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THESIS

A COST COMPARISON OF ALTERNATIVE METHODS FOR FLEET INTRODUCTION OF THE CG 47 CLASS

by

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September 1980

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20. (continued)

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The author's conclusions are; 1) the nucleus crew, balance crew concept is becoming obsolete, 2) use of the Fleet Introduction Team concept should be expanded, and 3) there is a need for early decisions relative to manning new construction ships.

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A Cost Comparison of Alternative Methods for Fleet Introduction of the CG 47 Class

by

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ABSTRACT

Manning of new construction ships in preparation for fleet introduction requires the utilization of considerable Navy resources, both in terms of personnel lost to the fleet and dollar costs. Criticism by the General Accounting Office and Navy self-evaluation of new construction manning occurred in the 1969-1971 time-frame and resulted in the development of the Fleet Introduction Team concept. The CG 47 Class Guided Missile Cruiser construction program has fostered another alternative method for accomplishing fleet introduction, patterned after the manning concept employed in nuclear powered ship construction programs. The objective of the thesis is to evaluate the various methods of introducing a new construction ship into the fleet by accomplishing a cost comparison of different methodologies and to provide a model which can be used by the Navy on future programs to perform such an evaluation.

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A. BACKGROUND ON NEW CONSTRUCTION PROGRAMS AND FLEET INTRODUCTION

The acquisition of a new class of ships for the Department of the Navy involves a myriad of tasks which must be accomplished and coordinated by various offices and activities. The Naval Sea Systems Command (NAVSEA) exercises overall control over ship acquisition, ship engineering, and life cycle support planning through the establishment of a Project Manager and Project Office. The Deputy Chief of Naval Operations (Surface Warfare) (DCNO-SW) acts as the Mission/Program Sponsor while the Deputy Chief of Naval Operations (Manpower, Personnel, and Training) (DCNO-MP&T) acts as the Manpower Sponsor. The Chief of Naval Education and Training (CNET) is responsible for development of courses and training of personnel. The Navy Military Personnel Command (NMPC) is responsible for the selection and assignment of personnel [17]. The Supervisor of Shipbuilding (SUPSHIP) having cognizance over the building site is responsible for monitoring construction and contract administration. The Type Commanders to whom the ships will ultimately be assigned when introduced into the fleet also monitor construction progress.

This large number of activities involved in the construction of a new class of Navy ships requires a considerable amount of coordination. However, the coordination effort involved is

facilitated by the fact that there is an ultimate, single purpose; to introduce into the fleet, on schedule, a fully operational and capable ship with a well-trained crew.

At the construction site there are numerous tasks to be performed during the construction process as well as the requirement for crew familiarization and training. The monitoring of construction progress and contract administration is under the purview of the locally assigned SUPSHIP. Traditionally, a portion of the ship's crew has been assigned to the construction site in a temporary duty status some months prior to delivery (the "nucleus crew" concept) for the purposes of familiarization and to perform administrative and organizational tasks (such as preparing letters of authority and instructions and receiving and cataloging publications, forms, and technical manuals). Other tasks performed by the nucleus crew include monitoring the receipt of repair parts, equipage, and government furnished consumables, as well as in some instances actually taking custody of equipage and consumables, monitoring construction progress, and serving as the Type Commander's on site representative for various functions such as sonar certification.

Some of the functions performed by the nucleus crew duplicate the effort of the SUPSHIP organization. A 1971 General Accounting Office (GAO) study criticized this duplication of effort between the SUPSHIP organization and the nucleus crew, as well as the fact that experienced personnel

have been assigned to the construction site both too soon and in too large numbers at the expense of the fleet. As a result of GAO recommendations and Navy evaluation of manpower needs relative to new construction, the concept of a Fleet Introduction Team (FIT) was developed. The FIT would be permanently assigned to the construction site to perform the traditional nucleus crew functions discussed earlier, thereby reducing per diem costs and allowing better use of manpower resources [12]. The FIT concept was initially utilized on a trial basis for the LST-1179 landing ship tank and DE-1052 destroyer escort construction programs with success and has subsequently been applied to the DD-963 class destroyer and FFG-7 class frigate programs.

