the water mission, the LWP is disassembled, cleaned, and prepared for redeployment or movement to an alternate site by one soldier in 45 minutes or less.

SECTION 2

ALTERNATIVES

2.1 CAPABILITY OBJECTIVES

The required *capability* objectives for the Lightweight Water Purifier (LWP) are defined in the Revised Draft Operational Requirements Document (ORD) for the LWP dated 7 April 1995, paragraph 4. They can be summarized as follows:

2.1.1 System Performance

2.1.1.1 The LWP will produce, store, and distribute potable water that meets TB Med 577 and Tri-Service field water quality standards.

2.1.1.2 The LWP will be transportable in commercial or standard military vehicles one and one-quarter ton size or larger and by UH-60 or larger helicopters as an internal, external or combined load. Thirty days of expendable supplies and repair parts will be included in the standard load.

2.1.1.3 The LWP will be emplaced and recovered from operational sites by two to four personnel. Emplacement and recovery by two individuals is desired.

2.1.1.4 The LWP will, after emplacement, be initially put into operation by one individual within 30 minutes without specialized training. On a daily basis, the LWP will not require more than 15 minutes preparation before producing potable water or require more than 15 minutes to shut down. No more than 30 minutes will be required by one individual to prepare the LWP for movement to a different site.

2.1.1.5 The LWP will, within size and weight limits, produce at least 75 gallons per hour (GPH) of potable water from source water with a salinity of 35,000 parts per million and temperature normalized to 77° F. A production rate of 200 GPH from fresh water is desired.

2.1.1.6 The LWP will store and distribute the equivalent of a one day potable water requirement for the supported unit or up to 800 gallons.

2.1.2 Logistics and Readiness

2.1.2.1 When operating or maintaining the LWP, any item requiring replacement or calibration by the operator must be replaced and/or calibrated within 15 minutes without special training or complex equipment.

2.1.2.2 Preventative maintenance checks and services for the LWP must not require more than 15 minutes for each four hours of operation and must be accomplished by individuals without specialized training.

2.1.3 Critical System Characteristics

2.1.3.1 The LWP will not require NBC contamination survivability.

2.1.3.2 The LWP will be capable of being operated and stored in basic climatic conditions as defined in AR 70-38. A winterization kit may be required in sub-freezing weather to enable the LWP to perform its mission.

2.1.3.3 LWP operation will not be adversely affected by exposure to rain, blowing dust, or blowing sand.

2.1.4 Integrated Logistics Support (ILS) Requirements

2.1.4.1 Maintenance Planning. The LWP will be maintained at unit level as an additional duty by individuals without special training. Maintenance at the direct support level will consist of test, calibration, and replacement of major components and sub-assemblies. Higher level maintenance requirements will be contractor supported.

2.1.4.2 Support Equipment. The LWP Basic Issue Items (BII) will include all tools, test, and calibration equipment required to operate and maintain the LWP at unit level. Direct support maintenance will be accomplished using standard tools and test equipment.

2.1.4.3 Human Systems Integration.

(1) Manpower. No additional manpower or increases to force structure will be required to operate or maintain the LWP.

(2) Personnel. The unit will be operated and maintained as an additional duty by current unit personnel. The LWP will be operable, transportable, and maintainable by soldiers from the 5th female through the 95th male percentile of individuals authorized for the gaining units.

(3) Training. The LWP and basic issue items will be designed so that institutional training or other special training for operator and maintenance personnel will not be required. Unit training will be the responsibility of receiving units.

(4) System Safety and Health Hazards. The LWP will not introduce unique health or safety hazards which cannot be controlled to a risk level acceptable for operation by personnel without special training.

2.2 DESCRIPTION OF ALTERNATIVES

2.2.1 Listing of Alternatives

In accordance with the Statement of Work (SOW) and in coordination with the study sponsor, this Cost and Operational Effectiveness Analysis (COEA) investigated the following alternatives:

- ▶ Base Case, Haul Water by Aircraft
- ▶ Rebuy - Water Purification Unit, Reverse Osmosis, 600 GPH w/o Trailer, Flatbed Cargo, 5 Ton, 4 Wheel Tandem (REBUY 600 GPH)
- ▶ Rebuild - Water Purification Unit, Reverse Osmosis, 600 GPH w/o Trailer, Flatbed Cargo, 5 Ton, 4 Wheel Tandem (REBUILD 600 GPH)
- ▶ Lightweight Water Purifier (LWP)

2.2.2 Base Case - Haul Water by Aircraft

When demand for water exceeds the capability of individual purification methods, bulk water production support can be provided to the user from a secure base area and airdropped or airlifted by helicopter. While detachments and teams performing long range reconnaissance and covert operations will presumably continue to rely on emergency or survival water procedures, support for semi-stationary missions involving 50 to 100 personnel will normally depend on air resupply. The 528th Special Operations Support Battalion (Airborne) performs such missions for elements of the Special Operations Command (SOCOM).

As outlined in Army FM 10-522, potable water may be rigged for airdrop/air transport in a variety of configurations. This manual describes the procedures for rigging water resupply ranging from 6 gallons (24 - one quart canteens) to 2160 gallons (5 - 250 gallon collapsible drums). These drums are not shipped at full capacity, hence the seeming discrepancy in total quantity. For these purposes, the 500 gallon drum is filled with 432 gallons of water and weighs approximately 3,599 pounds. A 250 gallon drum holds 240 gallons and weighs 2,150 pounds. The smaller drum measures 60 inches in length with a 40 inch diameter.

Peak demand, as defined in the ORD, is 800 gallons per day. For the purposes of this analysis, the smallest rigged single package that approaches this demand is comprised of three 250 gallon drums containing a total of 720 gallons of potable water. Air resupply using this package is thus defined as the base case.

Water teams of the support battalion produce potable water using their organic 600 GPH ROWPUs. This water is pumped into the collapsible drums at the designated water

point. Rigging teams then configure the drums for air movement. Three drums are positioned on a Type II modular airdrop platform and lashed to the platform using 28 tiedown assemblies and honeycomb cushioning pads. Actual rigging is estimated at 30 to 45 minutes for two persons exclusive of relocation of the drums and any material handling support required. Once rigged, the platform is suitable for low velocity airdrop (LVAD) or slingload. The entire assembly measures 120 by 108 by 80 inches and weighs approximately 8,000 pounds. The weight of water alone is approximately 5,976 pounds.

In this configuration, the drums may be air delivered by C-130 or C-141 to a forward support site and then further lifted using UH-60 Blackhawk or larger rotary wing aircraft into the actual area of operations. The base case considers only helicopter movement out to a range of about 100 miles (1 hour flight time). To meet peak demand, daily resupply is required.

Theoretically, a single drum can be transported by HMMWV. However, lifting or material handling equipment would be required. Ground movement over short distances may be accomplished by dragging/towing a drum behind a HMMWV. The bulk and weight of each drum precludes movement by hand for all but the shortest of distance, i.e. repositioning.

2.2.3 Water Purification Unit, Reverse Osmosis, 600 GPH (ROWPU 600)

This alternative consists of the current 600 GPH ROWPU. This system is currently the standard water purification equipment available to U.S. Army and U.S. Marine Corps supply and service units at division or below. Additional units are located in the 528th Special Operations Support Battalion (Airborne) to support elements of the Army Special Operations Command (SOCOM).

The 600 GPH Reverse Osmosis Water Purification Unit provides fresh drinking water from fresh, saline, brackish water sources. The system comes overpacked with a post treatment cartridges for NBC contaminated sources. Separate cartridges are required for nuclear or chemical contamination which can remove hazardous concentrations of all known chemical and biological agents. The system was Type classified in 1979 and is now in service with the US Armed Forces. An estimated 583 are in use with the Army, 702 with the USMC, and an additional 105 with the Navy/Air Force.

Under the SOF concept, the water purification unit (WPU) can produce up to 3,840 gallons of potable water per day (960 GPH) from a fresh water or brackish water source and up to an estimated 2,400 gallons daily (600 GPH) from a sea water source. Hourly production rates are extracted from Appendix C, FM 10-52-1 and daily production in a SOF environment is based on a part time maximum of 4 hours of operation per day. Using the maximum demand of 800 GPD, this unit could meet the daily consumption needs in 50 to 80 minutes of operation. Production flows are less at temperatures below 77 ° F and at TDS concentrations exceeding 35,000 milligrams per liter. According to FM 10-52-1, water production at 50 ° F drops 69-74 percent. Treated water is pumped to a potable water

distribution system consisting of two - 1500 gallon collapsible storage tanks and a dispensing pump. Brine waste water is collected in a third collapsible tank if required. The product water from the system meets quality standards for soldiers in the field.

The 600 GPH ROWPU was manufactured in two configurations to meet the needs of the principal using services. The US Army version includes a M105 trailer for transport. The USMC version without the trailer is lighter, more compact and is somewhat more compatible with the LWP requirement. This version of the 600 GPH ROWPU is most consistent with the SOF mission and consists of the water purification unit (WPU) housed in a 113 inch long by 68 inch high by 83 inch wide skid frame. The skid mounted ROWPU alone weighs 7,300 pounds (3.65 tons). A 30 KW diesel generator must be provided as a separate power source.

The 30 KW generator weighs approximately 2850 pounds (1.43 tons) and measures 79.75 inches long by 34 inches wide by 54.75 inches high. The complete system weight is about 10,150 pounds (5.08 tons). The weights of either component exceed the cargo capacity of the High Mobility Multi-Purpose Wheeled Vehicle. Therefore, if movement by road is required, a minimum M800 or M900 series 5 ton truck would be required to transport the WPU skid with generator. The combined system exceeds off-road design payload of the M923A2/M925A2 dropside 5 ton truck by about 150 pounds. A C-130 can carry three (3) skid mounted systems including the generator. A C-141 can transport six (6) skid mounted systems. Additional sorties are required for transport of the prime movers. The skid mounted version exceeds the maximum external lift capacity at sea level for the UH-1 (2,800 lbs); but is within the lift of the UH-60 (8,000 lbs) helicopters. A second UH-60 lift is necessary for the generator. External transport of the both skid and generator is possible by CH-47D rotary wing aircraft within its 22,800 maximum lift dependent on rigging limitations. The system was originally engineered to meet the needs of airborne units and can be rigged for Low Velocity Airdrop (LVAD).

The ROWPU 600 can be set up by two soldiers and operated by one soldier trained in water purification operations (MOS 77W). Operation is semi-automatic; however an operator must be present to mix and add chemicals, monitor gauges, and backwash the system. The WPU is equipped with a canvas cover to protect the unit from the effects of weather. The canvas cover is rolled up and stowed during normal operations.

According to the technical manual on the equipment, the ROWPU 600 can operate in temperatures between +32°F and +90°F. However, when the air temperature is below 32°F, adequate shelter and heating must be provided to protect equipment from the effects of freezing. Above 90°F special precautions must be taken to prevent pumps from overheating. The system must be operated on sites where the ground is as level as possible. The chemicals used in the purification process can be dangerous alone or in combination. Protective clothing and a well ventilated area is required when handling chemicals before, during, or after operations.

2.2.4 Rebuild - Water Purification Unit, Reverse Osmosis, 600 GPH (ROWPU 600)

The rebuilt ROWPU 600 has identical operational and performance characteristics as the basic 600 GPH ROWPU cited above. The rebuild option principally affects the cost of the program by using earlier or displaced versions of the item and repairing/rehabilitating the system as necessary. This alternative is defined more fully in section 3.3 on costs.

2.2.5 Lightweight Water Purifier (LWP)

The LWP is a US Army effort to meet the need for water purification to support small units and detachments in areas that are remote from normal support assets. The LWP is intended to support the basic water needs of task forces ranging up to a maximum of 125 personnel and a peak demand of 750-800 gallons per day. The system does not replace existing capabilities; but rather supplements existing water purification and supply systems. The design objectives of the system are outlined in the coordinating draft ORD.

An abbreviated development program using commercially available water purifiers and/or components is envisioned. Production quantities are estimated at 50 systems to support special operations forces and selected medical units. A specific Basis of Issue (BOI) has not yet been determined by the proponent(s). Production approval and Type Classification (TC) - Standard is planned for FY 1999 with deliveries occurring in FY2000.

A market survey of information on foreign and domestic purifiers obtained during the December 1992 - June 1993 period by the study sponsor. This survey canvassed thirty-seven (37) potential suppliers and obtained positive responses from sixteen (16) sources. Within size, weight, and production limitations - six (6) vendor options were determined to offer the most promise for further testing and evaluation. Specific LWP performance characteristics cited here represent a composite of the ORD requirements and market data on these items.

The Lightweight Water Purifier (LWP) will most likely consist of several small modules or components to provide potable water from fresh, brackish, saline, or NBC contaminated water sources. These components may include pre-treatment in the form of cartridge filters, screens, or membranes to reduce suspended solids in the feed water. A second bank of smaller mesh filtration may also be included to further improve water quality prior to entry into stage two. After removal of suspended solids, a desalinization module such as a reverse osmosis skid with multiple elements eliminates dissolved solids from the source water. By-pass of this stage may be possible depending on the initial level of dissolved solids in the source and quality of the water exiting the pre-treatment module(s). Post treatment will probably include filters to remove NBC contamination and a chlorinator to provide for residual protection against recontamination. Water quality is expected to exceed Environmental Protection Agency (EPA) standards since most commercial purifiers are intended to service the general populace.

The LWP will be capable of providing a minimum of 75 gallons per hour based on a feed water salinity of 45,000 milligrams per liter and a water temperature of 77 ° F.

Commercial equipment with capacities of 250 GPH using a seawater source are available. LWP projections of 75-125 GPH (Seawater) and 185-200 GPH (Fresh water) are considered reasonably achievable. The LWP will incorporate storage drums, bladders, or tanks and a dispensing capability to accommodate storage and issue of at least 800 gallons on a daily basis.

The LWP will consist of a purification skid or shelter housing and ideally will have a self-contained power source. The major limits on size and weight are derived from the smallest principal transporter, the M1097A HMMWV. Cargo dimensions are restricted to a length of 84.3 inches and a width of 52 inches (between the wheel wells). A maximum skid height of 69 inches above the bed floor is required so that the system can be driven onto the C-130 (i.e. $32.9" + 69" \leq 102"$). An optimal width of approximately 34 inches would permit the system to slide between the rear seats. An ideal design height of 39 inches would retain the system profile at or below the current 72 inches. Therefore, outside dimensions must not exceed 84" x 52" x 69" to 84" x 34" x 39" (all dimensions in inches).

The maximum single length, width, and height combination of any of the commercial systems considered is 84" x 36" x 60" and fits within the permissible envelope. This is therefore assumed to be the maximum possible size for the LWP. However, it is reasonable to expect that the actual system may be much smaller. Average dimensions of the commercial purifiers are roughly 60" x 36" x 40".

Gross payload of the HMMWV is estimated at 2,200 pounds (2,500 pounds minus a 300 pound allowance for the operator and equipment). Commercial candidates vary in weight from 315 to 750 pounds. Average system weight is 541 pounds. Power for the system may require a separate 3 KW generator estimated at 370 pounds. Weight of the total system is estimated at 911 pounds (0.46 tons) and is well within the cargo capacity of the HMMWV. The requirement for MHE (or expedient lifting devices) is dependent on the weight of individual modules. It should be noted that the standard generator alone exceeds the four man lift criteria.

The LWP can be unloaded and emplaced by 2-4 soldiers and can be set up or torn down within 45 minutes by one soldier. The LWP can be operated by one soldier with a minimum of training. Operation of the system will be conducted on a part-time basis no more than 4 hours per day. Routine maintenance and Preventive Maintenance Checks and Services will require no more than 30 minutes for every 4 hours of operation.

A C-130 can carry four (4) HMMWV mounted systems and a C-141 can transport eight (8). The downloaded LWP is well within the external lift capacity at sea level for UH-1 (2,800 lbs), UH-60 (8,000 lbs), and CH-47D (22,800) rotary wing aircraft. Movement by road, rail, or sea will not pose any restrictions due to the small size and weight of the LWP.

The LWP can operate in basic and hot climatic conditions at temperatures of -25°F to +120°F. Special insulation or winterization kits are necessary to conduct operations in sub-freezing temperatures. The system must be operated on site where the ground is as level as possible.

	Base Case Haul by Aircraft	600 GPH ROWPU Rebuy	600 GPH ROWPU Rebuild	LWP
Quality	Meets TB Med 577	Meets TB Med 577	Meets TB Med 577	Meets EPA Standards
Fresh (4 hrs/day)	720 gpd (3 x 240 gal)	960 gph (3840 gpd)	960 gph (3840 gpd)	185-200gph (800 gpd)
Brackish (4 hrs/day)	720 gpd (3 x 240 gal)	960 gph (3840 gpd)	960 gph (3840 gpd)	185-200gph (800 gpd)
Sea Water (4 hrs/day)	720 gpd (3 x 240 gal)	600 gph (2400 gpd)	600 gph (2400 gpd)	75-125gph (500gpd)
Design TDS	35K mg/l	35K mg/l	35K mg/l	45K mg/l
Dimensions (inches)	120x60x40 (3 drums) 120x108x80 (rigged)	113x83x68	113x83x68	84x36x60 est maximum
Basic Weight Generator (if reqd) Total	6450 lbs (3-250 gallon drums @240 gal water) 8000 lbs (rigged)	7300 lbs 2850 lbs 10150 lbs	7300 lbs 2850 lbs 10150 lbs	est 541 lbs 370 lbs <911 lbs
Crew/MOS	2 (riggers)	2 (MOS 77W)	2 (MOS 77W)	1 (Non-Specific)
Operating Temp	+32 to +110° F	+32 to +90° F	+32 to +90° F	-25 to +120° F
Set-Up/Tear Down	2 soldiers-30 to 45 min	2 soldiers-4 hr	2 soldiers-4 hr	1 pers-45 min
# of slingloads	1 UH-60 minimum	2 UH-60 minimum	2 UH-60 minimum	1 UH-60 minimum
# per C-130	4 rigged platforms	4 skid mtd with generator set	4 skid mtd with generator set	4 HMMWV mtd/ 10-13 skid mtd
# per C-141	8 rigged platforms	6 skid mtd with generator set	6 skid mtd with generator set	8 HMMWV mtd/ 30-36 skid mtd

Figure 2-1 Comparison of Selected Performance Elements for Alternatives

SECTION 3

ANALYSIS OF ALTERNATIVES

3.1 MODELS

3.1.1 General

No combat or battlefield simulation models were used in this Cost and Operational Effectiveness Analysis (COEA). However, a decision analysis support software package entitled Expert Choice™, Version 8.0 was employed in the operational analysis comparison of each of the alternative characteristics. Relative performance against original draft ORD requirements forms the basis for the Cost and Operational Effectiveness Analysis (COEA).

3.1.2 Analytical Hierarchy Process (AHP) and Expert Choice™

The methodology used in the operational evaluation portion of this study effort was based on the Analytical Hierarchy Process (AHP). AHP is a decision theory that was developed at the Wharton School of Business by Dr. Thomas L. Saaty as a means to define, organize, and resolve complex questions involving multiple criteria of varying significance. It is a mathematical model which relies on the mechanics of pairwise comparisons, direct data input, and matrix algebra. The process permits a logical and systematic evaluation of each proposed alternative with respect to each other over the full range of criteria. Commercially available computerized AHP decision support software designed by Dr. Ernest H. Forman, specifically *Expert Choice™*, was used as a principal tool in conducting the COEA analysis.

3.2 OPERATIONAL REQUIREMENT ANALYSIS

3.2.1 General

A hierarchy or decision tree description of the Operational Requirement serves as the core of the evaluation process. The hierarchy for LWP was derived indirectly from the paragraphs of the requirement documents found in Appendix A and B. Major capabilities criteria include factors such as systems performance, critical characteristics, and integrated logistics support. Subcriteria under each major category reflect ORD subparagraphs and specific design limitations or operational specifications. The initial hierarchy was developed and presented to the proponent and study sponsor for review and comment. The final hierarchy structure was coordinated with the project sponsor and the U.S. Army Quartermaster Center and School (USAQMC&S), Combined Arms Support Command (CASCOM), and other proponent representatives.

Since the relative importance of each criteria is not equal, a series of pairwise comparisons were necessary to assess the relative significance of one criteria versus another. Through the software, all of the individual comparisons are synthesized into an overall evaluation of importance of those factors. Results of the synthesis are expressed as criteria weights. Strawman comparisons were developed by a team from BRTRC and were reviewed and adjusted by representatives of the USAQMC&S at the direction of the study sponsors. Inconsistencies in the pairwise comparison process reflected as an "inconsistency (IC) index" were resolved to insure that the IC was below the recommended level of 0.1. The resultant hierarchy is depicted in Figure 3-1 and in also Appendix B. Appendix C presents a detailed summary of the individual pairwise comparisons.

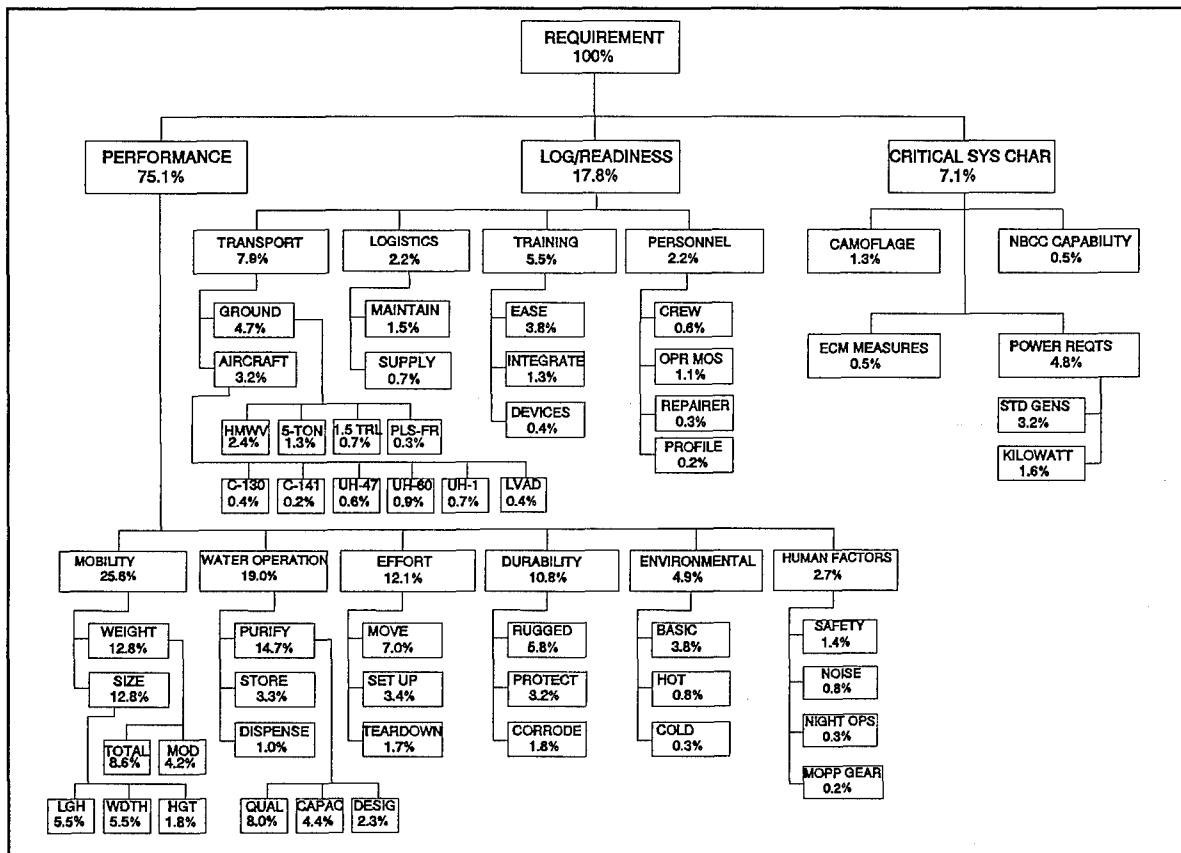


Figure 3-1 Lightweight Water Purifier (LWP) Evaluation Hierarchy

3.2.2 Analysis of Alternatives versus Operational Hierarchy

Appendix D presents the results of the overall operational evaluation. Information is provided for each of the alternatives investigated in both verbal and numerical form for each subcriteria. Input data for these investigations was derived from technical manuals, field manuals, performance reports, and other sources. Where hard data was not available, engineering judgment was used to supplement information to fill voids. Principal selected performance features are displayed in Figure 2-1. Results are expressed in ratio scale for each of the major operational criteria and the composite overall evaluation. Figures 3-2 and 3-3 depict these results in both tabular and graphical form.

	SYSTEM PERFORMANCE	LOG/READINESS CRITERIA	CRITICAL SYSTEMS CHARACT	OVERALL EVALUATION
LWP	.373 (1)	.422 (1)	.226 (2)	.371 (1)
SHIP BY AIR	.264 (2)	.331 (2)	.417 (1)	.287 (2)
600 REBUY	.182 (3)	.124 (3)	.178 (3)	.171 (3)
600 GPH REBUILD	.182 (3)	.124 (3)	.178 (3)	.171 (3)

Figure 3-2 Operational Criteria Evaluation Results

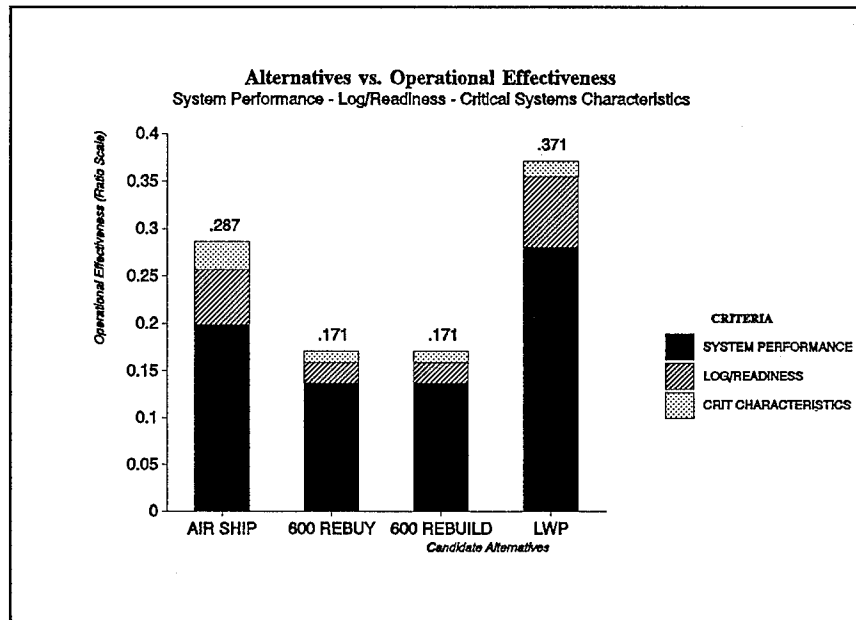


Figure 3-3 Graphical Results of Evaluation

The figures reveal that the LWP is the best overall alternative. Based on the hierarchy and relative importance of the criteria, LWP is rated as 29 percent more operationally effective than the Base Case of Shipping Water by helicopter. It is also 117 percent more effective overall than the 600 GPH REBUY or the 600 GPH REBUILD options. The LWP ranks as the number one choice in two of three major criteria. Details of these rankings will be explored further in the following paragraphs.

3.2.3 Major Elements of the LWP Hierarchy

In order to obtain a more exact representation regarding each of the alternatives, it is necessary to look at individual elements within the hierarchy. Five major subcriteria at the third level of the hierarchy comprise 75.4 percent of the total capability required. These are: mobility in terms of size and weight (25.6%), water operations including purification quality, capacity, storage, and dispensing capabilities (19.0%), effort to move, set-up, and tear down (12.1%), durability (10.8%), and transportability (7.9%). A closer inspection of these areas provides additional insight into the advantages and disadvantages of each of the alternatives.

3.2.3.1 Mobility. System mobility is driven not only by the size and dimensions of the system but also by the total system weight and individual weight of the largest module. The optimal system must be compatible with the forces to be supported and thus must be as small and mobile as possible. Figure 3-4 displays mobility characteristics of the alternatives.

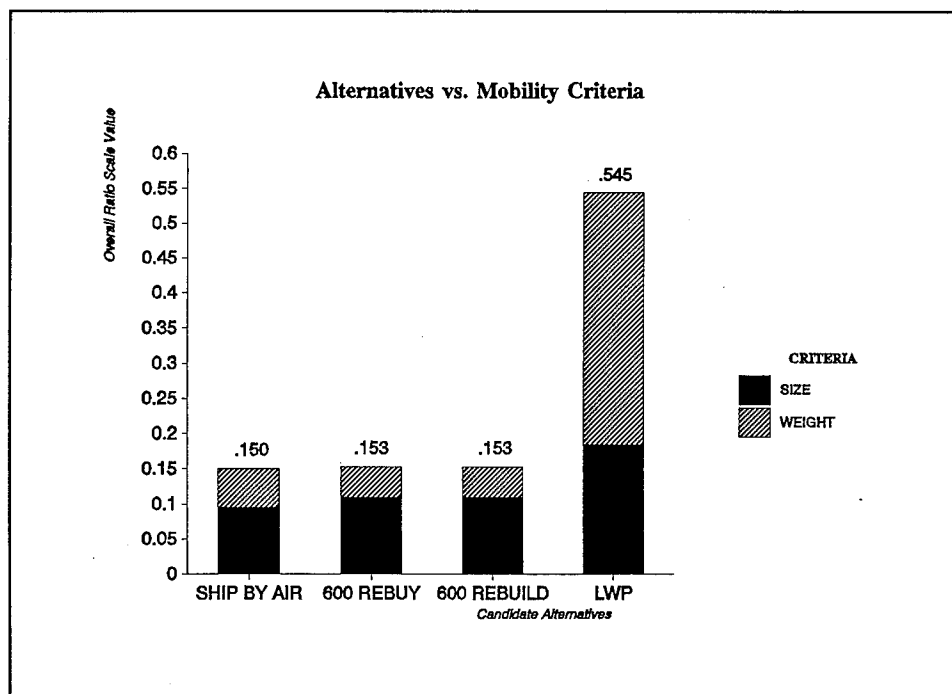


Figure 3-4 Comparison of Mobility Characteristics

Three of the alternatives are essentially equivalent with respect to mobility. Both of the 600 GPH ROWPU options display a slight edge over the Base Case Ship by Air with regard to size. The Base Case offsets this benefit with a lower total and module weight. However, the LWP demonstrates a significant advantage in both size and weight. The mobility advantage of the LWP is more than 2.5 times that of the other alternatives.

3.2.3.2 Water Purification Operations. Water Operations reflect the quality of the product water, as well as, the production-storage-dispensing capacities of the systems. Figure 3-5 displays relative ability of the alternatives to produce potable water based on these factors.

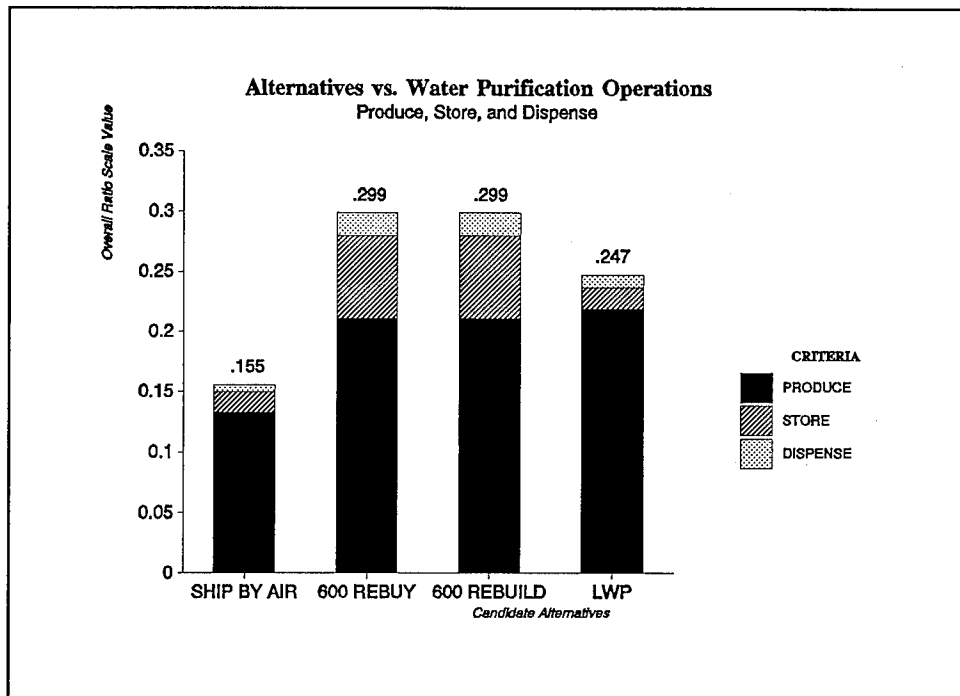


Figure 3-5 Comparison of Water Purification Operations

Both of the 600 GPH ROWPU options (Rebuy or Rebuild) show better performance in the area of water purification operations. These systems are 21 percent more effective than the LWP and 93 percent better than shipping the water by air. The 600 GPH systems reveal an excess production capacity which is more than four times the estimated peak demand. This advantage in capacity is balanced by the LWPs ability to produce water meeting the higher EPA standards of quality. Therefore, the 600 GPH systems and the LWP are about equal in purification capabilities. The Ship by Air alternative is the least flexible since production and storage is limited to the 720 gallon - 3 drum package. Increasing the size or number of drums to upgrade this characteristic would necessarily produce severe offsets in mobility and transportability criteria. The dispensing advantage goes to the 600 GPH systems.

3.2.3.3 Effort and Time Characteristics. These characteristics show the combined effects of the time and effort required to move the system, set it up for operations, and tear the system down for relocation or redeployment. Figure 3-6 displays relative system performance based on these factors.

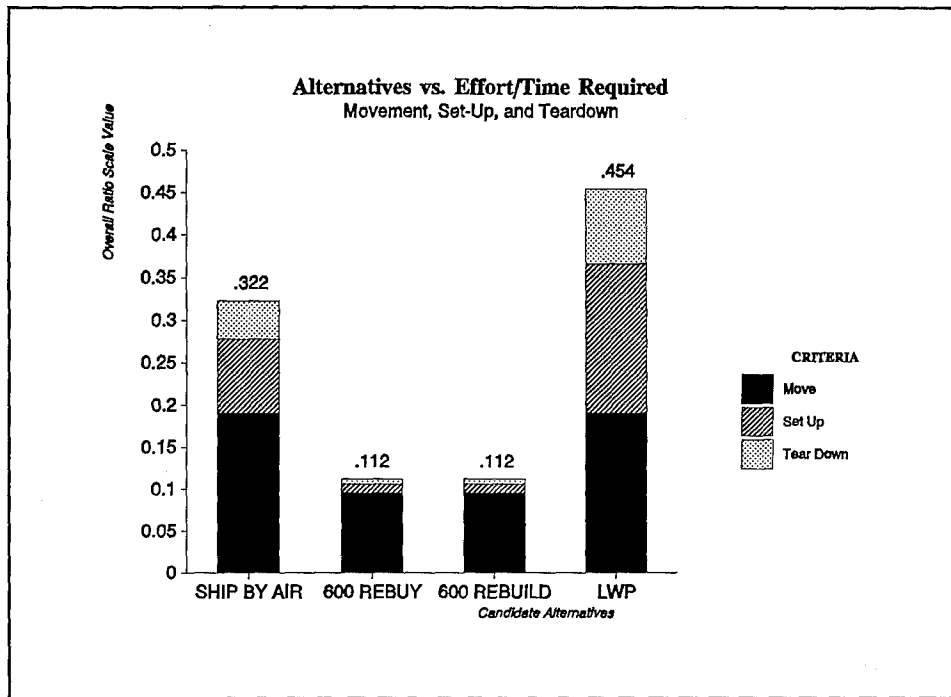


Figure 3-6 Comparison of Effort & Time Characteristics

Here, the LWP emerges as the preferred system. The LWP shows a 41 percent advantage over the Ship by Air alternative and a three-fold advantage over the 600 GPH ROWPUs. Initial movement of either of the 600 GPH systems requires substantially more effort due to the number of modules (i.e. pumps, filters, etc.) which must be downloaded from the transport vehicle. Material Handling Equipment must be made available in order to move the 30 KW generator power source. The LWP can be man-handled into position relatively easily by two persons. No more than four are expected for the heaviest of the LWP modules. Even the 250 gallon water drums can theoretically be rolled from the platform after derigging (or off the back of a HMMWV) to their final location fairly quickly by several (6-8) persons on generally flat terrain. As discussed earlier, gross bulk and weight of the individual drums have the most impact here. Actual set-up favors the LWP since it can be placed into full operation by one person in less than 45 minutes. The number of components and piping and electrical connections required for the 600 GPH systems is reflected in the higher overall set up and tear down effort required (estimated at 4 to 8 man-hours). Thus, the lower performance values in ratio scale.

3.2.3.4 Durability Characteristics. System durability characteristics reflect the ability of the alternatives to meet the demands of field handling under adverse conditions. Ruggedness of construction, resistance to corrosion, and protection afforded from the elements are the prime criteria. Figure 3-7 displays relative durability based on these factors.

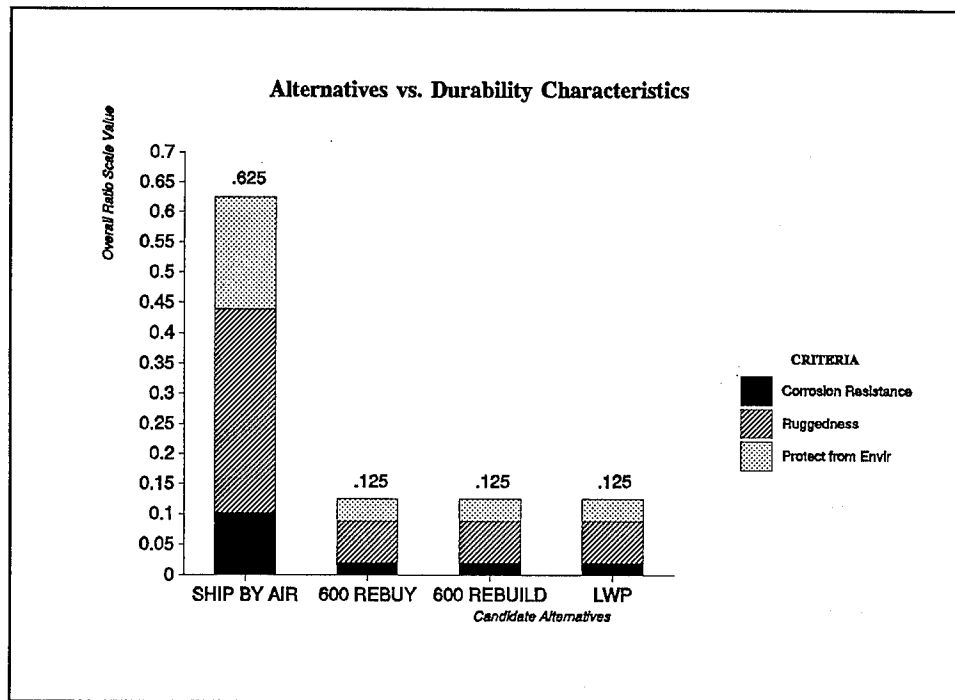


Figure 3-7 Comparison of Durability Characteristics

The Ship by Air option is favored by a wide margin in durability characteristics. Relatively speaking, using the collapsible water drums provides a solution that is about four times the durability of any of the other systems. The drums themselves are sufficiently rugged that they can be air dropped, rolled, and dragged with little difficulty. They are intended to withstand rough handling and reuse provided adequate care is taken to prevent accidental puncture. The materials used for the drums is designed to resist corrosion and the effects of wind, dust, dirt, and other environmental conditions. Both the 600 GPH and LWP contain modules that are exposed and susceptible to the environment and thus are shown here with about the same durability ratings.

3.2.3.5 Transportability. Transportability encompasses criteria related to both ground and air deployability by various vehicles available to units or support elements and aircraft normally used for tactical airlift. Figure 3-8 displays relative system transportability characteristics based on these factors.

