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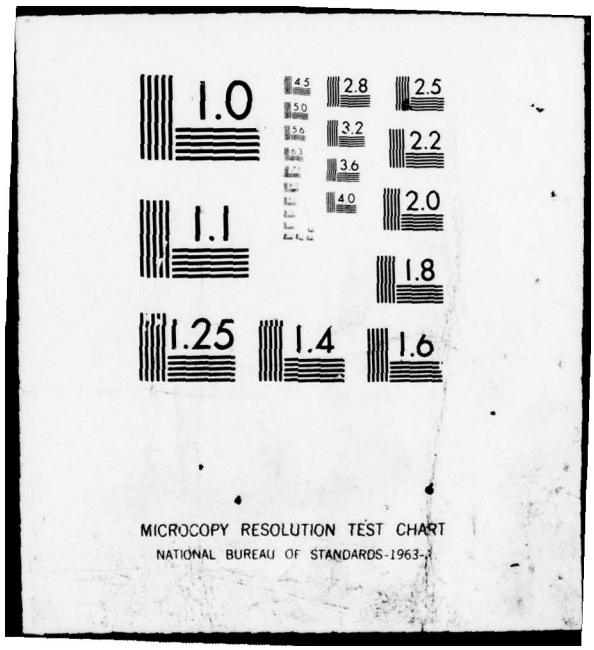
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NOSC MEDICAL BACKPACK TEST AND EVALUATION REPORT

NSAP Project TH-1-78

R. W. Kataoka

1 March 1979

Interim Report: 3 January — 30 September 1978

Prepared for
Naval Medical Research and Development Command
and
Naval Surface Weapons Center

NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CA 92152

AN ACTIVITY OF THE NAVAL MATERIAL COMMAND

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This document reports the results of a test and evaluation of five medical backpacks. The tests were performed over a three-month period by the medical departments of four Navy ships and one land-based Marine Corps search and rescue unit. The prototype medical backpacks were designed to transport advanced life support medical equipment and supplies (such as oxygen and ECG monitor/defibrillator) from the ship's medical department to a shipboard casualty. This configuration allowed the medical personnel to have their hands free to negotiate the narrow passages and ladders found aboard ship.

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B. REQUESTING COMMAND AND REFERENCE: NAVSURFWPNCEN 151637 Dec 77

C. PROJECT LABORATORY: Naval Ocean Systems Center (NOSC), San Diego CA 92152

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102. PURPOSE

The purpose of Navy Science Assistance Program (NSAP) Project TH-1-78 was to assess the potential operational effectiveness and operational suitability of the NOSC Medical Backpack for various classes of ships and its readiness for full-scale development.

103. SCOPE

This report is a summary of the operational effectiveness and operational suitability data collected from four ships and one Search and Rescue (SAR) unit during a 3-month test period, from May to September 1978. The NOSC Medical Backpack's operational effectiveness was evaluated in all situations pertinent to ship type. Its operational suitability was evaluated in

specific categories: availability, maintainability, reliability, supportability, compatibility, human engineering, technical documentation, personnel training, durability, and safety. Recommendations are made on the use and development of the NOSC Medical Backpack based on an analysis of the test and evaluation data.

104. BACKGROUND

During the shipboard test and evaluation of the Portable Life Support Stretcher Unit (PLSSU) by the Naval Ocean Systems Center (NOSC) under the sponsorship of the Naval Medical Research and Development Command (NMRDC), it was observed that the usual method of transporting medical equipment and supplies from the ship's medical department to a shipboard casualty was not only awkward, but also hazardous to the medical personnel. Corpsmen and physicians responding to emergencies aboard ship may have one or both hands occupied while trying to quickly negotiate narrow passageways, ladders, hatches, and catwalks. One solution considered for this problem was to mount the equipment and supplies to a backpack frame, thus allowing the free use of the hands.

The initial concept for the medical backpack was discussed with CDR. Etheridge, Head Surgeon, aboard the USS ENTERPRISE (7/77). NOSC developed a mockup unit and preliminary tests were conducted aboard the USS KITTY HAWK.

In October of 1977, the Navy Science Assistance Program was requested to develop and evaluate the Gann Medi-Pac Unit (a flight deck life preserver modified with pockets for carrying first aid supplies, designed by HM2 L. Gann) by COMTHIRDFLT.* COMTHIRDFLT also recommended that the NOSC unit be evaluated and an optimum design between the packs selected. In March of 1978, NOSC summitted a proposal** to NSAP to develop, test, and evaluate the Gann Unit and the NOSC Unit together. The simultaneous

* COMTHIRDFLT ltr 6700 ser 01T/1220, 5 Oct 1977
** NOSC memo ser 823-M-40 WTR:mvh, 8 Mar 1978

test and evaluation would allow similar test and evaluation plans to be used and evaluating personnel could use both packs together, determining their effectiveness in shipboard situations. NSAP agreed to the simultaneous testing if NOSC could provide prototype NOSC units. The Naval Medical Research and Development Command provided funds for NOSC to fabricate seven units to take part in the evaluation. NSAP funded the prototype Gann units and the test and evaluation.

Prototype units and a test and evaluation plan* were developed and COMTHIRDFLT assigned ships for an at sea evaluation. Also, a request was received from the SAR unit at MCAS, Beaufort, South Carolina** indicating they would like to participate in the test and evaluation of the NOSC Medical Backpack if a unit were available. Table 1 lists the participating organizations.

TABLE 1

NOSC Medical Backpack Evaluators

Evaluators	Ship Class	Number of Units Evaluated
USS ENTERPRISE	CVN	2
USS NEW ORLEANS	LPH	2
USS LONG BEACH	CGN	1
USS TRUXTUN	CGN	1
SAR, MCAS, Beaufort, SC	-	1

The test and evaluation plan included a questionnaire to be completed by the head of the medical department and evaluating corpsmen of each participating ship. The test and evaluation plans and the NOSC units

* NOSC TN 444, Test and Evaluation Plan for NOSC Medical Backpack, NSAP Project TH-1-78, by R. W. Kataoka, 17 May 1978

** Fonecon between Captain P. O. Fay, MCAS, Beaufort, SC, and R. W. Kataoka, NOSC on 15 May 1978

were distributed during April 1978. The questionnaires were completed and returned to COMTHIRDFLT at the end of August after a 3-month test period. The questionnaires were then forwarded to NOSC for evaluation.***

The test and evaluation showed that the Gann Unit and the NOSC Unit are appropriate for different concepts; the two units do not duplicate each other's functions, but rather complement each other. Together they provide an emergency response system that can provide first aid supplies (Gann Unit) and definitive medical equipment and supplies (NOSC unit) throughout the ship with a greater safety.

105. DESCRIPTION AND OPERATION

The medical backpack unit is designed to provide corpsmen the capability of carrying larger or specialized medical supplies and equipment in situations where a Unit One or Gann Medi-Pac Unit is not adequate. These situations might include MEDEVAC, mass casualties, cardiac arrest, and smoke inhalation requiring oxygen.

The medical backpack includes a backpack frame, pack modules, inserts for the pack modules, oxygen modules and ECG monitor/defibrillator module (see figure 1). The backpack frame is made of aluminum tubing with a flat aluminum plate (24 inches by 14.5 inches) riveted to the tubing frame. An array of studs is located on the flat aluminum plate with the corresponding mating parts located on the modules.

The backpack frame converts to an equipment platform for a Stokes litter (see figure 2). The conversion requires four legs or struts to be pivoted into place and locked with one wing nut. The legs pivot back into a stored position along the side of the backpack when not in use. The legs are secured to the tubing structure of the Stokes litter with straps.