B. PROBLEM DEFINITION

Having now used the Fleet Introduction Team concept to a considerable extent, there are still unresolved issues within the Navy concerning the cost effectiveness of the FIT approach as well as the benefits derived. Each new shipbuilding program has unique aspects requiring special consideration and evaluation of the desireability of using a nucleus crew or FIT for fleet introduction purposes as well as other alternative methods for accomplishing fleet introduction.

C. OBJECTIVES

The objective of this thesis is to evaluate the various methods of introducing a new construction ship into the fleet

by accomplishing a cost comparison of different methodologies. A second objective is to provide a model which can be used by the Navy on future programs to perform such an evaluation.

D. GENERAL APPROACH AND METHODOLOGY

The research conducted has been directed towards past new construction programs including the LST-1179 and DE-1052 programs. The author's experience within the same shipyard as a member of the nucleus crew of the ammunition ship KISKA (AE-35) and as a member of the SPRUANCE (DD-963) Class FIT has been drawn on as a basis for some of the information and research. A literature search was conducted which encompassed the GAO report library, the Naval Postgraduate School library, the Defense Logistics Studies Information Exchange, and the Defense Documentation Center. Primary sources of data within the Navy were the Chief of Naval Operations Mission/Program Sponsor (OP-355G) and Manpower Sponsor (OP-112D2) involved with the CG 47 Class, the Commander Naval Surface Force, U.S. Atlantic Fleet and Commander Naval Surface Force, U.S. Pacific Fleet offices having cognizance over new construction programs, the Navy Personnel Research and Development Center, San Diego, and the author's thesis advisor. Information and data pertaining to the DD 963 and CG 47 Class guided missile cruiser has been used extensively for the development of a model which can be used for the purpose of cost comparison and benefit analysis during consideration of fleet introduction methods for future shipbuilding programs.

E. THESIS CHAPTER SUMMARY

Chapter One introduces the reader to the concept of fleet introduction and the tasks required to be performed at the construction site by Navy personnel. The objectives and research methodology of the study are also presented.

Chapter Two discusses fleet introduction concepts including the nucleus crew, balance crew concept and the development of the fleet introduction team concept. The CG 47 Class guided missile cruiser is also discussed, as well as the method which will be used to man the CG 47 for fleet introduction purposes, known as the CG 47 Manning Concept.

Chapter Three develops scenarios for manning the CG 47 Class under the various alternative methods for accomplishing fleet introduction and provides the framework for analyzing the alternatives.

Chapter Four comprises the analysis of each alternative on the basis of criteria developed and concludes with an overall evaluation.

In Chapter Five the author draws conclusions from the analysis and makes recommendations for further evaluation of fleet introduction methods.

II. FLEET INTRODUCTION CONCEPTS

This chapter discusses the nucleus crew, balance crew concept for accomplishing fleet introduction of new construction ships, General Accounting Office findings and conclusions concerning personnel assigned to ships under construction, and the development and use of the fleet introduction team concept. The CG 47 Class guided missile cruiser is also discussed including the method which will be used for manning the CG 47 for fleet introduction purposes.

A. NUCLEUS CREW, BALANCE CREW CONCEPT

The assignment of personnel to new construction non-nuclear powered surface ships is accomplished in two groups, a nucleus crew and the balance crew [12]. The nucleus crew is normally ordered to the construction site four months prior to commissioning or delivery of the ship to the Navy with the balance crew reporting shortly before commissioning/delivery. Figure 2-1 is the Navy staffing plan used as a guide for assignment of personnel to new construction ships [1].