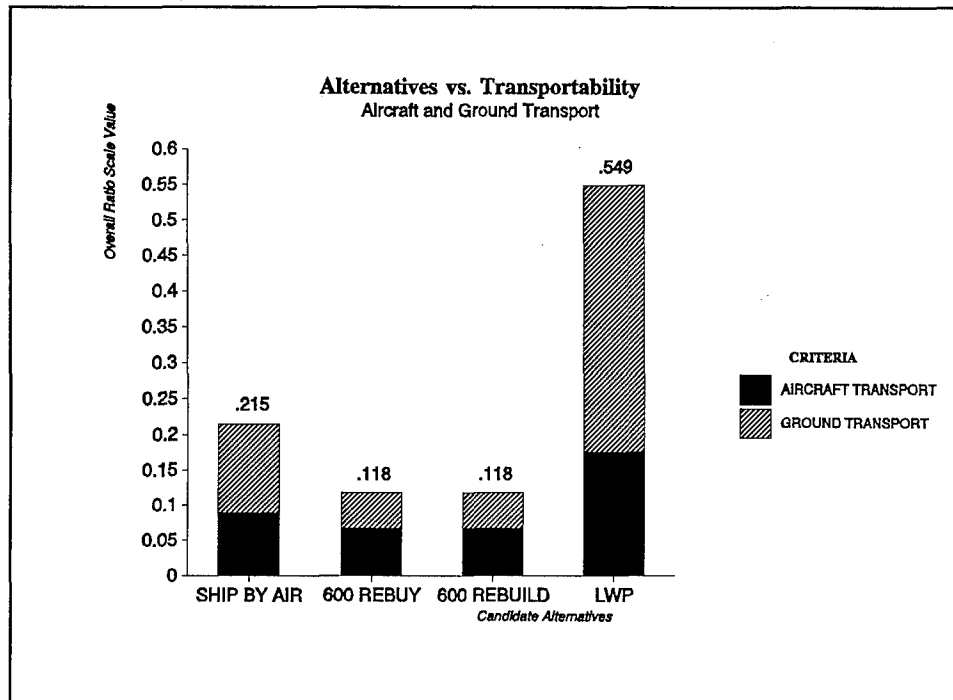


Figure 3-8 Comparison of Transportability Characteristics

From a total transportability point of view, the LWP is clearly the best option among the alternatives. It is almost twice as transportable as the Base Case of Shipping the water by Air and nearly five times better than the 600 GPH systems with respect to overall transportability. Only the LWP can be transported by the HMMWV in a single lift. A minimum of three HMMWVs are necessary to move the water drums (i.e. 1 per drum). The 600 GPH systems require a vehicle with at least a 5 ton capacity. Use of a 1.5 ton trailer is only compatible with the LWP. From an aircraft perspective, only the LWP can be inserted in a single lift by a UH-60 helicopter. A single UH-60 can also accommodate the Base Case Shipment of Water Drums. However, two lifts are required for the 600 GPH systems. External lift for any system is possible using the CH-47D. One C-130 sortie is required to transport four LWPs mounted on a HMMWV in a roll on/roll off configuration. As many as 10 to 13 LWP can be loaded onto a C-130 depending on the load orientation. Four skid mounted 600 GPH ROWPUs or four rigged Type II platforms can be transport in a single C-130. For transport in the C-141, eight LWPs mounted on HMMWVs or eight rigged platforms can be transported in a single sortie. Six 600 GPH ROWPUs can be transported by C-141. Low Velocity Airdrop is the only area where the 600 GPH ROWPU or Ship by Air option displays an advantage over the LWP. An airdrop capability for the LWP is required but may not be fully achievable using a commercial item and component strategy without added development costs. The capability was not credited to the LWP for this comparison.

3.2.4 Summary Results

The principal conclusion that can be derived from this analysis is that the LWP offers significant advantages in many of the major systems performance and logistics/readiness criteria. The LWP is the number one ranked candidate considering the composite overall criteria and the Systems Performance and Logistics and Readiness Criteria. Only in the realm of Critical Systems Characteristics (CSC) does the LWP place 2nd to the Base Case Ship by Air Option. For the five major subordinate criteria at the third level of the hierarchy, the LWP demonstrates clear advantage in 3 of 5 areas with respect to mobility, time and effort required, and transportability. With respect to water purification operations, the LWP rates about 21 percent below the combined purification, storage, and dispensing capability of the 600 GPH ROWPUs. This, however, represents the single most important advantage of the 600 GPH over the LWP and actually represents an excess capacity. Due to its size/weight and complexity, the 600 GPH systems are handicapped in many of the ORD criteria. The Base Case - Ship by Air alternative's prime major advantage is in the CSC and durability criteria.

3.2.5 Operational Sensitivity Analysis

Appendix D consists of a series of charts and graphs which capture the sensitivity of adjustments in the weights of the criteria of the LWP evaluation hierarchy. All comparisons are presented in ratio scale. The charts indicate that the selection of the LWP is not sensitive to variations in weightings two of the three the major level 2 criteria. Regardless of the specific weight placed on systems performance and Log/Readiness criteria, the LWP is always the preferred alternative. Selection of the LWP is somewhat sensitive, however, to the weighting of Critical Systems Characteristics if the base weighting of 7% is increased five-fold to above 35%. Such a weighting would indicate relative equality of the three chief factors and is presumed to be not very likely. Several of the individual level 3 criteria were determined slightly sensitive to the selection of the Base Case Ship by Air option. However, specific weightings must be increased (or decreased in some cases) by factors of 2 to 10 in order to make a difference in the overall selection. Decrease in emphasis on mobility (34 to 9%) or transportability (44 to 23%) leads to selection of the Base Case. Increases in the weightings of durability (14 to 30%), water operations (25 to 84%), logistics (12 to 41%), training (31 to 60%), or human factors (4 to 37%) have similar impacts on selection. All of the remaining level 3 criteria are insensitive to variations in weights. Based on the magnitude of change required, the choice of the LWP is not sensitive to moderate variations in the weightings of individual criteria. Further sensitivity analysis is included in the charts at Appendix D.

A series of four different types of charts or diagrams are included in this analysis. Each type requires a brief explanation:

- Barcharts. The barchart presents criteria weights on the left and resultant ratio scale values for each of the alternatives on the right. The first barchart shown within a series reflects the results at the initial criteria weightings. Subsequent charts examine the impact of varying individual criteria weights.

- Performance Illustrations. These illustrations depict criteria along the horizontal axis. The length of the vertical bar above a criteria indicates its weight which can be read from the left hand scale. Ratio scale values for each approach can be determined for each criteria from the right hand scale. The intersection of the criteria line with each of the approaches reveals their relative rankings for that measure of effectiveness. Combined or overall values for those criteria are shown in the far right column.

- 2-dimensional plots. These plots are used to compare two criteria simultaneously. Axes are labeled in ratio scale. In general, the more preferable characteristics would result in a plot in the upper right quadrant. Less preferable alternatives appear in the lower left quadrant. Tradeoffs are identified in the remaining sections.

- Gradient diagrams. These diagrams show the rankings of the approaches in ratio scale as the weighting or priority of a given criteria is altered. The vertical line indicates the baseline weight from Figure 3-1. The impact of varying the weight of the criteria can be deduced from the relative positions of the approach lines at the adjusted weight.

3.2.6 Conclusions of the Operational Requirement Analysis

The major conclusions of the Operational Requirement Analysis are summarized as follows:

- That the LWP exhibits the highest potential of the alternatives considered for meeting the capability requirements stated in the Operational Requirements Document (ORD).

- That the LWP offers best characteristics with regard to overall capability (29% better than the Base Case and 117% better than the 600 GPH ROWPU), systems performance (41% better than the Base Case and 105% better than the 600 GPH), and Log/Readiness criteria (27% better than the Base Case and 240% better than the 600 GPH).

- That the LWP offers a significantly greater potential with respect to mobility, transportability, and effort required to move, set up, and tear down the system. LWP is also significantly more smaller and lighter than the Base Case.

- That the 600 GPH ROWPU offers higher production and storage capacity; but is less mobile and transportable than the Base Case and significantly less mobile than the LWP. This excess capacity in the 600 GPH represents a tradeoff for size and weight.

- That the selection of LWP is not very sensitive to the exact weightings of major criteria at the 2nd and 3rd level of the evaluation hierarchy.

- That the Rebuilt 600 GPH system offers identical capabilities as a Rebuy of the 600 GPH ROWPU.

3.3 COSTS

LWP 22 Dec 95

3.3.1 General Methodology

The cost analysis for this Cost and Operational Effectiveness Analysis (COEA) was conducted in accordance with the guidance set forth in the DoD 5000 series Directives and Instructions, the Training and Doctrine Command (TRADOC) Pamphlet 11-8 (Draft), and other applicable references. In particular, the cost analysis utilized the concept of Decision Cost developed in that TRADOC publication. The general methodology consisted of the following steps:

- (1) A determination was made of the decision costs associated with selection of each of the four approaches. Decision cost categories include both dollar costs and non-dollar costs.
- (2) A comparison of the decision costs for each approach was performed.
- (3) Trade-off, sensitivity, and uncertainty analyses were conducted.
- (4) The Decision Cost Estimates were validated by the Belvoir Cost Analysis Office on October 25, 1994.
- (5) When the Operational Requirements Document (ORD) was changed to increase the Army requirement from 37 to 50 LWPs, the decision costs for each approach were revised.
- (6) The Trade-off, sensitivity, and uncertainty analyses were revised to be consistent with the revised Decision Cost Estimates.
- (7) The revised Decision Cost Estimates are being submitted for validation to the Cost Analysis Division, TACOM, since the Belvoir Cost Analysis Office has been disestablished and its functions transferred to TACOM.

3.3.2 Dollar Decision Costs

3.3.2.1 Development of Dollar Decision Costs

3.3.2.1.1 General

(1) All costs were estimated in thousands of FY 1996 Constant Dollars and converted into Current Dollars using Inflation Guidance from Memo, Headquarters, Army Materiel Command (AMCRM-CE), dated 1 February 1995.

(2) All costs through 1994 were considered Sunk Costs and excluded from the Decision Cost Estimates.

(3) In accordance with Draft TRADOC Pamphlet 11-8, Para 3-3.c.1 (page 25), Military Personnel Costs (Cost Category 4.0) were excluded from Decision Costs, although they are included in the Program Life Cycle Cost Estimate (LCCE) for the Lightweight Water Purifier (LWP). (Since the LWP requires no crew, Military Personnel Costs for this system are, in any case, only those for maintenance personnel.)

3.3.2.1.2 Base Case: Shipping Water in by Helicopter or Fixed Wing Aircraft

The current system represents the Base Case. The mission of supplying water and other supplies to SOF in operating areas is assigned to the 528th Special Operations Support Battalion (Airborne). This unit has four 600 GPH ROWPUs. The water section normally sets up a consolidated water point at a convenient location. The water is then delivered to the supported forces in the operating area by helicopters or airdropped from fixed wing aircraft. More detailed information is included in Section 2.2 above.

Since this alternative involves no RDT&E and no acquisition of new equipment, a detailed Decision Cost Estimate was not prepared. Instead the O&M costs of transporting the water over 20 years were estimated as follows:

- Assume 125 people to be supported with 6 gallons per day per person. Thus the requirement = $125 * 6 = 750$ gallons per day. This equates to three 250-gal collapsible water drums per day.
- Assume two 15-day exercises per year supported by helicopters for a total of 30 days per year. This assumption is extremely conservative. It agrees with the Operational Mode Summary/Mission Profile (OMS/MP) for the LWP for peacetime training missions. For operations other than war, however, operations may last up to one year. Similarly, for wartime missions, the OMS/MP anticipates durations of three months to one year.
- Assume the UH-60A is used to transport the water. A UH-60A can transport 3 drums per mission as an external load. Thus one mission each day is required for water.
- Assume an average one-hour flight each way from airfield to water point to operating area * 30 days per year = 60 flight hours per year.

Then operating costs of UH-60 will be:

Depot level reparables:	$\$1462.35/\text{hour}^1 * 60 \text{ hrs/year} * 20 \text{ years} * 50 \text{ systems} =$	\$87,741K
(FY96\$)		
Consumables:	$323.15/\text{hour} * 60 \text{ hrs/year} * 20 \text{ years} * 50 \text{ systems} =$	\$19,389K
(FY96\$)		
POL:	$88.05/\text{hour} * 60 \text{ hrs/year} * 20 \text{ years} * 50 \text{ systems} =$	\$ 5,283K
(FY96\$)		
	Total operating costs for 20 years =	<u>\$112,413K</u>
(FY96\$).		

These costs are, of course dependent on the assumptions discussed above. The effect of changing these assumptions is investigated in the Trade-Off Analyses in Section 3.4 below.

For this alternative, the water is assumed to be available in the base area, either from Host Nation Support or from an operating rear area water supply point. **Therefore no costs are included for purifying the water.**

3.3.2.1.3 600 GPH ROWPU - Rebuy of Marine Corps Version

As Section 2.2.2 indicates, this alternative consists of using the 600 GPH ROWPU for Special Operations Forces (SOF) as an alternative to developing and acquiring the Lightweight Water Purifier (LWP).

For this alternative, the US Marine Corps version of the 600 GPH ROWPU is used. This unit differs from the Army version in that it is skid mounted, and the 5-ton, 4-wheel tandem trailer is not included. A separate 30 kw generator, such as LIN J36109, NSN 6115-00-1118-1240, is required. The unit is capable of producing drinking water from polluted fresh water, brackish water, and sea water. It is also capable of removing chemical and radiological contaminants from the water.

The Marine Corps version of the 600 GPH ROWPU is lighter than the Army version and weighs only 7,300 pounds. The generator, LIN J36109, weighs an additional 2,850 pounds. Since it is lighter than the trailer-mounted Army version, the Marine Corps version is more suitable than the Army version for SOF missions. The unit and its generator could be transported to the SOF operating area by a UH-60A or CH-47D

1. Cost per hour of Depot Level Reparables, Consumables, and POL for UH-60A from USA CEAC Memo: FY 96 President's Budget Materiel System Sustainment Cost Factors, 13 January 1995.

helicopter -- in both cases as external loads. Alternatively, the ROWPU and the generator could be airdropped into the operating area by a C-130 or larger aircraft.

Although it is possible that surplus units could be obtained from the Marine Corps and rebuilt, this Cost Estimate assumes a rebuy. (The costs of acquiring surplus units and rebuilding them are explored in Section 3.3.2.1.4 below.) Requirements are anticipated to be the same as for the Lightweight Water Purifier (LWP); that is, 8 ROWPUs for Medical units and 42 for Special Operations Forces for a total of 50 units. The system is estimated to have a useful life of 20 years.

A detailed summary of the Decision Cost Estimate for using the 600 GPH ROWPU for Special Operations Forces, showing the assumptions, all the Cost Elements, and the breakdown of costs over the years is shown in Appendix E.

3.3.2.1.4 600 GPH ROWPU - Rebuilding Existing Units

With the drawdown of force levels, it is possible that the 50 units required could be found from Army assets. This alternative estimates the cost of acquiring and rebuilding the 600 GPH ROWPUs from service excesses.

Since the ROWPUs and generators are already in the field, both RDT&E Costs and Procurement Costs for this alternative are Sunk Costs and hence are excluded from the Decision Cost Estimate. However, it is assumed that the units would need to be rebuilt or overhauled before issue, as they have been in the field for 10-15 years. The overhaul is estimated to cost 50% of the procurement costs for new units. Except for the overhaul costs and the costs of transporting the units to the depot and from the depot to the SOF units, the O&M Costs would be the same as for the rebuy alternative above.

A detailed Decision Cost Estimate was not prepared for this alternative. As indicated above, there are no RDT&E Costs and no Procurement Costs. The only additional Cost Elements needed for O&M Costs are Depot Overhaul Costs and Transportation Costs to and from the depot. These costs were estimated as follows:

Depot Rebuild or Overhaul Costs:

Estimated to be 50% of cost of ROWPU and generator = $0.5 * (\$92.445K + 16.995K)(FY96\$) = 0.5 * \$109.440K * 50 \text{ units} = \$2,736.0 \text{ (FY96\$)}$ (Costs from December 1995 AMDF, using NSNs 4610-01-6287 and 6115-118-1240 and inflating to FY96\$.)

Transportation to Depot and from Depot to SOF Units.

Weight ROWPU	=	7,300 pounds
Weight Generator	=	2,850 pounds
Total	=	10,150 pounds + 10% for packing/2000 = 5.58 ST

Shipping cost per ton = \$121.41 (FY85\$)/0.7121 = \$0.17050K (FY96\$)

Total transportation cost = 2 (round trip) * 5.58 ST * 0.17050\$K per ST * 50 units = \$95.139K (FY 96\$)

3.3.2.1.5 Lightweight Water Purifier (LWP)

The Lightweight Water Purifier (LWP) is being developed to support small units and detachments, particularly Special Operations Forces (SOF) and small health care units, in low intensity conflict, nation building, civil affairs actions, peacekeeping, disaster relief operations, early entry, long range surveillance, and additional operations other than war (OOTW). It will be lightweight and highly mobile for deployment in areas where road nets and host nation water supply may be limited or unavailable. The LWP will purify salt, brackish, and fresh waters and water contaminated with nuclear, biological, and chemical (NBC) agents. A more detailed description and characteristics are included in Section 2.2.

Although the Mission Needs Statement for the Lightweight Water Purifier (LWP) was approved on 6 October 1993, the Operational Requirements Document (ORD) has not yet been approved. Present plans call for a Milestone I/II in the second or third quarter of FY 1996 and Milestone III in the first quarter of FY 1998. Requirements are anticipated to be 8 LWPs for Medical units and 42 for Special Forces for a total of 50 units. The system is estimated to have a useful life of 20 years.

Appendix F contains a detailed summary of the Program Life Cycle Estimate for the LWP, showing the assumptions, all the Cost Elements, and the breakdown of costs over the years. It should be noted that this is a **Program Life Cycle Estimate (PLCCE)**. To obtain the Decision Costs for the LWP, personnel related costs (Cost Category 4.0 and Cost Elements 2.11 and 5.11) must be subtracted in accordance with TRADOC guidance.

3.3.2.2 Comparison of Constant Dollar Decision Costs

Figure 3-9 presents a comparison of the Decision Costs of these alternatives in thousands of FY 1996 constant dollars. In order to simplify this presentation, only the most significant Cost Elements are listed in this figure. Listings of all the Cost Elements for each Decision Cost Element, as well as breakouts over the program years, are included in Appendices E and F. In developing the Decision Costs, the analyst carried calculations to eight significant figures for accuracy. In accordance with TRADOC guidance, however, the costs in this figure have been rounded to four significant figures. Because of this rounding, the numbers may not add to the totals shown.

	BASE CASE: SHIPPING WATER TO OPERATING AREA	600 GPH ROWPU FOR SOF: REBUY	600 GPH ROWPU FOR SOF: REBUILD	LWP
APPENDIX	N/A	E	N/A	F
1.0 RDT&E	0.0	0.0	0.0	2,433.0
1.01 Development Engineering	0.0	0.0	0.0	1,101.0
1.04 Prototype Manufacture	0.0	0.0	0.0	272.5
2.0 PRO- CUREMENT	0.0	6,418.0	0.0	2,823.0
2.021 Manufacturing	0.0	5,472.0	0.0	1,849.0
3.0 MIL CONSTRUCTION	0.0	0.0	0.0	0.0
4.0 MIL PERSONNEL	0.0	0.0	0.0	0.0
5.0 O&M (20 yrs)	112,400.0	5,362.0	8,193.0	4,338.0
5.03 Depot Level Reparables	87,740.0	2,311.0	2,311.0	973.3
5.04 Consumables	19,390.0	2,631.0	2,631.0	2,372.0
5.05 POL	5,283.0	320.0	320.0	357.1
5.06 Depot Overhaul	0.0	0.0	2,736.0	535.3
5.07 Transportation to and from Depot	0.0	0.0	95.1	0.0
TOTALS	112,400.0	11,780.0	8,193.0	9,594.0

Figure 3-9 Dollar Decision Costs in Thousands of FY 1996 CONSTANT Dollars

(Because all Cost Elements are not included, the figures will not add to the totals shown.)

3.3.2.3 Analysis of Constant Dollar Decision Costs

From Figure 3-9 it is clear that the Base Case -- purifying the water in a secure base area and shipping it by helicopter to the SOF operating areas -- is the most expensive of the four alternatives. Its total Decision Cost, about \$112.4 million, is over \$100 million higher than any other alternative. Even though this alternative requires no RDT&E or Procurement, the costs of shipping the water for 20 years by aircraft (assumed to be the UH-60A for cost purposes) are very high indeed.

The least expensive alternative is the 600 GPH ROWPU, provided that the equipment can be obtained from stocks and rebuilt or overhauled. As Section 3.3.2.1.3 indicates, the Marine Corps (skid mounted) version was used, since it appears to be less unsuitable for use by light forces than the heavier Army (trailer mounted) version. The RDT&E and Procurement Costs for this alternative are Sunk Costs and hence are excluded from the Decision Cost Estimate. However, the cost estimate assumes that rather extensive rebuild or overhaul would be required. Even with these overhaul costs, the total Decision Cost is less than \$8.2 million.

A rebuy of the Marine Corps 600 GPH ROWPU would increase the Total Decision Costs about \$3.5 million over the rebuild alternative. The total Decision Cost of this alternative, about \$11.8 million, makes it more expensive than any of the other alternatives except for shipping the water to the operating area by aircraft.

The costs of the Lightweight Water Purifier (LWP) are between those for the 600 GPH rebuy and the rebuild alternatives. Even though it includes both RDT&E and Procurement, its total Decision Costs are only about \$1.4 million more than those for the rebuild alternative and are about \$2.2 million less than the rebuy of the 600 GPH ROWPU. The LWP is, of course, a smaller system than the 600 GPH ROWPU, and its procurement and operating costs are estimated to be much lower. These much smaller procurement and O&M costs offset the RDT&E costs required for the LWP but not for the other systems.

3.3.2.4 Current Dollar Decision Costs

Figure 3-10 presents a comparison of the Decision Costs of the three alternatives in thousands of CURRENT dollars. Because of inflation, the figures are naturally all considerably higher than those in constant dollars.

As both the figure and the discussion in Section 3.3.2.3 indicate, the costs for the different alternatives are distributed differently among the cost categories. Only the LWP incurs RDT&E Costs, and the Base Case and the Rebuild Alternative for the 600 GPH ROWPU have no Production Costs. These differences in distribution do not affect the total Decision Costs in Constant Dollars. In Current Dollar Costs, however, the effects of inflation on these different distributions make a substantial difference. RDT&E expenditures occur in the early years of the program and hence are not affected a great deal by inflation. The O&M Costs,

	BASE CASE: SHIPPING WATER TO OPERATING AREA	600 GPH ROWPU FOR SOF: REBUY	600 GPH ROWPU FOR SOF: REBUILD	LWP
APPENDIX	N/A	E	N/A	F
1.0 RDT&E	0.0	0.0	0.0	2,509.0
1.01 Development Engineering	0.0	0.0	0.0	1,134.0
1.04 Prototype Manufacture	0.0	0.0	0.0	277.6
2.0 PRO- CUREMENT	0.0	7,527.0	0.0	3,313.0
2.021 Manufacturing	0.0	6,428.0	0.0	2,172.0
3.0 MIL CONSTRUCTION	0.0	0.0	0.0	0.0
4.0 MIL PERSONNEL	0.0	0.0	0.0	0.0
5.0 O&M (20 yrs)	184,500.0	8,800.0	11,900.0	7,119.0
5.03 Depot Level Reparables	144,000.0	3,793.0	3,793.0	1,597.0
5.04 Consumables	31,820.0	4,318.0	4,318.0	3,893.0
5.05 POL	8,670.0	525.2	525.0	586.1
5.06 Depot Overhaul	0.0	0.0	2,990.0	878.6
5.07 Transportation to and from Depot	0.0	0.0	105.5	0.0
TOTALS	184,500.0	16,330.0	11,900.0	12,940.0

Figure 3-10 Dollar Decision Costs

(In Thousands of CURRENT Dollars)

on the other hand, are spread over the 20-year life of the equipment and thus are greatly affected by inflation. Therefore the alternatives with a large proportion of O&M Costs -- the Base Case, and the 600 GPH ROWPU -- are most heavily affected by inflation. Since the LWP has the lowest proportion of O&M Costs, its costs are much less affected.

The result in this case, as Figure 3-10 indicates, is that the costs in current dollars for the LWP are closer to those for the Rebuild Alternative for the 600 GPH ROWPU. The difference in current dollars is only \$1.04 million -- about 8% of the total. This difference is about the same as the margin of error of the estimates. Consequently it would be accurate to say that these two alternatives cost about the same in current or budget dollars.

For the reasons discussed above, the differences in cost between these two systems and the more expensive alternatives are greater in current dollars than in constant dollars. A rebuy of the Marine Corps 600 GPH ROWPU would increase the Total Decision Costs about \$4.4 million in current dollars over the rebuild alternative. Likewise, the Base Case -- purifying the water in a secure base area and shipping it by helicopter to the SOF operating areas -- is still the most expensive of the four alternatives. Its total Decision Cost, about \$184.5 million in current dollars, is about \$172 million more than the least expensive alternatives.

3.3.3 Non-Dollar Decision Costs

3.3.3.1 Comparison of Non-Decision Costs

Figure 3-11 presents a comparison of the Non-Dollar Decision Costs of the alternatives. Since the Non-Dollar Costs for the Rebuy and the Rebuild Alternatives are the same, they are combined in a single column.

3.3.3.2 Analysis of Non-Decision Costs

As the first row of Figure 3-11 indicates, the estimated deployment weights of the different systems vary considerably. The Base Case, shipping the water to the SOF operating area by aircraft, would require shipping three 250-gallon drums per day. The weight of three drums filled with 240 gallons of water each is about 3.3 Short Tons (ST) for delivery by helicopter. (Three drums on a platform and rigged for air drop weigh about 4 ST.) The Marine Corps version of the 600 GPH ROWPU and its generator weigh just over 5 ST. The LWP is much lighter, with an estimated weight of only about 0.5 ST. In addition, both of these systems would require only **one** deployment to and from the operational area, while shipping the water in by helicopter would require that the three drums of water be shipped in every day throughout the exercise.

	BASE CASE: SHIPPING WATER TO OPERATING AREA	600 GPH ROWPU FOR SOF: REBUY OR REBUILD	LWP
Estimated Deployment Weight (ST)	3 Drums = 3 * 1.1 = 3.3 ST per Day	ROWPU: 3.65 ST + Gen: 1.43 ST = 5.08 ST	Estimated 0.50 ST
Operating Time (800 gallons from Fresh Water)	Flight Time Estimated at 1 Hour Each Way + Production & Rigging Time	About 1 Hour	About 6 Hours (ORD: OMS/MP)
Fuel Consumption for 800 Gal per day	2 * 113.3 = 226.6 gal/day (UH-60 Helicopter)	2.13 gal/day (1 hour)	Est 0.62 gal/hour = 3.72 gal/day
SOF Crew Required	No (But aircraft Crew)	Yes: 2 (MOS 77W)	No (Additional Duty)
Transportable by C-130	Yes	Yes	Yes
Moveable by Hand (2-4 soldiers)	No	No	Yes
Transportable by HMMWV	Yes: 3 (1 Drum Each)	No (Overweight)	Yes: 1
Transportable by Helicopter	Yes UH-60A (External)	Yes UH-60A (External)	Yes UH-60A (Internal)
Helicopter Sorties Required	1 <u>per day</u>	2 (for each insertion and extraction)	1 (for each insertion and extraction)

Figure 3-11 Non-Dollar Decision Costs

Fuel consumption is also quite different for the different systems. To transport 750 gallons per day to the operating area by helicopter would require about 227 gallons of fuel per day, assuming an hour flight each way to the area. The generator for the 600 GPH ROWPU, on the other hand, would require just over 2 gallons for the one hour needed to produce 800 gallons of potable water from a fresh water source. The LWP is, of course, a smaller unit. According to the Operational Mode Summary/Mission Profile (OMS/MP) of the ORD, it is expected to operate for about 6 hours a day using a fresh water source. This is estimated to require about 3.72 gallons of fuel.

Only the 600 GPH ROWPU would require a crew -- the normal crew is two soldiers with MOS 77W. The LWP will be operated by a soldier as an additional duty. Although shipping the water in by aircraft would require no crew, some effort would be required to set up the water distribution point in the operating area.

All of the alternatives are transportable by C-130 aircraft and by UH-60 helicopters. The water drums and the 600 GPH ROWPU and its generator would be transported as external loads. The LWP might be transported as an internal load, an external load, or by a combination of both.

The Draft Operational Requirements Document for the LWP states that it must be capable of being moved by 2 to 4 soldiers. The 600 GPH ROWPU and its generator are too heavy to meet this requirement -- the Marine Corps version of the ROWPU weighs 3.65 ST, and the generator 1.4 ST. Likewise, the filled water drums weigh just over one short ton each. They can be dragged for a short distance by a vehicle, but cannot be moved easily by hand. Thus only the LWP can meet the ORD requirement to be moved by hand by 2-4 soldiers.

Similarly, only the LWP can be transported by the 1¼ Ton HMMWV in one load as the ORD requires. In the Base Case, after the filled water drums have been transported to the operational area by helicopter, moving them would require 3 vehicles, each with one drum of water, or three trips by one vehicle. To move the 600 GPH ROWPU requires a 5-ton or larger cargo truck because of its weight and size.

Shipping the water to the operating area by helicopter would require a great deal of aviation support -- one UH-60 sortie per day for the duration of the operation. The 600 GPH ROWPU and the LWP, on the other hand, would require aviation support only during insertion and extraction. The ROWPU would require two sorties, one for the unit and one for the generator. One sortie will probably be sufficient for the LWP.

As this discussion indicates, these non-dollar costs are not so easy to quantify as dollar costs. Nevertheless, they need to be considered in selecting among the alternative approaches.

3.4 TRADE-OFF ANALYSES

3.4.1 Cost Uncertainties

3.4.1.1 Base Case: Shipping Water to the Operating Area by Helicopter or Fixed Wing Aircraft

All estimates are by their nature uncertain, but the uncertainties in this Cost and Operational Effectiveness Analysis (COEA) are considerably greater in some areas than in others. For the Base Case, estimates of the operating costs of the UH-60 helicopter -- replenishment parts and POL costs per hour -- are based on data published by DA and developed by the US Army Cost and Economic Analysis Center (USA CEAC) from Sample Data Collection (SDC). Consequently these estimates are probably quite accurate. On the other hand, as Section 3.3.2.1.2 made clear, the water required per day, the flight distance, and the number of exercise days per year are all based on assumptions. Varying the assumptions will obviously change the costs of the alternative.

3.4.1.2 600 GPH ROWPU - Rebuy of Marine Corps Version

The Development Costs for the 600 GPH ROWPU are Sunk Costs and hence are not included in the Decision Cost Estimate. The Manufacturing Costs are based on the cost in the June 1995 Army Master Data File (AMDF), converted to FY96 dollars. Actual production costs for the small quantity required might be somewhat higher, but will probably not be greatly different.

The estimates of O&M Costs, on the other hand, have more cost uncertainties. The item manager at Aviation and Troop Command (ATCOM) was not able to furnish data on actual consumption of Depot Level Repairables and Consumables. Consequently, based on experience with similar systems, costs of parts for the ROWPU were estimated at 5% of manufacturing cost per year. Costs for parts for the generator per operating hour, on the other hand, were based on data on a similar generator developed by the US Army Cost and Economic Analysis Center (USA CEAC) from Sample Data Collection (SDC). POL Costs per hour were based on actual data from the same source and are probably accurate. Operating hours per year, however, are only an estimate. Based on the Operational Mode Summary/Mission Profile, the LWP was estimated to operate about 744 hours per year. (See Section 3.4.1.4 for the detailed breakdown.) Since the 600 GPH ROWPU can produce the same amount of water as the LWP in about one-fourth the time, the 600 GPH was estimated to operate about 200 hours per year, including both field exercises and local training. Actual operating hours, however, might be either higher or lower than this estimate.

3.4.1.3 600 GPH ROWPU - Rebuilding Existing Units

The Decision Cost Estimates for the alternative of rebuilding existing 600 GPH ROWPUs are the same as for the rebuy, except that Procurement Costs are

deleted and the costs of rebuilding or overhauling the units is added. Consequently this alternative has the same cost uncertainties as the Rebuy Alternative for Depot Level Repairables, Consumables, and POL Costs. Rebuild Costs were estimated at 50% of the cost of the ROWPU and generator. Actual rebuild costs may well be different.

3.4.1.4 Lightweight Water Purifier (LWP)

The equipment for the other alternatives, the 600 GPH ROWPU and the UH-60 helicopter, have been in the field for several years. Hence actual data or reliable estimates are available for their Procurement and O&M Costs. The Lightweight Water Purifier (LWP), on the other hand, is at an early stage in the acquisition process. Hence there are probably more uncertainties involved in these cost estimates than in those for the other alternatives.

Estimates of Development Engineering Costs are based on those for similar systems -- the 1500 GPH ROWPU and the 3000 GPH ROWPU -- scaled down for a smaller piece of equipment with less development required. If an off-the-shelf model proves to be suitable for the LWP and a pure NDI acquisition strategy can be used, these estimates may be too high. On the other hand, if components from various manufacturers are acquired and assembled into the LWP, much more time and Development Engineering might be required.

For Manufacturing Costs, the average of the costs of the commercial models recommended at the 23 May 1994 Joint Working Group Meeting was used. Obviously Manufacturing Cost for any specific model will vary from this average.

Based on experience with similar systems, it was estimated that the replenishment spares and repair parts cost for the LWP will be 5% of the Manufacturing Cost each year, divided equally between the two Cost Elements. This estimate depends on estimates of Manufacturing Cost and may be either too high or too low. It is, however, the same assumption as was made for the 600 GPH ROWPU. Although the LWP may use host nation power or power from a common power plant, for costing purposes it is assumed to use a separate generator comparable to a PU-625 power unit (2 * 3 kw). Estimates of costs for parts and POL for this unit are based on data published by DA and developed by the US Army Cost and Economic Analysis Center (USA CEAC) from Sample Data Collection (SDC). Based on the Operational Mode Summary/Mission Profile (Annex B to the ORD), the LWP was estimated to operate an average of 744 hours per year (120 days per year, 5% at 10 hours per day and 95% at 6 hours per day). This includes all local training as well as more extensive field training. Actual operating hours may be higher or lower than this estimate.

3.4.2 Sensitivity Analyses

3.4.2.1 General

In the sensitivity analyses the values of the input parameters in each area of uncertainty identified above were varied one at a time. The purpose of these analyses was to determine whether the outputs are sensitive to the input changes, to bound the estimates, and to highlight the cost drivers. This section reports the results of these analyses.

3.4.2.2 Base Case: Shipping Water in by Helicopter or Fixed Wing Aircraft

As Section 3.4.1.1 indicated, operating costs per hour for the helicopter are based on actual data and hence are probably accurate. Consequently the Sensitivity Analysis concentrates on varying the assumptions.

If the number of personnel supported were decreased from 125 to 60, the amount of water required would decrease to 360 gallons per day. This could be supplied by one helicopter mission every other day instead of every day. In this case the total of depot level reparable and consumables would decrease to \$53,570K, POL to \$2,642K and total O&M Costs to \$56,200K. If the number of soldiers supported remained 100 but exercises were reduced to one 15-day exercise, the results would be exactly the same. Again the total of depot level reparable and consumables would decrease to \$53,570K, POL to \$2,642K and total O&M Costs to \$56,200K. Combining reduced numbers supported with only one 15-day exercise per year would reduce total O&M Costs to \$28,100K.

On the other hand, the one-hour average flight assumed from the airfield to the water point to the operating area seems quite short. If the average flight increased to 1½ hours, total flying time for these missions would increase to 90 hours per year. This would increase the total of depot level reparable and consumables to \$160,700K, POL to \$7,925K and total O&M Costs to \$168,600K. The magnitude of these changes indicates how sensitive these estimates are to changes in the assumed average flying time.

3.4.2.3 600 GPH ROWPU - Rebuy of Marine Corps Version

As the discussion in Section 3.4.1.2 indicated, the Manufacturing Costs are based on the cost in the June 1995 Army Master Data File (AMDF) converted to FY96 dollars. Since only 50 of the units are being procured, the actual costs could be higher than these estimates. If the actual manufacturing costs for both the ROWPU and the generator are 10% higher than those estimated, Cost Element 2.021 Manufacturing would increase to \$6,019K and Total Procurement Costs to about \$6,971K. These increases are within the margin of error of the cost estimates.

Costs of depot level reparable, consumables, and POL are a function of annual operating hours. In supporting SOF and medical units, the 600 GPH ROWPU was estimated in this COEA to operate 200 hours per year, including all local training as well as more extensive field exercises. This estimate was based on the Operational Mode Summary/ Mission Profile for the LWP, but it might turn out to be either too low or too high. If the unit and its generator operated only 100 hours per year, the total of depot level reparable and consumables would decrease to \$2,471K, POL to \$160K and total O&M Costs to \$2,731K. On the other hand, the annual operating hours could well increase over the 200 hours estimated -- the original BCE for the 600 GPH ROWPU estimated that it would operate an average of 1000 hours per year, and it is designed to operate 20 hours a day for considerable periods. Since SOF usually operate in fairly small detachments, the water requirements at one location are probably not large enough to require such high production. If the 600 GPH ROWPU operated 400 hours per year, however, the total for depot level reparable and consumables would increase to \$9,885K, POL to \$640K, and total O&M Costs to \$10,620K.

3.4.2.4 600 GPH ROWPU - Rebuild Existing Units

For this alternative the existing 600 GPH ROWPUs were assumed to require a rebuild or major overhaul before being issued to SOF units. Costs for this rebuild or overhaul were estimated to be 50% of the cost of the generator and ROWPU or $0.5 * (\$92.445K + 16.995K) = \$54.72K$ each (FY96\$). If the cost of the overhaul could be reduced to one-third of the manufacturing cost, the cost for overhauling each unit would decrease to $\$109.440K/3 = \$36.48K$. The total for overhauling all 50 units (Cost Element 5.06) would then be only \$1824.0K and Total O&M Costs \$7,281K.

Aside from the costs for the overhaul, the operating costs for the rebuilt 600 GPH ROWPU are, of course, the same as for the rebuy. Consequently changing the assumed operating hours from 200 per year to 100 and to 400 would have the same effect. In the first case, the total of depot level reparable and consumables would decrease to \$2,471K, POL to \$160K and total O&M Costs (including the rebuild or overhaul) to \$5,562K. If the reduced operating hours were combined with the lower overhaul costs, Total O&M Costs would be reduced to \$4,650K. In the second case, increasing the annual operating hours to 400 would increase the total parts cost to \$9,885, POL to \$640K, and total O&M Costs to \$13,450K.

3.4.2.5 Lightweight Water Purifier (LWP)

As Section 3.4.1.4 indicates, estimates of Development Engineering Costs for the LWP are based on those for similar systems -- the earlier 1500 GPH ROWPU and the 3000 GPH ROWPU -- scaled down for a smaller piece of equipment with less development required. The result in the Program Life Cycle Cost Estimate (PLCCE) is a Development Engineering program of 3 contract manyears and 8 government manyears spread over five years. This is a relatively lean program and assumes that a suitable off-the-shelf model requiring only minor modifications can be found. If the program becomes a pure NDI approach, the effort required for Development Engineering might be reduced by as much as 25%. This would

reduce Development Engineering to \$826.0K and Total RDT&E to \$2,158K. On the other hand, if no commercially available unit proves suitable, the modified NDI approach would change to assembling a system using NDI components from various manufacturers, as is being done for the 1500 GPH ROWPU. Such a program would require considerably more Development Engineering. Costs for this Cost Element could easily be about the same as those estimated for the current 1500 GPH ROWPU program, \$5,945K (PLCCE for 1500 GPH ROWPU). This would increase total RDT&E Costs to \$7,267K. The LWP program may well be too small to support RDT&E Costs of this magnitude.

For an estimate of Manufacturing Costs the PLCCE used the average of the costs of the commercial models recommended at the 25 May 1994 Joint Working Group Meeting and added 20% for a generator and minor modifications. The costs for the water purification units ranged from \$17K to \$45K (in FY95 dollars). If the least expensive model were selected, Manufacturing Cost would decrease to \$1,051K, and Total Procurement Costs would be about \$2,025K. Selecting the most expensive alternative, on the other hand, would increase Manufacturing Costs to \$2,781K and Procurement Costs to \$3,755K.