*** COMTHIRDFLT ltr 6700 ser 01T/1192 of Sep 1978

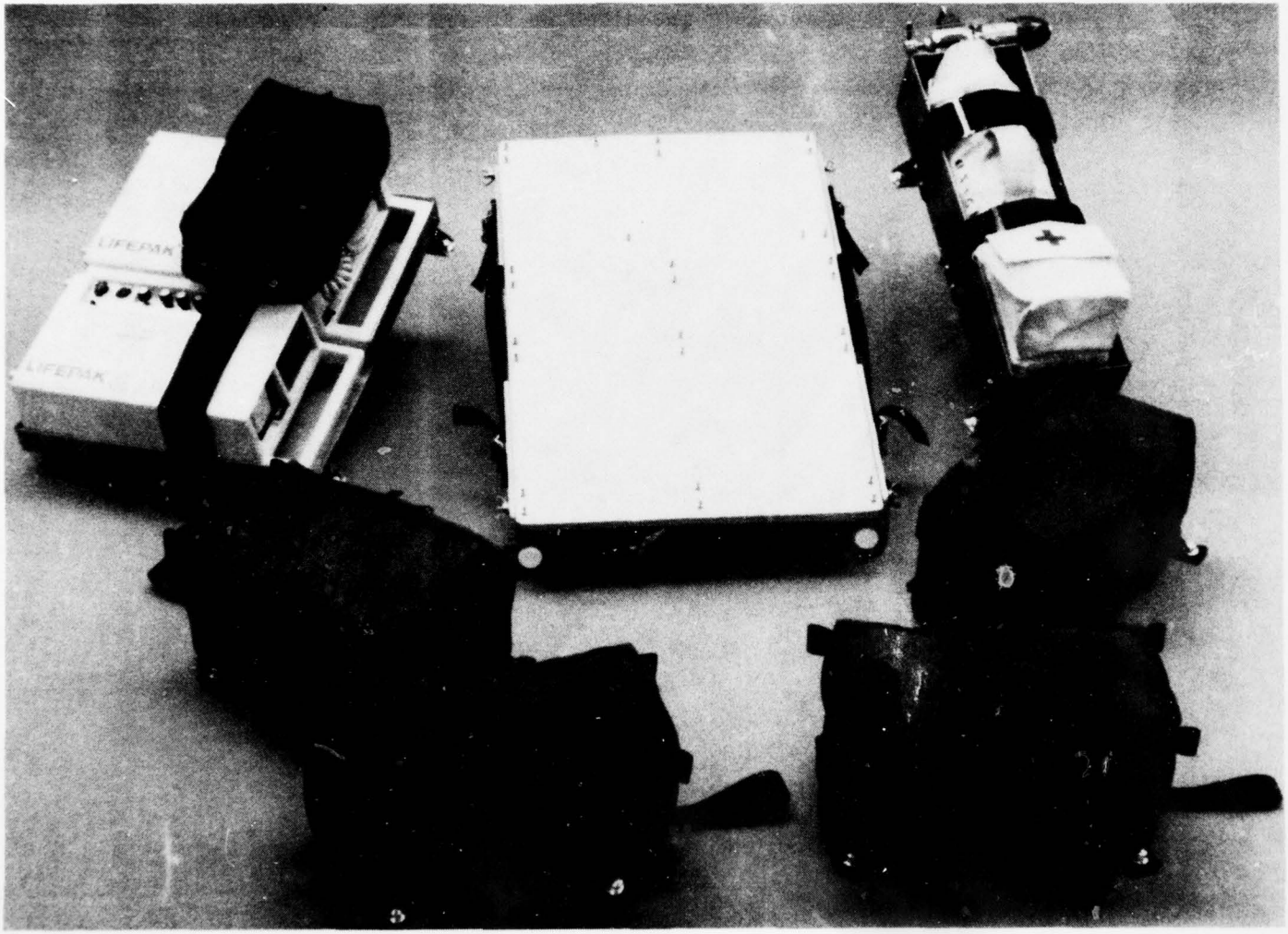

Figure 1. Backpack frame and attachable modules.

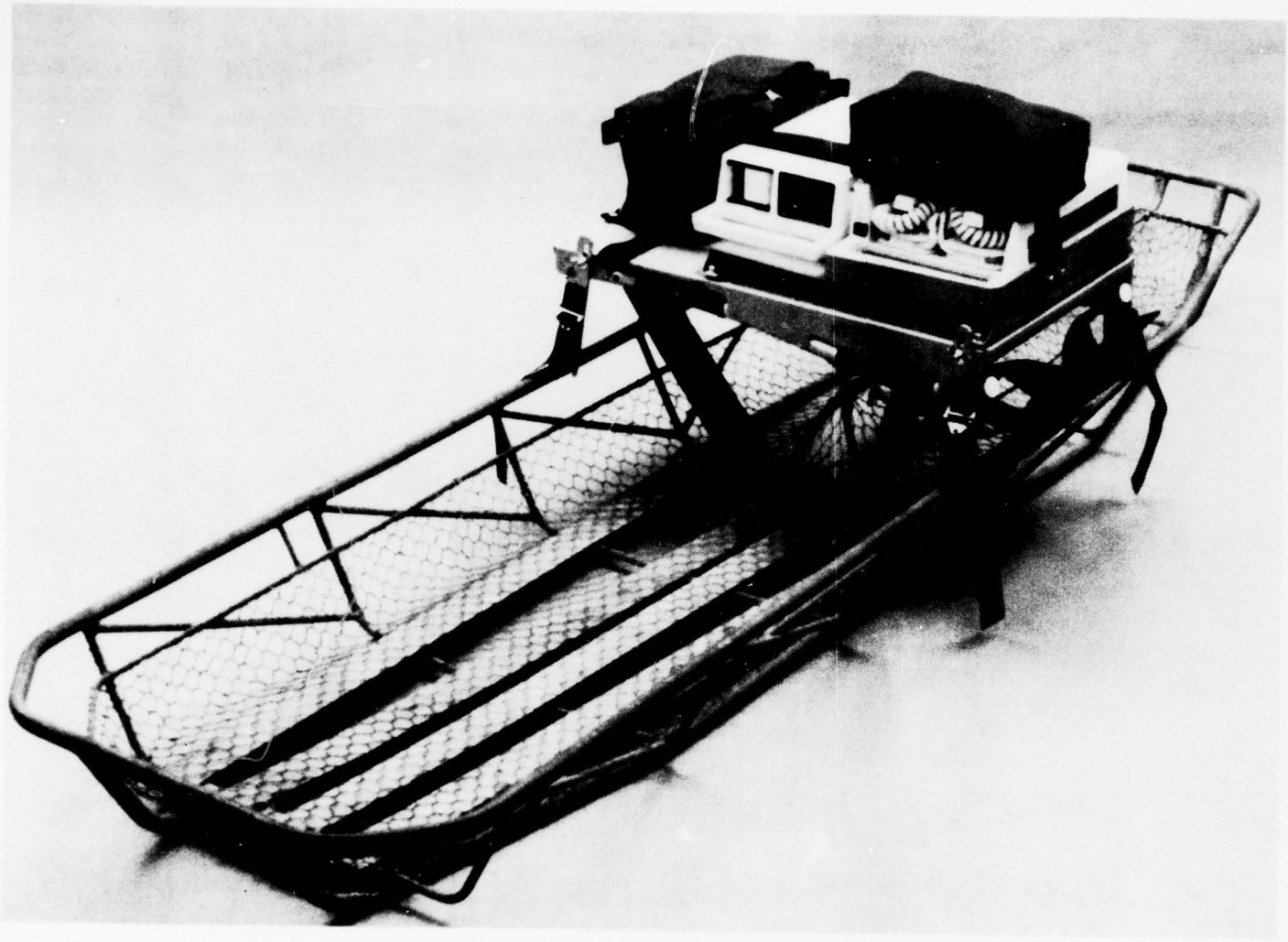

Figure 2. Backpack as an equipment platform on a Stokes litter.

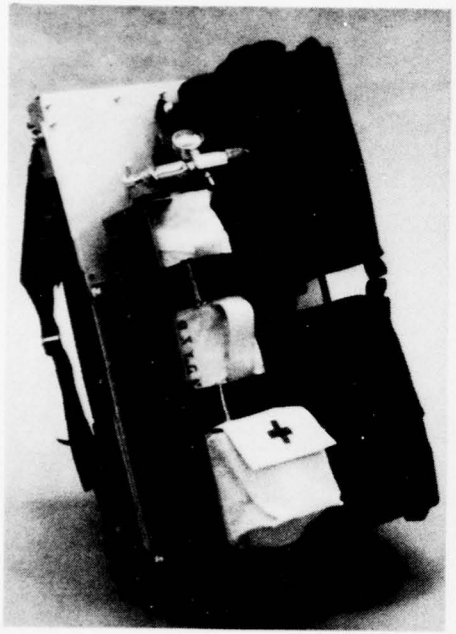

Figure 3. One oxygen and two pack module configuration.

Figure 4. ECG monitor/ defibrillator and one pack module configuration.