The composition of a nucleus crew varies by ship type but is comprised of experienced personnel. Normally, officer personnel assigned to the nucleus crew include the prospective commanding officer and department heads. Senior enlisted personnel from all major functional areas comprise the remainder of the nucleus crew, with the supply and engineering ratings

FIGURE 2-1

STAFFING PLAN FOR NEW CONSTRUCTION AND MAJOR CONVERSION

(To be utilized as a guide for formulating and promulgating manpower authorizations for individual ships)

The figures below indicate the number of officers and enlisted crew members respectively or total percentages of the crew required to be on board by a specific time (e.g., 3/25 indicates 3 officers and 25 enlisted; 40% indicates percentage of total number of officers and enlisted to be on board.

MONTHS PRIOR TO PROJECTED COMMISSIONING/DELIVERY (Note 1)	15	12	6	4	3	2
NUCLEAR SHIPS						
SSN/SSBN	(Detailed manning criteria for nuclear powered submarines is reflected in CNO ltr ser 0129P31 of 14 Nov 1970. Nuclear powered surface ships are treated on a special case basis depending on reactor fill dates and commissioning dates.)					
DLGN	3/25	10/80	40%	80%	100%	
CVAN	25/353		20%	25%	100%	
NON NUCLEAR SHIPS (Note 2)						
LESS THAN - 350				3/5	5/20% + BALANCE CREW	
LARGER THAN - 350				5/15	15% + BALANCE CREW	

Notes:

1. For ships constructed in private shipyards phasing of precom crews will be based on delivery date. For ships constructed in naval shipyards actions will be keyed to commissioning date when available.
2. For series production ships where the Fleet Introduction Team (FIT) concept may be implemented, the size of the precom crew will be reduced and phasing dates delayed as appropriate.

more heavily emphasized [12]. This emphasis is due to the nature of activities/tasks accomplished which center around engineering and supply/outfitting functions. The composition of the nucleus crew of the DD-963 Class ships is shown in Figure 2-2 [17].

The remainder of the ship's crew including the prospective executive officer and division officers comprise the balance crew. The balance crew is ordered to one of the Fleet Training Centers (FTC) (usually the one closest to the ship's ultimate homeport) for precommissioning training [12].

> "Precommissioning training is the process of assembling, organizing and training the officers and men comprising the crews of ships.... Included in this training are preparation for commissioning the vessel, dockside trials, the fast cruise, underway trials, the readiness for sea period, qualification trials and special tests, and the shakedown period. ... This training consists of individual, group and team training, school and on-site, required in connection with new equipments and systems being installed and new capabilities or characteristics being incorporated. It also includes individual, group and team training required for performance of watch, quarter and station duties" [1:Encl 1].

Precommissioning training is accomplished in accordance with the Navy training plan for the ship, developed by the Chief of Naval Education and Training and coordinated during implementation by the Chief of Naval Material [1].

Personnel assigned to a nucleus crew or balance crew are in a temporary duty status and therefore entitled to receive per diem. The daily per diem rate is reduced by set amounts

FIGURE 2-2

BREAKDOWN OF NUCLEUS CREW, DD-963 CLASS SHIP

Officers		Enlisted Men
Rank	Title	Rate/Rating[1]
CDR	Commanding Officer	ENCS ETCS
LCDR	Operations	CSC DSC
LT	Engineering	EMC FTGC
LT	Supply	GMGC HMC
LT	Combat Information Center	RDC RMC
LT	Navigator	SKC STC
LT	Weapons	BM1 DC1
ENS	Main Propulsion Assistant	EN1 EN1 ET1
ENS	Electrical	ETR2 GMG1 IC1
ENS	Damage Control Assistant	QMC RD1 RM1 SK1 ST1 YN1 EM2 EM2

[1]Enlisted rating abbreviations are contained in Appendix C.

when Government quarters and/or messing facilities are available [12]. The entitlement to per diem ceases when messing and berthing commences aboard the ship and temporary duty status officially terminates when the ship is placed in commission.