Based on the Operational Mode Summary/Mission Profile, the LWP was estimated to operate about 744 hours per year. (See Section 3.4.1.4 for the detailed breakdown.) If this were reduced by 50%, as was done for the other alternatives in Sections 3.4.2.3 and 3.4.2.4, the total of depot level reparables and consumables for the LWP would be reduced to \$1,673K, POL to \$179K and total O&M Costs to \$2,487K. On the other hand, if the annual operating hours were doubled to 1488 hours, total parts cost would increase to \$6,690K, POL to \$714K and total O&M Costs to \$8,040K. This would represent a high usage rate for a device like the LWP -- an average of 28.6 hours per week.

3.4.2.6 Summary of Sensitivity Analysis

Figure 3-12 presents a summary of the results of the sensitivity analysis.

APPROACH	COST ELEMENT NUMBER AND TITLE	PARAMETER CHANGED	COST ELEMENT LOW/HIGH	TOTAL COST CATEGORY LOW/HIGH	COMMENTS
Shipping Water to Operating Area	5.03 Replen: Depot Level Repairables 5.04 Replen: Consumables 5.05 POL	Soldiers supported decreased from 125 to 60 people.	Parts:53,565 POL:2,642 Parts:107,100 POL:5,280	56,210 112,400	
Shipping Water to Operating Area	5.03 Replen: Depot Level Repairables 5.04 Replen: Consumables 5.05 POL	Exercises reduced to 15 days per year.	Parts:53,565 POL:2,642 Parts:107,100 POL:5,280	56,210 112,400	Combining reduced numbers with fewer exercises would reduce total O&M to 28,100.
Shipping Water to Operating Area	5.03 Replen: Depot Level Repairables 5.04 Replen: Consumables 5.05 POL	Average flight time increased to 1½ hours each way	Parts:107,100 POL:5,283 Parts:160,700 POL:7,925	112,400 168,600	
600 GPH ROWPU: Rebuy	2.021 Manufacturing Cost	Manufacturing Cost increases by 10% (Both ROWPU and Generator)	5,472 6,019	6,418 6,971	

Figure 3-12 (Continued through page 3-29) Summary of Results of Sensitivity Analyses

(Costs in Thousands of FY 96 Dollars)

APPROACH	COST ELEMENT NUMBER AND TITLE	PARAMETER CHANGED	COST ELEMENT LOW/HIGH	TOTAL COST CATEGORY LOW/HIGH	COMMENTS
600 GPH ROWPU: Rebuy	5.03 Replen: Depot Level Repairables 5.04 Replen: Consumables 5.05 POL	Annual operating hours: Low: 100 High: 400	Parts:2,471 POL: 160 Parts:9,885 POL:640	2,731 10,620	
600 GPH ROWPU: Rebuild	5.06 Depot Overhaul	Overhaul/Rebuild Cost one-third of manufacturing cost instead of one-half.	1,824 2,736	7,281 8,193	
600 GPH ROWPU: Rebuild	5.03 Replen: Depot Level Repairables 5.04 Replen: Consumables 5.05 POL	Annual operating hours: Low: 100 High: 400	Parts:2,471 POL: 160 Parts:9,885 POL:640	5,562 13,460	Combining the lower operating hours with the lower overhaul costs would reduce Total O&M Costs to 4,650.
LWP	1.01 Development Engineering	Pure NDI: Manhours decreased by 25%	826.0 1101.0	2,158 2,433	

Figure 3-12 (Continued through page 3-29) Summary of Results of Sensitivity Analyses

(Costs in Thousands of FY 96 Dollars)

APPROACH	COST ELEMENT NUMBER AND TITLE	PARAMETER CHANGED	COST ELEMENT LOW/HIGH	TOTAL COST CATEGORY LOW/HIGH	COMMENTS
LWP	1.01 Development Engineering	NDI Components Only: 1.01 changed to that for 1500 GPH ROWPU.	998 5,945	2,320 7,267	
LWP	2.021 Manufacturing Cost	Manufacturing Cost Low: \$17K Each High: \$45K Each (FY95\$)	1,051 2,781	2,025 3,755	
LWP	5.03 Replen: Depot Level Repairables 5.04 Replen: Consumables 5.05 POL Cost	Annual operating hours: Low: 372 High: 1488	Parts: 1,673 POL: 179 Parts: 6,690 POL: 714	2,487 8,040	

Figure 3-12 (Concluded) Summary of Results of Sensitivity Analysis

(Costs in Thousands of FY 1996 Dollars)

3.4.3 Uncertainty Analysis

3.4.3.1 General

In the Sensitivity Analyses in Section 3.4.2 the values of input parameters in the various areas of uncertainty were varied one at a time and the resulting changes calculated and analyzed. In the Uncertainty Analysis, on the other hand, the values of an entire set of parameters were changed at one time. This section reports the results of this analysis.

3.4.3.2 High Estimates

Figure 3-13 presents the Decision Costs of the alternatives using the HIGHEST estimates from the Sensitivity Analyses above for each cost element. Section 3.4.1.1 indicated that there are significant cost uncertainties for the Base Case, shipping water to the operating area by helicopter. The cost estimates for this alternative are based on assumptions regarding the water required per day, the number of exercise days per year, and the average flight time to the operating area. Varying these assumptions produces large changes in the estimated costs. Merely increasing the average flight time from 1 hour each way to 1½ hours increased the Total Decision Cost by about \$56 million -- a larger increase from the basic estimates than for any of the other alternatives. This is still the most expensive alternative, and by a larger margin than in the basic analysis.

Since the LWP is a new program, it has greater uncertainties than the two approaches using the 600 GPH ROWPU. It is not surprising, therefore, that its costs increased more. Using the high estimates, the LWP is more expensive than either of the 600 GPH ROWPU alternatives.

3.4.3.3 Low Estimates

Figure 3-14 presents the Decision Costs of the approaches using the LOWEST estimates from the Sensitivity Analyses above for each cost element. The order among the alternatives ranked by cost is the same as for the basic estimates, although the differences between alternatives are, of course, smaller. The Base Case, shipping water to the operating area by helicopter, is again the most expensive alternative. However, combining a reduction in the number of soldiers to be supported with a reduction in the number of exercises per year produces a very large reduction in costs. Rebuilding the 600 GPH ROWPUs is still the least expensive alternative. The LWP costs about \$2.0 more than the rebuild alternative but \$2.75 million less than a rebuy of the 600 GPH ROWPU.

	BASE CASE: SHIPPING WATER TO OPERATING AREA	600 GPH ROWPU FOR SOF: REBUY	600 GPH ROWPU FOR SOF: REBUILD	LWP
APPENDIX	N/A	E	N/A	F
1.0 RDT&E	0.0	0.0	0.0	7,267.0
1.01 Development Engineering	0.0	0.0	0.0	5,945.0
1.04 Prototype Manufacture	0.0	0.0	0.0	204.0
2.0 PRO- CUREMENT	0.0	6,971.0	0.0	3,755.0
2.021 Manufacturing	0.0	6,019.0	0.0	2,781.0
3.0 MIL CONSTRUCTION	0.0	0.0	0.0	0.0
4.0 MIL PERSONNEL	0.0	0.0	0.0	0.0
5.0 O&M (20 yrs)	168,600.0	10,620.0	13,450.0	8,040.0
5.03 Depot Level Reparables plus 5.04 Consumables	160,700.0	9,885.0	9,885.0	6,690.0
5.05 POL	7,925.0	640.0	640.0	714.0
5.06 Depot Overhaul	0.0	0.0	2,736.0	0.0
5.07 Transportation to and from Depot	0.0	0.0	95.1	0.0
TOTALS	168,600.0	17,590.0	13,450.0	19,060.0

Figure 3-13 Dollar Decision Costs - HIGH Estimates

(In Thousands of FY 1996 CONSTANT Dollars)

	BASE CASE: SHIPPING WATER TO OPERATING AREA	600 GPH ROWPU FOR SOF: REBUY	600 GPH ROWPU FOR SOF: REBUILD	LWP
APPENDIX	N/A	E	N/A	F
1.0 RDT&E	0.0	0.0	0.0	2,158.0
1.01 Development Engineering	0.0	0.0	0.0	826.0
1.04 Prototype Manufacture	0.0	0.0	0.0	204.0
2.0 PRO- CUREMENT	0.0	6,418.0	0.0	2,025.0
2.021 Manufacturing	0.0	5,472.0	0.0	1,051.0
3.0 MIL CONSTRUCTION	0.0	0.0	0.0	0.0
4.0 MIL PERSONNEL	0.0	0.0	0.0	0.0
5.0 O&M (20 yrs)	28,100.0	2,731.0	4,650.0	2,487.0
5.03 Depot Level Reparables plus 5.04 Consumables	26,780.0	2,471.0	2,471.0	1,673.0
5.05 POL	1,321.0	160.0	160.0	179.0
5.06 Depot Overhaul	0.0	0.0	1,824.0	0.0
5.07 Transportation to and from Depot	0.0	0.0	95.1	0.0
TOTALS	28,100.0	9,419.0	4,650.0	6,670.0

Figure 3-14 Dollar Decision Costs - LOW Estimates

(In Thousands of FY 1996 CONSTANT Dollars)

3.4.3.4 High-Low Comparisons

Figure 3-15 presents in graphical form the results of the Uncertainty Analysis of the four alternatives. The vertical lines show the range between the high and low estimates for each alternative. The horizontal tick marks indicate the Basic Decision Cost Estimates for each system.

The Base Case, shipping water to the operating area by helicopter, is the most expensive alternative under all assumptions. Even the lowest estimate is higher than the highest estimate for any of the other alternatives. The alternative of rebuilding 600 GPH ROWPUs for SOF is generally the least expensive, but the lowest estimates for the LWP are cheaper than some of the estimates for the rebuild alternative. In fact, as the figure makes clear, there is a great deal of overlap among the estimates for the LWP and the two 600 GPH ROWPU alternatives -- the lowest estimate for any one of the three is less expensive than the high estimate for any of the others. Thus any one of these three approaches could turn out to be the least expensive in practice.

3.4.3.5 Conclusions of the Uncertainty Analysis

Although the Uncertainty Analysis produces quite large changes in the dollar decision costs, there are no changes in the ordinal comparison among the three approaches. The Base Case, shipping water to the operating area by helicopter, is always the most expensive approach, and Rebuilding the 600 GPH ROWPU is the cheapest, followed closely by the LWP.

Even though it does not produce changes in the ranking of the approaches, the Uncertainty Analysis does underline the importance of considering a range of costs rather than a single estimate for each cost element. The Uncertainty Analysis also provides envelopes within which there is a very high probability that the actual system costs will fall. In addition, Figure 3-15 clearly indicates the overlap in the cost estimates for three of the alternatives.

High and Low Decision Cost Estimates

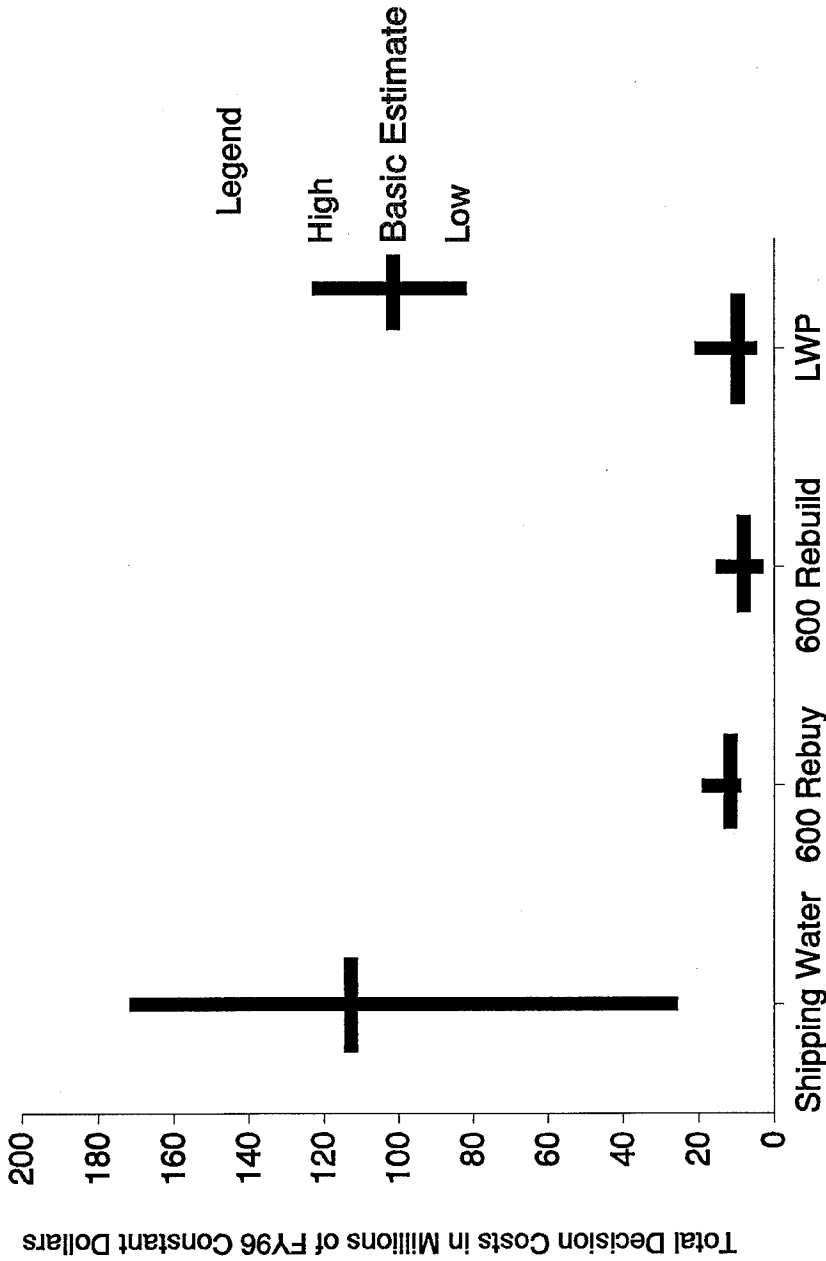


Figure 3-15 High and Low Decision Cost Estimates

3.5 DECISION CRITERIA

3.5.1 General

This section integrates the Operational Effectiveness Analysis from Section 3.2, the Cost Analysis from Section 3.3, and the Trade-Off Analysis from Section 3.4. Suggested criteria for selecting among the four alternatives are discussed.

3.5.2 Operational Effectiveness vs. Cost Comparison

The primary function of a Lightweight Water Purifier (LWP) is to provide water support to special forces detachments and selected medical units during contingency operations and during operations other than war. Conduct of operations at remote sites and often in hostile/non-permissive environments are the key elements of the concept. Water production, ease of operations, mobility, transportability, and performance are major considerations. Figure 3-16 below compares selected values for some of the chief Measures of Effectiveness (MOE).

CRITERIA	BASE CASE SHIP BY AIR	600 GPH ROWPU REBUY	600 GPH ROWPU REBUILD	LWP
OVERALL	.287	.171	.171	<u>.371</u>
PERFORMANCE	.264	.182	.182	<u>.373</u>
LOG/READI	.331	.124	.124	<u>.422</u>
CRIT SYST CHARACT'CS	<u>.417</u>	.178	.178	.226
MOBILITY	.150	.153	.153	<u>.545</u>
WATER OPNS	.155	<u>.299</u>	<u>.299</u>	.247
TIME/EFFORT	.322	.112	.112	<u>.454</u>
DURABILITY	<u>.625</u>	.125	.125	.125
TRANSPORT	.215	.118	.118	<u>.549</u>
TOTAL DCE (CONSTANT \$)	\$112.40 Million	\$11.78 Million	\$8.19 <u>Million</u>	\$9.59 Million
TOTAL DCE (CURRENT \$)	\$184.50 Million	\$16.33 Million	\$11.90 <u>Million</u>	\$12.94 Million

Figure 3-16 Measures of Effectiveness Comparison Matrix

3.5.3 Decision Criteria

- **Cost:** If cost were the only criterion, the decision would be simple -- a Rebuild of the existing 600 GPH ROWPU is clearly the cheapest of the four approaches in terms of Constant FY96 dollars. The rebuild option is \$ 1.4 million less than the LWP and \$ 3.6 million lower than a rebuy of the 600 GPH. Of particular interest is that the Base Case of Shipping Water by Air is, by an order of magnitude, the most expensive option. When viewed from the perspective of the base case, all the other alternatives are essentially equivalent in terms of cost.
- **Operational Effectiveness:** However, if operational effectiveness in terms of overall capability were the only gauge, the LWP is clearly superior to the other alternatives.
- **Cost and Operational Effectiveness:** In most real-world decisions, both cost and operational effectiveness must be considered. Figure 3-17 provides a graphic comparison of decision cost and operational performance. This diagram sharply reveals the cost-effective advantages of the Lightweight Water Purifier (LWP). The LWP offers the opportunity to significantly improve on the Base Case at a cost nearly equal to the least expensive alternative.

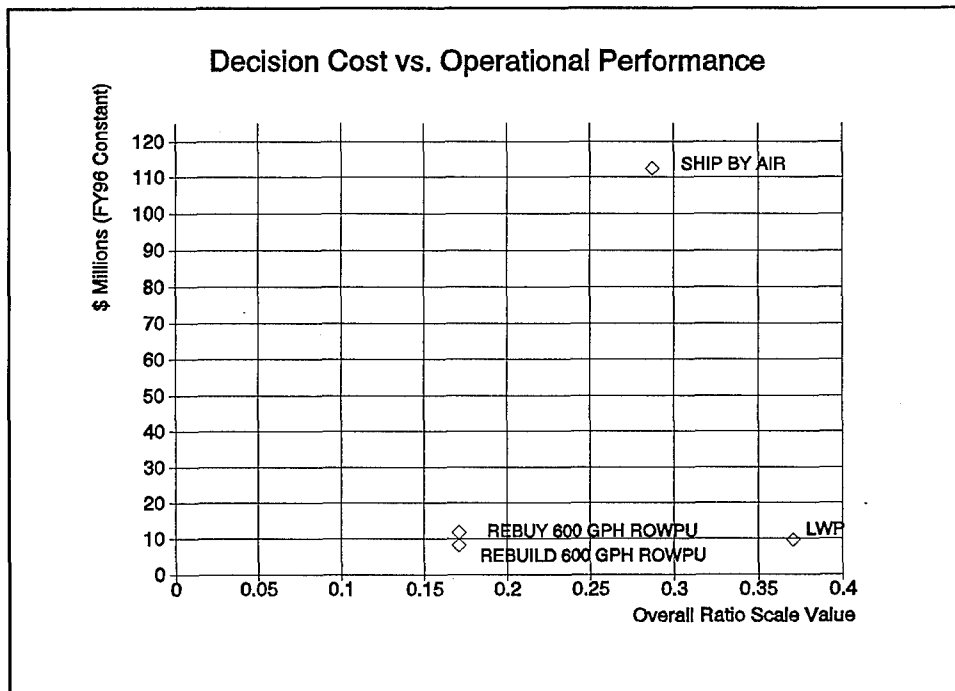


Figure 3-17 Cost and Operational Effectiveness Comparison

SECTION 4

SUMMARY OF RESULTS

4.1 THE ACQUISITION ISSUE

The U.S. Army has a need to provide a safe, potable water supply for small units and detachments, to include Special Operations Forces (SOF), engaged in early entry, long range surveillance, and contingency missions. Missions during Operations other than War (OOTW) may also include nation building, civil affairs assistance, and disaster relief. These units may operate independently for extended periods or at remote sites and at distances inconsistent with the established water distribution network. The need has been documented in the Mission Need Statement (MNS) for the Lightweight Water Purifier (LWP) approved by Headquarters, Department of the Army (HQDA) on 6 October 1993 (Appendix A) and in the draft Operational Requirements Document (ORD) for the Lightweight Water Purifier (LWP) (Appendix B).

The Lightweight Water Purifier (LWP) responding to this requirement shall be capable of producing potable water from fresh, brackish, and sea water sources or water sources tainted with nuclear, biological, or chemical contaminants. Water produced by the LWP must meet the US Army field water quality standards contained in Technical Bulletin, Medical (TB MED 577). The LWP shall be suitable for use by organic unit personnel in selected units with minimal training.

4.2 ALTERNATIVES

4.2.1 Listing

As required by the Task Order Statement of Work, this Cost and Operational Effectiveness Analysis (COEA) investigated alternative approaches to meeting the requirement. The alternatives investigated were:

- ▶ Base Case, Haul Water by Aircraft
- ▶ Rebuy - Water Purification Unit, Reverse Osmosis, 600 GPH w/o Trailer, Flatbed Cargo, 5 Ton, 4 Wheel Tandem (REBUY 600 GPH)
- ▶ Rebuild - Water Purification Unit, Reverse Osmosis, 600 GPH w/o Trailer, Flatbed Cargo, 5 Ton, 4 Wheel Tandem (REBUILD 600 GPH)
- ▶ Lightweight Water Purifier (LWP)

4.2.2 Principal Characteristics

Figure 4-1 lists some of the principal operational characteristics of the alternatives. Production quantities (*) shown are based on part time operations of a maximum of four (4) hours per day.

	BASE CASE HAUL BY AIR	REBUY 600 GPH	REBUILD 600 GPH	LWP
Quality	TB Med 577	TB Med 577	TB Med 577	EPA Stds
Fresh Qty*	720 gpd	3840 gpd	3840 gpd	800 gpd
Brackish Qty*	720 gpd	3840 gpd	3840 gpd	800 gpd
Sea Water Quantity*	720 gpd	2400 gpd	2400 gpd	500 gpd
Design TDS	35K mg/l	35K mg/l	35K mg/l	45K mg/l
Dimensions (inches)	120x108x80 (rigged)	113x83x68	113x83x68	84x36x60 est maximum
Basic Weight Generator Total	6450 lbs N/A 8000 lbs	7300 lbs 2850 lbs 10150 lbs	7300 lbs 2850 lbs 10150 lbs	est 541 lbs 370 lbs <911 lbs
Crew	2 (riggers)	2 (MOS 77W)	2 (MOS 77W)	1 (Non-Specific)
Temp Range	+32 to +110 ° Fahrenheit	+32 to +90 ° Fahrenheit	+32 to +90 ° Fahrenheit	-25 to +120 ° Fahrenheit
Set-Up	2 soldiers- 30 to 45 min	2 soldiers- 4 hours	2 soldiers- 4 hours	1 soldier- 45 min
Slingloads	1 UH-60 min	2 UH-60 min	2 UH-60 min	1 UH-60 min
per C-130	4 platforms	4 skid mtd	4 skid mtd	4 HMMWV mtd/ 10-13 skid mtd
per C-141	8 platforms	6 skid mtd	6 skid mtd	8 HMMWV mtd/ 30-36 skid mtd

Figure 4-1 Comparison of Selected Performance Elements for Alternatives

4.3 ANALYSIS OF ALTERNATIVES

4.3.1 Comparison of Alternatives

Figure 4-2 compares the Ratio Scale values for the Overall Capability, principal operational criteria, several of the subordinate performance criteria, and the Total Decision Costs in both Constant FY96 and Current Year dollars.

CRITERIA	BASE CASE SHIP BY AIR	600 GPH ROWPU REBUY	600 GPH ROWPU REBUILD	LWP
OVERALL	.287	.171	.171	<u>.371</u>
PERFORMANCE	.264	.182	.182	<u>.373</u>
LOG/READI	.331	.124	.124	<u>.422</u>
CRIT SYST CHARACT'CS	<u>.417</u>	.178	.178	.226
MOBILITY	.150	.153	.153	<u>.545</u>
WATER OPNS	.155	<u>.299</u>	<u>.299</u>	.247
TIME/EFFORT	.322	.112	.112	<u>.454</u>
DURABILITY	<u>.625</u>	.125	.125	.125
TRANSPORT	.215	.118	.118	<u>.549</u>
TOTAL DCE (CONSTANT \$)	\$112.40 Million	\$11.78 Million	\$8.19 <u>Million</u>	\$9.59 Million
TOTAL DCE (CURRENT \$)	\$184.50 Million	\$16.33 Million	\$11.90 <u>Million</u>	\$12.94 Million

Figure 4-2 Comparison of Decision Costs and Operational Effectiveness

4.3.2 Decision Criteria

- Cost: If cost were the only criterion, the decision would be simple -- a Rebuild of the existing 600 GPH ROWPU is clearly the cheapest of the four approaches in terms of both Constant FY96 and Current Year dollars. Of particular interest is that the Base Case of Shipping Water by Air is, by an order of magnitude, the most expensive option. When compared to the base case, the other alternatives are about equal in cost.

- Operational Effectiveness: However, if operational effectiveness in terms of overall capability were the only gauge, the LWP is clearly superior to the other alternatives.
- Cost and Operational Effectiveness: From a "best value" perspective, both cost and operational effectiveness must be considered. Figure 4-3 provides a graphic comparison of decision cost and operational performance. This diagram sharply reveals the cost-effective advantages of the Lightweight Water Purifier (LWP). The LWP offers the opportunity to significantly improve on the Base Case at a decision cost only slightly higher than the cheapest option.

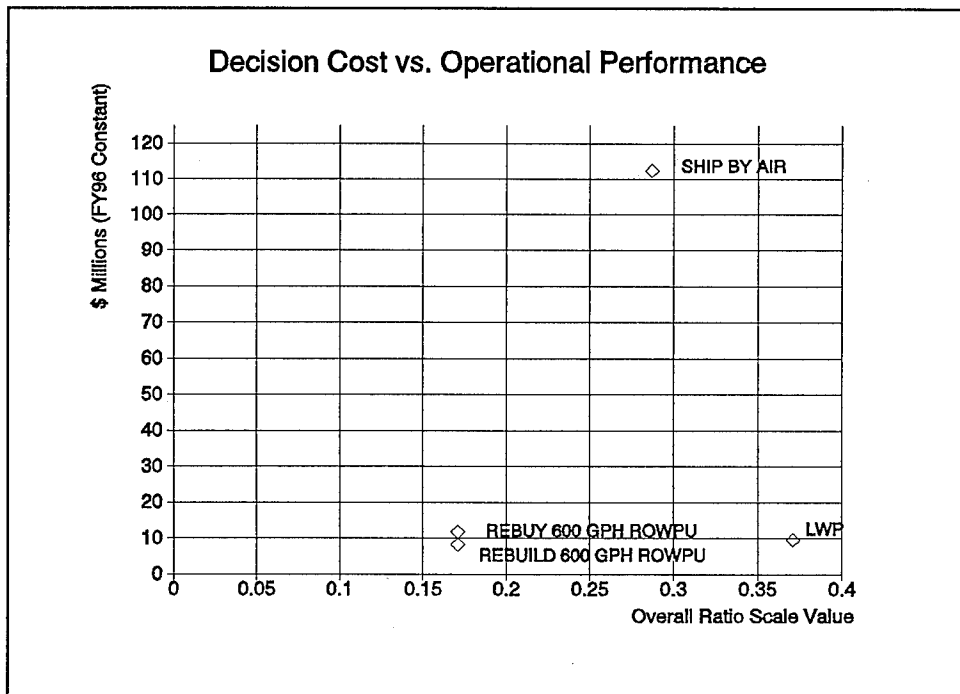


Figure 4-3 Cost and Operational Effectiveness Comparison

4.4 RECOMMENDATION

Based on the criteria and analysis presented herein, the Lightweight Water Purifier (LWP) described in Section 2 is the recommended alternative to satisfy the requirement defined in the Mission Needs Statement and the current Operational Requirement Document. Costs for the LWP are substantially lower than the current base case and roughly equivalent to the other options. However, for essentially the same decision cost, the LWP offers a marked improvement in performance.

APPENDIX A

**MISSION NEED STATEMENT
(MNS) FOR
LIGHTWEIGHT WATER PURIFIER
(LWP)**

**APPROVED
6 OCTOBER 1993**



DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS
400 ARMY PENTAGON
WASHINGTON, DC 20310-0400



REPLY TO
ATTENTION OF

DAMO-FDR

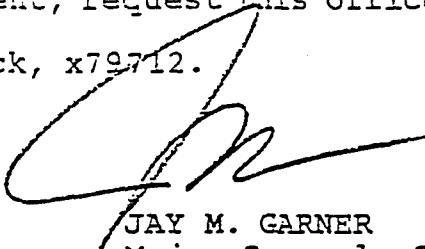
16 OCT 1993

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (RESEARCH,
DEVELOPMENT, AND ACQUISITION), ATTN: SARD-RP

SUBJECT: Mission Need Statement (MNS) for the Lightweight Water
Purifier (LWP)

1. Enclosed Mission Need Statement (MNS) for the Lightweight Water Purifier (LWP) has been reviewed by the Army staff and is approved.
2. The Marine Corps has recommended the Joint Potential Designator to be "Joint Interest".
3. The CARDS reference number is 22-93.
4. Request a Milestone Decision Authority (MDA) be assigned to accomplish the Milestone 0 (MS 0) actions as defined in the DOD 5000 series. Upon assignment, request this office be notified.
5. POC this office is M. Frick, x79712.

Encl


JAY M. GARNER
Major General, GS
Assistant Deputy Chief of Staff
for Operations and Plans,
Force Development

CF:
Secretary, Joint Requirements Oversight Council
Commander, U.S. Army Training and Doctrine Command, ATTN: ATCD-SL,
Ft. Monroe, VA 23651-5000
Deputy Chief of Staff for Operations and Plans, ATTN: DAMO-FDL,
Wash, DC 20310-0400

MISSION NEED STATEMENT

FOR

LIGHTWEIGHT WATER PURIFIER (LWP)

1. Defense Planning Guide Element. A LWP capability will resolve the deficiencies in U.S. Army Training and Doctrine Command Battlefield Development Plan 94-08, priority #43, which have been reviewed in accordance with (LAW) today's threat and remain valid.

2. Mission and Threat Analyses.

a. Mission Analysis. Small units and detachments, to include special forces, conducting missions such as early entry, long-range surveillance, nation building, civil affairs and disaster relief operations do not possess water purification capabilities to support such missions. This necessitates the use of equipment designed to support division, corps and echelons above corps to resupply water using limited road nets or aircraft or reliance on dubious quality host nation water support. These courses of action impose an undesirable logistical burden or threaten the health of soldiers participating in such operations. Soldiers are at risk from both intentionally placed and natural contaminants in raw water sources. These can be industrial chemical contaminants, natural biological and organic/inorganic substances, or even nuclear, biological, chemical (NBC) contaminants. This threat is further compounded when there is a lack of freshwater sources, as in arid regions of the world. The problems require the desalinization of brackish and salt water and removal of NBC and industrial contaminants. The LWP will provide an increased capability to provide potable water in operations described above and in differing environments.

b. Threat Analysis. The LWP does not counter any specific threat. An LWP capability and its associated personnel are vulnerable to the spectrum of threat destruction and/or disruption capabilities at all levels of conflict along the operational continuum. Though unlikely, the LWP capability also may be attacked as a target of opportunity. Destructive capabilities such as direct and indirect fires, small arms fire and sabotage can harm the system and associated personnel. This capability also will be susceptible to contamination. The NBC operations and weapons effects may render the system temporarily unusable or may destroy it.

3. Nonmaterial Alternatives. Doctrine, training, leadership and organization have been reviewed for possible solutions. The only nonmaterial solution is the use of safe, secure sources of water supply within the area of operation. This cannot be assured in all regions of the world because it requires protection of the source and a secure means of transport by friendly forces. It also assumes a safe level of water quality; however, many third world nations have severe water quality problems.

4. Potential Material Alternatives. There also may be a potential for interservice or allied cooperation on requirements similar to those stated in this MNS. The alternatives are: add NBC

and desalination capabilities to existing U.S. Marine Corps diatomaceous earth filtration systems; adapt commercial systems to U.S. Army requirements; adapt foreign military material to U.S. Army requirements; develop a system to meet U.S. Army requirements; modify and adapt the 150-gallon per hour (GPH) reverse osmosis water purification unit (ROWPU), (a prototype was developed for Southern Command).

5. Constraints. A LWP system must comply with industry and government safety and health hazard standards and must not present any uncontrolled safety or health hazards throughout the life cycle of the system. The LWP must produce water which meets U.S. Army field water quality standards Technical Bulletin, Medical (TB MED) 577 from fresh, brackish or sea water sources. It must also produce water which meets U.S. Army field water quality standards (TB MED 577) while operating in an NBC environment and/or drawing water from NBC-contaminated sources, and processed potable water shall be protected against NBC contamination/re-contamination. The LWP must be transportable, both internally and externally, by UH-1 and UH-60 U.S. Army aircraft, either by modules or as a single item. It also must be transportable by modules or as a single item, in cargo versions of the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and larger transportation assets. If the LWP is modular, each module should be transportable by no more than four soldiers; two soldier transportability is desired. It must be operable and maintainable by organic unit personnel with minimal training. The LWP must be supported IAW the Army's standard four-level maintenance system and logistics system. It must be repairable within current levels of the Army's maintenance system. Standard tools will be used. No special tools, new tools, or test, measurement or diagnostic equipment will be required to support the LWP. The LWP will have a minimum of components and a maximum commonality in parts. This capability must not increase personnel and training requirements or any additional military occupational specialties (MOS) or skill identifiers. The LWP must be capable of interoperability with current U.S. Army water storage and distribution equipment. This capability is essential to mission enhancement and accomplishment. Therefore, IAW Army Regulation (AR) 70-71, it must be NBC contamination survivable. Its components, in transit and use, will be hardened against the materiel damaging effects of NBC contaminants and capable of being operated, maintained, and resupplied by organic unit personnel during day and night operations in basic climatic environments while wearing the field uniform and full protective ensemble. The LWP must be operated and maintained safely and efficiently by U.S. Army organic unit personnel during day and night operations under conditions specified for hot, basic, and cold. They must also be able to operate the system while wearing the required combat clothing and equipment. The LWP must not expose soldiers to unacceptable health hazards. It must be capable of being stored and transported in climatic environments cold, basic and hot without damage and must be capable of operating without additional protection (i.e. shelters in temperature above freezing). Training will require both institutional and unit training for operator and maintenance personnel.

6. Joint Potential Designator. The Marine Corps has recommended this mission need be designated as Joint Interest.

APPENDIX B

OPERATIONAL REQUIREMENTS DOCUMENT (ORD) FOR THE LIGHTWEIGHT WATER PURIFIER (LWP), Draft 7 April 1995



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
UNITED STATES ARMY COMBINED ARMS SUPPORT COMMAND
AND FORT LEE
FORT LEE, VIRGINIA 23801-6000



7 April 1995

S: 30 June 1995

ATCL-MES

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Draft Operational Requirements Document (ORD) for the Lightweight Water Purifier (LWP)

1. References.

- a. DOD Directive 5000.1, 23 Feb 91, Defense Acquisition.
- b. DOD Instruction 5000.2, 23 Feb 91, Defense Acquisition Management Policies and Procedures.
- c. DOD 5000.2-M, 23 Feb 91, Defense Acquisition Management Documentation and Reports.


2. Request action addressees review the enclosed draft ORD and provide comments or concurrence NLT 30 June 95. Request other Service addressees' response include the appropriate Joint Potential Indicator. The final draft will be submitted to the U.S. Army Training and Doctrine Command for approval.

3. A Joint Work Group (JWG) will be designated, if necessary, to address and resolve substantive issues developed during the staffing of the draft ORD. CPT Scott Wright, DSN 687-0496, will be the chairperson of the JWG. Request the materiel developer, TACOM (TARDEC), provide a JWG vice-chairperson. Request your representative to the JWG have the authority to represent your organization to resolve any issues in developing the final draft.

4. Our point of contact for this action is CPT Scott Wright, DSN 687-0496, or commercial (804) 734-0496; facsimile DSN 687-0574 or commercial (804) 734-0574.

FOR THE COMMANDER:

Encl


CLAYTON R. LEE
Director, Modernization and
Technology

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Operational Requirements Document
For
Lightweight Water Purifier (LWP)

1. General Description of Operational Capability.

a. Overall Mission Area. The LWP provides water purification and storage capability to small units and detachments, particularly Special Operation Forces (SOF) and small health care units, in low intensity conflict, nation building, civil affairs actions, peace keeping, disaster relief operations, and additional operations other than war (OOTW). The LWP will be used to purify a broad range of water sources. It will be used when logistical support for potable water is not feasible based on existing water delivery systems. The LWP may also be used to support initial and/or early entry of units to an undeveloped theater of operations. This requirement supports the Army's combat, combat support, and combat service support mission.

b. Type of System Proposed. The LWP is an Army program with Joint Service interest from the U.S. Marine Corps which will produce potable water meeting field water quality standards from fresh, brackish, and sea waters, including NBC-contaminated water when configured with an NBC treatment component. The LWP will produce 125 gallons per hour (GPH), which will supply sufficient water to meet consumption and personal hygiene needs of the supported unit with intermittent operation. The LWP will be a multi-module, non-developmental item that can be emplaced by four personnel within one hour. It will be highly transportable (fit in a HMMWV and UH-60 helicopter) for deployment to areas where road nets, airlift assets and/or vehicle support is limited. The LWP will be emplaced, operated, and maintained at the unit level as an additional duty by personnel without specialized operator training.

c. Operational Concept. The concept of operation is to produce water as far forward as possible using a flexible and highly mobile treatment system during war- and peace-time scenarios. The LWP will be employed throughout the range of highly developed, densely populated urban areas to isolated rural areas in undeveloped countries. Employment of the LWP will be governed by METT-T considerations since water sources generally must be identified and approved while an operation develops. The LWP will be compatible with ground, amphibious, air mobile, and airborne units.

(1) Wartime Mission Profile. The LWP will be employed throughout SOF operational areas as a direct support asset. Special Forces Groups will employ the LWP throughout the operational area at locations where acceptable water supplies exist. The Command Medical Authority's designee will coordinate the selection of an acceptable water source from which the LWP will be capable of producing a safe, reliable supply of potable water. The LWP will be used to produce water that will be: distributed at the point of production; transported to forward supply points; and/or delivered to major consumers (e.g., local indigenous forces). It will be operated in basic and hot climate conditions as defined in AR 70-38, including NBC-contaminated environments when the system is contained in an NBC-safe structure. The LWP will not be NBC survivable since it is not a mission essential item.

(2) Peacetime Mission Profile. The LWP will be deployed for foreign internal defense, unconventional warfare, special activities, and CONUS/OCONUS field training exercises. Additionally, the LWP may be used to support OOTW (e.g., disaster relief, humanitarian assistance, etc.) and the operational concept will be tailored to meet situational needs.

1
2 d. Support Concept. The LWP will be supported logistically by both military and contract
3 personnel by the most cost-effective means available during peacetime with acceptable risk when
4 in transition to war. Cost-effectiveness is second only to materiel readiness. Training will be in
5 accordance with standard Army training policy for systems not requiring specific MOS training.
6

7 e. Mission Need Statement Summary. The Mission Need Statement (CARD reference
8 22-93) for the LWP was approved 6 October 1993. The MNS established a Joint Potential
9 Designator, Joint Interest, to improve the water purification capabilities of small units and
10 detachments, including special operating forces, conducting military missions and operations other
11 than war.
12

13 2. Threat.

14
15 a. The LWP does not defeat a threat capability. US forces deploying worldwide in support
16 of US interests are always subject to a range of health and environmental hazards. These hazards
17 can have a significant impact on soldier performance and overall combat effectiveness. US forces
18 deploying worldwide are especially at risk from both intentionally placed and natural contaminants
19 in water sources. These contaminants include industrial chemical contaminants, natural biological
20 contaminants, organic inorganic substances, and possibly nuclear, biological and chemical
21 contaminants.
22

23 b. The LWP will encounter the same battlefield threats as those of employing SOF
24 units/teams. In a hostile environment, the system could experience inadvertent destruction from
25 conventional explosive ordnance (delivered by ground forces, artillery fire, aircraft, or missiles) or,
26 less likely, non-conventional ordnance (nuclear, and chemical weapons). The System Threat
27 Assessment Report (STAR) for Land Warrior has been approved for use as the baseline threat
28 assessment for LWP.
29

30 3. Shortcomings of Existing Systems.