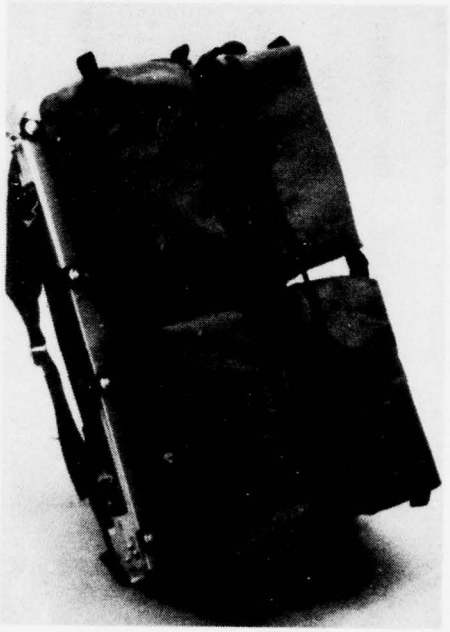

Figure 5. Four pack module configuration.

The modules can be attached to the packpack frame in the following configurations: one ECG monitor/defibrillator module and one pack module (see figure 3), four pack modules (see figure 4), one oxygen module and two pack modules (see Figure 5), or two oxygen modules. The modules are attached to the backpack with quick release and locking parts.

The pack modules are made of a waterproof canvas type material and have one double zipper openning and four points for attachment to the backpack frame. Each module measures 6 inches by 6 inches by 12 inches and occupies one-fourth of the backpack plate. Pack module inserts hold small medical supplies on dividers, using elastic bands. The inserts are held in place in the module with Velcro.

The oxygen module is aluminum with four attachment points to the backpack frame. It holds one "D" size oxygen cylinder with two straps. This module occupies the same area as two pack modules, or one-half the area of the backpack plate.

The ECG monitor/defibrillator module holds one Life Pak 5 ECG Monitor/Defibrillator Unit with one strap. The module has four points for attachment to the backpack frame. The ECG monitor/defibrillator module is 16.5 inches by 13.5 inches by 5 inches and occupies approximately three-fourths of the area of the backpack plate.

SECTION 2

SUMMARY AND RECOMMENDATIONS

201. SUMMARY

A. Overview

All evaluators (on four ships and at one Search and Air Rescue Unit) recommended the medical backpack for their operations. The advantages cited for the backpack concept over their present system were that corpsmen could respond to emergencies with less hazard because their hands were free, and that the modular design allowed a quick change of configurations to respond to most shipboard emergencies. Table 2 shows the number of backpacks and modules recommended by the evaluators. **(See Appendix 3.)**

TABLE 2

Recommended Number of Medical Backpacks

Evaluator	Pack Frames	Pack Modules	Oxygen Modules	ECG Modules
USS ENTERPRISE	3	6	2	1
USS NEW ORLEANS	6	12	5	1
USS LONG BEACH	3	9	3	1
USS TRUXTUN	1	3	1	1
SAR, MCAS, Beaufort, SC	2	8	2	2

The operational effectiveness and operational suitability of the NOSC Unit are summarized from the tabulated questionnaire results in the following paragraphs. An estimate of the cost impact of implementing the unit is also summarized. The results of the questionnaires are tabulated in Appendices 1, 2 and 3.

B. Operational Effectiveness

The medical backpack was evaluated in various shipboard situations, as a medical unit and as a medical equipment mount on a Stokes litter in actual and simulated operations.

1. It was determined that four out of the five evaluators would assign corpsmen with medical backpacks to mass casualty, Medevac, man overboard, and trauma situations. Other situations such as general quarters, fire parties, flight deck, fueling, and repair parties drew a mixture of assignments from the evaluators (see Appendix 1, Table 1-1a). A majority also felt that the contents and the number of backpacks required would not change from a peacetime to combat situation.

Comment - Assigning corpsmen with medical backpacks to shipboard situations is a responsibility that should be left to each medical department. They are in the best position to assess personnel and shipboard situations.

2. As a medical unit, an assortment of suggested medical equipment and supplies was used by each evaluator. Most evaluators preferred to outfit and arrange their own pack modules instead of having standard modules provided. An HN corpsman, or above, familiar with the contents of the backpack and correct use of the items was recommended to be assigned to use the backpack.

Comment - The medical backpack should be implemented without medical equipment and supplies. This will allow the individual medical departments to configure the backpack to their particular needs.

3. When the backpack was used as an equipment mount on a Stokes litter, three problems were documented.

a. Three evaluators cited problems with mounting the backpack with the top half of the underway flotation device in place. The USS NEW ORLEANS

redesigned their underway flotation device to solve a problem experienced during a highline operation. This new design accommodated the mounting of the backpack to the Stokes litter. This new design is documented in Appendix 1, paragraph B.

Comments - The USS NEW ORLEANS design for the underway flotation device should be reviewed. As a safety precaution, the backpack should never be secured to the Stokes litter with straps when a flotation device is used with the Stokes litter. The flotation devices are designed to support a patient and litter only. The backpack should be capable of being removed quickly.

b. The backpack used as an equipment mount on a Stokes litter is most effective when the Stokes is in a horizontal position.

Comment - The mounting feature was not designed for vertical lifting of the Stokes. Also the backpack should not be attached to the Stokes litter during highlining or cable lifts. The weight of the backpack will unbalance the patient and Stokes configuration.

c. Another three inches of clearance for the patient was recommended when the unit is mounted to the Stokes.

Comment - An extra three inches of patient clearance will be considered in future designs.

C. Operational Suitability

This section summarizes the operational suitability of the NOSC Medical backpack in the following categories: availability, maintainability, reliability, supportability, compatibility, human engineering, technical documentation, training, durability, and safety. A tabulated summary of the questionnaire data can be found in Appendix 2.

1. Availability, Maintainability, and Reliability (Appendix 2, Table 2-1): No problems or failures were documented during the test period. The medical backpack was used by two evaluators in actual emergencies aboard ship. Another evaluator noted that, although the unit was not used on an actual emergency during the test period, the unit could have been used effectively on an emergency that occurred just before they received the backpack.

Comment - An attempt will be made to contact the evaluator to determine if problems or failure occurred after the three month test period.

2. Supportability (Appendix 2, Table 2-2): Medical supplies routinely stocked by the ships to support the Unit One kits provide the majority of items suggested for a trauma pack module provide each ship. Additional items which some of the ships would like to stock to support the backpack were a portable suction, pneumatic splints and an ECG monitor/defibrillator.

Comment - The NOSC Unit should be implemented as a backpack without medical supplies or equipment. The stocking and arrangement of the contents should be left to the individual medical departments. The specific contents and arrangement will depend on the training of the corpsmen and the situations to which the units are assigned.

3. Compatibility (Appendix 2, Table 2-3):

a. Most corpsmen wearing the backpack could not pass through a 18-inch hatch.

b. No problems were encountered lowering the backpack through an 18-inch hatch.

c. A five-foot ten-inch one-hundred-eighty pound corpsman had no problems with access through a 24 inch hatch while wearing the backpack.

However, corpsmen in the 200-pound range could not get through a 24-inch hatch wearing the backpack.

d. No evaluator had problems with the stowage of the unit but a hook was recommended on the unit so that the backpack could be hung.

e. The only clothing that interfered with the wearing of the backpack was a life jacket (inherently bouyant type).

f. The backpack does not interfere with other equipment carried by the corpsmen.

g. The backpack and modules should be marked with red crosses for identification.

Comment - Corpsmen assigned to use the backpack should know their own limitations as far as access through the smaller hatches while wearing the backpack. Physically larger corpsmen will have access problems through smaller hatches whether hand carrying or wearing the backpack equipment. In both cases, the equipment will have to be lowered or lifted through the hatch separately.

4. Human Engineering (Appendix 2, Table 2-4):

a. Contents of the pack modules were easily accessible.

b. One-half of the evaluators indicated that mobility of user is hampered.

c. The backpack was comfortable to wear.

d. The oxygen regulator valve requires additional protection.

e. The Life Pak 5 controls were easily accessible.

f. The large pack frame size fit all corpsmen testing the units.

Comment - The pack will hamper the mobility of corpsmen but is considered less inhibiting and safer than hand carrying the equipment and supplies. The oxygen module will require redesign.

5. Technical Documentation and Training (Appendix 2, Table 2-5):

a. The documentation recommended for the backpack included an inventory list, instructions for attaching the backpack to the Stokes litter, instructions for operating the Life Pak 5, and a list of standard drug dosages as given in COMNAVSURFPAC 6000 .1A.

b. Corpsmen will require familiarization with the location of medical supplies in the unit and a working knowledge of how to use the medical supplies and equipment included in the backpack.

Comment - The documentation and training required to implement the backpack will be minimal.

6. Durability (Appendix 2, Table 2-6): No damage was reported to the backpack during the test period.

Comment - An attempt will be made to contact the evaluators to determine if problems or failures occurred after the three-month test period.