31
32 a. The current means of providing water is to conduct frequent aerial resupply with bottled
33 water. This means of support is expensive and uses valuable cargo space on aircraft supporting
34 SOF and medical teams conducting various missions. Contracting requirements to obtain bottled
35 water and testing bottled water quality to ensure that it is acceptable for human consumption places
36 additional burden on SOF and medical teams. The existing and projected military water purifiers
37 are not designed for use by small units or detachments with limited potable water requirements and
38 limited supplies. The 600- and 3,000-GPH ROWPUs require heavy vehicles, materiel handling
39 equipment, large generators for power supplies, and dedicated operators. These systems are not
40 practical for the mission requirements identified in paragraph 1.
41

42 b. The only non-materiel solution is the use of safe, secure potable water sources within the
43 area of operations. This cannot be assured since many areas of the world have severe water
44 quality problems associated with their municipal water supplies and sufficient secure means of
45 transport are normally unavailable in these areas.
46

47 4. **Capabilities Required**. Annex A contains the rationale supporting the following system
48 performance requirements. The system performance capabilities identified in paragraph 4a are
49 listed in priority order.
50

51 a. System Performance. The LWP must:

1
2 (1) Produce a minimum normalized flow of at least 75 GPH from a source water with
3 salinity 45,000 mg/L total dissolved solids (TDS), and 125 GPH from a fresh water source with
4 salinity 1,000 mg/L TDS. Both flow rates shall be normalized to 77 degrees Fahrenheit. The
5 desired performance objective is 75 GPH from a source water with salinity 60,000 mg/L TDS.
6

7 (2) Produce, store and distribute potable water that meets the field drinking water
8 standards identified in TB MED 577, STANAG 2136, and QSTAG 245, and the proposed Tri-
9 Service Field Water Quality Standards from all surface and ground water sources of fresh,
10 brackish, and sea water, including NBC-contaminated water, as described in paragraph 4a(1).
11

12 (3) Contain interchangeable raw water and product water distribution pumps.
13

14 (4) Operate using multi-purpose fuel (e.g., JP-8) powered, direct drive pumps or
15 electrical motor powered pumps (208V, 3-phase or 120V, 1-phase) driven by a multi-purpose fuel
16 generator set. A combination of both types of pumps is acceptable provided all other requirements
17 are met.
18

19 (5) Contain a raw water pump capable of drawing water from any type of water source
20 (ocean, lake, river, well, etc.) a distance of 50 horizontal feet and 10 vertical feet. The raw water
21 pump shall also be capable of pumping the water a distance of 100 horizontal feet and 25 vertical
22 feet.
23

24 (6) Contain a product water distribution pump capable of dispensing product water at a
25 minimum rate of 10 gallons per minute.
26

27 (7) Total weight must not exceed 1,000 pounds. This includes the weight of the power
28 generation equipment utilized to operate the LWP, all basic issue items (BII) plus 150 operating
29 hours of supply. The desired objective total weight is 750 pounds. The LWP must be small
30 enough to fit in the rear compartment area of a M1097A truck, cargo [HMMWV (85"x50"x48")],
31 and must be air transportable inside the UH-60 in one lift. This requirement includes the power
32 generation equipment required to operate the LWP. No single component of the LWP can exceed
33 53" in length, 48" in width and 48" in height.
34

35 (8) Have the capability to add disinfectant and maintain a disinfectant residual.
36

37 (9) Contain two (2) 400-gallon storage bags to be used as holding tanks for source
38 water and/or product water tanks. The storage tanks shall be closed to the atmosphere.
39

40 (10) Be capable of identifying defective reverse osmosis (RO) membranes during
41 operations.
42

43 (11) Incorporate in-line water quality monitoring technology for system performance
44 parameters such as turbidity, TDS, pH, and temperature. Additionally, flow totalizing and
45 recording devices are required for the LWP. Monitoring results should be reported in continuous
46 digital display and programmable paper recording devices.
47

48 (12) Preplanned product improvement (P3I) efforts must be targeted at: permitting
49 transit and storage of the LWP in the hot climate category as described in AR 70-38; treat

1 chlorinated water sources; provide 75 GPH on a source water with 80,000 mg L TDS; provide
2 continuous monitoring of all potential chemical/biological agents and compounds identified in FM
3 3-9 (NAVFAC P-467, AFR 355-7) Potential Military Chemical/Biological Agents and
4 Compounds; incorporate automatic shutdown systems when concentrations of chemical
5 contaminants exceed field drinking water standards; reduce weight of single modules so that four
6 personnel (male or female) can emplace and recover equipment; and reduce energy consumption
7 by 25% and improve the Mean Time Between Essential Function Failure by 25% so that overall
8 logistics demands are reduced during mission operation.

9
10 b. Logistics and Readiness. The LWP shall:

11
12 (1) Be emplaced and recovered from operational sites by four personnel. Single
13 modules must not weigh more than 328 pounds. Emplacement and recovery by two individuals is
14 desired.

15
16 (2) Following emplacement, be initially put into operation by one individual within 45
17 minutes without specialized training. Daily operational setup and shutdown will be 15 minutes or
18 less. No more than 45 minutes will be required by one individual to prepare the LWP for
19 movement to another site.

20
21 (3) The LWP must have 280 hours Mean Time Between Essential Function Failure
22 (MTBEFF), a Mean Time to Repair (MTTR) no greater than 1 hour for all Unscheduled
23 Maintenance Demands (UMD), and a Maximum Time to Repair (MaxTTR) of 2 hours for 90
24 percent of all Essential Unscheduled Maintenance Demands (EUMD).

25
26 (4) Any LWP item requiring adjustment and/or alignment by the operator must be
27 adjusted and/or aligned within 30 minutes without special training or complex equipment.
28 Preventative maintenance checks and services (PMCS) must not require more than 30 minutes for
29 each four hours of operation and must be accomplished by individuals without specialized training.

30
31 (5) Be capable of self-sustained operations (system with on-hand processing supplies)
32 for at least 150 operating hours, excluding Class III requirements.

33
34 (6) Not require the establishment of a new MOS. The LWP shall be operated and
35 maintained as an additional duty by personnel in receiving units.

36
37 (7) Be supported by standard supply and maintenance systems.

38
39 (8) There shall be no performance degradation due to environmental or climatic
40 conditions for the operating conditions identified in paragraph 1c(1).

41
42 (9) There shall be no differences in system readiness during war or peace operations.
43 Additional logistics requirements during peace operations may be necessary to support appropriate
44 collection, storage, and disposal of waste products (e.g., brine concentrate) in accordance with
45 local, State, Federal, and/or host nation environmental laws.

46
47 c. Critical System Characteristics. The LWP shall:

48
49 (1) Meet field drinking water standards identified in TB MED 577, STANAG 2136,
50 QSTAG 245, and the proposed Tri-Service Field Water Quality Standards in all operational
51 environments with no observable deleterious effects caused by blowing rain/sand/soil.

1
2 (2) Be capable of storage and transportation in basic (-28 to 145 °F) climate; be capable
3 of operation in the basic (-25 to 110°F) and hot (88 to 120°F) climate (see AR 70-38). A
4 winterization kit or warming facility (e.g. tent, building, vehicle) is considered an acceptable
5 materiel solution for operating in cold weather conditions where system freezing may occur.
6

7 (3) Be designed with appropriate occupational safety, health and environmental
8 protective equipment that minimizes operator exposure to health hazards.
9

10 (4) Be transportable as detailed in paragraph 4a(8) and 6b.
11

12 (5) Corrosion resistant materials will be used to the maximum extent possible.
13

14 (6) Operational and physical security will be provided by the supporting unit.
15

16 (7) System safety requirements will be completed by the materiel developer in
17 accordance with the requirements of AR 385-16. At a minimum, system safety hazards must
18 address: unloading/loading; setup/takedown, operation, maintenance, and repairs to the system.
19

20 5. Integrated Logistics Support.

21

22 a. Maintenance Planning. Support objectives for initial operational capability will be full
23 organic support with no interim contractor support. The LWP will be designed for testability.
24 The use of Built-in Test Equipment (BIT/BITE) will be used to unambiguously fault
25 isolate to a single line replacement unit (LRU). The LWP will be supported by standard supply
26 and maintenance systems. Operator maintenance and direct support (DS) will consist of PMCS,
27 scheduled services, and modular replacement of defective assemblies. General support (GS)
28 maintenance and depot maintenance will consist of contract repair of assemblies replaced at lower
29 level maintenance support.
30

31 b. Support Equipment. Unit-level and DS maintenance will be accomplished with common
32 tools and/or tools in the general mechanics tool kit. General support maintenance and depot level
33 maintenance will be accomplished by contractor support. The Integrated Family of Test
34 Equipment (IFTE) will be used if automatic test equipment (ATE) is required for the LWP.
35

36 c. Human Systems Integration. 37

38 (1) Manpower and Personnel. No additional manpower or increases to force structure
39 will be required to operate or maintain the LWP.
40

41 (2) Training. The LWP and basic issue items will be designed so that institutional
42 training will not be required. Instructor and key personnel training will be provided by the
43 equipment manufacturer. The Materiel Developer will ensure that a New Equipment Training
44 (NET) package will be developed to support unit sustainment training. Unit training will be the
45 responsibility of receiving units.
46

47 (3) Systems and Soldier Survivability/Health Hazard Assessment.

48

49 (a) Survivability for the soldier should be developed from a systems approach (see AR
50 70-75, Survivability of Army Personnel and Materiel).
51

1 (b) Soldier survivability includes minimizing the system's visual, auditory, and RF
2 signature and exploiting the system's mobility and emplacement and displacement capability. The
3 soldier survivability analysis should also consider typical operator workload, especially during high
4 intensity operations, to ensure that operator overload or fatigue will not lead to operational errors
5 which could jeopardize the support force.

6
7 (c) The LWP will meet applicable health, safety, and human engineering design
8 requirements and will not present any uncontrollable safety or health hazards to personnel
9 throughout the life cycle of the system. Health hazard assessments will be completed in
10 accordance with guidelines provided by the Army Surgeon General. The system will be assessed
11 for environmental impact.

12
13 (d) Appropriate labels or instructions shall be provided on or near operating equipment
14 to assist soldiers in the safe operation of each piece of equipment.

15
16 (4) Human Systems Integration. The LWP will be operable and field maintainable in
17 daylight and darkness by appropriately trained, representative soldiers from Special Operation
18 Forces for gaining units dressed appropriately for the anticipated environments of operation.
19 Operation and maintenance shall be accomplished with less than 5 percent repeated error (errors of
20 omission and commission) in performance of critical tasks. The LWP design shall comply with
21 applicable commercial and military human engineering design requirements. The LWP will be
22 capable of being operated by the target audience while in Mission Oriented Protective Posture 0
23 through IV and in cold weather overgarments.

24
25 d. Computer Resources. None.

26
27 e. Other Logistics Considerations. The LWP will be fielded using the total package concept.
28 The LWP will be supported by Electronic Technical Manuals (ETM), unless a waiver is granted by
29 the Logistics Support Activity (LOGSA), Huntsville, AL to use commercial, off-the-shelf (COTS)
30 manuals. If a waiver is obtained, the COTS manuals or ILS addendums to the COTS manuals
31 must include decontaminating procedures for internal LWP components. At a minimum, the
32 procedures must address: internal piping (including RO vessels); waste disposal; and specific
33 operating procedures when treating NBC-contaminated water so that the LWP can be relocated and
34 operated on an uncontaminated source. The materiel developer's ILS manager will prepare the
35 ILS Plan (ILSP). A care of supplies in storage (COSIS) plan will identify long-term storage
36 requirements for reverse osmosis elements and chemicals. Special cold weather storage may be
37 required for the LWP to prevent the system from freezing. Unique storage facilities may be
38 necessary for membrane elements during hot and cold temperature storage and transport. The user
39 requires procedures for safe collection and disposal of brine concentrate during CONUS and
40 OCONUS training operations in accordance with applicable local, State, Federal, and host nation
41 environmental regulations.

42 43 6. **Infrastructure Support and Interoperability.**

44
45 a. Command, Control, Communications, and Intelligence. The LWP will not require any
46 integration into the C3I architecture. The system will be deployed with units that will be able to
47 receive or transmit any required C3I information.

48
49 b. Transportation and Basing. The LWP must meet US and NATO countries' highway legal
50 limits when carried in a HMMWV; have military standard lifting and tie down provisions; meet the
51 GIC equipment gauge rail outline diagram; pass the rail impact test; and be transportable in 8 ft x 8
52 ft x 20 ft ISO frame. The LWP must be transportable by a M1097A truck, cargo [HMMWV

1 (85"x50"x48")], and by internal transport in a UH-60. The LWP must be air dropable from normal
2 airdrop platforms (e.g., C-130 and C-141 aircraft) using current air delivery container systems.
3

4 c. Standardization, Interoperability, and Commonality: The LWP will be capable of
5 operating with all U.S. services, NATO forces, and other Allied forces. The LWP will be
6 compatible with standard fuels and lubricants. Standard tools will be used to the maximum extent
7 possible. Electric power or multi-fuel engine requirements will be compatible with standard
8 military generator sets and standard mobile electric power distribution equipment. The LWP
9 should be compatible with standard plumbing connections for hoses and couplings. The US
10 Marine Corps has expressed joint interest in the LWP.
11

12 d. Mapping, Charting, and Geodesy Support. Standard Defense Mapping Agency data will
13 be used to assist with surface or ground water site selection.
14

15 e. Environmental Support. No requirement will exist for any specific weather,
16 oceanographic, or astrogeophysical support. The LWP will be capable of operating in the
17 temperature, humidity, and solar radiation conditions of the hot and basic climatic design types of
18 AR 70-38.
19

20 7. **Force Structure**. The LWP will be issued to Special Forces units and to selected medical
21 detachments. The initial Army purchase is projected at 50 systems; SOF is projected to receive 42
22 systems; AMEDD is projected to receive 8 systems.
23

24 8. **Schedule Considerations**.

25

26 a. Initial procurement of the LWP is anticipated for FY99; however, the initial procurement
27 date may change to reflect revised funding schedules.
28

29 b. Initial Operational Capability is attained when: all primary and supporting equipment is
30 received; repair parts, expendable items, and field and technical manuals are available; instructor
31 and key personnel training is complete; and the first unit equipped has received its authorized LWP
32 equipment.
33

34 c. Full Operational Capability is attained when all authorized units have received their LWP
35 equipment and all standards associated with paragraph 8b is complete.
36
37

38 END OF DOCUMENT
39

ANNEX A

Supporting Rationale for Capabilities Required
by the U.S. Army Special Operations Command

4. **Capabilities Required.** Annex A contains the rationale supporting the following system performance requirements. The system performance capabilities identified in paragraph 4a are listed in priority order.

a. System Performance. The LWP must:

(1) Produce a minimum normalized flow of at least 75 GPH from a source water with salinity 45,000 mg/L total dissolved solids (TDS), and 125 GPH from a fresh water source with salinity 1,000 mg/L TDS. Both flow rates shall be normalized to 77 degrees Fahrenheit. The desired performance objective is 75 GPH from a source water with salinity 60,000 mg/L TDS.

RATIONALE: This flow rate was determined using a water planning factor of 6.0 gal/day/man and a force size of approximately 125 soldiers. Assuming that the LWP will be operated for ten hours per day on a seawater source (worst case conditions), a total of 75 gallons per hour is required to meet the daily requirement of 750 gallons.

(2) Produce, store and distribute potable water that meets the field drinking water standards identified in TB MED 577, STANAG 2136, and QSTAG 245, and the proposed Tri-Service Field Water Quality Standards from all surface and ground water sources of fresh, brackish, and sea water, including NBC-contaminated water, as described in paragraph 4a(1).

RATIONALE: It is necessary for the LWP to produce safe drinking water that meets military water quality standards.

(3) Contain interchangeable raw water and product water distribution pumps.

RATIONALE: Pump failures can have a large impact on water production. This requirement allows the LWP to have greater operational flexibility when performing its missions. The ability to interchange the raw water and distribution pump will allow the LWP to continue to operate in a "work around" mode while the damaged pump is repaired.

(4) Operate using multi-purpose fuel (e.g., JP-8) powered, direct drive pumps or electrical motor powered pumps (208V, 3-phase or 120V, 1-phase) driven by a multi-purpose fuel generator set. A combination of both types of pumps is acceptable provided all other requirements are met.

RATIONALE: The fuel-powered equipment must operate on multi-purpose fuel, including diesel and JP-8, to ensure that the LWP is capable of using any fuel during various missions. The voltage and phase requirements listed above are standard for most US Army generator sets and will allow the LWP to operate powered by standard US Army generators sets if the generator sets supplied with the LWP fail.

(5) Contain a raw water pump capable of drawing water from any type of water source (ocean, lake, river, well, etc.) a distance of 50 horizontal feet and 10 vertical feet. The raw water pump shall also be capable of pumping the water a distance of 100 horizontal feet and 25 vertical feet.

1
2 **RATIONALE:** This requirement ensures that the LWP can access raw water sources under
3 varying conditions and environments.
4

5 (6) Contain a product water distribution pump capable of dispensing product water at
6 a minimum rate of 10 gallons per minute.
7

8 **RATIONALE:** This flow rate will allow the LWP to quickly supply its users with potable
9 water. Also, it will allow the unit to empty its storage tanks in the event rapid deployment to
10 another site is required.
11

12 (7) Total weight must not exceed 1,000 pounds. This includes the weight of the
13 power generation equipment utilized to operate the LWP, all basic issue items (BII) plus 150
14 operating hours of supply. The desired objective total weight is 750 pounds. The LWP must be
15 small enough to fit in the rear compartment area of a M1097A truck, cargo [HMMWV
16 (85"x50"x48")], and must be air transportable inside the UH-60 in one lift. This requirement
17 includes the power generation equipment required to operate the LWP. No single component of
18 the LWP can exceed 53" in length, 48" in width and 48" in height.
19

20 **RATIONALE:** Special Operation Forces are inherently small, mobile forces and require their
21 equipment to be lightweight and compact. They traditionally do not have organic support units
22 required to move heavy equipment. The dimensions of the A22 single container that will be
23 used to airdrop the LWP requires that the LWP not exceed 53" in length, 48" in width and 48" in
24 height.
25

26 (8) Have the capability to add disinfectant and maintain a disinfectant residual.
27

28 **RATIONALE:** This requirement ensures that disease-causing organisms and viruses are
29 inactivated and that a safe, reliable supply is provided to consumers.
30

31 (9) Contain two (2) 400-gallon storage bags to be used as holding tanks for source
32 water and/or product water tanks. The storage tanks shall be closed to the atmosphere.
33

34 **RATIONALE:** This provides the LWP with enough storage capacity to hold one days' water
35 supply. The requirement for a closed tank will reduce the potential recontamination of the
36 product water.
37

38 (10) Be capable of identifying defective reverse osmosis (RO) membranes during
39 operations.
40

41 **RATIONALE:** This minimizes the logistical burden caused by replacing all membranes
42 contained in the RO vessels when only one membrane is damaged or defective.
43

44 (11) Incorporate in-line water quality monitoring technology for system performance
45 parameters such as turbidity, TDS, pH, and temperature. Additionally, flow totalizing and
46 recording devices are required for the LWP. Monitoring results should be reported in
47 continuous digital display and programmable paper recording devices.
48

49 **RATIONALE:** This requirement ensures that the water quality parameters and production data
50 are routinely recorded and continuous monitoring provides instant feedback to operators on
51 system performance. These devices will enable the operator to make appropriate adjustments as

1 source water quality varies and improve overall system performance. This is particularly
2 important since there will not be a dedicated operator for this system.
3

4 (12) Preplanned product improvement (P3I) efforts must be targeted at: permitting
5 transit and storage of the LWP in the hot climate category as described in AR 70-38; treat
6 chlorinated water sources; provide 75 GPH on a source water with 80,000 mg L TDS; provide
7 continuous monitoring of all potential chemical/biological agents and compounds identified in
8 FM 3-9 (NAVFAC P-467, AFR 355-7) Potential Military Chemical/Biological Agents and
9 Compounds; incorporate automatic shutdown systems when concentrations of chemical
10 contaminants exceed field drinking water standards; reduce weight of single modules so that four
11 personnel (male or female) can emplace and recover equipment; and reduce energy consumption
12 by 25% and improve the Mean Time Between Essential Function Failure by 25% so that overall
13 logistics demands are reduced during mission operation.
14

15 **RATIONALE:** The P3I program ensures that the LWP will accommodate future product
16 improvements as technology becomes available. Specifically, RO membranes tend to degrade
17 when stored at temperatures within the hot category for transit and storage; chlorinated waters
18 cannot currently be treated using RO membranes without destroying the membranes; RO
19 membranes are not currently capable of producing sufficient quantities of treated water when
20 source waters have high TDS; no means exists for continuous monitoring of raw or treated water
21 quality which has obvious advantages for ensuring potability and record keeping; although the
22 system is for SOF units (which has no female soldiers), future Army requirements for similar
23 equipment would benefit from modules that can be emplaced and recovered by all soldiers (male
24 or female); any improvement to reliability and maintainability that can reduce logistical demands
25 is a desired performance characteristic.
26

27 b. Logistics and Readiness. The LWP shall:
28

29 (1) Be emplaced and recovered from operational sites by four personnel. Single
30 modules must not weigh more than 328 pounds. Emplacement and recovery by two individuals
31 is desired.
32

33 **RATIONALE:** This ensures that the LWP is lightweight and easily transportable under various
34 field conditions. The weight limit addresses the standard lift capability for a four-man lift. Note
35 that there are no females in SOF units.
36

37 (2) Following emplacement, be initially put into operation by one individual within
38 45 minutes without specialized training. Daily operational setup and shutdown will be 15
39 minutes or less. No more than 45 minutes will be required by one individual to prepare the
40 LWP for movement to another site.
41

42 **RATIONALE:** This requirement ensures that the LWP can be quickly placed into operation
43 when needed. It also ensures that the LWP can be quickly repackaged for movement to another
44 site.
45

46 (3) The LWP must have 280 hours Mean Time Between Essential Function Failure
47 (MTBEFF), a Mean Time to Repair (MTTR) no greater than 1 hour for all Unscheduled
48 Maintenance Demands (UMD), and a Maximum Time to Repair (MaxTTR) of 2 hours for 90
49 percent of all Essential Unscheduled Maintenance Demands (EUMD).

1 **RATIONALE:** R&M Requirements Rationale (RRR) is being prepared by TRADOC Combat
2 Development Engineering (CDE). Upon approval, the RRR will be on file at U.S. Army
3 CASCOM, ATTN: ATCL-MES, Fort Lee, VA 23801-6000 and TRADOC CDE, Eastern
4 Regional Office, ATTN: ATCD-SRE, Fort Lee, VA 23801.

5
6 (4) Any LWP item requiring adjustment and/or alignment by the operator must be
7 adjusted and/or aligned within 30 minutes without special training or complex equipment.
8 Preventative maintenance checks and services (PMCS) must not require more than 30 minutes
9 for each four hours of operation and must be accomplished by individuals without specialized
10 training.

11
12 **RATIONALE:** This requirement ensures that the LWP can be quickly and easily maintained
13 by the receiving units without extensive training.

14
15 (5) Be capable of self-sustained operations (system with on-hand processing supplies)
16 for at least 150 operating hours, excluding Class III requirements.

17
18 **RATIONALE:** This requirement ensures that Special Operations Forces will have an operable
19 system even when logistical support is not readily available.

20
21 (6) Not require the establishment of a new MOS. The LWP shall be operated and
22 maintained as an additional duty by personnel in receiving units.

23
24 **RATIONALE:** This requirement ensures that the LWP will not incur additional manpower
25 requirements for operation and maintenance.

26
27 (7) Be supported by standard supply and maintenance systems.

28
29 **RATIONALE:** This requirement minimizes the need for special tools, diagnostic, and
30 calibrating equipment which will increase weight/space of the LWP.

31
32 (8) There shall be no performance degradation due to environmental or climatic
33 conditions for the operating conditions identified in paragraph 1c(1).

34
35 **RATIONALE:** Normalizing temperatures to 77 °F considers the impact of low and high
36 temperatures on the performance of the RO membrane systems and recognizes that production
37 rates will decrease when operating in extreme environmental conditions. The requirement for
38 no performance degradation stated in this requirement relates to degradation in excess of that
39 permitted by normalizing temperatures to 77°F.

40
41 (9) There shall be no differences in system readiness during war or peace operations.
42 Additional logistics requirements during peace operations may be necessary to support
43 appropriate collection, storage, and disposal of waste products (e.g., brine concentrate) in
44 accordance with local, State, Federal, and/or host nation environmental laws.

45
46 **RATIONALE:** The LWP system must be capable of producing potable water for all situations.
47 Compliance with environmental laws, such as the Clean Water Act, and obtaining National
48 Pollution Discharge Elimination System (NPDES) permits to discharge brine concentrate wastes
49 must be addressed during system development.

50
51 c. Critical System Characteristics. The LWP shall:

1
2 (1) Meet field drinking water standards identified in TB MED 577, STANAG 2136,
3 QSTAG 245, and the proposed Tri-Service Field Water Quality Standards in all operational
4 environments with no observable deleterious effects caused by blowing rain, sand/soil.
5

6 **RATIONALE:** This requirement ensures that the LWP can operate and provide safe drinking
7 water in environmental conditions common to Special Operations Forces missions.
8

9 (2) Be capable of storage and transportation in basic (-28 to 145 °F) climate; be
10 capable of operation in the basic (-25 to 110°F) and hot (88 to 120°F) climate (see AR 70-38).
11 A winterization kit or warming facility (e.g. tent, building, vehicle) is considered an acceptable
12 materiel solution for operating in cold weather conditions where system freezing may occur.
13

14 **RATIONALE:** This requirement will ensure that the LWP can operate effectively in the
15 climatic conditions in which it will be deployed. A winterization kit or heated shelter is
16 required to operate most commercially available systems in sub-freezing conditions.
17

18 (3) Be designed with appropriate occupational safety, health and environmental
19 protective equipment that minimizes operator exposure to health hazards.
20

21 **RATIONALE:** This requirement ensures that adequate environmental, health, and safety
22 requirements are designed in the system.
23

24 (4) Be transportable as detailed in paragraph 4a(8) and 6b.
25

26 **RATIONALE:** This requirement ensures that the LWP will be transportable in the vehicles and
27 modes used by the gaining units.
28

29 (5) Corrosion resistant materials will be used to the maximum extent possible.
30

31 **RATIONALE:** Experience has shown that while the existing ROWPUs are capable of
32 effectively treating sea water, salt deposition on the equipment occurs when the a ROWPU is
33 located near the ocean. As a result, existing ROWPU systems have experienced corrosion. Use
34 of corrosion resistant materials will reduce the potential for system failures and maintenance
35 requirements.
36

37 (6) Operational and physical security will be provided by the supporting unit.
38

39 **RATIONALE:** The Special Operating Force will provide all operational or physical security as
40 needed when the LWP is located away from base camp operations. If necessary, the LWP can
41 be relocated to a secure area during periods of inoperation.
42

43 (7) System safety requirements will be completed by the materiel developer in
44 accordance with the requirements of AR 385-16. At a minimum, system safety hazards must
45 address: unloading/loading; setup/takedown, operation, maintenance, and repairs to the system.
46

47 **RATIONALE:** System safety is a critical system characteristic.
48

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ANNEX B

Operational Mode Summary/Mission Profile (OMS/MP)

1. **System Description.** The Lightweight Water Purifier (LWP) is a new program which provides small units with the capability to produce potable water for human consumption at about 75 to 125 gallons per hour (1.25 - 2.0 gallons per minute) depending on the water source. The LWP purifies fresh, brackish, and salt waters. It consists primarily of a raw water pump, filtration system, reverse osmosis membrane system, and chemical feed pumps for disinfection. The LWP will fit in a HMLMV and a UH-60 helicopter. It will be accessible and operated from the ground in a skid-mounted configuration.

2. **Operational Mode Summary (OMS).**

a. **Operational Concept.** The concept of operation is to produce water as far forward as possible, using a flexible and mobile treatment system. The LWP will be used throughout the spectrum of SOF operational continuum in peace and wartime. The typical missions that it will be used in will range from highly developed densely populated urban areas to isolated rural areas in undeveloped countries under various types of mission profiles (see Table 1). The LWP will be used to purify raw water from a broad range of waters for human consumption. The governing parameters are the number of personnel for which support is required, and the climatic conditions in which it will be employed. The system will be mobile, compatible with ground, amphibious, air mobile, and airborne units. The system will be operated in basic (-25 to 110 °F) and hot (88 to 120 °F) climates (see AR 70-38). The system will be stored and transported in the basic (-28 to 145 °F) climate (see AR 70-38). The system will be operated in an NBC-contaminated environment only if the LWP is contained in an NBC-safe structure.

Table 1. Types of Missions.

Mission	% of Occurrence
Foreign Internal Defense	45
Unconventional Warfare	5
Civil Affairs	15
Operations Other Than War	35

b. **Wartime.**

(1) The LWP will be employed throughout the SOF Operational Area as a Direct Support asset. Special Forces Groups will employ the LWP throughout the operational area at locations where acceptable water supplies exist. The LWP will be used to produce water that will be distributed at the point of production; line-hauled to forward supply points; and/or line-hauled to major consumers (e.g., local indigenous forces). The anticipated duration for wartime missions is three months to one year. The mission profile will generally consist of 75% operation under the conditions described for Situation 1 and 25% operation under conditions described for Situation 2 (see Table 3).

1 (2) Threat Matrix.

2
3 Table 2. Threat Matrix for LWP.

Threat	Indirect Strike	Direct Strike
Artillery	X	
Rockets	X	
Bombs		X
Nuclear	X	
Biological	X	X
Chemical	X	X
Sabotage		X
Raids	X	
Other theater area attack weapons	X	

4
5 c. Peacetime. The LWP will be deployed for support of foreign internal defense;
6 unconventional warfare, special activities, and CONUS/OCONUS field training exercises. It
7 will be operated in the same manner as prescribed in the operational concept and wartime OMS.
8 Additionally, the LWP will be used to support operations other than war (e.g., disaster relief,
9 humanitarian assistance, peace-keeping missions, etc.) using the operational concept tailored to
10 the situation needs. The anticipated duration for peacetime missions is two weeks (field training
11 exercises) and up to one year for operations other than war. The mission profile will generally
12 consist of 95% operation under the conditions described for Situation 1 (see Tables 3 and 4) and
13 5% operation under conditions described for Situation 2 (see Tables 3 and 4). The remainder of
14 the peacetime operations will generally follow mission requirements.

15
16 3. Mission Profile (MP).

17
18 a. Tables 3 and 4 describe the operation of the LWP and the tasks required during normal
19 operation.

20
21 Table 3. Mission Profile for LWP on Fresh Water Source.

Task	Situation 1*: (hrs)	Situation 2§ (hrs)
Produce potable water	6	6
Backwash filters	1	1
Maintenance‡	1.5	1.5
Tear down	0	0.5
Relocate	0	2
Set up	0	0.5

22 * Extended operations during 24-hour period.

23 § Operation with one relocation during at 24-hour period.

24 ‡ Includes operator checks and services conducted during daily operations.

1
2 Table 4. Mission Profile for LWP on Sea Water Source.

Task	Situation 1* (hrs)	Situation 2§ (hrs)
Produce potable water	10	10
Backwash filters	1	1
Maintenance‡	1.5	1.5
Tear down	0	0.5
Relocate	0	2
Set up	0	0.5

- 3 * Extended operations during 24-hour period.
 4 § Operation with one relocation during at 24-hour period.
 5 ‡ Includes operator checks and services conducted during daily operations.
 6

7 b. The production rate of the LWP will vary based on the type of raw water source as
 8 shown in Table 5. The production rate is also affected by the specific physical characteristics of
 9 the raw water quality (e.g., temperature, TDS, etc.).
 10

11 Table 5. LWP Mission Profile Based on Source Water Quality.

Type of Source Water†	Frequency of Operation	Production Profile ‡(GPH)
Fresh Water	75%	125
Sea Water	25%	75

- 12 † Average water quality characteristics defined in paragraph 5, below.
 13 ‡ Average normalized hourly flow rate during operation (6-10 hours) in a 24-hour period. Potable water quality and
 14 sampling in accordance with frequency (minimum sampling 1x/4 hours operation) and proposed Tri-Service
 15 standards for TB MED 577
 16

17 4. **Environmental Conditions.** Tables 6 and 7 show the anticipated operating climate
 18 conditions and movement terrain for the LWP, respectively.
 19

20 Table 6. Operating Climatic Conditions.

Climate Conditions	% of Fleet
Hot	30
Basic	70

21
22 Table 7. Movement Terrain Conditions.

Terrain	Usage
Improved Roads	25%
Unimproved Roads	55%
Cross Country	20%

23
24 5. **Methodologies and References for OMS/MP.**
 25

26 a. For the purpose of defining the production profile, a fresh water source is defined as
 27 having less than 1,000 mg/L TDS. This definition is consistent with the Tri-Service Water
 28 Quality Standards for potable water. For the purpose of defining the production profile, sea

1 water source is defined as any water source with a TDS greater than 15,001 mg/L. Additionally,
 2 all waters are normalized to the average concentration at 77 degrees Fahrenheit.

3
 4 b. The treated water quality profile is based on the proposed Tri-Service standards for long-
 5 term (greater than one year) exposure.

6
 7 Table 8. Proposed Tri-Service Water Standards for long-term, large quantity consumption
 8 requirements.

Physical Property	15 liters/day standard
Color (color units)	50
Odor (threshold odor number)	3
pH	5.0-9.0
Temperature (Celsius)	15-22
TDS (mg/L)	1000
Turbidity (NTU)	1.0
Chemical Property (mg/L)	
Arsenic	0.02
Cyanide	2
Chloride	600
Lindane	0.2
Magnesium	30
Sulfate	100
Microbiological Property	
Coliforms (#/100 ml)	1
Chemical Agents* (µg/L)	
Hydrogen Cyanide	2
Incapacitants	2.3
Lewisite	200
Mustard	47
Nerve Agents	4
T-2 Toxins	8.7
Radiological Property	
Radiological	0.05 µCuries/L

9 * Chemical Agent standards are based on short-term (less than 7 days) exposure during NBC
 10 operation.

11

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ANNEX C
Coordination

ANNEX D

Funding Implications§

Lifecycle Costs‡	FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	thru FY22	TOTALS
RDTE	0.271	0.605	0.555	0.15	0	0	0	0	0	0	0	1.581
Procurement	0	0	0	0	1.05	3.05	0	0	0	0	0	-1.10
Military Construction	0	0	0	0	0	0	0	0	0	0	0	0
Military Personnel†	0	0	0	0	0	0	0.236	0.236	0.236	0.236	0.236	4.72
O&M	0	0	0	0	0	0	0.155	0.155	0.155	0.155	0.155	3.1
TOTALS	0.271	0.605	0.555	0.15	1.05	3.05	0.391	0.391	0.391	0.391	na	13.501

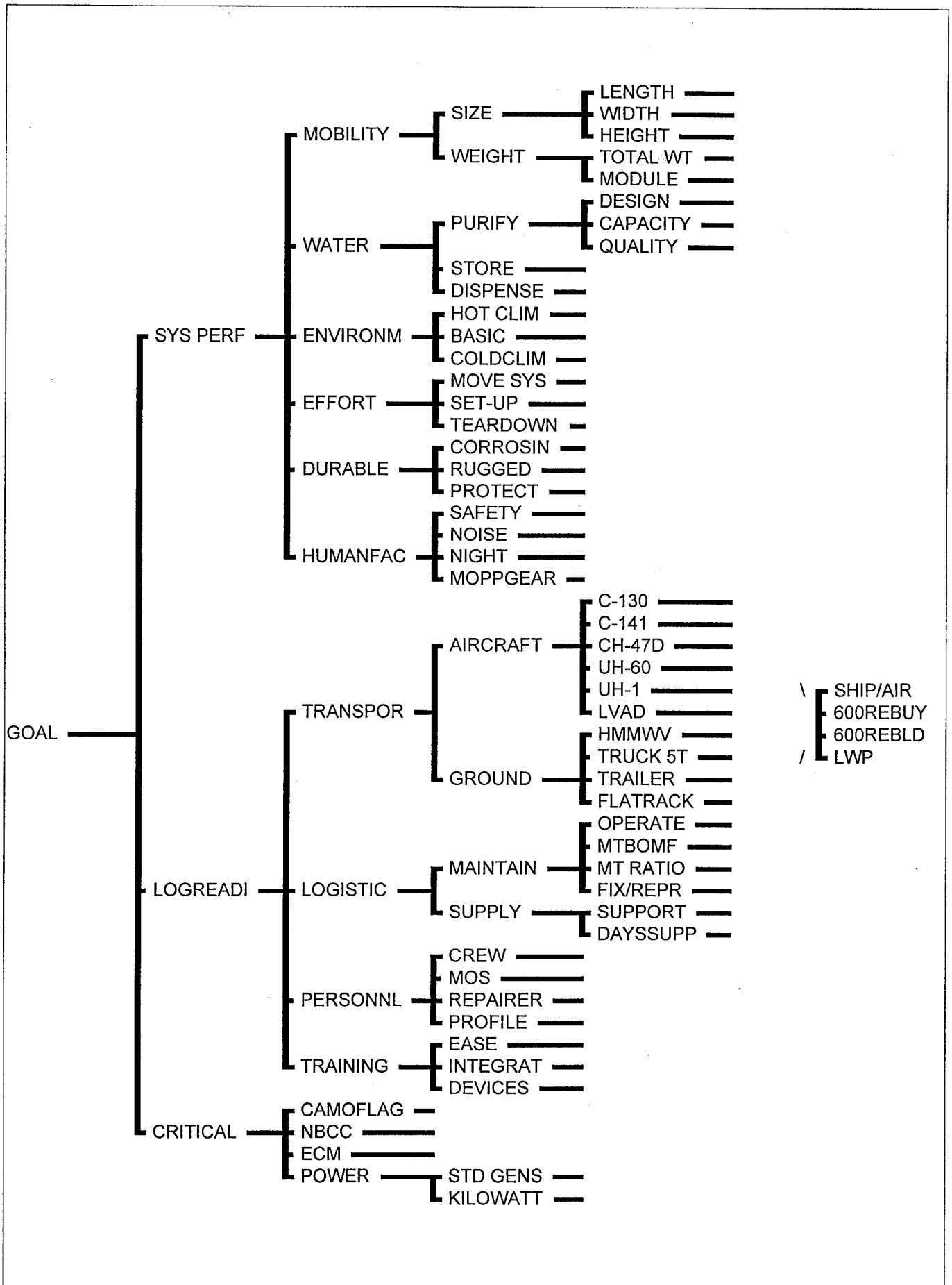
§ Dollar values are in millions of FY95 constant dollars. To convert from FY95 to FY90 dollars, multiply the value in the table by 0.8602.

‡ Lifecycle Costs for five major program areas.