7. Safety (Appendix 2, Table 2-7):

a. Potential hazards documented included:

1) Breakage or damage to the oxygen regulator and valve.

Comment - The oxygen module will be redesigned to minimize the breakage possibility.

2) Quick release waist belt is needed to allow removal of the backpack in emergencies.

Comment - A waist belt with a velcro or quick release buckle will be considered. The same quick release will be considered for one of the shoulder straps to speed the removing of the backpack in emergencies.

3) Possibility of getting stuck in the hatch while trying to squeeze through wearing the backpack.

Comment - Each corpsman should know his own limitations through hatches.

b. The backpack allows corpsmen to carry medical supplies and equipment with greater safety than the present method.

D. Cost Impact (Appendix 4)

The Medical backpacks are best utilized on the larger ships such as CVN, CV, CGN, CG, and amphibious classes. These ships usually have a physician and/or several corpsmen to utilize the backpacks. The estimated number of medical backpacks and modules required for these ships is 318 backpack frames, 556 pack modules, 166 oxygen modules, and 76 ECG monitor/defibrillator modules. These estimates were determined by assuming a number of units for each class of ship based on the evaluators' responses (see Appendix 4, Table 4-1).

The estimated cost impact for implementing the NOSC Medical Backpack is $86,000. This estimate was based on the cost of the prototype units (see Appendix 4).

202. RECOMMENDATIONS

1. Since all the evaluators viewed the backpack concept favorably and recommended the backpacks for their class of ship, engineering development models of the medical backpack should be developed.

2. All modifications and potential hazards documented in the test and evaluation should be considered in the design of the engineering development model.

a. Redesign of the oxygen module for better protection of the regulator and valve.

b. Add three inches to the height of the backpack when it is used as an equipment mount on a Stokes litter.

c. Easier attachment and detachment of the oxygen and ECG monitor/defibrillator module.

d. Develop a quick release waist belt.

3. Review the possibility of incorporating the Marine Corps backpack frame into the backpack design with the medical modules as options.

4. Develop more pack module sizes.

5. Develop an operating manual.

6. Test and evaluate the engineering development models.

APPENDIX 1

SUMMARY OF QUESTIONNAIRE DATA ON OPERATIONAL EFFECTIVENESS

Included in this Appendix are the tabulated results of questions on the operational effectiveness of the NOSC Medical Backpack. The questions asked in the questionnaire are stated at the top of each table. The operational effectiveness of the unit in shipboard situations, as a medical unit, and as an equipment mount on a Stokes litter are documented.

TABLE 1-1a. OPERATIONAL EFFECTIVENESS IN SHIPBOARD SITUATIONS

1. Indicate the number of NOSC units that you would recommend could be used or that were assigned in the following situations aboard your class ship.

Evaluator	general quarters	fire parties	flight deck	fueling	repair parties	mass casualty	MEDEVAC	man overboard	trauma calls
USS ENTERPRISE		1		1			1	1	1
USS NEW ORLEANS	6	1	1			2	2		
USS LONG BEACH	3	1	1		1	3	1	1	1
USS TRUXTUN						1		1	1
SAR, MCAS Beaufort, S.C.						1	1	1	1

TABLE 1-1b OPERATIONAL EFFECTIVENESS IN SHIPBOARD SITUATIONS

2. Would there be any changes in the number of NOSC units or their contents for peacetime versus combat situations?

Evaluators	Content changes?	Comments
USS ENTERPRISE	no	
USS NEW ORLEANS	no	
USS LONG BEACH	no	
USS TRUXTUN	no	
SAR, MCAS Beaufort, S.C.	yes	"Tailor the backpack for trauma rather than a wide variety of injuries and situations."

TABLE 1-2a OPERATIONAL EFFECTIVENESS AS A MEDICAL UNIT

1. Indicate the contents of the pack modules your department used during the test and evaluation period.

Evaluators	Pack Module Contents
USS ENTERPRISE	#1. O_2 modules with in-line O_2 to AMBU bag connection. #2. AMBU Bab, leg air splint, arm air splint #3. Trauma pack provided
USS NEW ORLEANS	#1. Respirator/aspirator, tube inhaler, O_2 mask, connecting surgical tubing, airway #2. Aspirator, catheter and connector for suction (14 Fr and 10 Fr)
USS LONG BEACH	#1. Trauma pack provided #2. Providine iodine 4oz., 2x2" gauze pad, 4x4" sponge gauze, first aid eye dressing, petrolatum 3x18" gauze, Iso. Alcohol pad, Bacitracin ointment #3. Sphygmomanometer, stethoscope, O_2 ventimask, 250 cc saline inj., IV inj. tubing, 20 ga needles, minor surgical kit, ammonia ampules, sodium bicarb. 7.5% 50 cc
USS TRUXTUN	#1. Trauma pack provided #2. Ringer's lactate, IV inj. set, 16&18 ga angiocath IV cannula, 10 cc syringe, 5 cc syringe, sterile disposable needles #3. Lidocaine 1%, 4-0 nylon cutting needle suture set
SAR, MCAS Beaufort, S.C.	#1. Trauma kit provided

TABLE 1-2b OPERATIONAL EFFECTIVENESS AS A MEDICAL UNIT

2. Should the contents of the pack modules be standardized or left empty to be filled by each Medical department?
3. Indicate the experience level you would recommend for corpsmen assigned to use the NOSC unit and its contents.

Evaluators	Standardize Modules?	Training?	Comments
USS ENTERPRISE	empty	advanced first aid	
USS NEW ORLEANS	Standardize aboard each ship	ship trained	1. Standardize with available supplies, compatible with the mission and personnel. 2. CPR, Emergency medicine, O_2 administration, ECG monitoring and defibrillation.
USS LONG BEACH	empty	HN and above	
USS TRUXTUN	empty	HN and above	
SAR, MCAS Beaufort, S.C.	Standardize	---	1. Standardize for burns, IV and trauma.

TABLE 1-3a OPERATIONAL EFFECTIVENESS AS A MOUNT FOR EQUIPMENT ON A STOKES LITTER

1. Problems with mounting unit to a Stokes litter?
2. Does the unit interfere with slings, flotation equipment or standard attachments to Stokes?

Evaluator	Mounting problems?	Interference?	Comments
USS ENTERPRISE	Yes	No	2. Difficulty encountered when moving Stokes on ladder.
USS NEW ORLEANS	Yes	Yes	1. None with standard Stokes. 2. Underway transfer Stokes stretcher did not allow mounting of NOSC unit.
USS LONG BEACH	None	Yes	2. Interferes with patient accessibility when Stokes is rigged for flotation.
USS TRUXTUN	None	Yes	1. Easily mountable, no problems. 2. Top half of flotation gear will not attach with backpack in place.
SAR, MCAS Beaufort, S.C.	None	No	

TABLE 1-3b OPERATIONAL EFFECTIVENESS AS A MOUNT FOR EQUIPMENT ON A STOKES LITTER

3. Is there enough clearance for patient with the unit mounted?
4. Does the unit stay secured to the Stokes litter in all positions?

Evaluators	Patient clearance?	Stay secured?	Comments
USS ENTERPRISE	no	no	4. Had to remove when moving patient on some ladders.
USS NEW ORLEANS	yes	yes	
USS LONG BEACH	no	yes	3. Need 3" more clearance. 69", 180 pound patient had only 3" clearance with no room for outer clothing or blankets.
USS TRUXTUN	yes	no	3. Fits well over hips, tight over chest. Another 3-4" might be good. 4. Ladders and passage very narrow, transfer by Stokes alone difficult.
SAR, MCAS Beaufort, S.C.	yes	yes	4. Strap slips when Stokes is in the vertical position. No problem horizontally.

APPENDIX 2

SUMMARY OF QUESTIONNAIRE DATA ON OPERATIONAL SUITABILITY

Included in this Appendix are the tabulated results of questions on the operational suitability of the NOSC Medical Backpack. The questions asked in the questionnaire are stated at the top of each table. The operational suitability evaluation includes availability, maintainability, reliability, supportability, compatibility, human engineering, technical documentation, training, durability and safety.

TABLE 2-1 OPERATIONAL SUITABILITY: AVAILABILITY, MAINTAINABILITY AND RELIABILITY

1. Document all problems, failures, causes and the time the NOSC unit was not available for uses.

Evaluators	Problems	Comments
USS ENTERPRISE	None	1. Unit was used to treat man caught in canopy with chest and spine injury.
USS NEW ORLEANS	None	1. No failures.
USS LONG BEACH	None	1. Used for resuscitation of CVA, unit functioned properly.
USS TRUXTUN	None	1. Not used during test period, but had to treat and transfer a casualty from a Merchant Marine vessel one week before receiving the pack. It would have been a perfect application.
SAR, MCAS Beaufort, S.C.	None	1. None listed.

TABLE 2-2 OPERATIONAL SUITABILITY: SUPPORTABILITY

1. Do you normally stock all items included in the trauma pack module provided?
2. What items would you like to stock to support the NOSC unit?

Evaluators	Stock trauma pack items?	Other items you would like to stock
USS ENTERPRISE	Yes	Flashlight but have suitable replacement
USS NEW ORLEANS	Yes	Supporting items listed in COMNAVSURFPACINST 6000.1A
USS LONG BEACH	Yes	All desired items on board
USS TRUXTUN	Yes	Do not have ECG pack which might be of value
SAR, MCAS Beaufort, S.C.	Yes	Supporting items portable suction, pneumatic splints

TABLE 2-3a OPERATIONAL SUITABILITY: COMPATIBILITY

1. Does the NOSC unit allow the wearer access through 24" hatches, ladders and passages?
2. Is there adequate stowage for the unit in the Medical Department?
3. Does the unit allow other clothing to be worn while carrying the unit?

Evaluators	access?	adequate stowage?	wear other clothing?	Comments
USS ENTERPRISE	yes	no	no	1. No problem for corpsman 5'10", 180 pounds 2. Had to fashion a hanger 3. Can't use with a life jacket
USS NEW ORLEANS	yes	yes	yes	
USS LONG BEACH	-	yes	yes	
USS TRUXTUN	no	yes	yes	1. 73", 165-pound corpsman could barely sqeeze through 18" hatch. Other two corpsman (71" 203 pounds and 74", 222 pounds) could not get through a 24" hatch
SAR, MCAS Beaufort, S.C.	N/A	yes	yes	3. Including LPA-2

TABLE 2-3b OPERATIONAL SUITABILITY: COMPATIBILITY

4. Is the unit compatible with other equipment carried by corpsmen?
5. What markings should the NOSC unit have to be compatible with ships recognition of corpsmen aboard your class ship?
6. Problems lowering unit through 18" hatch?

Evaluators	Equipment compatible?	Markings?	Problems with 18" hatch?
USS ENTERPRISE	yes	red crosses and ship identification	None
USS NEW ORLEANS	yes	red cross	None
USS LONG BEACH	yes	satisfactory as is	None
USS TRUXTUN	yes	red crosses	No problems
SAR, MCAS Beaufort, S.C.	yes	red cross	N/A

TABLE 2-4a OPERATIONAL SUITABILITY: HUMAN ENGINEERING

1. Are the contents of the pack modules easily accessible?
2. Is the mobility of the user hampered?
3. Is the unit comfortable to wear (weight, balanced)?

Evaluators	modules accessible?	mobility hampered?	comfortable?	Comments
USS ENTERPRISE	yes	yes	yes	1. Orientation of zippers important 2. A little heavy but tolerable
USS NEW ORLEANS	yes	not appreciably	yes	
USS LONG BEACH	yes	no	yes	
USS TRUXTUN	yes	yes	yes	2. Through small hatches
SAR, MCAS Beaufort, S.C.	yes	no	yes	3. Very well balanced

TABLE 2-4b OPERATIONAL SUITABILITY: HUMAN ENGINEERING

4. Can the oxygen regulator valve be utilized with obstruction?
5. Are the controls on the Life Pak 5 easily accessible?
6. Does the backpack fit the various sizes of corpsmen in your department or would different sizes of backpack frames be required?

Evaluators	O_2 valve obstruction?	Life Pak 5 controls?	backpack size adequate?	comments
USS ENTERPRISE	yes	yes	yes	4. Valves need to be protected from banging on the hatches 6. Standard size OK
USS NEW ORLEANS	no	yes	yes	4. Suggest enlarging opening at the neck of the O_2 holder to allow more room for connecting to O_2 mask 6. Fits all corpsmen aboard
USS LONG BEACH	yes	not tested	yes	4. Regulator should be rotated toward pack 5. Do not have a Life Pak 5 on board 6. Generally all purpose
USS TRUXTUN	no	not tested	yes	4. Bottle holding frame can prevent easy access to oxygen valve control and O_2 outlet. Redesign canvas bag to hold O_2 cylinder without metal container 5. Do not have Life Pak 5 6. Fits all
SAR, MCAS Beaufort S.C.	yes	N/A	yes	6. No difficulty

TABLE 2-5 OPERATIONAL SUITABILITY: TECHNICAL DOCUMENTATION AND TRAINING

1. What documentation should be included with the unit?
2. Do you recommend training for corpsmen in the use of the backpack?

Evaluators	documentation?	training?	comments
USS ENTERPRISE	yes	no	1. Instruction manual for Life Pack 5 2. Just familiarization with contents
USS NEW ORLEANS	yes	yes	1. Inventory list, operating instructions for Life Pak 5, standard dosage for drugs listed in COMNAVSURFPAC 6000.1A 2. CPR, Emergency medicine, O_2 administration, ECG monitoring and defibrillation
USS LONG BEACH	yes	yes	1. Contents of modules, Stokes attachment 2. Contents of modules, Stokes attachment
USS TRUXTUN	yes	yes	1. A suggested inventory list, instructions for attaching to Stokes litter and operating ECG 2. Nothing special unless ECG module provided
SAR, MCAS Beaufort, S.C.	yes	no	1. Inventory list 2. Familiarization with contents

TABLE 2-6 OPERATING SUITABILITY: DURABILITY

Document all damage.

Evaluators	Damage	Comments
USS ENTERPRISE	None	
USS NEW ORLEANS	None	
USS LONG BEACH	None	
USS TRUXTUN	None	
SAR, MCAS Beaufort, S.C.	None	

TABLE 2-7 OPERATING SUITABILITY: SAFETY

1. Are there any potential hazards caused by the NOSC unit configuration?
2. Does the unit allow you to carry medical equipment aboard the ship with greater safety than your present method?

Evaluators	Potential hazards?	Safer with backpack?	Comments
USS ENTERPRISE	yes	yes	1. Potential for hang-up with O_2 bottle, need quick release for waist belt
USS NEW ORLEANS	no	yes	
USS LONG BEACH	yes	yes	1. Potential hazard of regulator breakage if not turned toward pack, however, when it is turned inward the O_2 line hampers access to module 1
USS TRUXTUN	no	yes	1. Not unless you include someone getting stuck in a hatch 2. Primarily because it keeps both hands free for grasping ladder handrails or preventing falls in rough seas
SAR, MCAS Beaufort, S.C.	no	yes	

APPENDIX 3

SUMMARY OF QUESTIONNAIRE DATA ON OVERVIEW

General comments included in the questionnaire and attached comments to the questionnaire are documented in this Appendix. Also included are the number of Medical Backpacks recommended by each evaluator for his situation.

Table 3-1 Overview: Medical Personnel

Table 3-2 Overview: Recommended Number of NOSC Medical Backpacks for Ship Classes.

Figure 3-1: Navy Corpsman with NOSC Medical Backpack being lowered with hoist from CH-46 Helicopter.

Figure 3-2: Navy Corpsman with NOSC Medical Backpack and Gann Medi-Pac Unit being lowered through hatch in CH-46 Helicopter.

Figure 3-3: Modified flotation on Stokes litter.

Figure 3-4: Modified flotation on Stokes litter secured in place.

Figure 3-5: NOSC Medical Backpack mounted on Stokes litter with patient.

Figure 3-6: Modified flotation on Stokes litter with patient and NOSC Medical Backpack mounted.

A. General Comments Included in the Questionnaire

USS ENTERPRISE: "Appears to be a step forward and will be used if included in the inventory. We like to have the AMBU bag available therefore provisions to include this in contents should be considered."

USS NEW ORLEANS: "The backpack units are well designed and increase the ability to respond to emergencies with less hazard to corpsmen as their hands are free to hang on to handrails when using ladders, etc. With the module concept the backpack units can be modified to most shipboard emergencies. The only problem encountered with the backpack unit was separating the oxygen and Life-Pak 5 modules from the backpack. It was almost impossible for one person to separate the modules from the backpack. Suggest modifying the clips to facilitate easy removal by one person."