APPENDIX C

HIERARCHY WEIGHTING JUDGMENTS (REQUIREMENT)

COMPARE ALTERNATIVES FOR LWP PROGRAM



COMPARE ALTERNATIVES FOR LWP PROGRAM

Abbreviation	Definition
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
AIRCRAFT	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED AIRCRAFT
BASIC	ABILITY TO OPERATE IN BASIC CLIMATES (I.E. +110 TO -25 DEGREES F)
C-130	ABILITY TO BE TRANSPORTED BY C-130 HERCULES
C-141	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY C-141 STARLIFTER
CAMOFLAG	CAMOUFLAGE COLOR AND TEXTURE
CAPACITY	RATED CAPACITY OF THE SYSTEM (IN GPH) IN SALTWATER
CH-47D	ABILITY TO BE TRANSPORTED BY CH-47D CHINOOK HELICOPTER
COLDCLIM	ABILITY OF THE SYSTEM TO OPERATE IN COLD CLIMATES (I.E. -65 F)
CORROSIN	ABILITY OF THE SYSTEM TO RESIST CORROSION IN ADVERSE WEATHER
CREW	NUMBER OF SOLDIERS REQUIRED TO OPERATE SYSTEM
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
DAYSSUPP	DAYS OF SUPPLY (DOS) OVERPACKED TO MEET 30 DAY REQUIREMENT
DESIGN	SOURCE MAXIMUM TOTAL DISSOLVED SOLIDS (TDS) IN PARTS PER MILLION
DEVICES	DOES THE SYSTEM REQUIRE UNIQUE TRAINING DEVICES, AIDS, ETC.
DISPENSE	ABILITY OF THE SYSTEM TO DISPENSE POTABLE WATER (IN GPH)
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
EASE	EASE OF TRAINING/COMPLEXITY OF TRAINING
ECM	ABILITY OF THE ALTERNATIVE TO RESIST ELECTRONIC COUNTERMEASURES
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS

COMPARE ALTERNATIVES FOR LWP PROGRAM

FIX/REPR	AMOUNT OF TIME REQD TO FIX OR REPAIR/REPLACE COMPONENTS (15 MIN)
FLATRACK	COMPATIBILITY OF THE SYSTEM WITH A PLS FLATRACK
GROUND	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED GROUND ASSETS
HEIGHT	HEIGHT OF SYSTEM IN INCHES (IN TRANSPORT CONFIGURATION)
HMMWW	COMPATIBILITY OF THE SYSTEM WITH WITH HMMWW (M998/M1038) CARGO
HOT CLIM	ABILITY OF THE SYSTEM TO OPERATE IN HOT CLIMATES
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)
INTEGRAT	ABILITY TO INTEGRATE TRAINING INTO EXISTING MOS RELATED COURSES
KILOWATT	MINIMUM GENERATOR SIZE REQUIRED TO PROVIDE POWER FOR THE SYSTEM
LENGTH	LENGTH OF SYSTEM IN INCHES (IN TRANSPORT CONFIGURATION)
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
LOGREADI	LOGISTICS AND READINESS CRITERIA
LVAD	ABILITY OF THE SYSTEM TO WITHSTAND LOW VELOCITY AIRDROP (LVAD)
LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
MAINTAIN	SELECTED MAINTENANCE CRITERIA OF THE SYSTEM
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
MODULE	WEIGHT OF HEAVIEST MODULE OR INDIVIDUAL COMPONENT OF THE SYSTEM
MOPPGEAR	CAN THE SYSTEM BE OPERATED BY SOLDIERS WHEN IN FULL MOPP
MOS	CAN THE SYSTEM BE OPERATED BY NON-SPECIFIC (I.E. NON-77W) PERSON
MOVE SYS	NUMBER OF SOLDIERS REQUIRED TO DOWN LOAD AND MOVE SYSTEM
MT RATIO	MAINT RATIO (MR) BASED ON NO MORE THAN 15 MIN PER 4 HOURS OPNS
MTBOMF	MEAN TIME BETWEEN OPERATIONAL MISSION FAILURES (MTBOMF)/ABORTS

COMPARE ALTERNATIVES FOR LWP PROGRAM

NBCC	ABILITY OF THE SYSTEM TO WITHSTAND CHEMICAL CONTAM AND DECON
NIGHT	IS THE SYSTEM SUITABLE AND COMPATIBLE WITH NIGHT/LOW VIS OPNS
NOISE	MAXIMUM NOISE LEVEL OF SYSTEM (EXPOSURE OF SOLDIERS)
OPERATE	ABILITY OF THE SYSTEM TO SUSTAIN MINIMUM OF 100 HOURS OPERATION
PERSONNL	OPERATOR (CREW) AND MAINTAINER REQUIREMENTS OR LIMITATIONS
POWER	POWER REQTS FOR THE SYSTEM/COMPATIBILITY WITH STD GENERATORS
PROFILE	CAN SYSTEM BE OPERATED AND MAINTAIN BY 5-95 PERCENTILE TROOPS
PROTECT	ABILITY OF SYSTEM TO WITHSTAND EFFECTS OF DUST, SAND, RAIN, SNOW
PURIFY	ABILITY OF THE ITEM TO PURIFY WATER (I.E. SOURCE, QUALITY, CAPAC)
QUALITY	ABILITY OF THE SYSTEM TO MEET QUALITY STDS OF TB MED 577/TRI-SERV
REPAIRER	CAN THE SYSTEM BE REPAIRED BY THE 63J QM & CHEM EQUIP REPAIRER
RUGGED	ABILITY OF THE SYSTEM TO SURVIVE TRANSPORT, LOAD, OPS IN ADVERSE
SAFETY	IS THE SYSTEM SAFE TO OPERATE AND MAINTAIN, NO HAZARDS
SET-UP	EFFORT REQUIRED TO SET UP SYSTEM FOR PRODUCTION (IN MAN-HOURS)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
SIZE	DIMENSIONS OF THE SYSTEM IN INCHES
STD GENS	IS THE SYSTEM COMPATIBLE WITH STANDARD 120/240V, 120/208V, 60HZ
STORE	ABILITY OF THE SYSTEM TO STORE POTABLE WATER (IN GALLONS)
SUPPLY	SELECTED SUPPLY CRITERIA FOR THE SYSTEM
SUPPORT	CAN THE SYSTEM BE SUPPORTED BY THE STANDARD ARMY SUPPLY SYSTEM?
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
TEARDOWN	EFFORT REQD TO TEARDOWN THE SYSTEM/PREP FOR MOVE (IN MAN-HOURS)
TOTAL WT	TOTAL WEIGHT OF ALTERNATIVE IN POUNDS (IN TRANSPORT CONFIGURATION)

COMPARE ALTERNATIVES FOR LWP PROGRAM

TRAILER	COMPATIBILITY OF THE SYSTEM WITH A 1.5 TON TRAILER
TRAINING	EASE OF TRAINING AND INTEGRATION INTO CURRENT MOS/SKILL COURSES
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
TRUCK 5T	COMPATIBILITY OF THE SYSTEM WITH THE STANDARD 5 TON CARGO TRUCK
UH-1	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY UH-1 IROQUOIS HELO
UH-60	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY UH-60 BLACKHAWK HELO
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
WEIGHT	WEIGHT OF THE TOTAL SYSTEM AND HEAVIEST INDIVIDUAL MODULE
WIDTH	WIDTH OF SYSTEM IN INCHES (IN TRANSPORT CONFIGURATION)

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 0

Compare the relative IMPORTANCE with respect to: GOAL <

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	SYS PERF	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LOGREADI
2	SYS PERF	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CRITICAL
3	LOGREADI	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CRITICAL

Abbreviation	Definition

SYS PERF	.751	<div style="background-color: black; height: 15px; width: 100%;"></div>
LOGREADI	.178	<div style="background-color: black; height: 15px; width: 40%;"></div>
CRITICAL	.070	<div style="background-color: black; height: 15px; width: 15%;"></div>

Inconsistency Ratio =0.03

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 10000

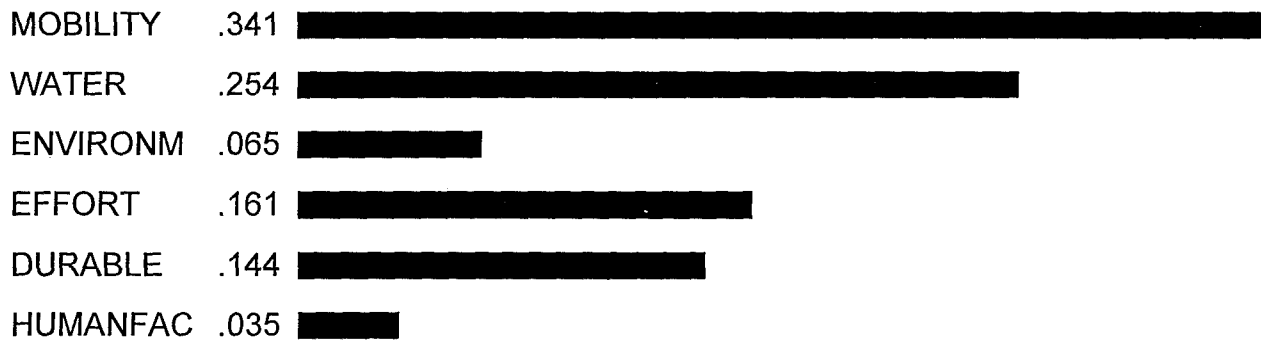
Compare the relative IMPORTANCE with respect to: SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	MOBILITY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	WATER
2	MOBILITY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	ENVIRONM
3	MOBILITY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EFFORT
4	MOBILITY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DURABLE
5	MOBILITY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HUMANFAC
6	WATER	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	ENVIRONM
7	WATER	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EFFORT
8	WATER	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DURABLE
9	WATER	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HUMANFAC
10	ENVIRONM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EFFORT
11	ENVIRONM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DURABLE
12	ENVIRONM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HUMANFAC
13	EFFORT	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DURABLE
14	EFFORT	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HUMANFAC
15	DURABLE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HUMANFAC

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
MOBILITY	REQUIRED SYSTEMS PERFORMANCE CRITERIA
WATER	LOGISTICS AND READINESS CRITERIA
ENVIRONM	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
EFFORT	
DURABLE	
HUMANFAC	

COMPARE ALTERNATIVES FOR LWP PROGRAM



Inconsistency Ratio = 0.01

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 11000

Compare the relative IMPORTANCE with respect to: MOBILITY < SYS PERF < GOAL

1	SIZE		WEIGHT
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Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
SIZE	DIMENSIONS OF THE SYSTEM IN INCHES
WEIGHT	WEIGHT OF THE TOTAL SYSTEM AND HEAVIEST INDIVIDUAL MODULE

SIZE	.500	
WEIGHT	.500	

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 11100

Compare the relative IMPORTANCE with respect to: SIZE < MOBILITY < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	LENGTH	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	WIDTH
2	LENGTH	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HEIGHT
3	WIDTH	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	HEIGHT

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
SIZE	DIMENSIONS OF THE SYSTEM IN INCHES
LENGTH	REQUIRED SYSTEMS PERFORMANCE CRITERIA
WIDTH	LOGISTICS AND READINESS CRITERIA
HEIGHT	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

LENGTH	.429	<div style="background-color: black; height: 15px; width: 100%;"></div>
WIDTH	.429	<div style="background-color: black; height: 15px; width: 100%;"></div>
HEIGHT	.143	<div style="background-color: black; height: 15px; width: 40%;"></div>

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 11200

Compare the relative IMPORTANCE with respect to: WEIGHT < MOBILITY < SYS PERF < GOAL

1	TOTAL WT		MODULE
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Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WEIGHT	WEIGHT OF THE TOTAL SYSTEM AND HEAVIEST INDIVIDUAL MODULE
TOTAL WT	TOTAL WEIGHT OF ALTERNATIVE IN POUNDS (IN TRANSPORT CONFIGURATION)
MODULE	WEIGHT OF HEAVIEST MODULE OR INDIVIDUAL COMPONENT OF THE SYSTEM

TOTAL WT	.670	
MODULE	.330	

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 12000

Compare the relative IMPORTANCE with respect to: WATER < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	PURIFY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	STORE
2	PURIFY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DISPENSE
3	STORE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DISPENSE

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
PURIFY	REQUIRED SYSTEMS PERFORMANCE CRITERIA
STORE	LOGISTICS AND READINESS CRITERIA
DISPENSE	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

PURIFY	.772	<div style="background-color: black; height: 15px; width: 100%;"></div>
STORE	.173	<div style="background-color: black; height: 15px; width: 100%;"></div>
DISPENSE	.055	<div style="background-color: black; height: 15px; width: 100%;"></div>

Inconsistency Ratio = 0.2

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 12100

Compare the relative IMPORTANCE with respect to: PURIFY < WATER < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	DESIGN	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CAPACITY
2	DESIGN	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	QUALITY
3	CAPACITY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	QUALITY

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
PURIFY	ABILITY OF THE ITEM TO PURIFY WATER (I.E. SOURCE, QUALITY, CAPAC)
DESIGN	REQUIRED SYSTEMS PERFORMANCE CRITERIA
CAPACITY	LOGISTICS AND READINESS CRITERIA
QUALITY	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

DESIGN	.163	<div style="background-color: black; height: 15px; width: 100%;"></div>
CAPACITY	.297	<div style="background-color: black; height: 15px; width: 100%;"></div>
QUALITY	.540	<div style="background-color: black; height: 15px; width: 100%;"></div>

Inconsistency Ratio =0.01

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 13000

Compare the relative IMPORTANCE with respect to: ENVIRONM < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	HOT CLIM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	BASIC
2	HOT CLIM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	COLDCLIM
3	BASIC	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	COLDCLIM

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
HOT CLIM	REQUIRED SYSTEMS PERFORMANCE CRITERIA
BASIC	LOGISTICS AND READINESS CRITERIA
COLDCLIM	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

HOT CLIM	.173	<div style="background-color: black; width: 15%; height: 15px;"></div>
BASIC	.772	<div style="background-color: black; width: 85%; height: 15px;"></div>
COLDCLIM	.055	<div style="background-color: black; width: 5%; height: 15px;"></div>

Inconsistency Ratio =0.2

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 14000

Compare the relative IMPORTANCE with respect to: EFFORT < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	MOVE SYS	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	SET-UP
2	MOVE SYS	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TEARDOWN
3	SET-UP	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TEARDOWN

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
MOVE SYS	REQUIRED SYSTEMS PERFORMANCE CRITERIA
SET-UP	LOGISTICS AND READINESS CRITERIA
TEARDOWN	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

MOVE SYS	.571	<div style="background-color: black; height: 15px; width: 100%;"></div>
SET-UP	.286	<div style="background-color: black; height: 15px; width: 80%;"></div>
TEARDOWN	.143	<div style="background-color: black; height: 15px; width: 40%;"></div>

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 15000

Compare the relative IMPORTANCE with respect to: DURABLE < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	CORROSIN	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	RUGGED
2	CORROSIN	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PROTECT
3	RUGGED	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PROTECT

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
CORROSIN	REQUIRED SYSTEMS PERFORMANCE CRITERIA
RUGGED	LOGISTICS AND READINESS CRITERIA
PROTECT	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

CORROSIN	.163	<div style="background-color: black; height: 15px; width: 100%;"></div>
RUGGED	.540	<div style="background-color: black; height: 15px; width: 100%;"></div>
PROTECT	.297	<div style="background-color: black; height: 15px; width: 100%;"></div>

Inconsistency Ratio =0.01

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 16000

Compare the relative IMPORTANCE with respect to: HUMANFAC < SYS PERF < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	SAFETY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	NOISE
2	SAFETY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	NIGHT
3	SAFETY	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MOPPGEAR
4	NOISE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	NIGHT
5	NOISE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MOPPGEAR
6	NIGHT	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MOPPGEAR

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)
SAFETY	REQUIRED SYSTEMS PERFORMANCE CRITERIA
NOISE	LOGISTICS AND READINESS CRITERIA
NIGHT	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
MOPPGEAR	

SAFETY	.544	<div style="background-color: black; height: 15px; width: 100%;"></div>
NOISE	.292	<div style="background-color: black; height: 15px; width: 70%;"></div>
NIGHT	.107	<div style="background-color: black; height: 15px; width: 30%;"></div>
MOPPGEAR	.057	<div style="background-color: black; height: 15px; width: 15%;"></div>

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

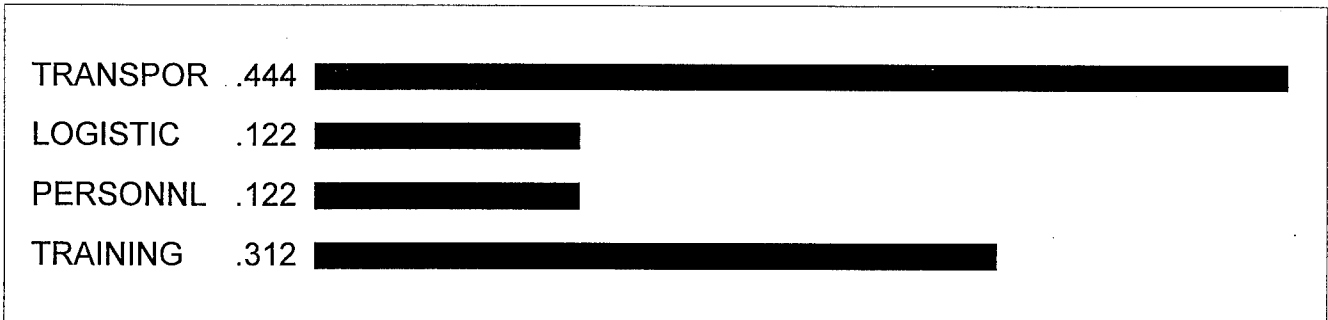
Node: 20000

Compare the relative IMPORTANCE with respect to: LOGREADI < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	TRANSPOR	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LOGISTIC
2	TRANSPOR	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PERSONNL
3	TRANSPOR	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TRAINING
4	LOGISTIC	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PERSONNL
5	LOGISTIC	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TRAINING
6	PERSONNL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TRAINING

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
TRANSPOR	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGISTIC	LOGISTICS AND READINESS CRITERIA
PERSONNL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
TRAINING	



Inconsistency Ratio =0.02



COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 21000

Compare the relative IMPORTANCE with respect to: TRANSPOR < LOGREADI < GOAL

1	AIRCRAFT	GROUND
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Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
AIRCRAFT	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED AIRCRAFT
GROUND	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED GROUND ASSETS

AIRCRAFT	.400	
GROUND	.600	

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 21100

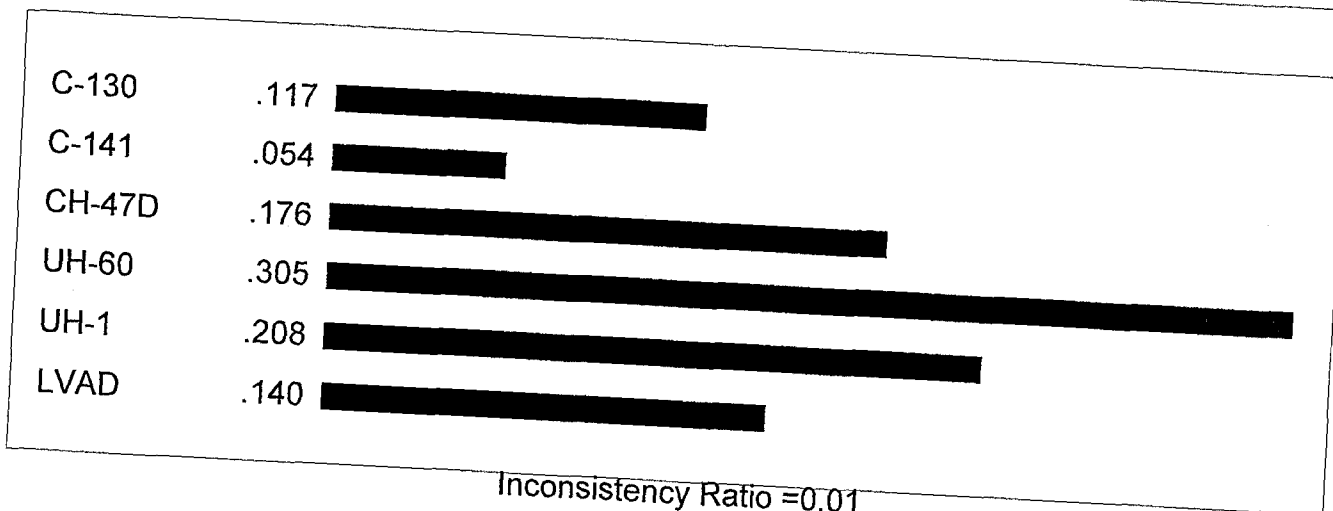
Compare the relative IMPORTANCE with respect to: AIRCRAFT < TRANSPOR <
LOGREADI < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	C-130	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	C-141
2	C-130	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CH-47D
3	C-130	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-60
4	C-130	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-1
5	C-130	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LVAD
6	C-141	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CH-47D
7	C-141	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-60
8	C-141	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-1
9	C-141	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LVAD
10	CH-47D	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-60
11	CH-47D	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-1
12	CH-47D	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LVAD
13	UH-60	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	UH-1
14	UH-60	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LVAD
15	UH-1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	LVAD

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
AIRCRAFT	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED AIRCRAFT
C-130	REQUIRED SYSTEMS PERFORMANCE CRITERIA
C-141	LOGISTICS AND READINESS CRITERIA
CH-47D	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
UH-60	
UH-1	
LVAD	

COMPARE ALTERNATIVES FOR LWP PROGRAM



COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 21200

Compare the relative IMPORTANCE with respect to: GROUND < TRANSPOR < LOGREADI
< GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	HMMWV	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TRUCK 5T
2	HMMWV	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TRAILER
3	HMMWV	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	FLATRACK
4	TRUCK 5T	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	TRAILER
5	TRUCK 5T	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	FLATRACK
6	TRAILER	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	FLATRACK

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
GROUND	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED GROUND ASSETS
HMMWV	REQUIRED SYSTEMS PERFORMANCE CRITERIA
TRUCK 5T	LOGISTICS AND READINESS CRITERIA
TRAILER	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
FLATRACK	

HMMWV	.507	<div style="background-color: black; height: 15px; width: 100%;"></div>
TRUCK 5T	.280	<div style="background-color: black; height: 15px; width: 80%;"></div>
TRAILER	.157	<div style="background-color: black; height: 15px; width: 60%;"></div>
FLATRACK	.055	<div style="background-color: black; height: 15px; width: 20%;"></div>

Inconsistency Ratio = 0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 22000

Compare the relative IMPORTANCE with respect to: LOGISTIC < LOGREADI < GOAL

1	MAINTAIN	SUPPLY
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Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
MAINTAIN	SELECTED MAINTENANCE CRITERIA OF THE SYSTEM
SUPPLY	SELECTED SUPPLY CRITERIA FOR THE SYSTEM

MAINTAIN	.670	
SUPPLY	.330	

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 22100

Compare the relative IMPORTANCE with respect to: MAINTAIN < LOGISTIC < LOGREADI < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	OPERATE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MTBOMF
2	OPERATE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MT RATIO
3	OPERATE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	FIX/REPR
4	MTBOMF	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MT RATIO
5	MTBOMF	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	FIX/REPR
6	MT RATIO	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	FIX/REPR

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
MAINTAIN	SELECTED MAINTENANCE CRITERIA OF THE SYSTEM
OPERATE	REQUIRED SYSTEMS PERFORMANCE CRITERIA
MTBOMF	LOGISTICS AND READINESS CRITERIA
MT RATIO	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
FIX/REPR	

OPERATE	.503	<div style="background-color: black; height: 15px; width: 100%;"></div>
MTBOMF	.290	<div style="background-color: black; height: 15px; width: 80%;"></div>
MT RATIO	.155	<div style="background-color: black; height: 15px; width: 50%;"></div>
FIX/REPR	.052	<div style="background-color: black; height: 15px; width: 20%;"></div>

Inconsistency Ratio = 0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 22200

Compare the relative IMPORTANCE with respect to: SUPPLY < LOGISTIC < LOGREADI < GOAL

1	SUPPORT		DAYSSUPP
---	---------	--	----------

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
SUPPLY	SELECTED SUPPLY CRITERIA FOR THE SYSTEM
SUPPORT	CAN THE SYSTEM BE SUPPORTED BY THE STANDARD ARMY SUPPLY SYSTEM?
DAYSSUPP	DAYS OF SUPPLY (DOS) OVERPACKED TO MEET 30 DAY REQUIREMENT

SUPPORT	.670	
DAYSSUPP	.330	

Inconsistency Ratio = 0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 23000

Compare the relative IMPORTANCE with respect to: PERSONNL < LOGREADI < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	CREW	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	MOS
2	CREW	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	REPAIRER
3	CREW	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PROFILE
4	MOS	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	REPAIRER
5	MOS	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PROFILE
6	REPAIRER	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	PROFILE

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
PERSONNL	OPERATOR (CREW) AND MAINTAINER REQUIREMENTS OR LIMITATIONS
CREW	REQUIRED SYSTEMS PERFORMANCE CRITERIA
MOS	LOGISTICS AND READINESS CRITERIA
REPAIRER	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
PROFILE	

CREW	.290	<div style="background-color: black; height: 15px; width: 95%;"></div>
MOS	.503	<div style="background-color: black; height: 15px; width: 95%;"></div>
REPAIRER	.155	<div style="background-color: black; height: 15px; width: 60%;"></div>
PROFILE	.052	<div style="background-color: black; height: 15px; width: 20%;"></div>

Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

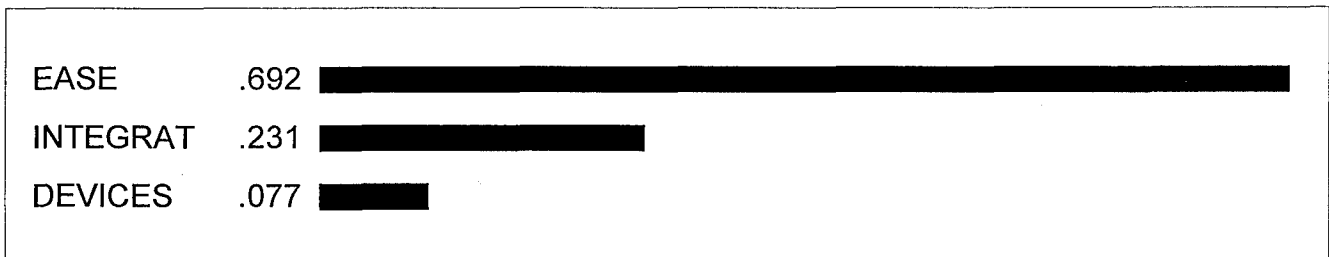
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Compare the relative IMPORTANCE with respect to: TRAINING < LOGREADI < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	EASE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	INTEGRAT
2	EASE	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DEVICES
3	INTEGRAT	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	DEVICES

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
LOGREADI	LOGISTICS AND READINESS CRITERIA
TRAINING	EASE OF TRAINING AND INTEGRATION INTO CURRENT MOS/SKILL COURSES
EASE	REQUIRED SYSTEMS PERFORMANCE CRITERIA
INTEGRAT	LOGISTICS AND READINESS CRITERIA
DEVICES	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD



Inconsistency Ratio =0.0

COMPARE ALTERNATIVES FOR LWP PROGRAM

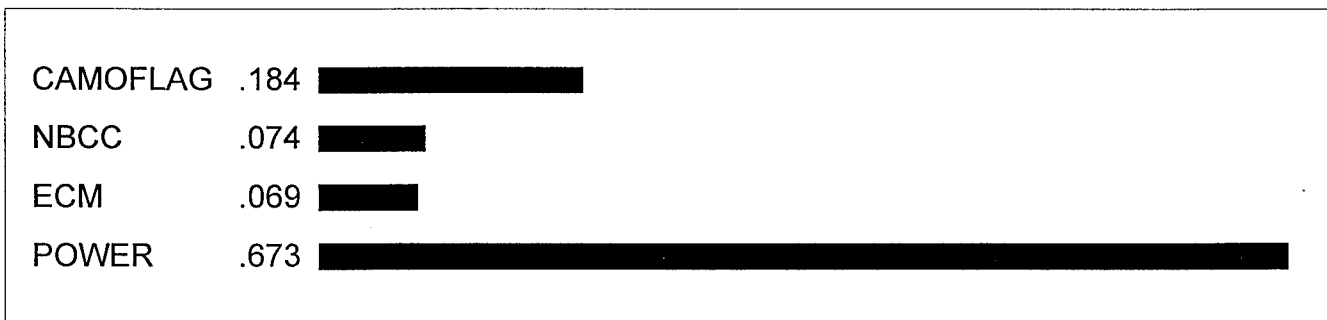
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Compare the relative IMPORTANCE with respect to: CRITICAL < GOAL

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

1	CAMOFLAG	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	NBCC
2	CAMOFLAG	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	ECM
3	CAMOFLAG	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	POWER
4	NBCC	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	ECM
5	NBCC	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	POWER
6	ECM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	POWER

Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
CAMOFLAG	REQUIRED SYSTEMS PERFORMANCE CRITERIA
NBCC	LOGISTICS AND READINESS CRITERIA
ECM	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
POWER	



Inconsistency Ratio =0.02

COMPARE ALTERNATIVES FOR LWP PROGRAM

Node: 34000

Compare the relative IMPORTANCE with respect to: POWER < CRITICAL < GOAL

1	STD GENS		KILOWATT
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Abbreviation	Definition
Goal	COMPARE ALTERNATIVES FOR LWP PROGRAM
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD
POWER	POWER REQTS FOR THE SYSTEM/COMPATIBILITY WITH STD GENERATORS
STD GENS	IS THE SYSTEM COMPATIBLE WITH STANDARD 120/240V, 120/208V, 60HZ
KILOWATT	MINIMUM GENERATOR SIZE REQUIRED TO PROVIDE POWER FOR THE SYSTEM

STD GENS	.670	
KILOWATT	.330	

Inconsistency Ratio =0.0

APPENDIX D

OPERATIONAL SENSITIVITY ANALYSES

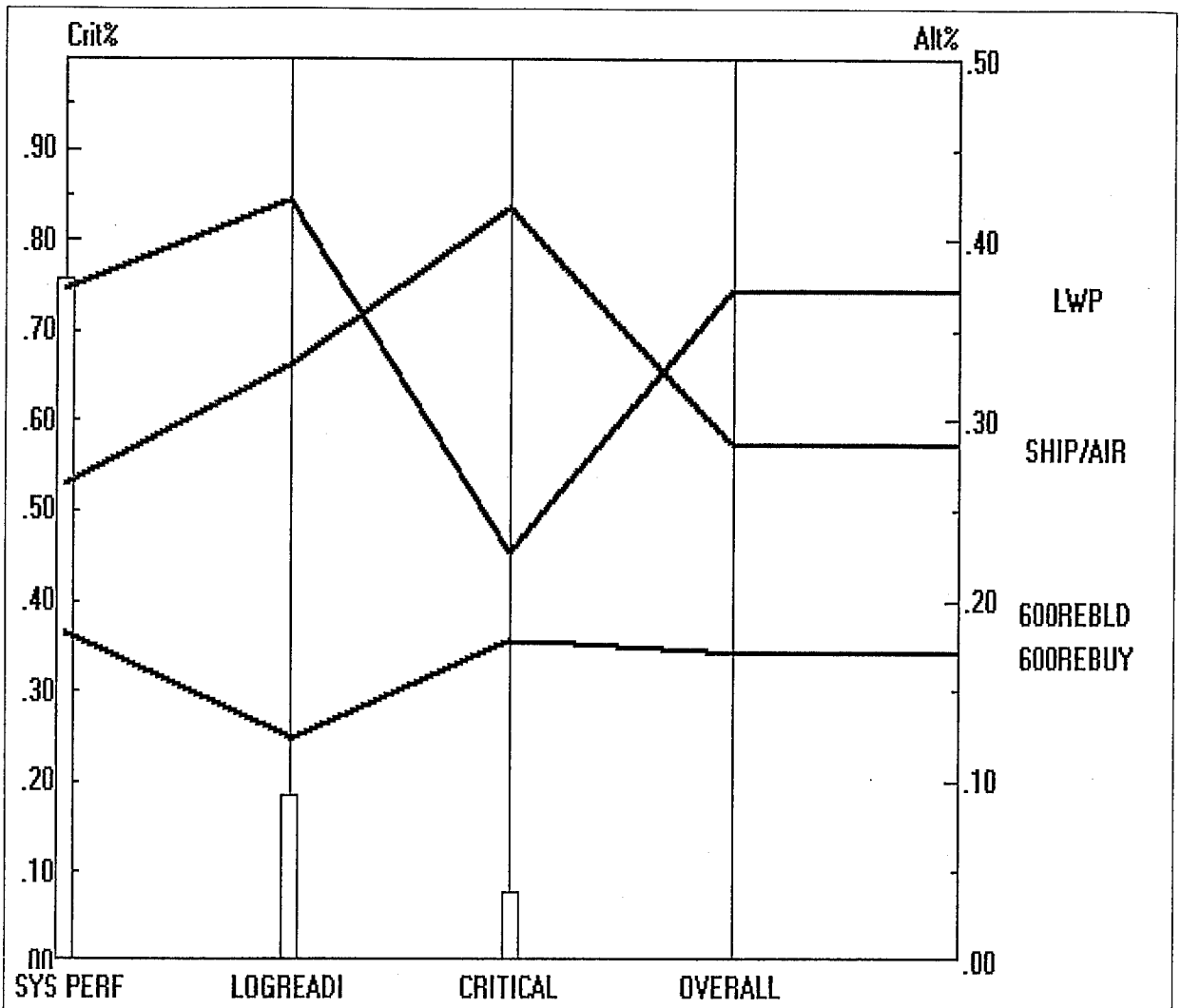
COMPARE ALTERNATIVES FOR LWP PROGRAM

Distributive Mode

LWP	.371	<div style="background-color: black; height: 15px; width: 100%;"></div>
SHIP/AIR	.287	<div style="background-color: black; height: 15px; width: 80%;"></div>
600REBUY	.171	<div style="background-color: black; height: 15px; width: 50%;"></div>
600REBLD	.171	<div style="background-color: black; height: 15px; width: 50%;"></div>

Abbreviation	Definition
LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Performance Sensitivity w.r.t. GOAL for nodes below GOAL



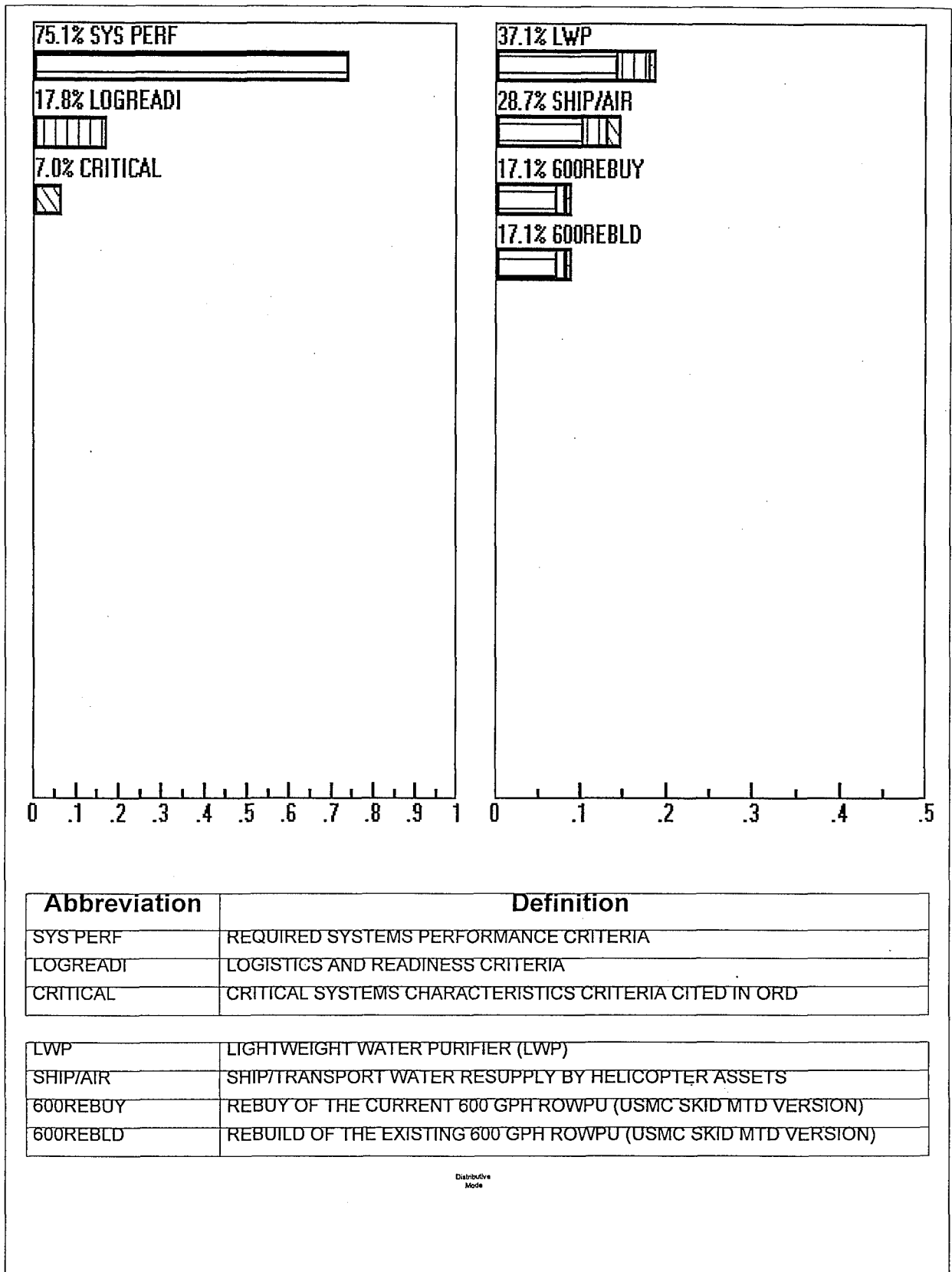
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Dynamic Sensitivity w.r.t. GOAL for nodes below GOAL



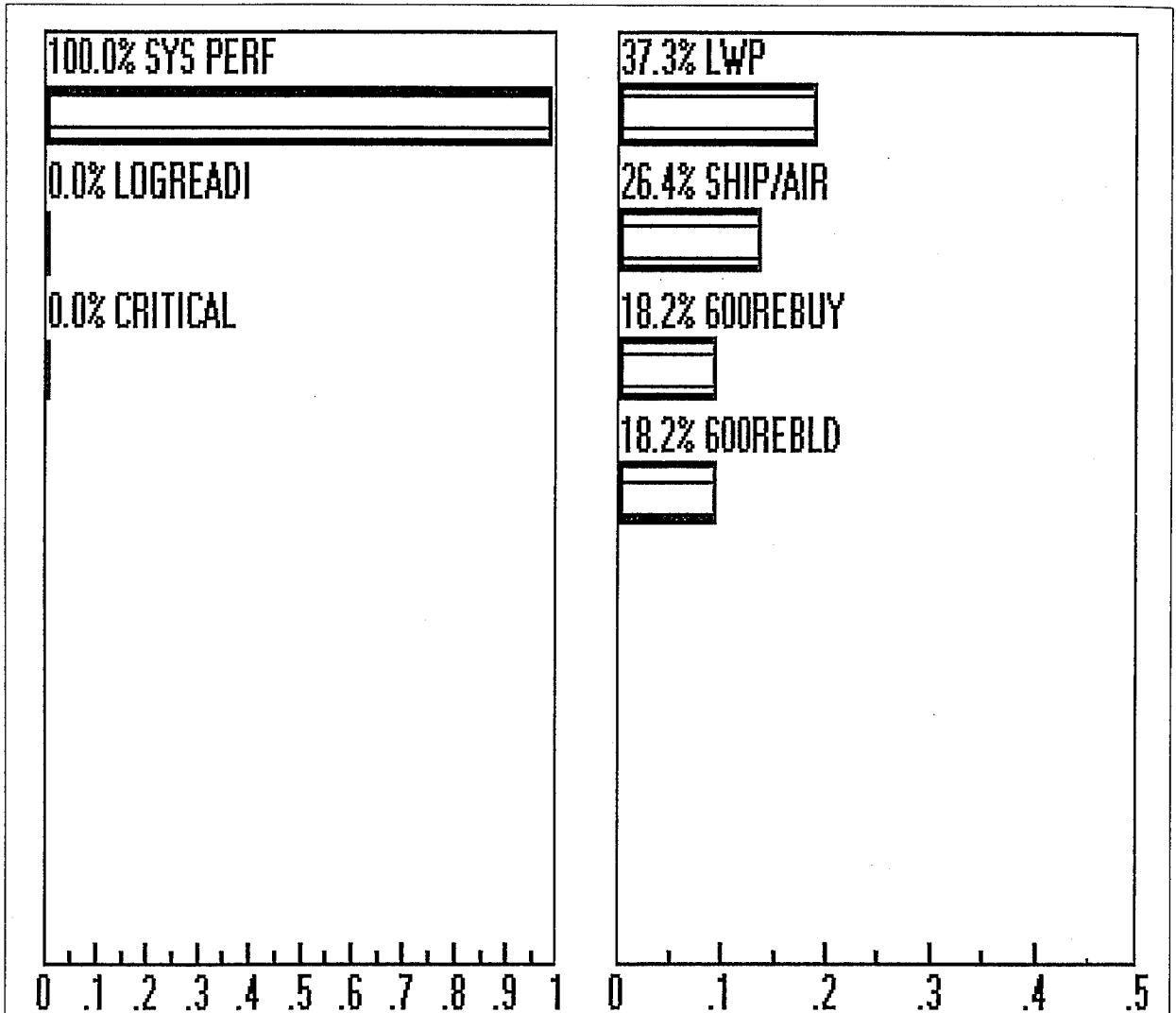
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Dynamic Sensitivity w.r.t. GOAL for nodes below GOAL