USS LONG BEACH: The Canvas O_2 Cover - "Suggest replacement of rectangular pocket by a long pocket situated longitudinally and large enough to contain the regulator. This would require moving the uppermost strap toward the valve stem about 1½" or more, so as to secure the regulator yoke when the regulator is stowed. The woven handle now attached to the bag could be moved to the top of the bag and situated laterally."

The Pack chassis and O_2 box - "The aluminum O_2 box could be shortened by 1" and the legs of the chassis cut flush with the box. The spring snaps could be mounted under the box and holes made in the styrofoam if desired. The snap heads could be placed on both sides of the cylinder frame and would not abut the cylinder directly.

The support piece for the O_2 cylinder stem should be spring loaded from below to maintain pressure against the regulator.

Suggest the back pack frame legs be rotated 90 degrees using current fastening design, so that pack can fit lengthwise at foot end of the Stokes litter as opposed to transversely as in your photo, thus allowing improved access to the patient when litter is rigged with full flotation gear.

The male fastening snaps at upper corner of chassis should be moved toward the center about ¼" to allow modules to be fastened on chassis when the legs are in position to be mounted on a Stokes.

Current male snap adapter sites should allow for O_2 attachment lengthwise. With current Stokes attachments the O_2 cylinder head and regulator are too susceptible to damage. Ideally, with backpack mounted crosswise on Stokes the O_2 cylinder should be parallel to the litter for maximum safety and ease of access to the patient from either side."

USS TRUXTUN: No comment

SAR MCAS, Beaufort SC: "Much more versatile and comprehensive than Unit 1 or Gann Medi-Pac. A combination of the backpack and the Gann Unit can deal with most situations very effectively."

TABLE 3-1 OVERVIEW: MEDICAL PERSONNEL

Evaluators	Physicians	HMC	HM1	HM2	HM3	HN & Below
USS ENTERPRISE	4	5	8	10	19	6
USS NEW ORLEANS	1	1	3	2	2	4
USS LONG BEACH	1	2	1	4	3	1
USS TRUXTUN	1	1	1		2	
SAR, MCAS Beaufort S.C.				1	3	1

TABLE 3-2 OVERVIEW: RECOMMENDED NUMBER OF NOSC MEDICAL BACKPACKS FOR SHIP CLASSES

Evaluators	Pack frames	Pack modules	O_2 modules	ECG monitor defibrillator unit
USS ENTERPRISE	3	6	2	1
USS NEW ORLEANS	6	12	5	1
USS LONG BEACH	3	9	3	1
USS TRUXTUN	1	3	1	1
SAR, MCAS Beaufort, S.C.	2	8	2	2

B. Attached Comments to the Questionnaire

1. Memorandum, from HM3 D. D. Henning Jr., USS ENTERPRISE, 22 August 1978.

2. Letter, from CAPT P. O. Fay, USMC, Officer-in-Charge, SAR MCAS, Beaufort, SC, August 1978.

3. Attached comments, from LT D. C. Larned, MC, USS NEW ORLEANS, August 1978.

USS ENTERPRISE

22 AUG 78

MEMORANDUM:

Subj: Gann Medi-Pac; evaluation of

1. The times I have had the use of the Gann Pac has been limited, due to the lack of serious accidents. I had carried it only on actual fires and emergency calls.

2. The times that I did use the Gann Pac, I found the basic concept a much needed one. It serves three (03) obvious purposes very well:

a. It provides a storage area for an add on feature to the basic unit.

b. The two pouches are neatly put together and easily accessable, due to zippers and hook-like design.

c. It puts a first aid package and oxygen supplies together on the back pack that can be strapped on.

3. Some of the complaints are as follows:

a. When you put it on and start running to the scene you notice its' a little on the heavy side.

b. The contents of the pack when received, are not practical on ENTERPRISE:

(1) To many bandages

(2) No splints

(3) No AMBU Bag

(4) No inline oxygen or AMBU Bag connection lines

(5) No protection for oxygen bottle and top assemble unit

(6) Pouches are to close together, causing zipper opening difficulties

4. In my opinion the Gann Pac is a tool that will be indispensable to Medical personnel of the future, and I highly recommend its' usage fleet wide.

Carden D Fleming Jr

CARDEN D. FLEMING JR.
HM3 USN

NOTE: NOSC Medical Backpack name confused with Gann Medi-Pac. All references to Gann Medi-Pac are actually to the NOSC Backpack.

SEARCH AND AIR RESCUE
Marine Corps Air Station
Beaufort, South Carolina 29902

AO:POF:jld
3130

From: Officer-In-Charge
To: Biomedical Engineering Branch (Code 8233), Naval Ocean Systems Center San Diego, Ca. 92152

Subj: Test and Evaluation GANN MEDI-PAC Unit, Medical Backpack;

Encl: (1) Test and Evaluation Questionaire GANN MEDI-PACK
(2) PHOTOGRAPHS
(3) NOSC Backpack, Recommended Equipment

1. An intensive usage and evaluation study was conducted by this unit of the subject equipment in the actual operational environment. Both units were found to be completely compatible with all phases of overland rescue from the HH-46A helicopter whether the boom-hoist or winch device were utilized. Constructive recommendations are offered in the following paragraphs.

2. The NOSC Backpack was found to be of greatest utility, permitting the optimum selection of medical equipment necessary to deal with aviation related accidents or ejections and multiple injuries. In addition, equipment such as traction splints, etc. could be easily attached to the backpack frame augmenting equipment already internal to the backpack. It is recommended that shoulder padding be attached to the straps and that a velcro waist band replace the present buckle assembly which does not hold and must be continuously readjusted. It is further recommended that pocket assemblies be designed to accommodate a portable suction unit, Oxygen bottle and IV apparatus in addition to standard first aid equipment. It is felt that the EKG unit is most expendable as an immediate care apparatus as a determination of death can only be made by competent authority following EEG results and helicopter vibration makes the test results somewhat questionable.

3. The GANN Medi-Pack unit is considered an excellent combination of first aid and floatation/survival equipment. It was found to easily accommodate usage of the NOSC backpack for more extensive first aid efforts in or around a water environment. It is considered to have some significant drawbacks however. The snap closures did not hold the GANN Medi-Pack closed when tower abandon-ship drills were conducted. Impact with the water from twelve feet resulted in unfastening of all snaps not held down. The rotor-wash

AO:POF:jld
3130

of the helicopter had the same affect of opening the snap type closures. Velcro is recommended as an alternative. It was also found that the material utilized in the GANN Medi-Pac tears easily when lowering corpsmen into brush or trees resulting in snagging. This tendency and the highly absorbant qualities towards fuel, oil and hydraulic fluids would indicate that a non-absorbant fire resistant material such as was employed in the NOSC backpack is by far the most preferable. Operating Oxygen equipment about an aircraft or shipboard fire while wearing a fuel/oil saturated vest is not conducive to longevity.

4. In closing it is desirable to point out that both concepts are considered operationally applicable to the helicopter search and rescue mission. Both backpacks have been found utilitarian, singly or in combination. The NOSC backpack concept is by far and large the greatest asset for overland rescue and this Unit had been seeking just such a solution. The NOSC backpack is easily obtainable on open purchase and would be easily adaptable to NOSC configured standards. The unit is considered highly cost effective as an item of initial purchase and serves to limit, standardize and conserve medical equipment purchases to predictable budget levels. Replacement and maintenance costs are also easily projected which ensures elimination of unnecessary cost or waste. The NOSC backpack and standardized configurations are strongly recommended for Navy wide incorporation as standard search and rescue equipment. Such recommendation can be made to ASEP Coordinator (OP-50C), Office of the Chief of Naval Operations, Navy Department, Washington D.C. 20350.

P. O. Fay

P. O. FAY
CAPT USMC

Figure 3-1. Navy Corpsman with NOSC Medical Backpack being lowered with hoist from CH-46 Helicopter.

Figure 3-2. Navy Corpsman with NOSC Medical Backpack and Gann Medi-Pac Unit being lowered through hatch in CH-46 Helicopter.

LT David C. Larned, MC, USS NEW ORLEANS

"Recently a problem was encountered with the Underway Transfer Stokes stretcher (ship to ship highline) in air MEDEVAC. This prompted USS NEW ORLEANS air crew personnel to design a modified Underway Transfer Stokes Stretcher. The bulk of the standard Underway Transfer Stokes made it almost impossible to transfer a patient from a ship in heavy seas by hoist into the Ship's helicopter (CH-46). Enclosed are some pictures taken of the modified Stokes designed by the Ship's air crew. Although the stretcher did not float as high out of the water as the standard underway transfer Stokes, it did accommodate the NOSC Backpack. I feel with additional floatation the modified Stokes would work equally as well as the standard Underway Transfer Stokes and with less weight and bulk. The simulated patient in the stretcher is 72 inches tall and weighs 235 pounds. Plan to do further testing with the modified Stokes stretcher as time permits."