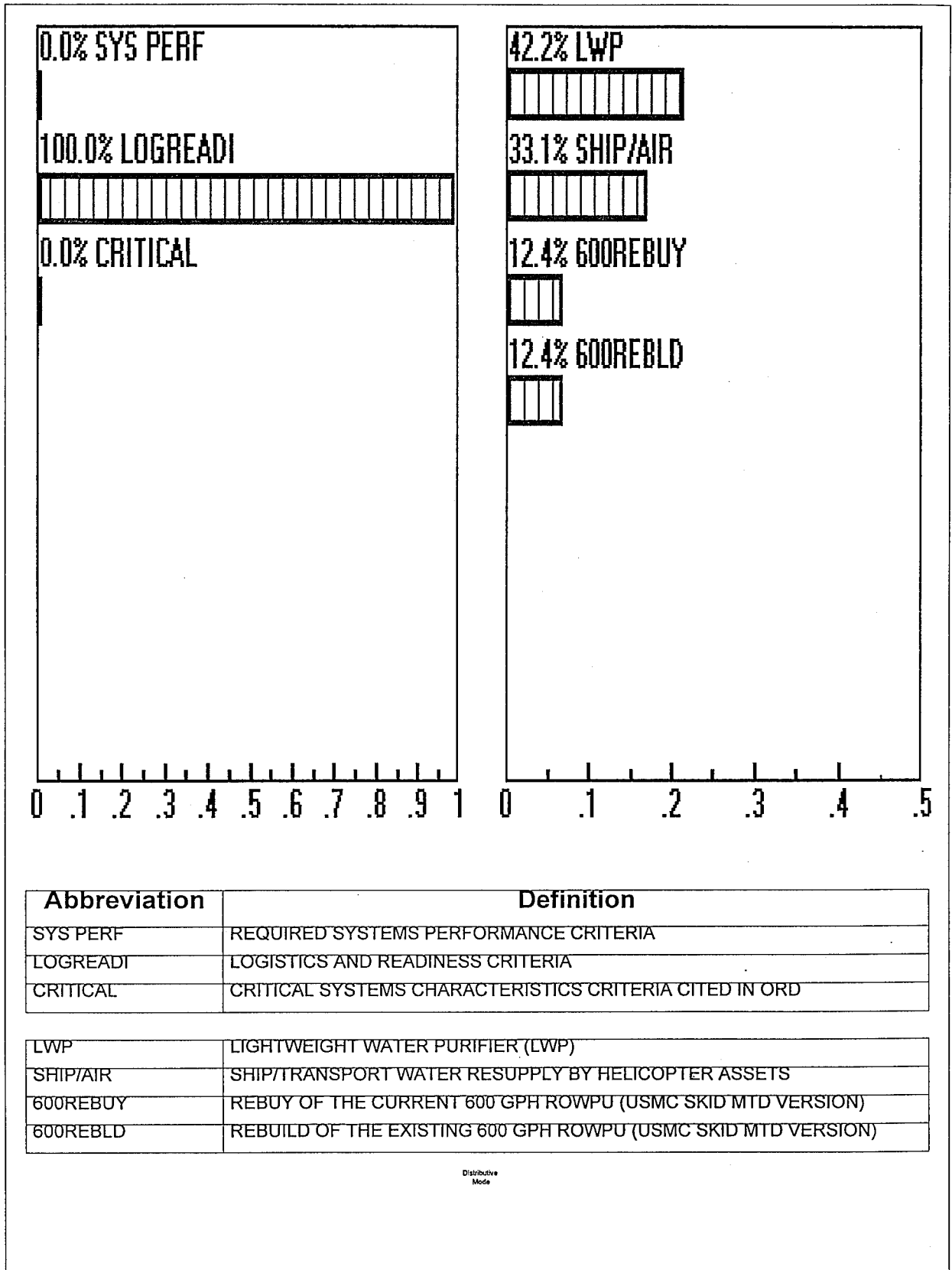
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

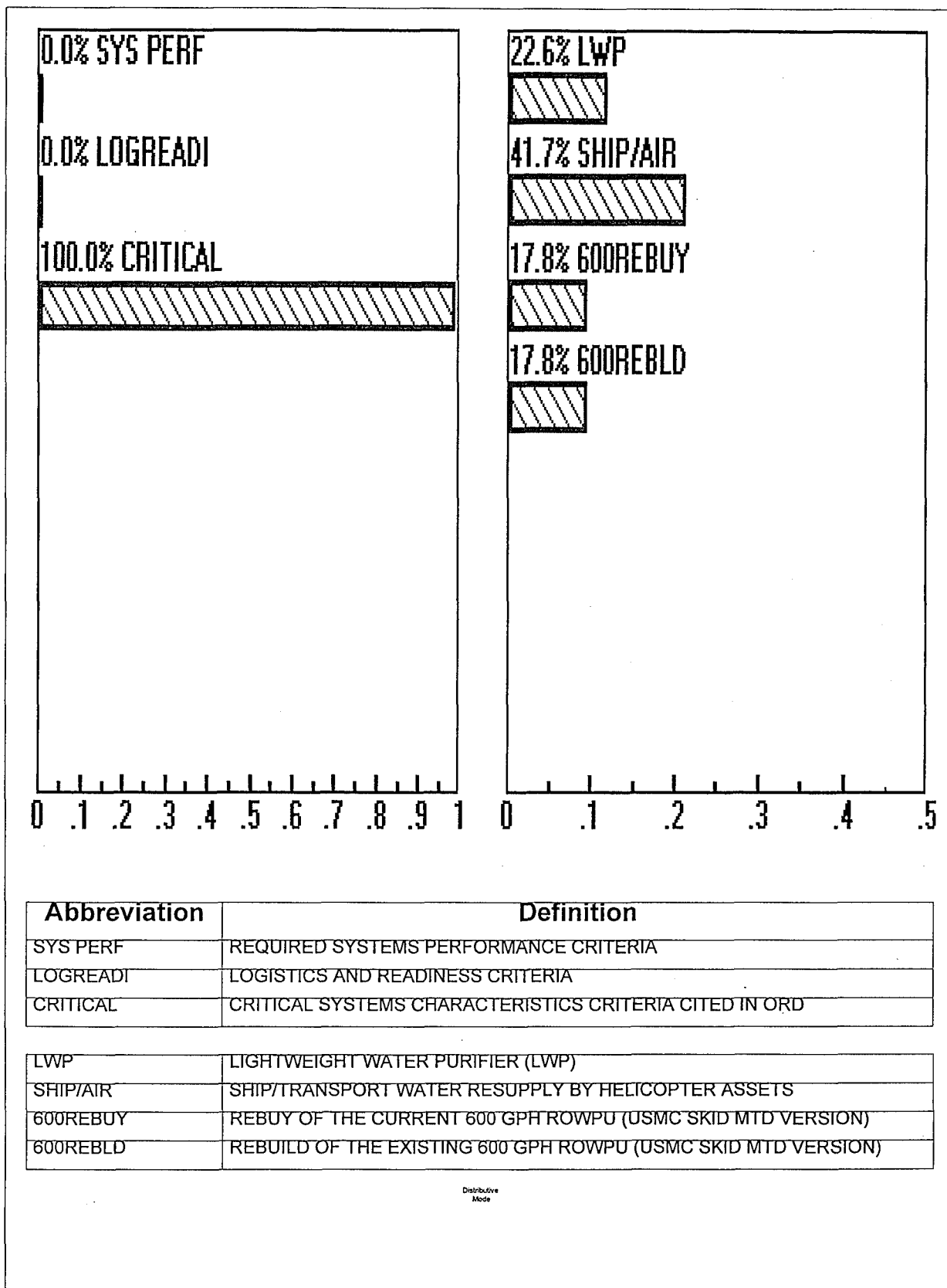
BRTRC

Dynamic Sensitivity w.r.t. GOAL for nodes below GOAL



BRTRC

Dynamic Sensitivity w.r.t. GOAL for nodes below GOAL



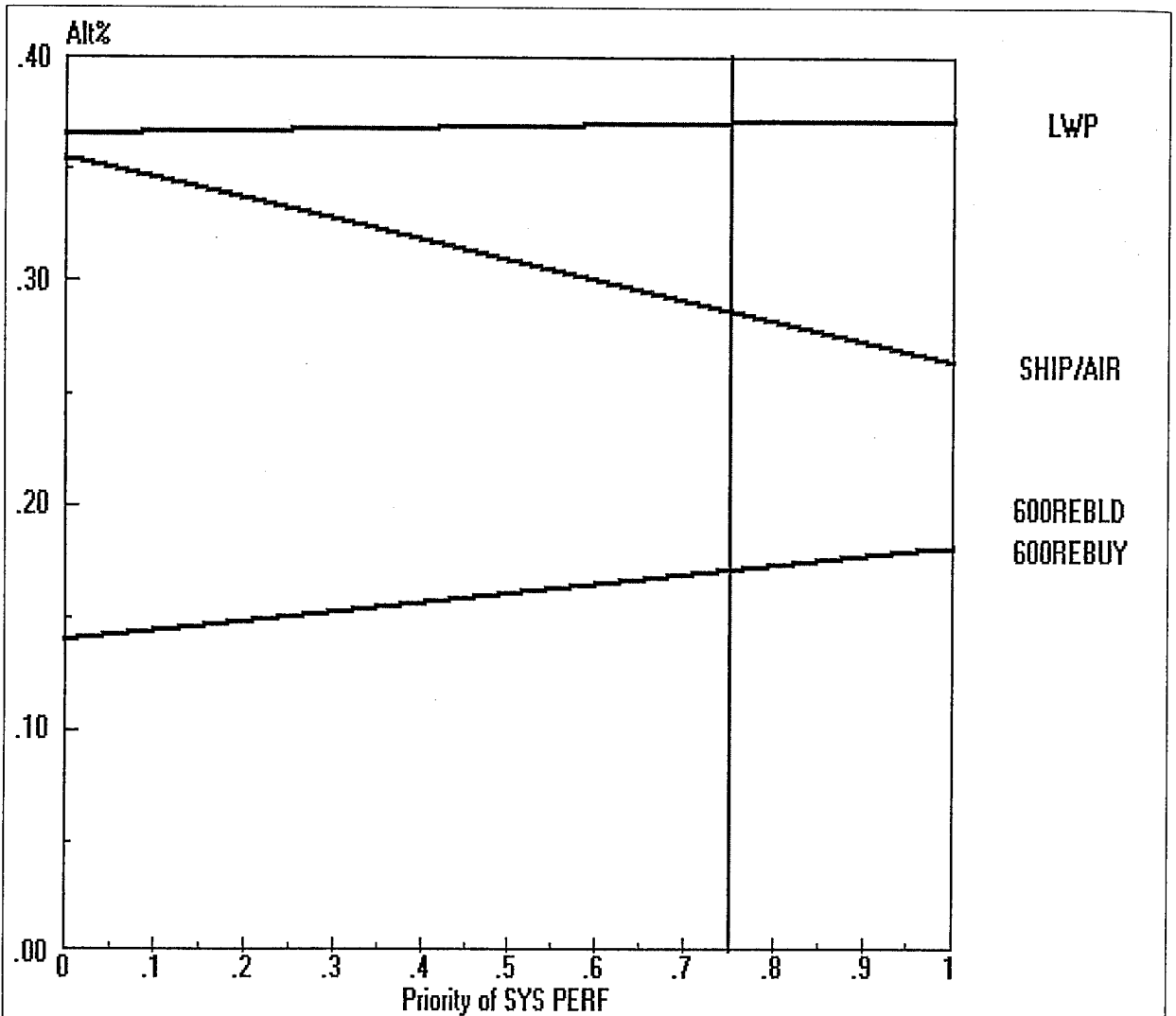
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

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SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. GOAL for nodes below GOAL



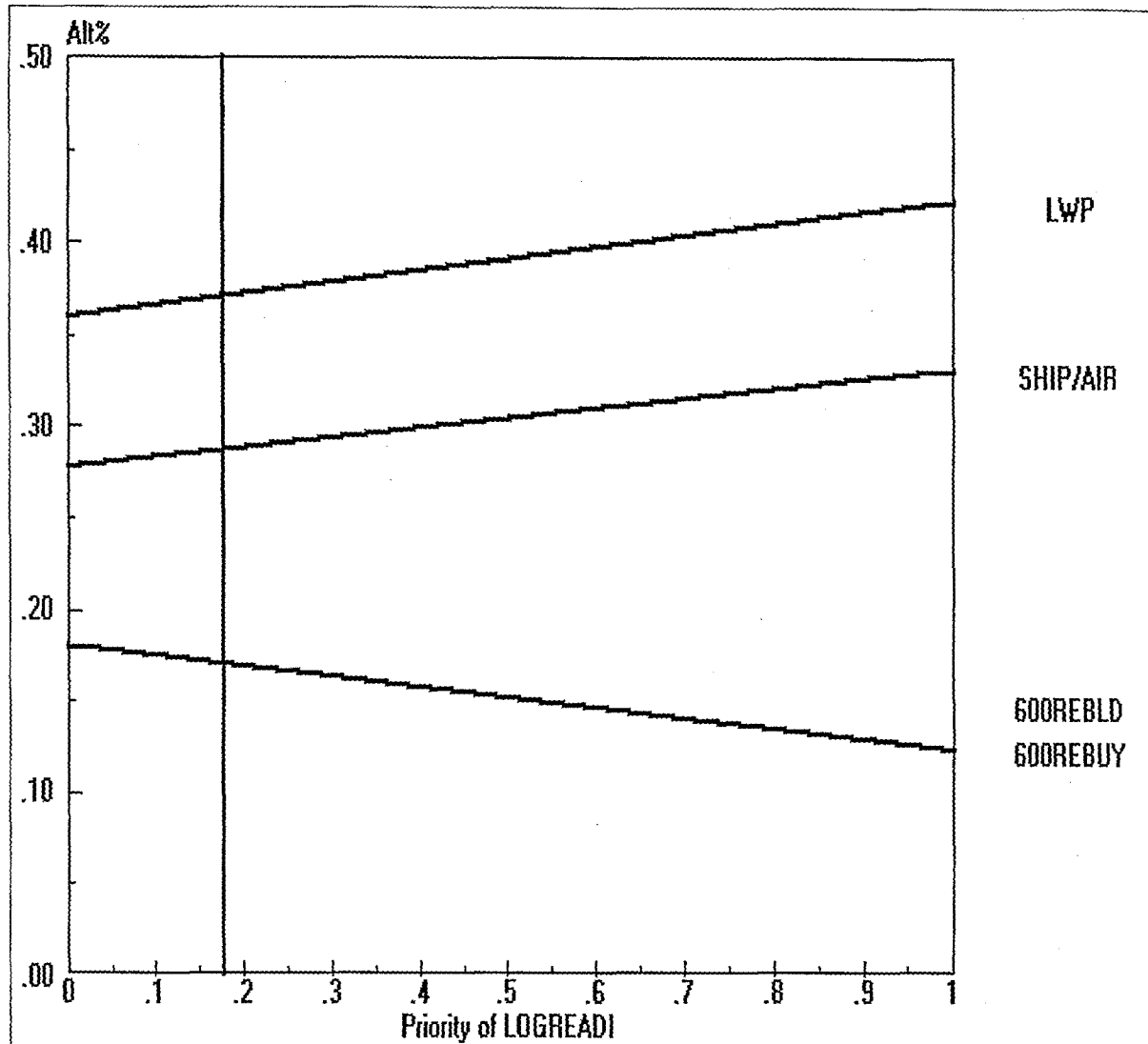
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

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600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. GOAL for nodes below GOAL



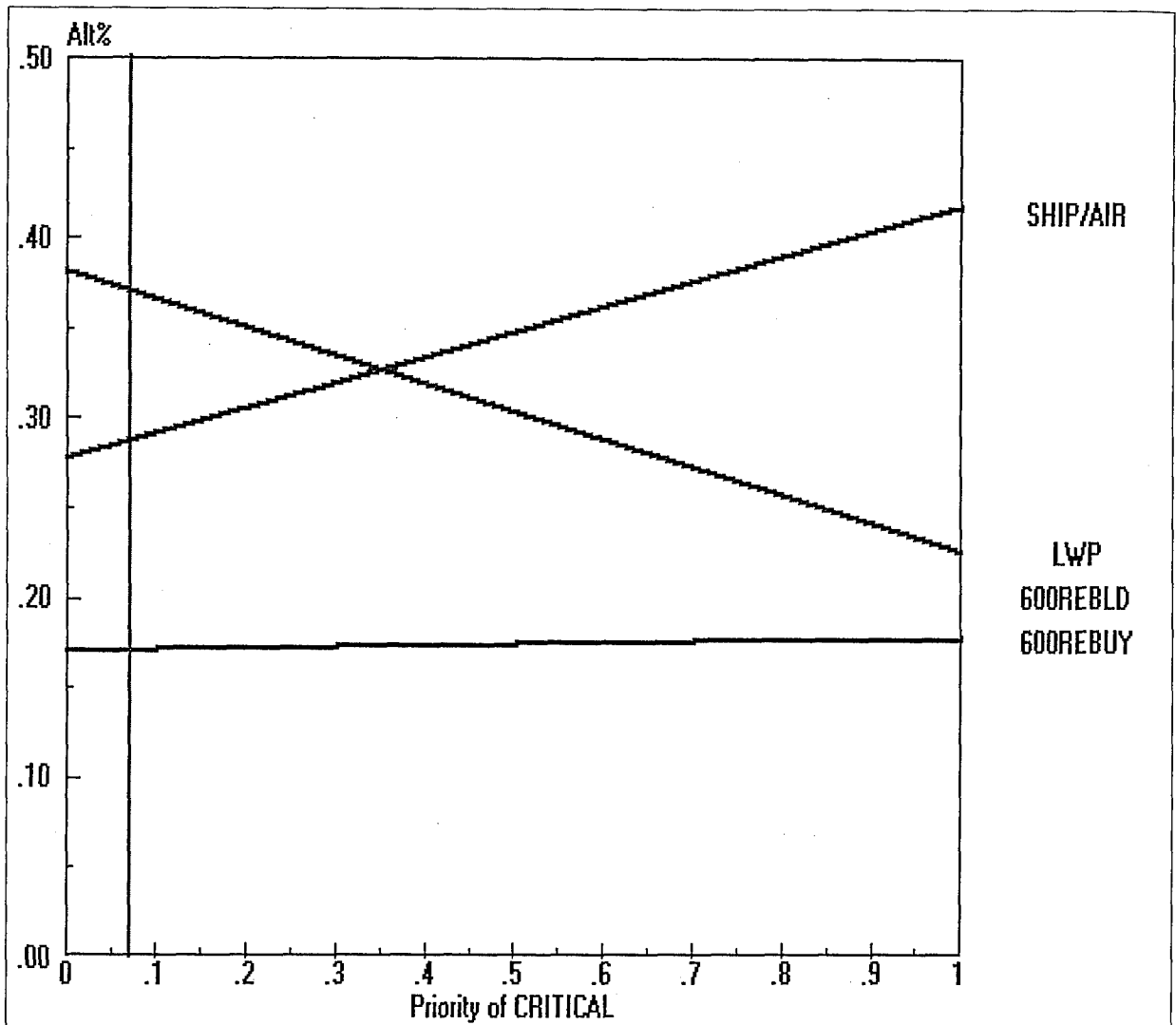
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

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600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. GOAL for nodes below GOAL



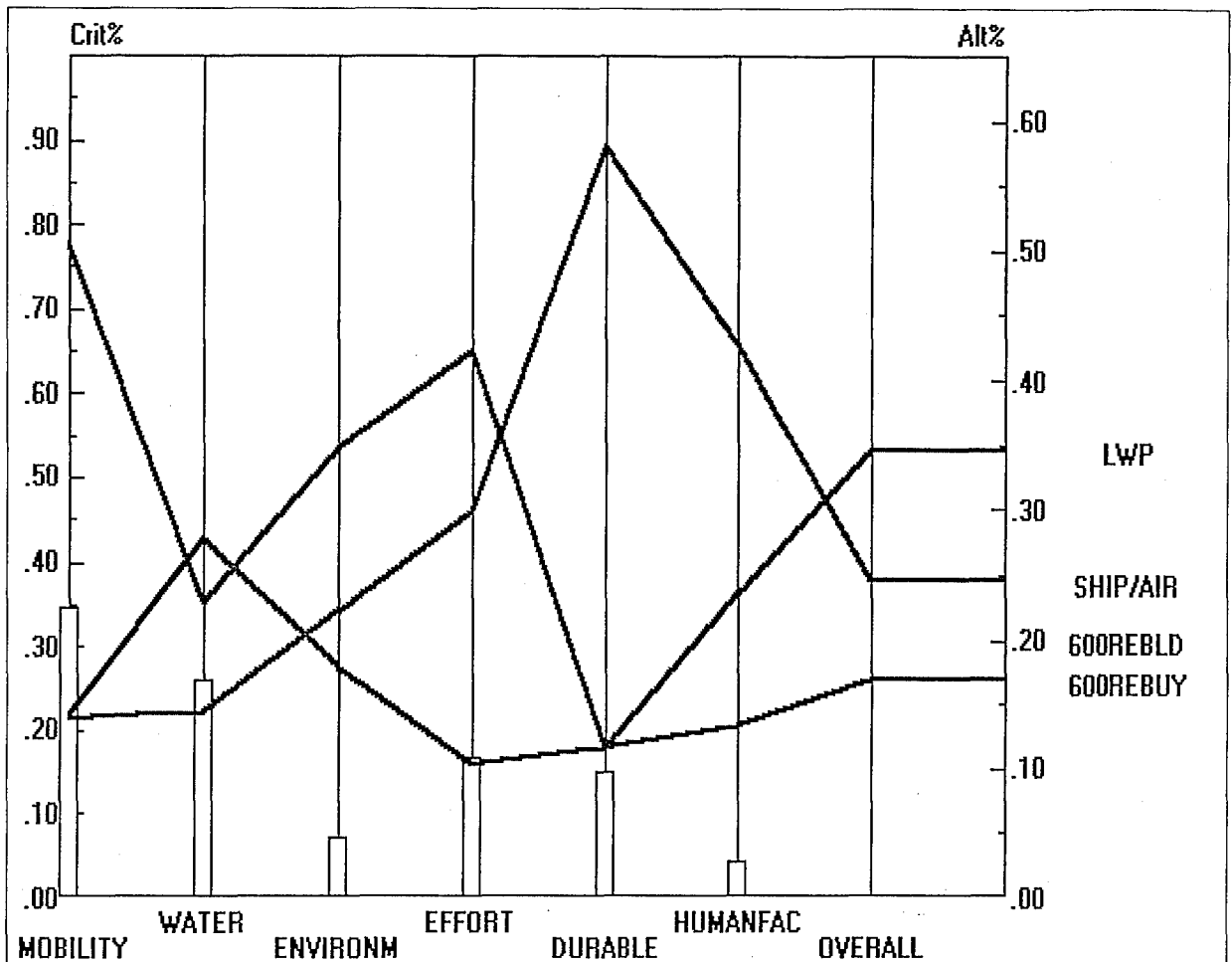
Abbreviation	Definition
SYS PERF	REQUIRED SYSTEMS PERFORMANCE CRITERIA
LOGREADI	LOGISTICS AND READINESS CRITERIA
CRITICAL	CRITICAL SYSTEMS CHARACTERISTICS CRITERIA CITED IN ORD

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
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600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

performance Sensitivity w.r.t. SYS PERF for nodes below SYS PER



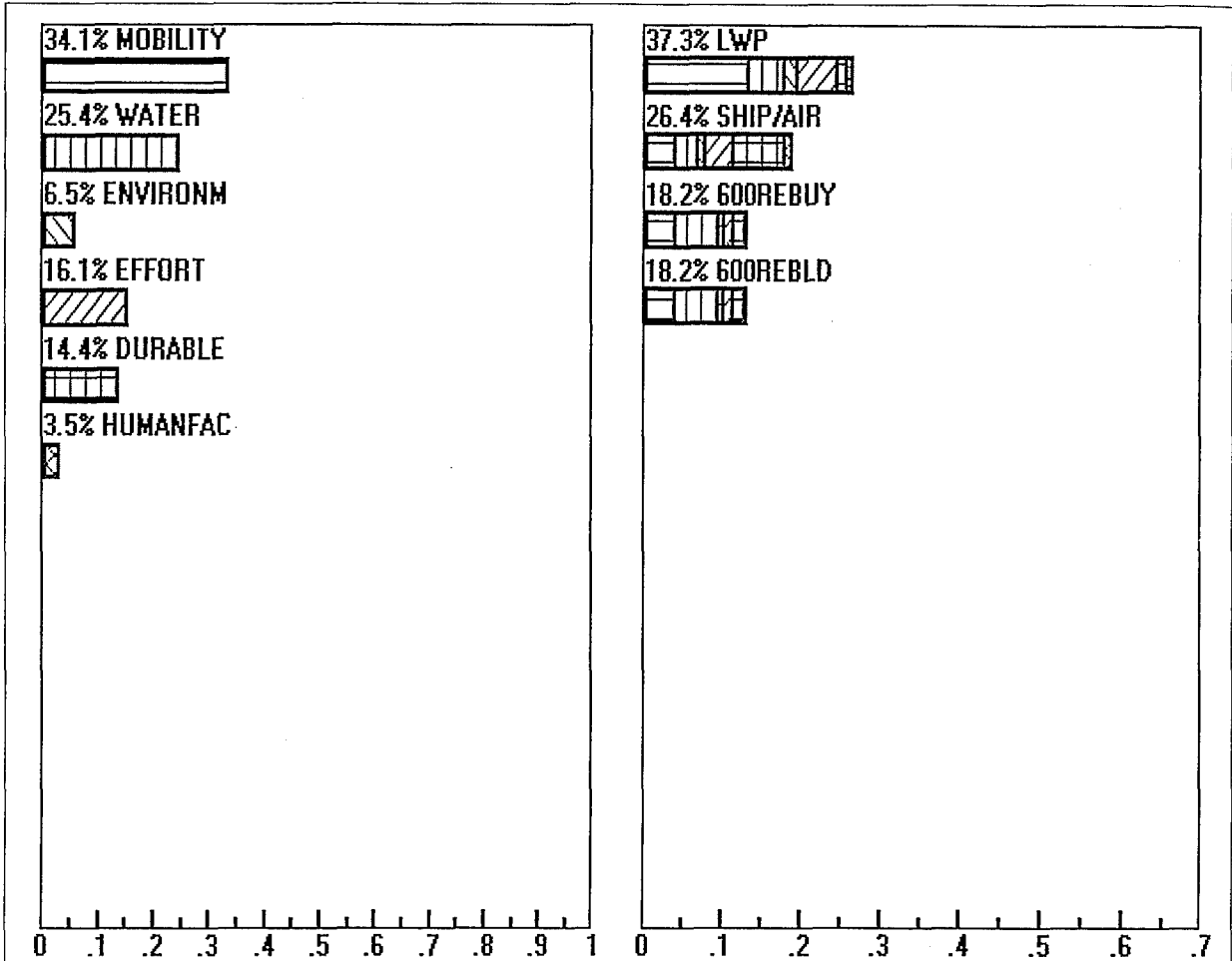
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Dynamic Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



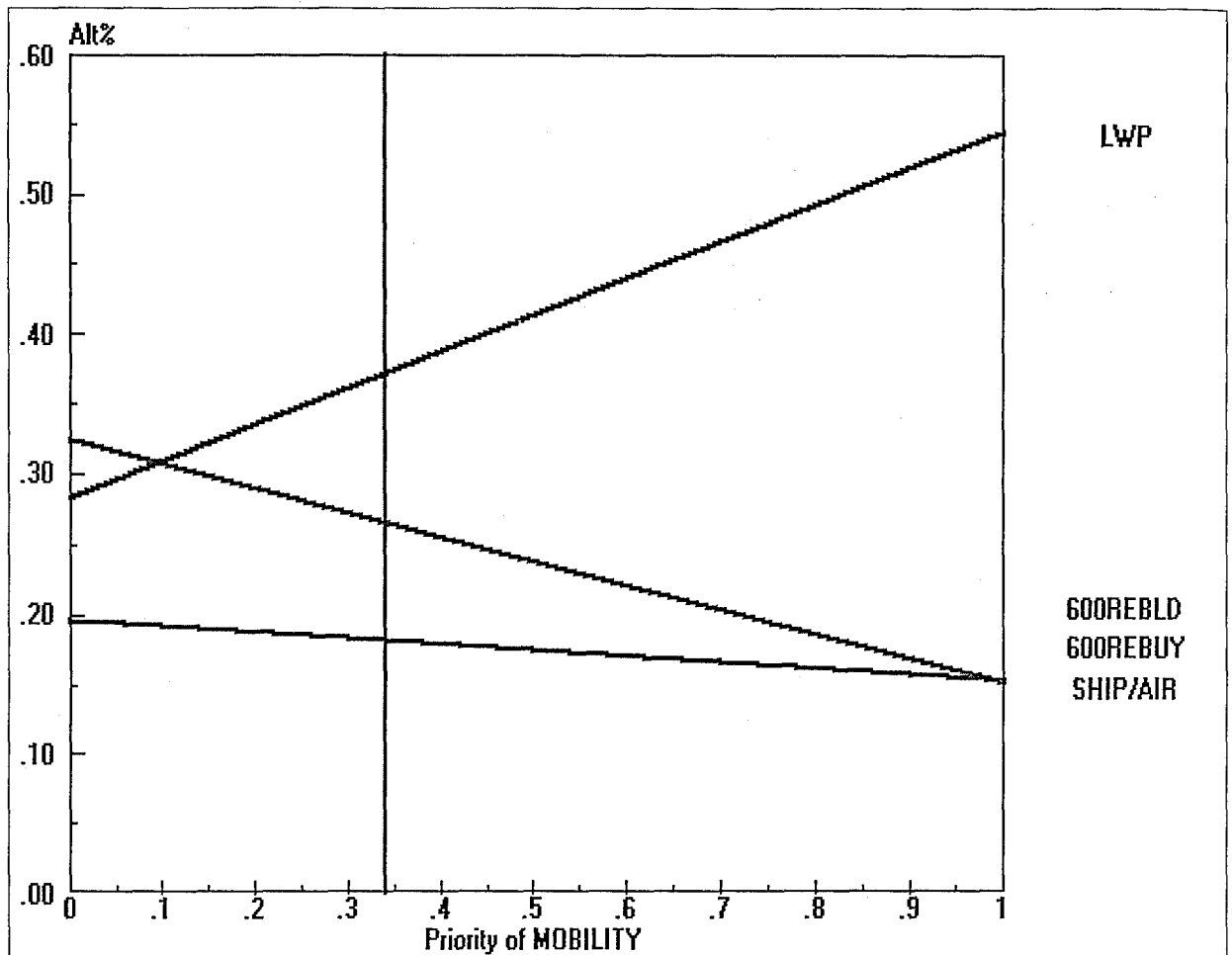
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Gradient Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



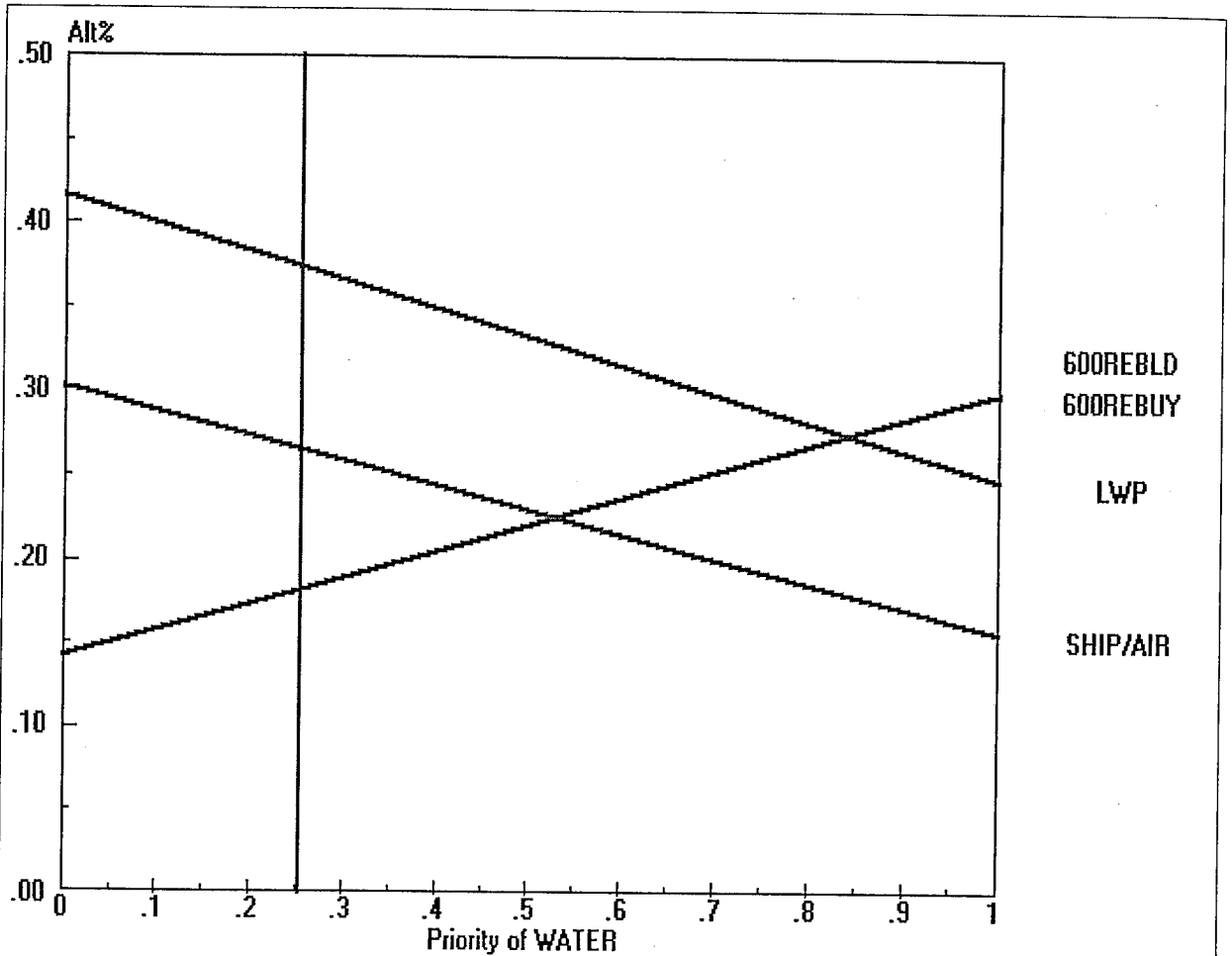
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

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600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distribute
Mode

BRTRC

Gradient Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



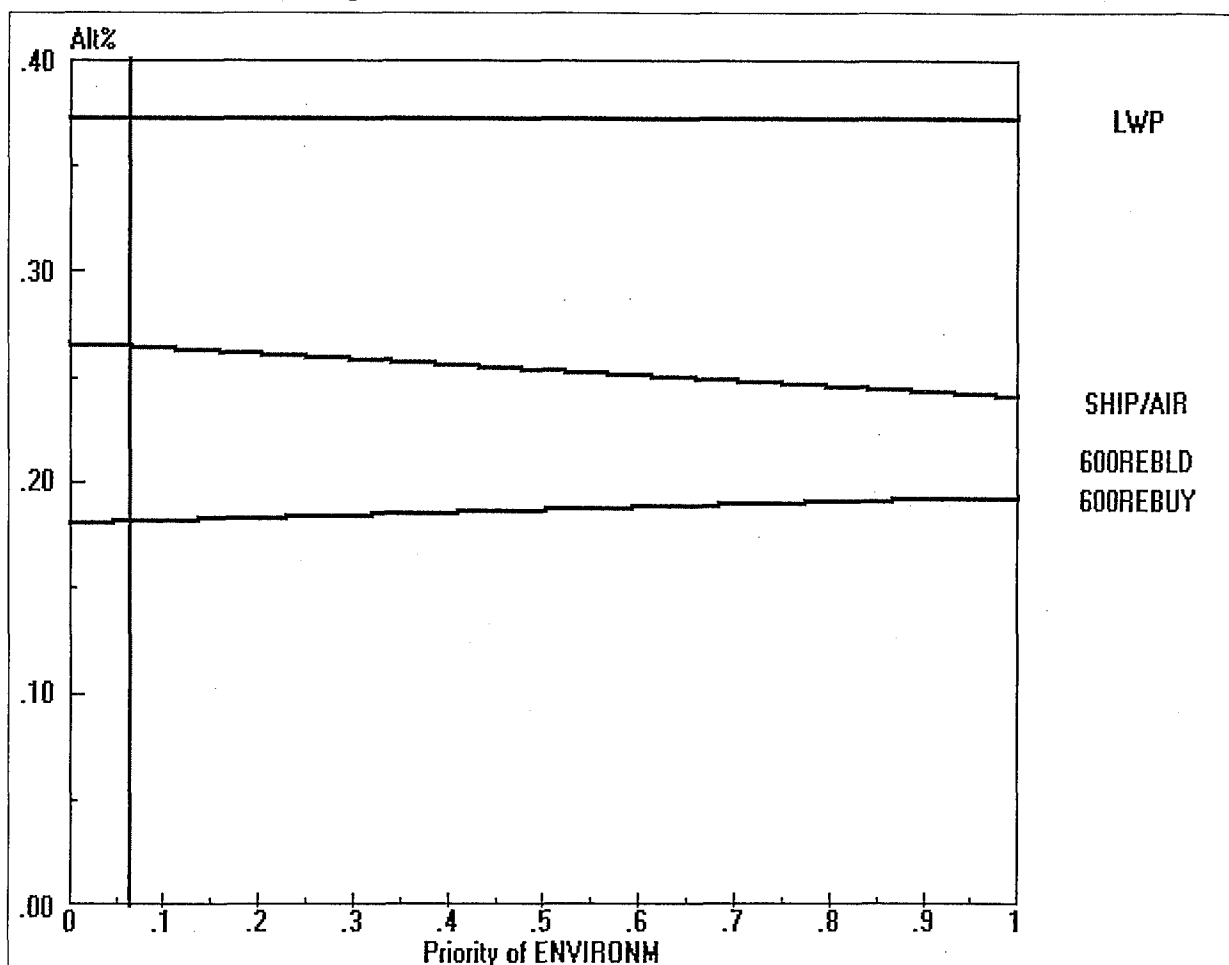
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distribute
Mode

BRTRC

Gradient Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



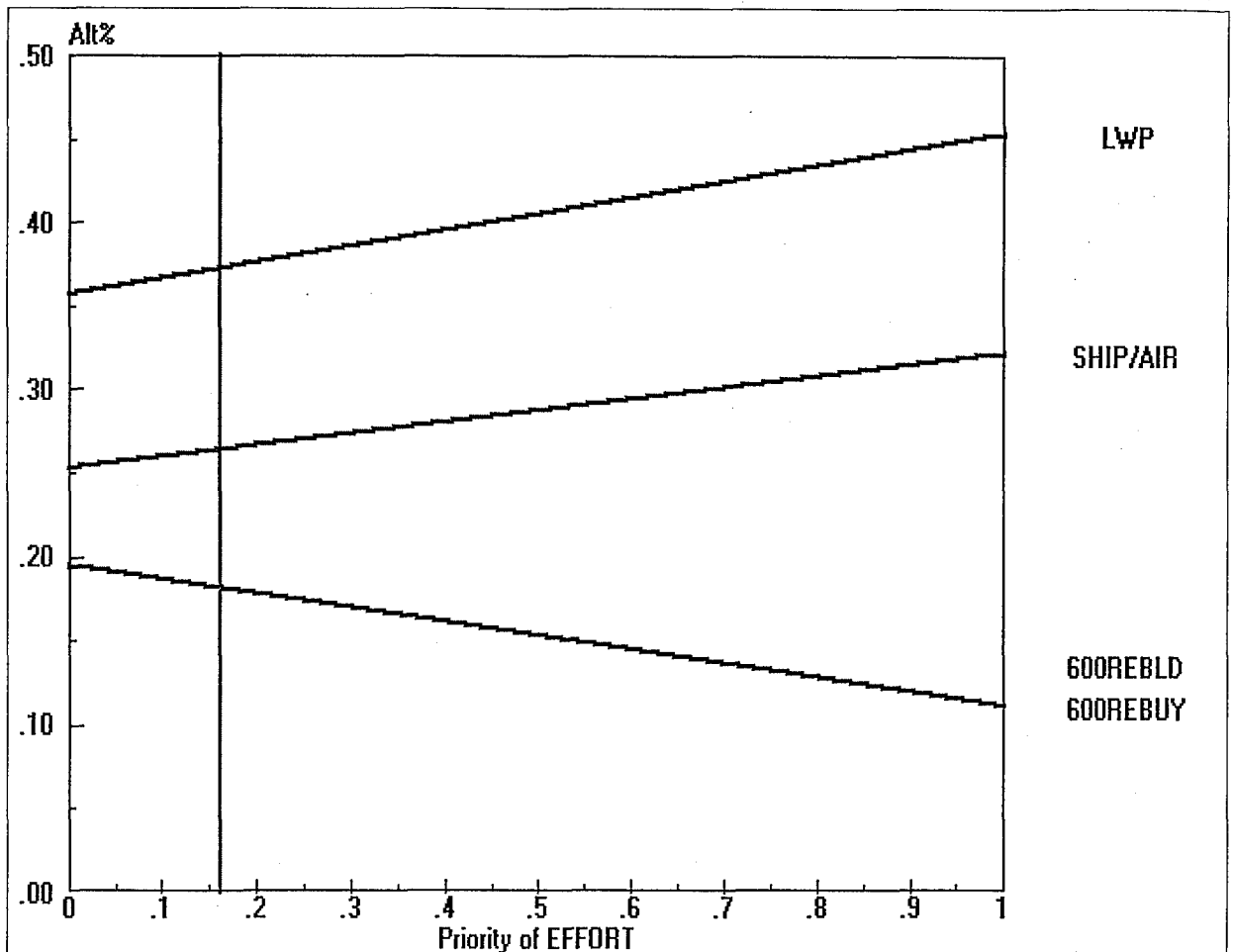
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



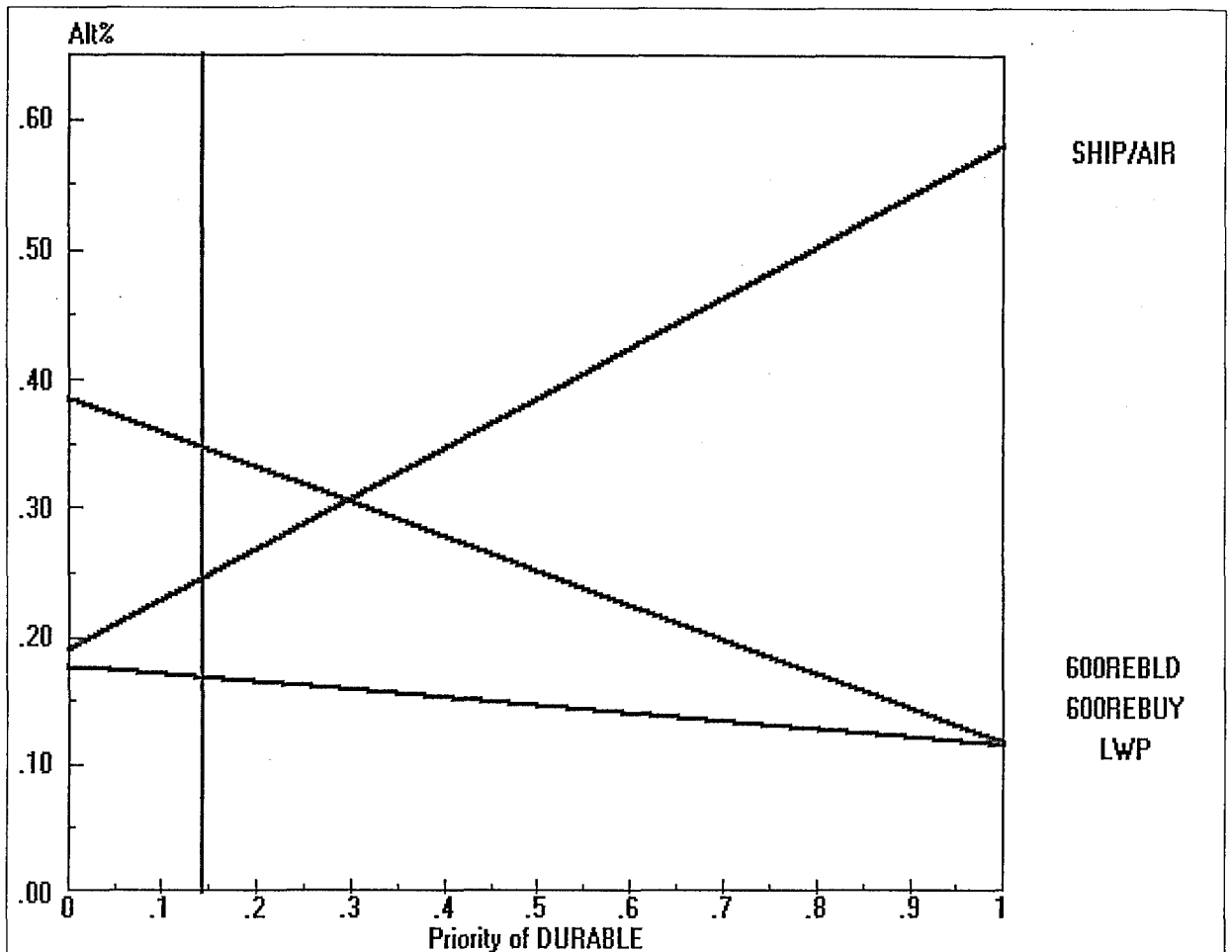
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



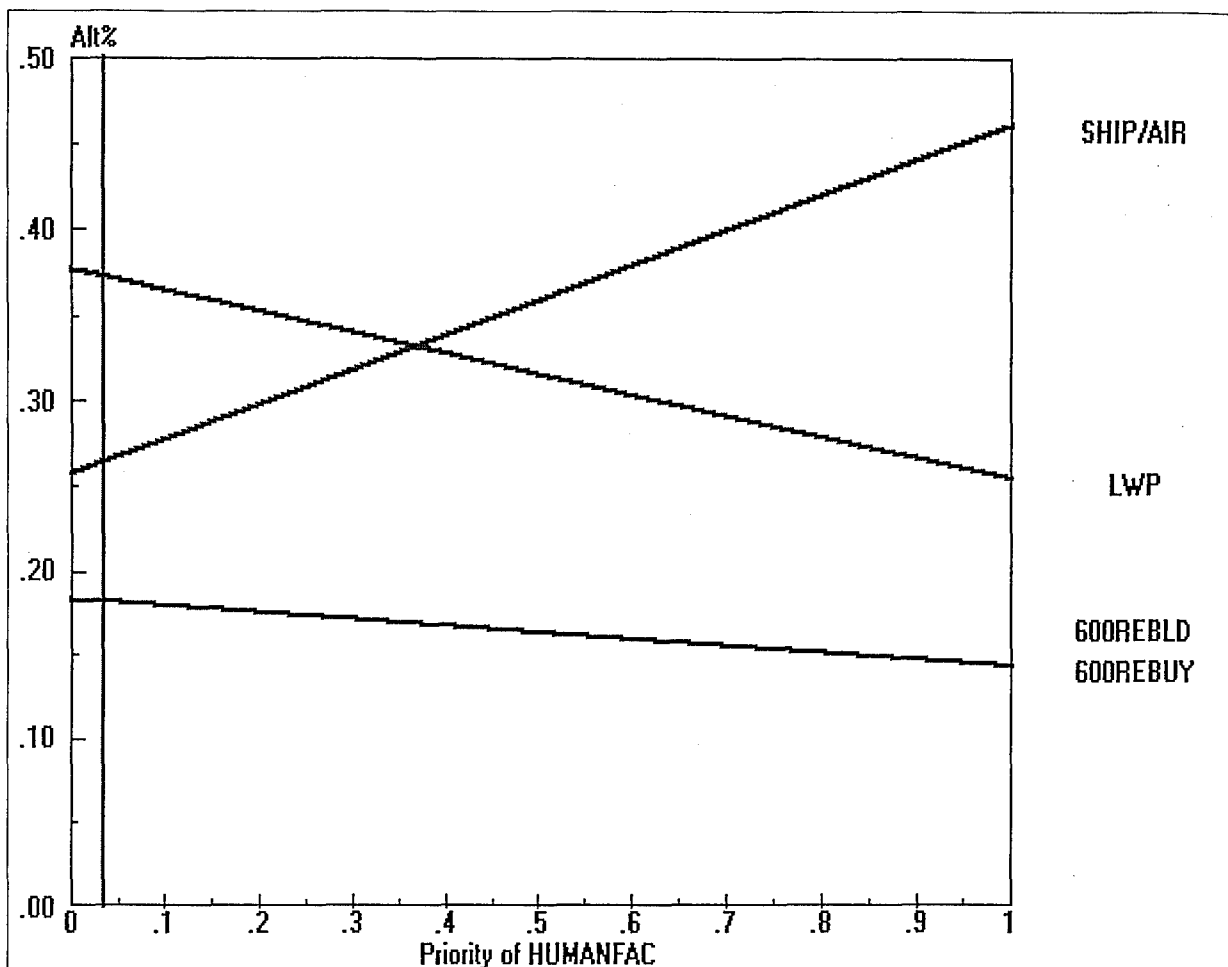
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
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EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. SYS PERF for nodes below SYS PERF



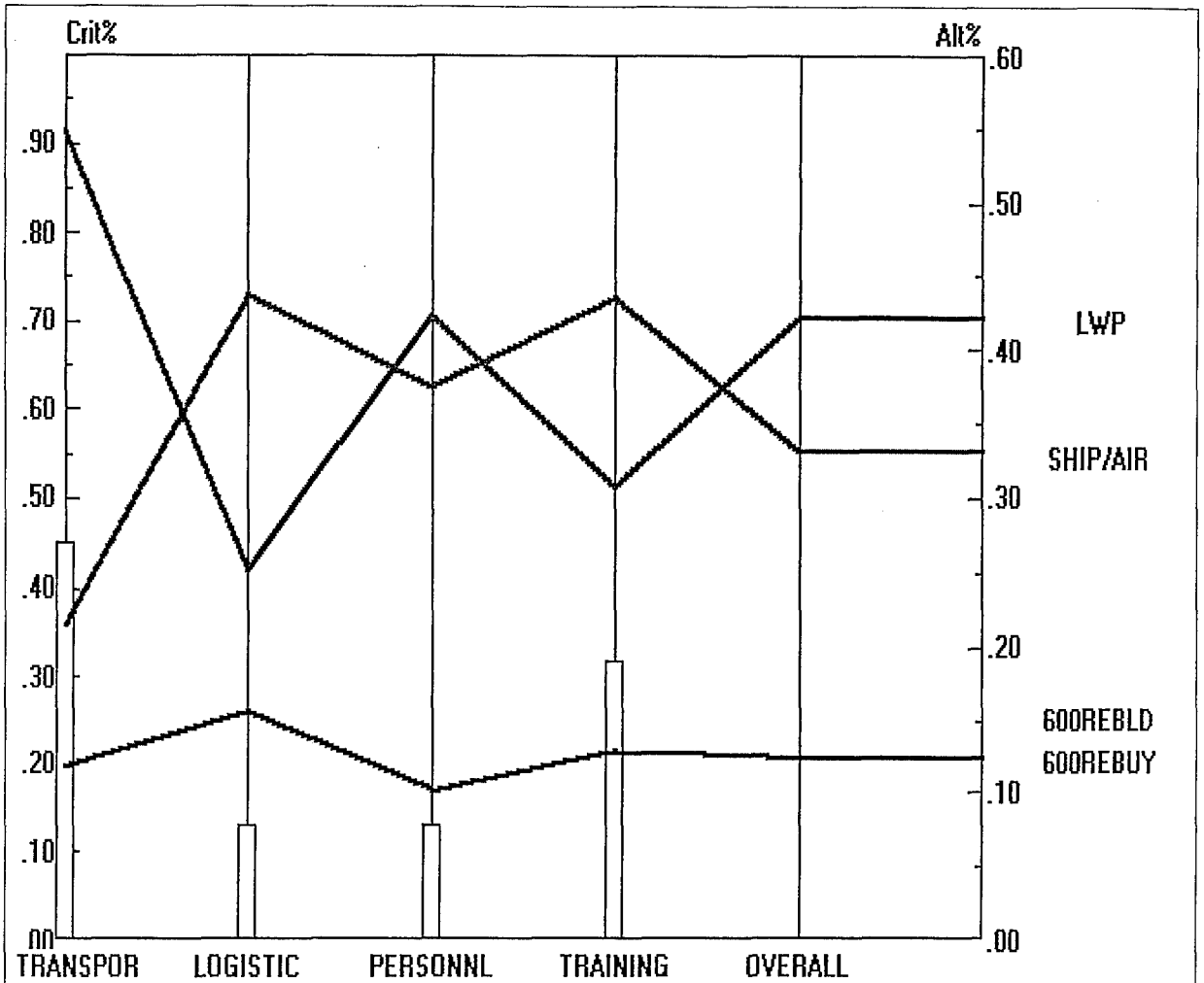
Abbreviation	Definition
MOBILITY	MOBILITY RESTRICTIONS OF THE SYSTEM BASED ON SIZE AND WEIGHT
WATER	ABILITY OF THE ALTERNATIVE TO PRODUCE, STORE, & DISTRIBUTE WATER
ENVIRONM	ABILITY OF THE SYSTEM TO OPERATE IN ALL CLIMATIC CONDITIONS
EFFORT	QUANTITY OF EFFORT REQUIRED TO MOVE, SET UP, OR TEAR DOWN SYSTEM
DURABLE	DURABILITY & RUGGEDNESS OF SYSTEM TO OPERATE IN ADVERSE CONDITION
HUMANFAC	HUMAN FACTORS ENGINEERING CRITERIA (SAFETY, ETC)

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Performance Sensitivity w.r.t. LOGREADI for nodes below LOGREA



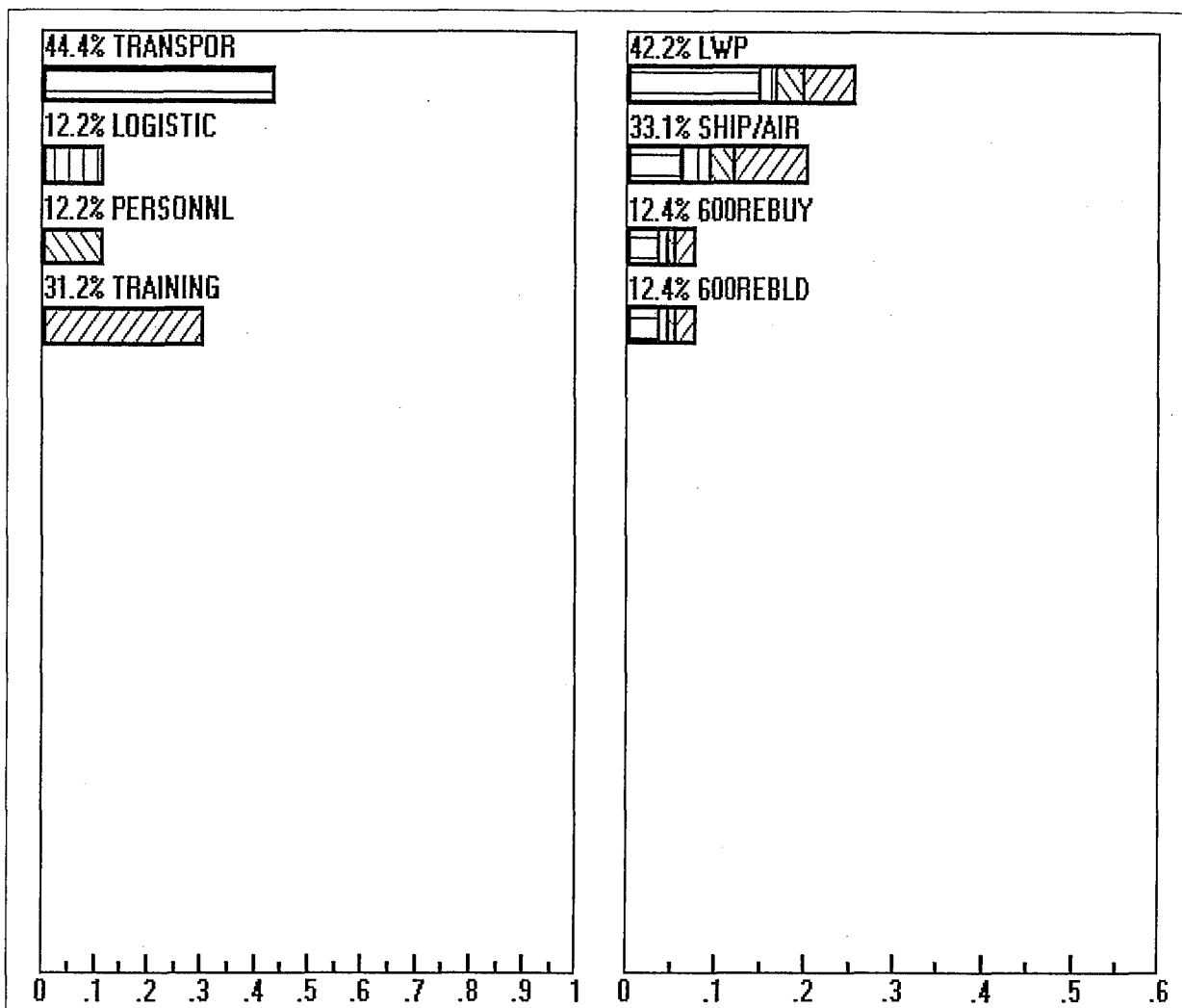
Abbreviation	Definition
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
PERSONNL	OPERATOR (CREW) AND MAINTAINER REQUIREMENTS OR LIMITATIONS
TRAINING	EASE OF TRAINING AND INTEGRATION INTO CURRENT MOS/SKILL COURSES

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Dynamic Sensitivity w.r.t. LOGREADI for nodes below LOGREAD.



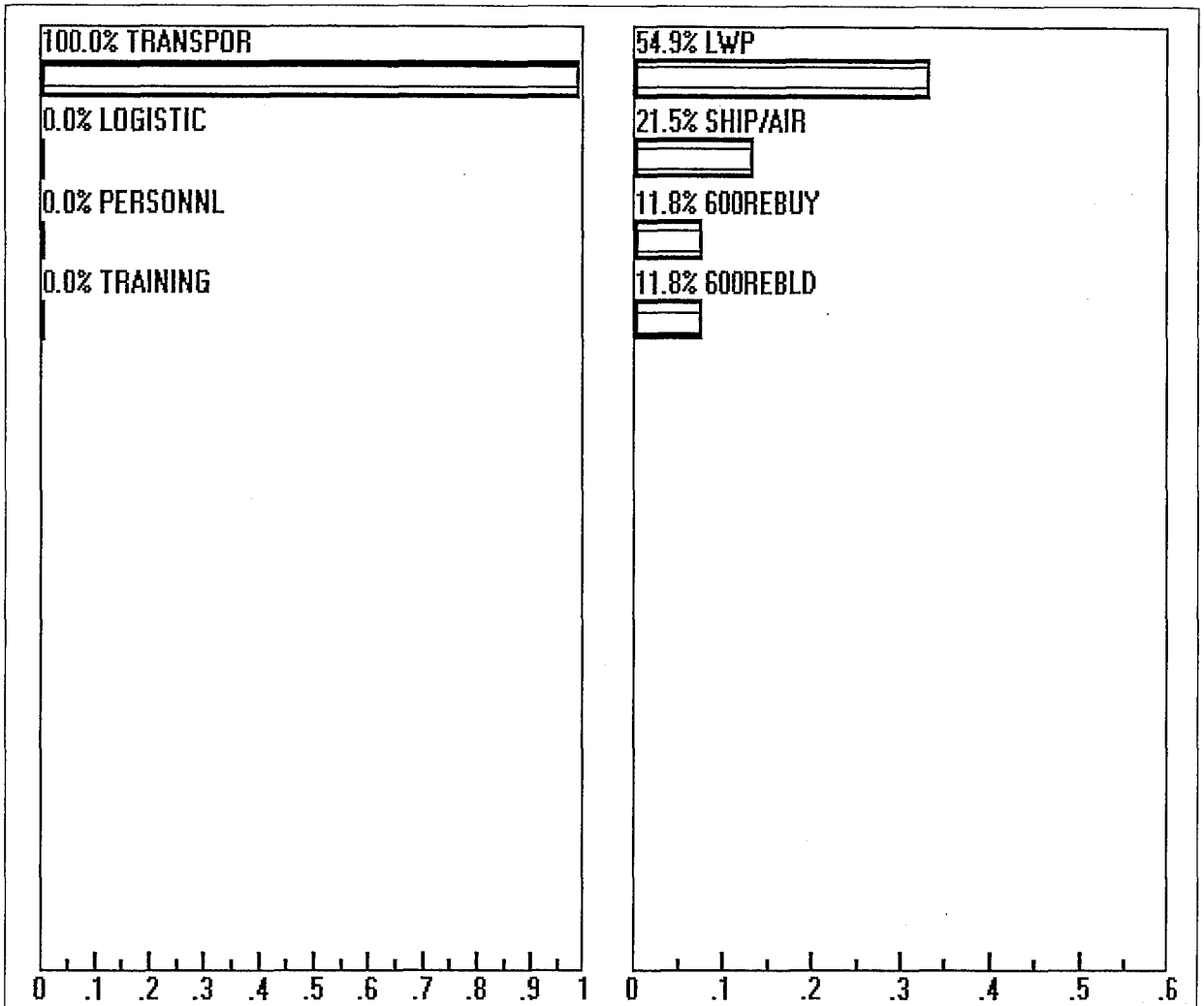
Abbreviation	Definition
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
PERSONNL	OPERATOR (CREW) AND MAINTAINER REQUIREMENTS OR LIMITATIONS
TRAINING	EASE OF TRAINING AND INTEGRATION INTO CURRENT MOS/SKILL COURSES

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Dynamic Sensitivity w.r.t. LOGREADI for nodes below LOGREAD



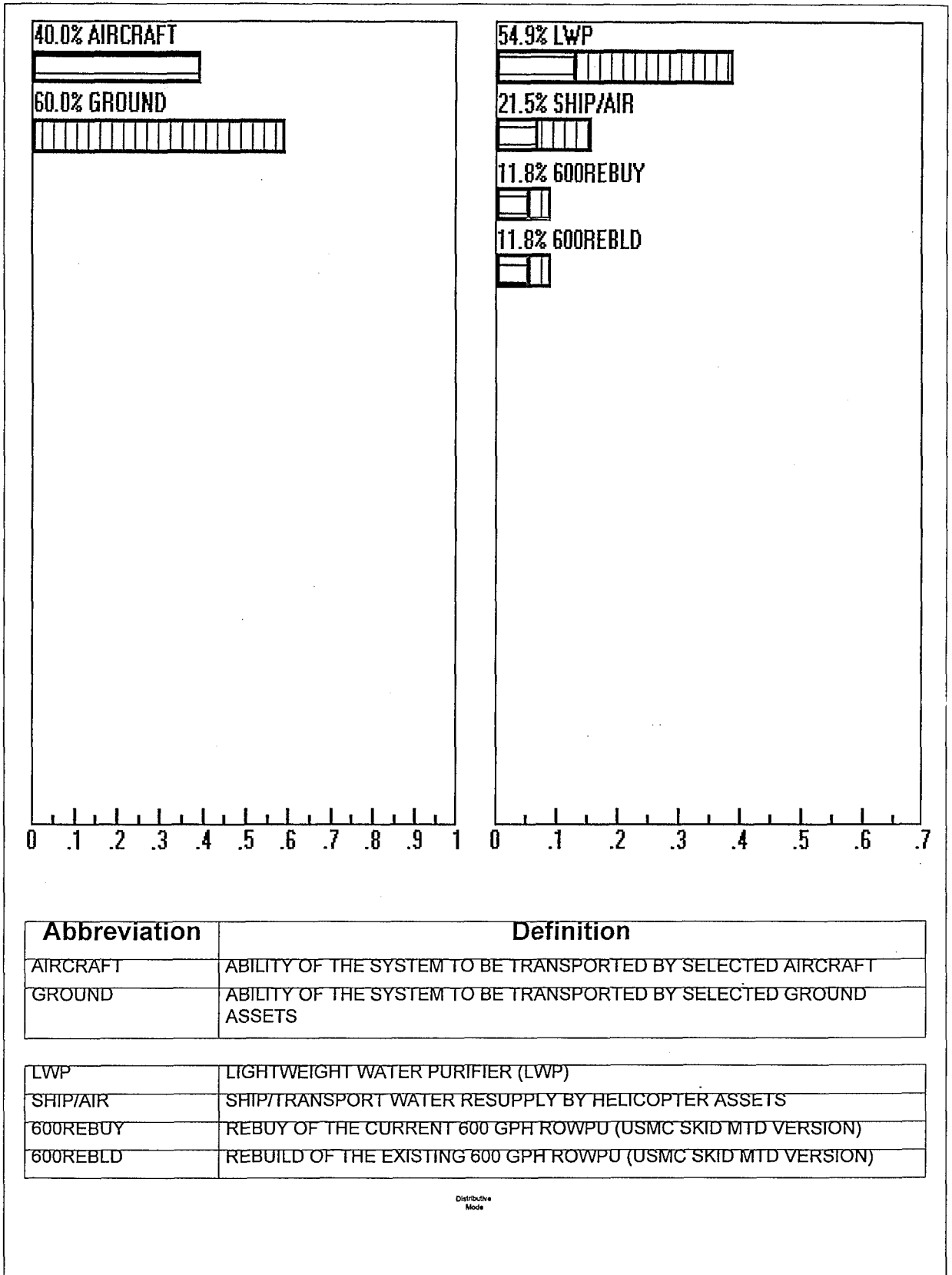
Abbreviation	Definition
TRANSPOR	TRANSPORTABILITY OF THE ALTERNATIVE BY AIR OR GROUND TRANSPORT
LOGISTIC	SUPPLY, MAINTENANCE, AND LOGISTICS CRITERIA OR LIMITATIONS
PERSONNL	OPERATOR (CREW) AND MAINTAINER REQUIREMENTS OR LIMITATIONS
TRAINING	EASE OF TRAINING AND INTEGRATION INTO CURRENT MOS/SKILL COURSES

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Dynamic Sensitivity w.r.t. TRANSPOR for nodes below TRANSPOR



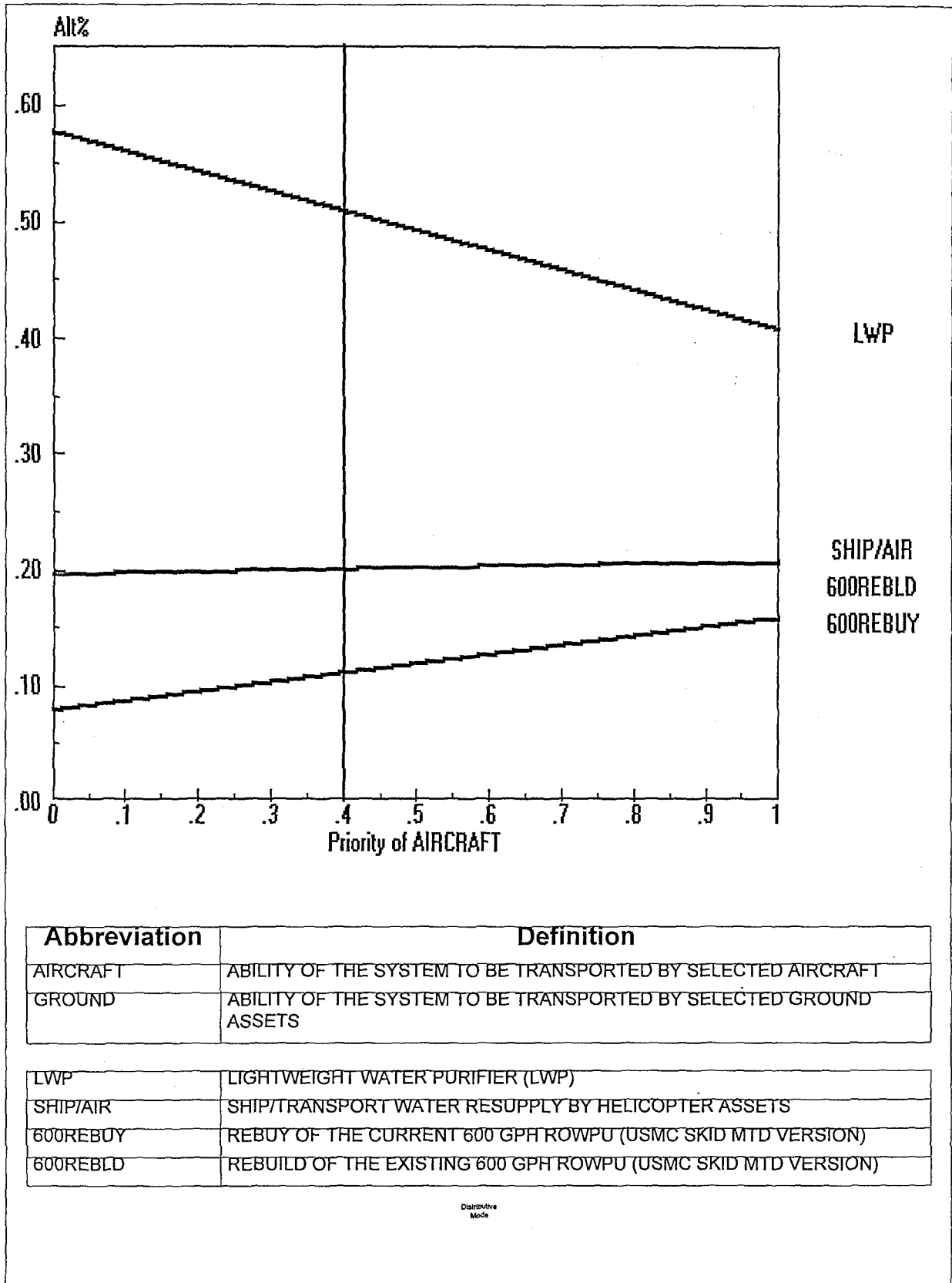
Abbreviation	Definition
AIRCRAFT	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED AIRCRAFT
GROUND	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED GROUND ASSETS

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive Mode

BRTRC

Gradient Sensitivity w.r.t. TRANSPOR for nodes below TRANSPC



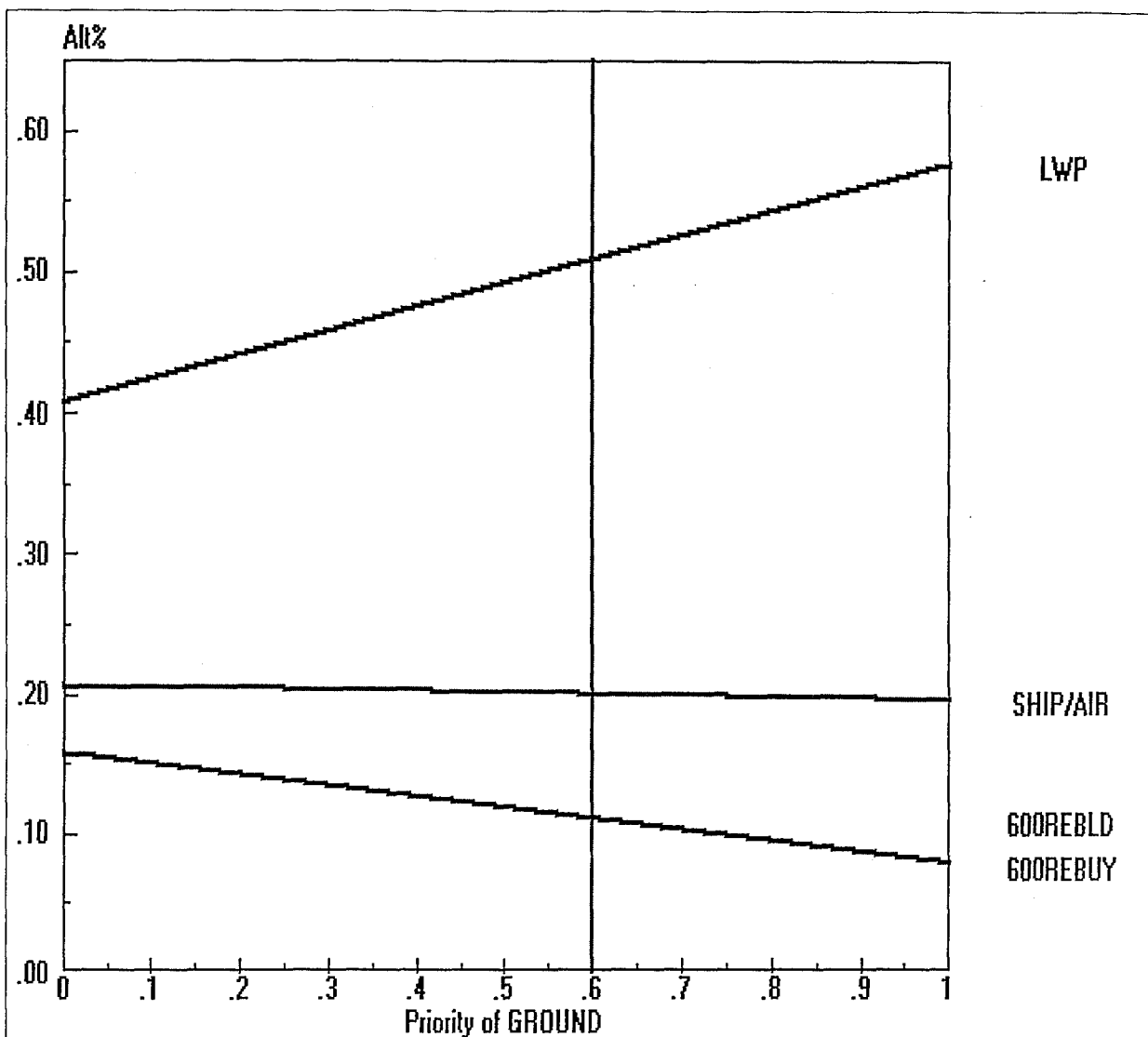
Abbreviation	Definition
AIRCRAFT	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED AIRCRAFT
GROUND	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED GROUND ASSETS

LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
600REBLD	REBUILD OF THE EXISTING 600 GPH ROWPU (USMC SKID MTD VERSION)

Distributive
Mode

BRTRC

Gradient Sensitivity w.r.t. TRANSPOR for nodes below TRANSPO



Abbreviation	Definition
AIRCRAFT	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED AIRCRAFT
GROUND	ABILITY OF THE SYSTEM TO BE TRANSPORTED BY SELECTED GROUND ASSETS
LWP	LIGHTWEIGHT WATER PURIFIER (LWP)
SHIP/AIR	SHIP/TRANSPORT WATER RESUPPLY BY HELICOPTER ASSETS
600REBUY	REBUY OF THE CURRENT 600 GPH ROWPU (USMC SKID MTD VERSION)
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Distributive
Mode

BRTRC

APPENDIX E

DECISION COST ESTIMATE SUMMARY FOR 600 GPH REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

**REVISED
DECISION COST
ESTIMATE FOR
600 GPH
REVERSE OSMOSIS
WATER PURIFICATION
UNIT (ROWPU)
FOR SPECIAL
OPERATIONS FORCES
(SOF)**

11 JULY 1995

**DEVELOPED IN SUPPORT OF COST AND OPERATIONAL EFFECTIVENESS
ANALYSIS FOR
LIGHTWEIGHT WATER PURIFIER (LWP)**

Prepared for US Army Tank Automotive Command, Mobility Technology
Center - Belvoir under contract number DAAK70-92-D-0003, DO 0039.

BRTRC - Baseline Cost Model - V1.2

ID: 1

Title: 600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

First Year: 1994

DESCRIPTION:

This Decision Cost Estimate (DCE) develops the costs for using the 600 GPH ROWPU for Special Operations Forces (SOF) as an alternative to developing and acquiring the Lightweight Water Purifier (LWP).

This DCE is a revision of the DCE for this system validated on 25 October 1994. The most significant change is the increase of the Army requirements from 37 to 50 units. In addition, production and fielding schedules have been revised to agree with the latest Acquisition Strategy for the LWP.

For this Decision Cost Estimate the US Marine Corps version of the 600 GPH ROWPU is used. This unit differs from the Army version in that it is skid mounted and the 5-ton, 4-wheel tandem trailer is not included. A separate 30 kw generator, such as LIN J36109, NSN 6115-00-1118-1240, is required. The unit is capable of producing drinking water from polluted fresh water, brackish water, and sea water. It is also capable of removing chemical and radiological contaminants from the water.

The Marine Corps version of the 600 GPH ROWPU is lighter than the Army version and weighs only 7,300 pounds. The generator, LIN J36109, weighs an additional 2850 pounds. Hence the ROWPU and its generator could be transported to the SOF operating area by a UH-60 or CH-47D helicopter -- in both cases as external loads. Alternatively, the unit and the generator could be airdropped into the operating area by a C-130 or larger aircraft.

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ASSUMPTIONS - 600 GPH ROWPU FOR SPECIAL OPERATIONS FORCES (SOF)

1. All costs are in thousands of FY 1996 dollars, with inflation applied in accordance with Hq Army Materiel Command (AMCRM-E) Memo, Subject: Inflation Guidance, dated 1 February 1995.
2. The version of the 600 GPH ROWPU used for this Decision Cost Estimate is the Marine Corps version. It is skid mounted rather than mounted on a 5-ton trailer like the Army version. Hence is more suitable to support SOF missions. Although it is possible that surplus units could be obtained from the Marine Corps and rebuilt, this Decision Cost Estimate assumes a rebuy. Requirements are anticipated to be the same as for the Lightweight Water Purifier; that is, 8 for Medical Units and 42 for Special Forces for a total of 50 units. The system is anticipated to have a useful operating life of 20 years.
3. Based on the schedule for the LWP and the requirements above, system costs for this Cost Estimate are allocated across the life cycle cost years based on the following quantities:

<u>Year</u>	<u>Production Quantity</u>	<u>Fielding Quantity</u>	<u>Sustainment Quantity</u>
1999	10		
2000	40		
2001		50	
2002			50
2003			50
2004			50
2005			50
2006			50
2007			50
2008			50
2009			50
2010			50
2011			50
2012			50
2013			50
2014			50
2015			50
2016			50
2017			50
2018			50
2019			50
2020			50
2021			50
2022			0
Σ	50	50	1000ROWPU-yrs

4. Initial Deployment of the 600 GPH ROWPU for Special Operations Forces will be entirely within CONUS.

5. For both operations and training missions the ROWPU will be deployed to the operating area by fixed or rotary wing aircraft along with the troop unit and its other equipment. Transportation costs for this movement are considered operational or training costs for the unit and are not charged to this program.

ORGANIZATION OF DECISION COST ESTIMATE (DCE)

This Cost Estimate is composed of three parts as follows:

1. This Introduction.
2. Four Cost Matrices:
 - a. Cost Totals by Phase in Constant Dollars
 - b. Cost Totals by Phase in Current Dollars
 - c. Cost Totals by Year in Constant Dollars
 - d. Cost Totals by Year in Current Dollars
3. -Cost Data Sheets and Variable Information Sheets arranged by cost category:
 1. RDT&E (No costs)
 2. Procurement
 3. Construction (No Costs)
 4. Military Personnel (No costs)
 5. O&M

MAJOR DIFFERENCES FROM PROGRAM LIFE CYCLE COST ESTIMATE

This Decision Cost Estimate was developed as to support the Cost and Operational Effectiveness Analysis (COEA) for the Lightweight Water Purifier (LWP). It differs from the Program Office Life Cycle Cost Estimate (POLCCE) or Baseline Cost Estimate for the system in two important respects:

1. Sunk costs are excluded from the Decision Cost Estimate (DCE).
2. Military Personnel Costs are excluded from the DCE in accordance with Draft TRADOC Pamphlet 11-8, Para 3-2.c.1 (page 25).