Figure 3-3 Modified flotation on Stokes litter.

Enclosure (2) to COMTHIRDFLT ltr
FF/3 6700 Ser. 017

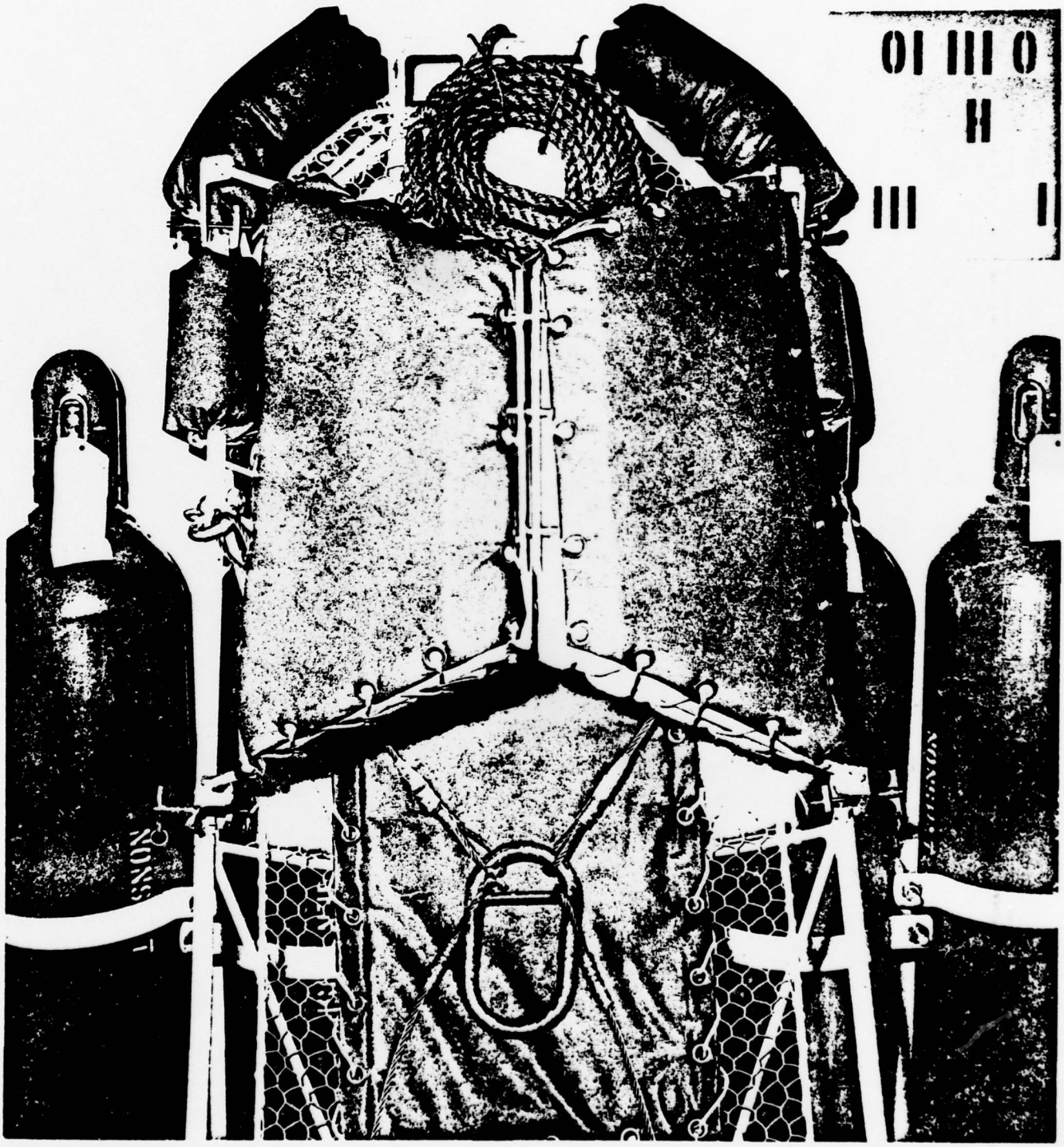

Figure 3-4. Modified flotation on Stokes litter secured in place.

Encl (2) to COMTHIRDFLT ltr
6700 Ser 01T/

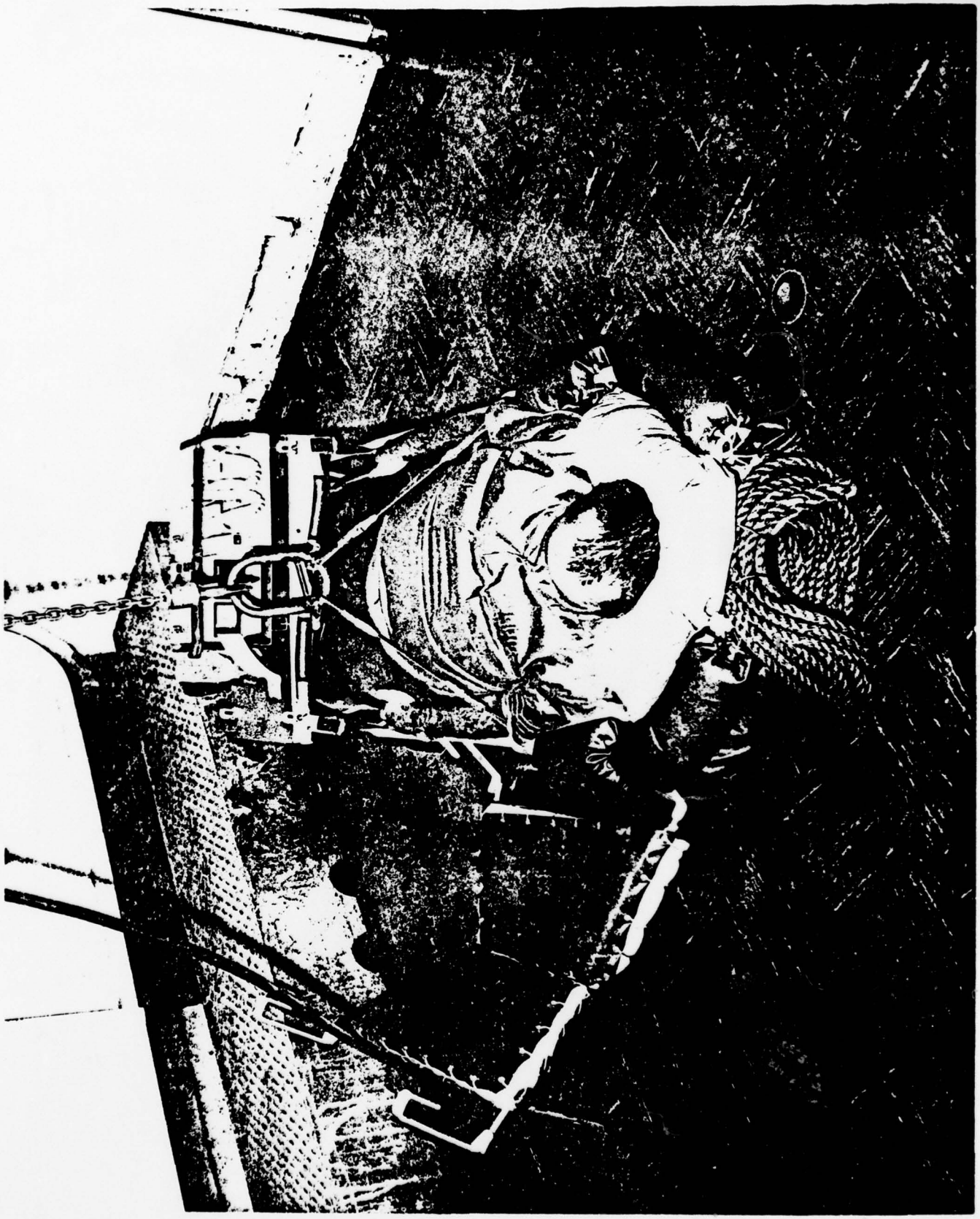

Figure 3-5. NOSC Medical Backpack mounted on Stokes litter with patient.

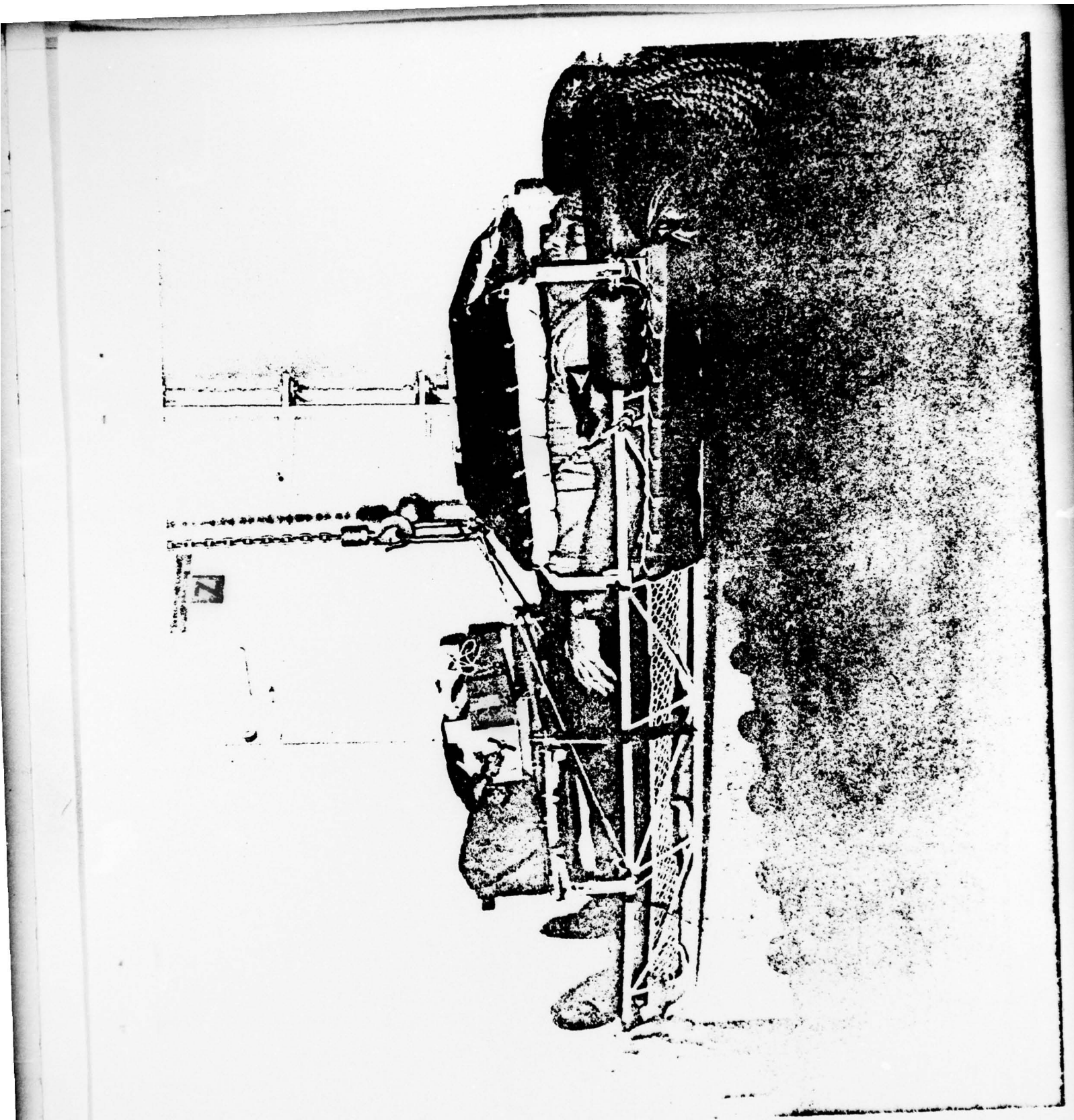

Figure 3-6 Modified flotation on Stokes litter
with patient and NOSC Medical Backpack mounted.

APPENDIX 4

ESTIMATED NUMBER OF MEDICAL BACKPACKS FOR FLEET USE AND THE COST OF IMPLEMENTING

Included in this Appendix are an estimate of the number of NOSC Medical Backpacks that could be utilized by the Fleet and an estimate of the cost impact.

Table 4-1: Estimated Number of Backpacks for Fleet Use

Table 4-2: Estimated Cost of Backpacks for Fleet Use

A. ESTIMATED NUMBER OF MEDICAL BACKPACKS FOR FLEET USE

The medical backpack is best utilized on the larger ships such as CVN, CV, CGN, CG and amphibious classes. The following estimate of the number of backpacks and modules that would be required for these class ships is based on the questionnaire results (see Table 3-2).

Estimates are:

1. Four backpack frames each for CVN, CV, LHA, and LPH classes.
2. Two backpack frames each for CGN, CG, and other amphibious classes.
3. Two pack modules for each backpack frame.
4. One less oxygen module for each backpack frame aboard ship. (A ship with four backpacks, for example, would have three oxygen modules)
5. One ECG monitor/defibrillator module per ship.

Table 4-1 shows the total number of backpack frames and modules required for the Fleet based on these estimates.

B. ESTIMATED COST OF IMPLEMENTING

The cost to produce the production model would be less than the cost of the prototype model due to mass production and no design costs. The contractor of the prototypes estimates that a 25% to 30% reduction in the price of the prototype units might be realized depending on the size of the order. The following cost estimate for implementing the medical backpack uses a 30% reduction in the prototype unit cost. Table 4-2 shows the estimates.

TABLE 4-1 ESTIMATED NUMBER OF BACKPACKS FOR FLEET USE

CATEGORY-TYPE	SHIPS ACTIVE & BUILDING TOTAL	BACKPACK FRAMES		PACK MODULES		OXYGEN MODULES		ECG MONITOR DEFIBRILLATOR MODULES	
		Per Ship	Total	Per Ship	Total	Per Ship	Total	Per Ship	Total
AIRCRAFT CARRIERS									
CVN Aircraft Carriers (nuclear)	4	4	16	8	32	3	12	1	3
CV Aircraft Carriers	11	4	44	8	88	3	33	1	33
CRUISERS									
CGN Guided Missile Cruisers (nuclear)	8	2	16	4	32	1	8	1	8
CG Guided Missile Cruisers	20	2	80	4	80	1	20	1	20
AMPHIBIOUS WARFARE FORCES									
LCC Amphibious Command Ships	2	2	4	4	8	1	2		
LHA Amphibious Assault Ships (GP)	5	4	20	8	40	3	15	1	5
LPH Amphibious Assault Ships	7	4	28	8	56	3	21	1	7
LKA Amphibious Cargo Ships	6	2	12	4	24	1	6		
LPA Amphibious Transports	2	2	4	4	8	1	2		
LPD Amphibious Transport Docks	14	2	28	4	56	1	14		
LSD Landing Ships Dock	13	2	26	4	52	1	13		
LST Landing Ships Tank	20	2	40	4	80	1	20		
TOTALS			318		556		116		76

TABLE 4-2 ESTIMATED COST OF BACKPACKS FOR FLEET USE

	prototype cost	production cost factor	number required	total
Backpack Frame	$250	.7	313	$55,650
Pack modules	$ 35	.7	556	$13,622
O_2 modules	$100	.7	166	$11,620
ECG monitor/defibrillator	$100	.7	76	$ 5,320
			TOTAL	$86,212

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RJ SCHULTE, CAPT USN, CHIEF OF STAFF
NSAP ADVISOR (DR GENE E. LAYMAN)

CHIEF, BUREAU OF MEDICINE AND SURGERY
NM&S-51 (CAPT MG WEBB, ASST CHIEF FOR OPERATIONAL MEDICAL SUPPORT)
NM&S-43 (CDR L MANTEL, MC, USN, EQUIP & LOGISTICS DIV)

NAVAL MEDICAL RESEARCH & DEVELOPMENT COMMAND (10)
CODE 45 (LCDR J BATES, USN)

USS ENTERPRISE (CVN 65)
MEDICAL DEPT

USS NEW ORLEANS (LPH 11)
MEDICAL DEPT

USS LONG BEACH (CGN 9)
MEDICAL DEPT

USS TRUXTUN (CGN 35)
MEDICAL DEPT

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N02E, NSAP ADVISOR (R MC MANUS)

COMMANDER NAVAL SURFACE FORCE
US ATLANTIC FLEET
NSAP ADVISOR (WC HEARD)

COMMANDER NAVAL SURFACE FORCE
US PACIFIC FLEET
NSAP ADVISOR (R SULIT)

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NSAP ADVISOR (D CARDIN)

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