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Phase (Constant Dollars) (\$k)

600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

	Total	Phase I	Phase II	Phase III	Subsys 3	Subsys 4	Subsys 5
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00					
1.01 DEVELOPMENT ENGINEERING	0.00	0.00					
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00					
1.03 DEVELOPMENT TOOLING	0.00	0.00					
1.04 PROTOTYPE MANUFACTURING	0.00	0.00					
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00					
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00					
1.052 OTHER	0.00	0.00					
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00					
1.07 TRAINING	0.00	0.00					
1.08 DATA	0.00	0.00					
1.09 SUPPORT EQUIPMENT	0.00	0.00					
1.091 PECULIAR	0.00	0.00					
1.092 COMMON	0.00	0.00					
1.10 DEVELOPMENT FACILITIES	0.00	0.00					
1.11 OTHER RDT&E	0.00	0.00					
2.0 PROCUREMENT-FUNDED ELEMENTS	6418.26	6418.26					
2.01 NON-RECURRING PRODUCTION	0.00	0.00					
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00					
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00					
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00					
2.02 RECURRING PRODUCTION	5636.78	5636.78					
2.021 MANUFACTURING	5472.00	5472.00					
2.022 RECURRING ENGINEERING	164.78	164.78					
2.023 SUSTAINING TOOLING	0.00	0.00					
2.024 QUALITY CONTROL	0.00	0.00					
2.025 OTHER RECURRING PRODUCTION	0.00	0.00					
2.03 ENGINEERING CHANGES	54.72	54.72					
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	50.00	50.00					
2.041 PROJECT MGMT ADMIN	50.00	50.00					
2.042 OTHER	0.00	0.00					
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	460.45	460.45					
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00					
2.07 DATA	121.13	121.13					
2.08 SUPPORT EQUIPMENT	0.00	0.00					
2.081 PECULIAR	0.00	0.00					
2.082 COMMON	0.00	0.00					
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00					
2.10 FIELDING	95.18	95.18					
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00					
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00					
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00					
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	95.18	95.18					
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00					
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00					
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00					
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00					
2.13 MODIFICATIONS	0.00	0.00					
2.14 OTHER PROCUREMENT	0.00	0.00					
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00					
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00					
3.02 PRODUCTION CONSTRUCTION	0.00	0.00					
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00					
3.04 OTHER MC	0.00	0.00					
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00					
4.01 CREW	0.00	0.00					
4.02 MAINTENANCE (MTOE)	0.00	0.00					
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00					
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00					
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00					
4.042 OTHER	0.00	0.00					
4.05 REPLACEMENT PERSONNEL	0.00	0.00					
4.051 TRAINING	0.00	0.00					
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00					
4.06 OTHER MP	0.00	0.00					
5.0 O&M-FUNDED ELEMENTS	5362.25	5362.25					
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00					
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00					
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	2311.13	2311.13					
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	2631.13	2631.13					
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	320.00	320.00					
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00					
5.061 OVERHAUL (P7M)	0.00	0.00					
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00					
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00					
5.064 INDUSTRIAL READINESS	0.00	0.00					
5.065 DEMILITARIZATION	0.00	0.00					
5.07 TRANSPORTATION	0.00	0.00					
5.08 SOFTWARE	0.00	0.00					
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00					
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	100.00	100.00					
5.101 PROJ MGMT ADMIN (PM CIV)	100.00	100.00					
5.102 OTHER	0.00	0.00					
5.11 TRAINING	0.00	0.00					
5.12 OTHER O&M	0.00	0.00					
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00					
6.01 CLASS IX WAR RESERVE	0.00	0.00					
6.02 OTHER DBOF	0.00	0.00					
TOTALS	11780.51	11780.51					

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Phase (Current Dollars) (\$k)

600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

	Total	Phase I	Phase II	Phase III	Subsys 3	Subsys 4	Subsys 5
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00					
1.01 DEVELOPMENT ENGINEERING	0.00	0.00					
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00					
1.03 DEVELOPMENT TOOLING	0.00	0.00					
1.04 PROTOTYPE MANUFACTURING	0.00	0.00					
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00					
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00					
1.052 OTHER	0.00	0.00					
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00					
1.07 TRAINING	0.00	0.00					
1.08 DATA	0.00	0.00					
1.09 SUPPORT EQUIPMENT	0.00	0.00					
1.091 PECULIAR	0.00	0.00					
1.092 COMMON	0.00	0.00					
1.10 DEVELOPMENT FACILITIES	0.00	0.00					
1.11 OTHER RDT&E	0.00	0.00					
2.0 PROCUREMENT-FUNDED ELEMENTS	7526.99	7526.99					
2.01 NON-RECURRING PRODUCTION	0.00	0.00					
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00					
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00					
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00					
2.02 RECURRING PRODUCTION	6619.94	6619.94					
2.021 MANUFACTURING	6428.07	6428.07					
2.022 RECURRING ENGINEERING	191.87	191.87					
2.023 SUSTAINING TOOLING	0.00	0.00					
2.024 QUALITY CONTROL	0.00	0.00					
2.025 OTHER RECURRING PRODUCTION	0.00	0.00					
2.03 ENGINEERING CHANGES	63.72	63.72					
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	58.22	58.22					
2.041 PROJECT MGMT ADMIN	58.22	58.22					
2.042 OTHER	0.00	0.00					
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	528.23	528.23					
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00					
2.07 DATA	141.04	141.04					
2.08 SUPPORT EQUIPMENT	0.00	0.00					
2.081 PECULIAR	0.00	0.00					
2.082 COMMON	0.00	0.00					
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00					
2.10 FIELDING	115.85	115.85					
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00					
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00					
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00					
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	115.85	115.85					
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00					
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00					
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00					
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00					
2.13 MODIFICATIONS	0.00	0.00					
2.14 OTHER PROCUREMENT	0.00	0.00					
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00					
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00					
3.02 PRODUCTION CONSTRUCTION	0.00	0.00					
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00					
3.04 OTHER MC	0.00	0.00					
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00					
4.01 CREW	0.00	0.00					
4.02 MAINTENANCE (MTOE)	0.00	0.00					
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00					
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00					
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00					
4.042 OTHER	0.00	0.00					
4.05 REPLACEMENT PERSONNEL	0.00	0.00					
4.051 TRAINING	0.00	0.00					
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00					
4.06 OTHER MP	0.00	0.00					
5.0 O&M-FUNDED ELEMENTS	8800.47	8800.47					
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00					
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00					
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	3793.00	3793.00					
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	4318.18	4318.18					
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	525.18	525.18					
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00					
5.061 OVERHAUL (P7M)	0.00	0.00					
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00					
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00					
5.064 INDUSTRIAL READINESS	0.00	0.00					
5.065 DEMILITARIZATION	0.00	0.00					
5.07 TRANSPORTATION	0.00	0.00					
5.08 SOFTWARE	0.00	0.00					
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00					
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	164.12	164.12					
5.101 PROJ MGMT ADMIN (PM CIV)	164.12	164.12					
5.102 OTHER	0.00	0.00					
5.11 TRAINING	0.00	0.00					
5.12 OTHER O&M	0.00	0.00					
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00					
6.01 CLASS IX WAR RESERVE	0.00	0.00					
6.02 OTHER DBOF	0.00	0.00					
TOTALS	16327.46	16327.46					

BRTRC - Baseline Cost Model - V1.2
Cost Totals by Year (Constant Dollars) (\$k)

600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

	2000	2001	2002	2003	2004	2005	2006
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	4572.91	95.18	0.00	0.00	0.00	0.00	0.00
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	4459.99	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	4377.60	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	82.39	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	27.36	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	25.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	25.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	60.57	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	95.18	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	95.18	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	0.00	0.00	268.11	268.11	268.11	268.11	268.11
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	0.00	0.00	115.56	115.56	115.56	115.56	115.56
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	0.00	0.00	131.56	131.56	131.56	131.56	131.56
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	0.00	0.00	16.00	16.00	16.00	16.00	16.00
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	5.00	5.00	5.00	5.00	5.00
5.101 PROJ MGMT ADMIN (PM CIV)	0.00	0.00	5.00	5.00	5.00	5.00	5.00
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	4572.91	95.18	268.11	268.11	268.11	268.11	268.11

BRTRC - Baseline Cost Model - V1.2
Cost Totals by Year (Current Dollars) (\$k)

600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

	2000	2001	2002	2003	2004	2005	2006
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	5403.36	115.85	0.00	0.00	0.00	0.00	0.00
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	5269.92	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	5172.57	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	97.35	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	32.33	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	29.54	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	29.54	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	71.56	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	115.85	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	115.85	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	0.00	0.00	327.53	337.34	347.47	357.88	368.63
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	0.00	0.00	141.16	145.39	149.76	154.24	158.88
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	0.00	0.00	160.71	165.52	170.50	175.60	180.88
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	0.00	0.00	19.55	20.13	20.74	21.36	22.00
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	6.11	6.29	6.48	6.67	6.87
5.101 PROJ MGMT ADMIN (PM CIV)	0.00	0.00	6.11	6.29	6.48	6.67	6.87
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	5403.36	115.85	327.53	337.34	347.47	357.88	368.63

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Year (Current Dollars) (\$k)

600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

	2007	2008	2009	2010	2011	2012	2013
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	379.67	391.07	402.81	414.88	427.34	440.16	453.35
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	163.64	168.55	173.61	178.81	184.19	189.71	195.39
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	186.30	191.89	197.65	203.57	209.69	215.98	222.45
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	22.66	23.34	24.04	24.76	25.50	26.27	27.05
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	7.08	7.29	7.51	7.74	7.97	8.21	8.45
5.101 PROJ MGMT ADMIN (PM CIV)	7.08	7.29	7.51	7.74	7.97	8.21	8.45
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	379.67	391.07	402.81	414.88	427.34	440.16	453.35

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Year (Current Dollars) (\$k)

600 GPH (ROWPU) FOR SPECIAL OPERATIONS FORCES (SOF)

07/11/95

	2014	2015	2016	2017	2018	2019	2020
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	466.97	480.97	495.39	510.24	525.55	541.35	557.57
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	201.26	207.30	213.51	219.92	226.51	233.32	240.31
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	229.13	236.00	243.08	250.36	257.88	265.63	273.58
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	27.87	28.70	29.56	30.45	31.36	32.31	33.27
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	8.71	8.97	9.24	9.52	9.80	10.10	10.40
5.101 PROJ MGMT ADMIN (PM CIV)	8.71	8.97	9.24	9.52	9.80	10.10	10.40
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	466.97	480.97	495.39	510.24	525.55	541.35	557.57

APPENDIX F

PROGRAM LIFE CYCLE COST ESTIMATE (PLCCE) SUMMARY FOR LIGHTWEIGHT WATER PURIFIER (LWP)

**REVISED
PROGRAM
LIFE CYCLE
COST ESTIMATE
(LCCE)
FOR
LIGHTWEIGHT
WATER PURIFIER
(LWP)**

4 OCTOBER 1995

Prepared for US Army Tank Automotive Command,
Mobility Technology Center - Belvoir, under
Contract Number DAAK70-92-D-0003, DO 0039.

ID: 1

Title: LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

First Year: 1994

DESCRIPTION:

This Program Life Cycle Cost Estimate (LCCE) for the Lightweight Water Purifier (LWP) is a revision of the LCCE for the LWP validated on 25 October 1994. The most significant change is the increase of the Army requirements from 37 to 50 units. In addition, milestone, production, and fielding schedules have been revised to agree with the latest Acquisition Strategy.

The Lightweight Water Purifier (LWP) will support small units and detachments, including special forces conducting early entry, long range surveillance, nation building, civil affairs, and disaster relief operations.

At present small units and detachments conducting operations of these types must carry all required water with them or obtain it from the host nation. This host nation support is often unavailable, and the carrying of heavy, bulky water containers is often impractical. The use of current military water purification equipment, such as the 600 GPH and the 3000 GPH Reverse Osmosis Water Purification units (ROWPU), on the other hand, requires heavier trucks than those available to these small units. In addition, these water purification devices are often too large for the roads found on these missions and may require water sources larger than may be available.

To solve these problems, the LWP will be light weight and highly mobile for deployment in areas where road nets, aircraft assets, and host nation water support may be limited or unavailable. The LWP will purify salt, brackish, and fresh waters, and water contaminated with nuclear, biological, and chemical (NBC) agents. It will function in hot and basic climates as defined by AR 70-38.

TECHNICAL:

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Bob Shalewitz
Organization: MOBILITY TECH CTR BELVOIR
Office symbol: AMSTA-RBWE
Comm phone: (703) 704-3358
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Chuong Anh Luu
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ASSUMPTIONS - LIGHTWEIGHT WATER PURIFIER (LWP)

1. All costs are in thousands of FY 1996 dollars, with inflation applied in accordance with Hq Army Materiel Command (AMCRM-E) Memo, Subject: Inflation Guidance, dated 1 February 1995.
2. Although the Mission Need Statement for the Lightweight Water Purifier (LWP) was approved on 6 October 1993, only a draft Operational Requirements Document (ORD) exists. Present plans call for a Milestone I/II in the first quarter of FY 1996 and Milestone III in the first quarter of FY 1998. Requirements are anticipated to be 8 LWPs for Medical Units and 42 for Special Forces for a total of 50 units. The system is anticipated to have a useful operating life of 20 years.
3. Based on the schedule and requirements above, system costs for this Cost Estimate are allocated across the life cycle cost years based on the following quantities:

<u>Year</u>	<u>Production Quantity</u>	<u>Fielding Quantity</u>	<u>Sustainment Quantity</u>
1999	10		
2000	40		
2001		50	
2002			50
2003			50
2004			50
2005			50
2006			50
2007			50
2008			50
2009			50
2010			50
2011			50
2012			50
2013			50
2014			50
2015			50
2016			50
2017			50
2018			50
2019			50
2020			50
2021			50
2022			0
Σ	50	50	1000 LWP-yrs

4. In Special Forces Units, the LWP will be operated as a part time additional duty by members of CMF 18, probably MOS 18C and 18D. In Medical Units the system will be operated by MOS 91B, again as a part time additional duty. The repairer for the LWP will be MOS 63J, assumed to be E-4, who will probably be located at the base.

5. Initial Deployment of the LWP will be entirely within CONUS.

6. For both operations and training missions the LWP will be deployed to the operating area by fixed or rotary wing aircraft along with the troop unit and its other equipment. Transportation costs for this movement are considered operational or training costs for the unit and are not charged to the LWP program.

ORGANIZATION OF PROGRAM LIFE CYCLE COST ESTIMATE (LCCE)

This Cost Estimate is composed of three parts as follows:

1. This Introduction.
2. Four Cost Matrices:
 - a. Cost Totals by Phase in Constant Dollars
 - b. Cost Totals by Phase in Current Dollars
 - c. Cost Totals by Year in Constant Dollars
 - d. Cost Totals by Year in Current Dollars
3. Cost Data Sheets and Variable Information Sheets arranged by cost category:
 1. RDT&E
 2. Procurement
 3. Construction (No Costs)
 4. Military Personnel
 5. O&M

MAJOR DIFFERENCES FROM DECISION COST ESTIMATE

This Program Life Cycle Cost Estimate (LCCE) was developed as one of the Acquisition Management Documents required to support a Milestone I/II In-Process Review scheduled for late FY 1995 or early FY 1996 for the Lightweight Water Purifier (LWP). A Decision Cost Estimate (DCE) for the system differs from this LCCE in two important respects:

1. Sunk costs are excluded from the Decision Cost Estimate (DCE).
2. Military Personnel Costs are excluded from the DCE in accordance with Draft TRADOC Pamphlet 11-8, Para 3-2.c.1 (page 25).

Thus to develop a Decision Cost Estimate for the LWP from this Program Life Cycle Cost Estimate (LCCE), the following must be subtracted:

- Sunk Costs
- Military Personnel Costs: Cost Category 4.0 plus Cost Elements 2.11, 5.11, and 5.12.

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Phase (Constant Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	Total	Phase I	Phase II	Phase III	Subsys 3	Subsys 4	Subsys 5
1.0 RDT&E-FUNDED ELEMENTS	2433.26	2433.26					
1.01 DEVELOPMENT ENGINEERING	1101.34	1101.34					
1.02 PRODUCIBILITY ENGR AND PLAN (PEP)	0.00	0.00					
1.03 DEVELOPMENT TOOLING	0.00	0.00					
1.04 PROTOTYPE MANUFACTURING	272.53	272.53					
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	50.00	50.00					
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	50.00	50.00					
1.052 OTHER	0.00	0.00					
1.06 SYSTEM TEST AND EVALUATION	369.11	369.11					
1.07 TRAINING	50.59	50.59					
1.08 DATA	589.70	589.70					
1.09 SUPPORT EQUIPMENT	0.00	0.00					
1.091 PECULIAR	0.00	0.00					
1.092 COMMON	0.00	0.00					
1.10 DEVELOPMENT FACILITIES	0.00	0.00					
1.11 OTHER RDT&E	0.00	0.00					
2.0 PROCUREMENT-FUNDED ELEMENTS	2835.87	2835.87					
2.01 NON-RECURRING PRODUCTION	0.00	0.00					
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00					
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00					
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00					
2.02 RECURRING PRODUCTION	1952.30	1952.30					
2.021 MANUFACTURING	1849.32	1849.32					
2.022 RECURRING ENGINEERING	102.98	102.98					
2.023 SUSTAINING TOOLING	0.00	0.00					
2.024 QUALITY CONTROL	0.00	0.00					
2.025 OTHER RECURRING PRODUCTION	0.00	0.00					
2.03 ENGINEERING CHANGES	92.47	92.47					
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	100.00	100.00					
2.041 PROJECT MGMT ADMIN	100.00	100.00					
2.042 OTHER	0.00	0.00					
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	230.22	230.22					
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00					
2.07 DATA	242.26	242.26					
2.08 SUPPORT EQUIPMENT	0.00	0.00					
2.081 PECULIAR	0.00	0.00					
2.082 COMMON	0.00	0.00					
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00					
2.10 FIELDING	205.59	205.59					
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	92.47	92.47					
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	92.47	92.47					
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00					
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	8.53	8.53					
2.105 NEW EQUIPMENT TRAINING (NET)	12.14	12.14					
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00					
2.11 TRAINING AMMUNITIONS/MISSILES	13.03	13.03					
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00					
2.13 MODIFICATIONS	0.00	0.00					
2.14 OTHER PROCUREMENT	0.00	0.00					
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00					
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00					
3.02 PRODUCTION CONSTRUCTION	0.00	0.00					
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00					
3.04 OTHER MC	0.00	0.00					
4.0 MIL PERSONNEL-FUNDED ELEMENTS	3327.51	3327.51					
4.01 CREW	0.00	0.00					
4.02 MAINTENANCE (MTOE)	2593.10	2593.10					
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00					
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00					
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00					
4.042 OTHER	0.00	0.00					
4.05 REPLACEMENT PERSONNEL	734.41	734.41					
4.051 TRAINING	563.10	563.10					
4.052 PERMANENT CHANGE OF STATION (PCS)	171.31	171.31					
4.06 OTHER MP	0.00	0.00					
5.0 O&M-FUNDED ELEMENTS	4876.66	4876.66					
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00					
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00					
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	973.33	973.33					
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	2372.05	2372.05					
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	357.12	357.12					
5.06 END-ITEM SUPPLY AND MAINTENANCE	535.33	535.33					
5.061 OVERHAUL (P7M)	535.33	535.33					
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00					
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00					
5.064 INDUSTRIAL READINESS	0.00	0.00					
5.065 DEMILITARIZATION	0.00	0.00					
5.07 TRANSPORTATION	0.00	0.00					
5.08 SOFTWARE	0.00	0.00					
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00					
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	100.00	100.00					
5.101 PROJ MGMT ADMIN (PM CIV)	100.00	100.00					
5.102 OTHER	0.00	0.00					
5.11 TRAINING	332.22	332.22					
5.12 OTHER O&M	206.62	206.62					
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00					
6.01 CLASS IX WAR RESERVE	0.00	0.00					
6.02 OTHER DBOF	0.00	0.00					
TOTALS	13473.31	13473.31					

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Phase (Current Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	Total	Phase I	Phase II	Phase III	Subsys 3	Subsys 4	Subsys 5
1.0 RDT&E-FUNDED ELEMENTS	2509.17	2509.17					
1.01 DEVELOPMENT ENGINEERING	1133.64	1133.64					
1.02 PRODUCIBILITY ENGR AND PLAN (PEP)	0.00	0.00					
1.03 DEVELOPMENT TOOLING	0.00	0.00					
1.04 PROTOTYPE MANUFACTURING	277.62	277.62					
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	51.34	51.34					
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	51.34	51.34					
1.052 OTHER	0.00	0.00					
1.06 SYSTEM TEST AND EVALUATION	387.87	387.87					
1.07 TRAINING	53.16	53.16					
1.08 DATA	605.54	605.54					
1.09 SUPPORT EQUIPMENT	0.00	0.00					
1.091 PECULIAR	0.00	0.00					
1.092 COMMON	0.00	0.00					
1.10 DEVELOPMENT FACILITIES	0.00	0.00					
1.11 OTHER RDT&E	0.00	0.00					
2.0 PROCUREMENT-FUNDED ELEMENTS	3334.82	3334.82					
2.01 NON-RECURRING PRODUCTION	0.00	0.00					
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00					
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00					
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00					
2.02 RECURRING PRODUCTION	2292.34	2292.34					
2.021 MANUFACTURING	2172.43	2172.43					
2.022 RECURRING ENGINEERING	119.91	119.91					
2.023 SUSTAINING TOOLING	0.00	0.00					
2.024 QUALITY CONTROL	0.00	0.00					
2.025 OTHER RECURRING PRODUCTION	0.00	0.00					
2.03 ENGINEERING CHANGES	107.67	107.67					
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	116.44	116.44					
2.041 PROJECT MGMT ADMIN	116.44	116.44					
2.042 OTHER	0.00	0.00					
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	264.11	264.11					
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00					
2.07 DATA	282.09	282.09					
2.08 SUPPORT EQUIPMENT	0.00	0.00					
2.081 PECULIAR	0.00	0.00					
2.082 COMMON	0.00	0.00					
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00					
2.10 FIELDING	250.23	250.23					
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	112.54	112.54					
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	112.54	112.54					
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00					
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	10.38	10.38					
2.105 NEW EQUIPMENT TRAINING (NET)	14.77	14.77					
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00					
2.11 TRAINING AMMUNITIONS/MISSILES	21.94	21.94					
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00					
2.13 MODIFICATIONS	0.00	0.00					
2.14 OTHER PROCUREMENT	0.00	0.00					
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00					
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00					
3.02 PRODUCTION CONSTRUCTION	0.00	0.00					
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00					
3.04 OTHER MC	0.00	0.00					
4.0 MIL PERSONNEL-FUNDED ELEMENTS	4860.30	4860.30					
4.01 CREW	0.00	0.00					
4.02 MAINTENANCE (MTOE)	3787.59	3787.59					
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00					
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00					
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00					
4.042 OTHER	0.00	0.00					
4.05 REPLACEMENT PERSONNEL	1072.71	1072.71					
4.051 TRAINING	822.49	822.49					
4.052 PERMANENT CHANGE OF STATION (PCS)	250.22	250.22					
4.06 OTHER MP	0.00	0.00					
5.0 O&M-FUNDED ELEMENTS	8003.53	8003.53					
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00					
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00					
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	1597.41	1597.41					
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	3892.98	3892.98					
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	586.10	586.10					
5.06 END-ITEM SUPPLY AND MAINTENANCE	878.58	878.58					
5.061 OVERHAUL (P7M)	878.58	878.58					
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00					
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00					
5.064 INDUSTRIAL READINESS	0.00	0.00					
5.065 DEMILITARIZATION	0.00	0.00					
5.07 TRANSPORTATION	0.00	0.00					
5.08 SOFTWARE	0.00	0.00					
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00					
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	164.12	164.12					
5.101 PROJ MGMT ADMIN (PM CIV)	164.12	164.12					
5.102 OTHER	0.00	0.00					
5.11 TRAINING	545.24	545.24					
5.12 OTHER O&M	339.10	339.10					
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00					
6.01 CLASS IX WAR RESERVE	0.00	0.00					
6.02 OTHER DBOF	0.00	0.00					
TOTALS	18707.82	18707.82					

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Year (Constant Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	Total	1994	1995	1996	1997	1998	1999
1.0 RDT&E-FUNDED ELEMENTS	2433.26	262.06	450.99	610.34	878.96	230.91	0.00
1.01 DEVELOPMENT ENGINEERING	1101.34	102.98	198.46	398.46	298.46	102.98	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	272.53	31.15	124.58	0.00	116.80	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	50.00	10.00	10.00	10.00	10.00	10.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	50.00	10.00	10.00	10.00	10.00	10.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	369.11	0.00	0.00	73.82	295.28	0.00	0.00
1.07 TRAINING	50.59	0.00	0.00	10.12	40.47	0.00	0.00
1.08 DATA	589.70	117.94	117.94	117.94	117.94	117.94	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	2835.87	0.00	0.00	0.00	0.00	0.00	868.94
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	1952.30	0.00	0.00	0.00	0.00	0.00	421.35
2.021 MANUFACTURING	1849.32	0.00	0.00	0.00	0.00	0.00	369.86
2.022 RECURRING ENGINEERING	102.98	0.00	0.00	0.00	0.00	0.00	51.49
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	92.47	0.00	0.00	0.00	0.00	0.00	46.23
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	100.00	0.00	0.00	0.00	0.00	0.00	50.00
2.041 PROJECT MGMT ADMIN	100.00	0.00	0.00	0.00	0.00	0.00	50.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	230.22	0.00	0.00	0.00	0.00	0.00	230.22
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	242.26	0.00	0.00	0.00	0.00	0.00	121.13
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	205.59	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	92.47	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	92.47	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	8.53	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	12.14	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	13.03	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	3327.51	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	2593.10	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	734.41	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	563.10	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	171.31	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	4876.66	0.00	0.00	0.00	0.00	0.00	0.00
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	973.33	0.00	0.00	0.00	0.00	0.00	0.00
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	2372.05	0.00	0.00	0.00	0.00	0.00	0.00
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	357.12	0.00	0.00	0.00	0.00	0.00	0.00
5.06 END-ITEM SUPPLY AND MAINTENANCE	535.33	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	535.33	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	100.00	0.00	0.00	0.00	0.00	0.00	0.00
5.101 PROJ MGMT ADMIN (PM CIV)	100.00	0.00	0.00	0.00	0.00	0.00	0.00
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	332.22	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	206.62	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	13473.31	262.06	450.99	610.34	878.96	230.91	868.94

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Year (Constant Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	2000	2001	2002	2003	2004	2005	2006
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	1748.31	205.59	0.65	0.65	0.65	0.65	0.65
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	1530.94	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	1479.45	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	51.49	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	46.23	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	50.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	50.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	121.13	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	205.59	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	92.47	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	92.47	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	8.53	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	12.14	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00	0.65	0.65	0.65	0.65	0.65
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00	166.38	166.38	166.38	166.38	166.38
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	0.00	0.00	129.66	129.66	129.66	129.66	129.66
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	0.00	0.00	36.72	36.72	36.72	36.72	36.72
4.051 TRAINING	0.00	0.00	28.15	28.15	28.15	28.15	28.15
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00	8.57	8.57	8.57	8.57	8.57
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	0.00	0.00	243.83	243.83	243.83	243.83	243.83
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	0.00	0.00	48.67	48.67	48.67	48.67	48.67
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	0.00	0.00	118.60	118.60	118.60	118.60	118.60
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	0.00	0.00	17.86	17.86	17.86	17.86	17.86
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00	26.77	26.77	26.77	26.77	26.77
5.061 OVERHAUL (P7M)	0.00	0.00	26.77	26.77	26.77	26.77	26.77
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	5.00	5.00	5.00	5.00	5.00
5.101 PROJ MGMT ADMIN (PM CIV)	0.00	0.00	5.00	5.00	5.00	5.00	5.00
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	0.00	0.00	16.61	16.61	16.61	16.61	16.61
5.12 OTHER O&M	0.00	0.00	10.33	10.33	10.33	10.33	10.33
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	1748.31	205.59	410.86	410.86	410.86	410.86	410.86

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Year (Constant Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	2021	2022	2023	2024	2025	2026	2027
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	0.65	0.00	0.00	0.00	0.00	0.00	0.00
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.65	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	166.38	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	129.66	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	36.72	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	28.15	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	8.57	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	243.83	0.00	0.00	0.00	0.00	0.00	0.00
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	48.67	0.00	0.00	0.00	0.00	0.00	0.00
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	118.60	0.00	0.00	0.00	0.00	0.00	0.00
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	17.86	0.00	0.00	0.00	0.00	0.00	0.00
5.06 END-ITEM SUPPLY AND MAINTENANCE	26.77	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	26.77	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	5.00	0.00	0.00	0.00	0.00	0.00	0.00
5.101 PROJ MGMT ADMIN (PM CIV)	5.00	0.00	0.00	0.00	0.00	0.00	0.00
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	16.61	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	10.33	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	410.86	0.00	0.00	0.00	0.00	0.00	0.00

BRTRC - Baseline Cost Model - V1.2
 Cost Totals by Year (Current Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	Total	1994	1995	1996	1997	1998	1999
1.0 RDT&E-FUNDED ELEMENTS	2509.17	253.34	449.05	626.33	929.06	251.40	0.00
1.01 DEVELOPMENT ENGINEERING	1133.64	99.55	197.61	408.90	315.48	112.11	0.00
1.02 PRODUCIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	277.62	30.11	124.05	0.00	123.46	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	51.34	9.67	9.96	10.26	10.57	10.89	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	51.34	9.67	9.96	10.26	10.57	10.89	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	387.87	0.00	0.00	75.76	312.12	0.00	0.00
1.07 TRAINING	53.16	0.00	0.00	10.38	42.78	0.00	0.00
1.08 DATA	605.54	114.01	117.43	121.03	124.66	128.40	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	3334.82	0.00	0.00	0.00	0.00	0.00	996.85
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	2292.34	0.00	0.00	0.00	0.00	0.00	483.38
2.021 MANUFACTURING	2172.43	0.00	0.00	0.00	0.00	0.00	424.31
2.022 RECURRING ENGINEERING	119.91	0.00	0.00	0.00	0.00	0.00	59.07
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	107.67	0.00	0.00	0.00	0.00	0.00	53.04
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	116.44	0.00	0.00	0.00	0.00	0.00	57.36
2.041 PROJECT MGMT ADMIN	116.44	0.00	0.00	0.00	0.00	0.00	57.36
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	264.11	0.00	0.00	0.00	0.00	0.00	264.11
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	282.09	0.00	0.00	0.00	0.00	0.00	138.96
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	250.23	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	112.54	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	112.54	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	10.38	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	14.77	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	21.94	0.00	0.00	0.00	0.00	0.00	0.00
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	4860.30	0.00	0.00	0.00	0.00	0.00	0.00
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	3787.59	0.00	0.00	0.00	0.00	0.00	0.00
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	1072.71	0.00	0.00	0.00	0.00	0.00	0.00
4.051 TRAINING	822.49	0.00	0.00	0.00	0.00	0.00	0.00
4.052 PERMANENT CHANGE OF STATION (PCS)	250.22	0.00	0.00	0.00	0.00	0.00	0.00
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	8003.53	0.00	0.00	0.00	0.00	0.00	0.00
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	1597.41	0.00	0.00	0.00	0.00	0.00	0.00
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	3892.98	0.00	0.00	0.00	0.00	0.00	0.00
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	586.10	0.00	0.00	0.00	0.00	0.00	0.00
5.06 END-ITEM SUPPLY AND MAINTENANCE	878.58	0.00	0.00	0.00	0.00	0.00	0.00
5.061 OVERHAUL (P7M)	878.58	0.00	0.00	0.00	0.00	0.00	0.00
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	164.12	0.00	0.00	0.00	0.00	0.00	0.00
5.101 PROJ MGMT ADMIN (PM CIV)	164.12	0.00	0.00	0.00	0.00	0.00	0.00
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	545.24	0.00	0.00	0.00	0.00	0.00	0.00
5.12 OTHER O&M	339.10	0.00	0.00	0.00	0.00	0.00	0.00
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	18707.82	253.34	449.05	626.33	929.06	251.40	996.85

BRTRC - Baseline Cost Model - V1.2
Cost Totals by Year (Current Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	2000	2001	2002	2003	2004	2005	2006
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	2065.80	250.23	0.82	0.84	0.87	0.89	0.92
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	1808.96	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	1748.12	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	60.84	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	54.63	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	59.08	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	59.08	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	143.13	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	250.23	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	112.54	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	112.54	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	10.38	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	14.77	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.00	0.00	0.82	0.84	0.87	0.89	0.92
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	0.00	0.00	195.18	199.52	203.96	208.50	213.16
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	0.00	0.00	152.10	155.48	158.94	162.48	166.11
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	0.00	0.00	43.08	44.04	45.02	46.02	47.05
4.051 TRAINING	0.00	0.00	33.03	33.76	34.52	35.28	36.07
4.052 PERMANENT CHANGE OF STATION (PCS)	0.00	0.00	10.05	10.27	10.50	10.73	10.97
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	0.00	0.00	297.87	306.79	316.01	325.47	335.25
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	0.00	0.00	59.45	61.23	63.07	64.96	66.91
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	0.00	0.00	144.88	149.23	153.71	158.31	163.07
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	0.00	0.00	21.81	22.47	23.14	23.83	24.55
5.06 END-ITEM SUPPLY AND MAINTENANCE	0.00	0.00	32.70	33.68	34.69	35.73	36.80
5.061 OVERHAUL (P7M)	0.00	0.00	32.70	33.68	34.69	35.73	36.80
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	6.11	6.29	6.48	6.67	6.87
5.101 PROJ MGMT ADMIN (PM CIV)	0.00	0.00	6.11	6.29	6.48	6.67	6.87
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	0.00	0.00	20.29	20.90	21.53	22.17	22.84
5.12 OTHER O&M	0.00	0.00	12.62	13.00	13.39	13.79	14.20
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	2065.80	250.23	493.86	507.15	520.83	534.86	549.33

BRTRC - Baseline Cost Model - V1.2
Cost Totals by Year (Current Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	2007	2008	2009	2010	2011	2012	2013
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	0.95	0.98	1.00	1.03	1.07	1.10	1.13
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	0.95	0.98	1.00	1.03	1.07	1.10	1.13
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	217.90	222.78	227.74	232.83	238.03	243.36	248.80
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	169.81	173.61	177.47	181.44	185.50	189.65	193.89
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	48.09	49.17	50.26	51.39	52.54	53.71	54.91
4.051 TRAINING	36.87	37.70	38.54	39.40	40.28	41.18	42.10
4.052 PERMANENT CHANGE OF STATION (PCS)	11.22	11.47	11.72	11.99	12.25	12.53	12.81
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	345.29	355.65	366.33	377.31	388.65	400.30	412.30
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	68.92	70.98	73.12	75.31	77.57	79.90	82.29
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	167.95	172.99	178.19	183.53	189.04	194.71	200.54
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	25.29	26.04	26.83	27.63	28.46	29.31	30.19
5.06 END-ITEM SUPPLY AND MAINTENANCE	37.90	39.04	40.21	41.42	42.66	43.94	45.26
5.061 OVERHAUL (P7M)	37.90	39.04	40.21	41.42	42.66	43.94	45.26
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	7.08	7.29	7.51	7.74	7.97	8.21	8.45
5.101 PROJ MGMT ADMIN (PM CIV)	7.08	7.29	7.51	7.74	7.97	8.21	8.45
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	23.52	24.23	24.96	25.70	26.48	27.27	28.09
5.12 OTHER O&M	14.63	15.07	15.52	15.99	16.47	16.96	17.47
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	564.14	579.41	595.07	611.17	627.74	644.76	662.23

BRTRC - Baseline Cost Model - V1.2
Cost Totals by Year (Current Dollars) (\$k)

LIGHTWEIGHT WATER PURIFIER (LWP) - REVISED

10/04/95

	2014	2015	2016	2017	2018	2019	2020
1.0 RDT&E-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.01 DEVELOPMENT ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.02 PRODUCTIBILITY ENGR AND PLAN (PEP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.03 DEVELOPMENT TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.04 PROTOTYPE MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.05 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.051 PROJECT MGMT ADMIN (PM CIV/MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.052 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.06 SYSTEM TEST AND EVALUATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.07 TRAINING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.08 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.09 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.091 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.092 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.10 DEVELOPMENT FACILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.11 OTHER RDT&E	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0 PROCUREMENT-FUNDED ELEMENTS	1.16	1.20	1.24	1.27	1.31	1.35	1.39
2.01 NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.011 INITIAL PRODUCTION FACILITIES (IPF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.012 PRODUCTION BASE SUPPORT (PBS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.013 OTHER NON-RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.02 RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.021 MANUFACTURING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.022 RECURRING ENGINEERING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.023 SUSTAINING TOOLING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.024 QUALITY CONTROL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.025 OTHER RECURRING PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.03 ENGINEERING CHANGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.04 SYSTEM ENGRNG/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.041 PROJECT MGMT ADMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.05 SYSTEM TEST & EVALUATION, PRODUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.06 TRAINING AIDS & EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.07 DATA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.08 SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.081 PECULIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.082 COMMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.09 OPERATIONAL/SITE ACTIVATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.10 FIELDING	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.101 INITIAL DEPOT LEVEL REPARABLE (SPARES)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.102 INITIAL CONSUMABLES (REPAIR PARTS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.103 INITIAL SUPPORT EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.104 TRANSPORTATION (EQUIPMENT TO UNIT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.105 NEW EQUIPMENT TRAINING (NET)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.106 CONTRACTOR LOGISTICS SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.11 TRAINING AMMUNITIONS/MISSILES	1.16	1.20	1.24	1.27	1.31	1.35	1.39
2.12 WAR RESERVE AMMUNITION/MISSILES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.13 MODIFICATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.14 OTHER PROCUREMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0 MILITARY CON-FUNDED ELEMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.01 DEVELOPMENT CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.02 PRODUCTION CONSTRUCTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.03 OPERATIONAL/SITE ACTIVATION CON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.04 OTHER MC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.0 MIL PERSONNEL-FUNDED ELEMENTS	254.36	260.06	265.88	272.27	278.80	285.48	292.34
4.01 CREW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.02 MAINTENANCE (MTOE)	198.22	202.66	207.20	212.18	217.26	222.48	227.82
4.03 SYSTEM-SPECIFIC SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.04 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.041 PROJECT MGMT ADMIN (PM MIL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.042 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.05 REPLACEMENT PERSONNEL	56.14	57.40	58.68	60.09	61.53	63.01	64.52
4.051 TRAINING	43.04	44.01	44.99	46.08	47.18	48.31	49.47
4.052 PERMANENT CHANGE OF STATION (PCS)	13.09	13.39	13.69	14.02	14.35	14.70	15.05
4.06 OTHER MP	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0 O&M-FUNDED ELEMENTS	424.68	437.41	450.53	464.04	477.96	492.32	507.08
5.01 FIELD MAINTENANCE CIVILIAN LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.02 SYSTEM-SPECIFIC BASE OPERATIONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.03 REPLEN DEPOT-LEVEL REPARABLE (SPARES)	84.76	87.30	89.92	92.62	95.40	98.26	101.21
5.04 REPLEN CONSUMABLES (REPAIR PARTS)	206.57	212.76	219.14	225.71	232.48	239.47	246.65
5.05 PETROLEUM, OILS AND LUBRICANTS (POL)	31.10	32.03	32.99	33.98	35.00	36.05	37.13
5.06 END-ITEM SUPPLY AND MAINTENANCE	46.62	48.02	49.46	50.94	52.47	54.04	55.66
5.061 OVERHAUL (P7M)	46.62	48.02	49.46	50.94	52.47	54.04	55.66
5.062 INTEGRATED MATERIEL MANAGEMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.063 SUPPLY DEPOT SUPPORT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.064 INDUSTRIAL READINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.065 DEMILITARIZATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.07 TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.08 SOFTWARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.09 SYS TEST AND EVAL, OPERATIONAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.10 SYSTEM ENGINEERING/PROGRAM MANAGEMENT	8.71	8.97	9.24	9.52	9.80	10.10	10.40
5.101 PROJ MGMT ADMIN (PM CIV)	8.71	8.97	9.24	9.52	9.80	10.10	10.40
5.102 OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.11 TRAINING	28.93	29.80	30.69	31.61	32.56	33.54	34.54
5.12 OTHER O&M	17.99	18.53	19.09	19.66	20.25	20.86	21.48
6.0 DEFENSE BUS OPERATION FUND (DBOF) ELEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.01 CLASS IX WAR RESERVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.02 OTHER DBOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	680.20	698.67	717.65	737.58	758.07	779.16	800.80