The assignment of nucleus crew personnel to ships under construction is for the purpose of ensuring that

> "the best possible product, consisting of both a ship and a trained, well-organized crew, ... [will] ... be delivered. To accomplish this objective a nucleus crew (1) assists in identifying ship construction deficiencies, (2) assists in assembling the precommissioning outfit (materials, repair parts, and other supply items), (3) prepares the organization of the ship, and (4) becomes familiar with the details of the ship's operation" [12:5].

Appendix D lists specific tasks/functions to be performed by members of the DD-963 Class Fleet Introduction Team (FIT) [10]. Except for the tasks necessary as part of the FIT interface with the ship's force, tasks listed in Appendix D are representative of the tasks that would be accomplished by members of a nucleus crew.

B. GENERAL ACCOUNTING OFFICE (GAO) FINDINGS AND CONCLUSIONS CONCERNING PERSONNEL ASSIGNED TO SHIPS UNDER CONSTRUCTION

The GAO study of assignment of personnel to new construction ships was based on the review of personnel assigned to five ships during the twelve month period ending 31 July 1970. GAO findings were as follows:

"The number of personnel assigned to a nucleus crew was based on personal judgment and precedent, rather than on actual need.

Some crew members had been sent to construction sites before they were needed. They also had been assigned to perform certain tasks that already were the responsibilities of other Navy organizations.

The Navy had not evaluated work requirements to determine the type of personnel that should be included in a nucleus crew.

The system for obtaining information on the use of nucleus crews was inadequate" [12:1].

The GAO finding that the assignment of personnel to a nucleus crew was based on personal judgment and precedent rather than actual need and that some crew members had been sent to construction sites before needed was a result of the Navy's lack of ability to provide justification for the manner in which such assignments were made [12]. Additionally, the Prospective Commanding Officers (PCO's) and Commanding Officers (CO's) of the five ships reviewed indicated that the number of personnel and period of time assigned to the nucleus crew could be reduced significantly. Figure 2-3 is a recapitulation of the number of men and corresponding man-months proposed by the PCO's and CO's compared to that authorized. The total net savings for the five ships would have been 384 man-months and a reduction in per diem costs of $198,000 [12].

The GAO finding that nucleus crew members performed certain tasks already the responsibility of other Navy organizations refers to dual responsibility noted between

FIGURE 2-3

NUCLEUS CREW STAFFING: AUTHORIZATIONS COMPARED TO PCO AND CO RECOMMENDATIONS

Type of Ship	Authorized		PCO and CO recommended		Net decrease		Value of man-months	Per Diem[1]	Total
	Men	Man-months	Men	Man-months	Men	Man-months			
DE	51	204	69	170	18[2]	34	$ 18,000	$ 8,000	$ 26,000
DE	50	200	43	180	7	20	10,000	1,000	11,000
AOR	84	420	85	325	1[2]	95	50,000	46,000	96,000
AOR	89	312	55	182	34	130	68,000	98,000	166,000
LPD	105	480	94	375	11	105	55,000	45,000	100,000
	379	1,616	346	1,232	33	384	$201,000	$198,000	$399,000

[1]Computed on the basis of the per diem normally received by nucleus crew enlisted personnel at each building site.

[2]Increase.

the Supervisor of Shipbuilding (SUPSHIP) organization in

> "(1) detecting contractor's work which was not in conformance with contract requirements, (2) discovering a need for and recommending operational design improvements, (3) assessing the progress of the work, and (4) determining that the contractor properly performed his fitting-out functions, such as binning and stowage of repair parts. The most apparent difference in responsibility between the two activities is that the Supervisors of Shipbuilding have continuing responsibility for these tasks and functions during construction of the ship and the nucleus crew is responsible only during the final stages of construction" [12:10].

Although some SUPSHIP organizations rely on the nucleus crew to perform tasks which might receive less emphasis due to SUPSHIP's manpower shortages, GAO noted that

> "Since the Supervisors of Shipbuilding should have the capability to perform the tasks and functions required to accomplish their basic missions, the Navy might better use its manpower if nucleus crew personnel were not also expected to perform some of these tasks and functions. Eliminating some of a nucleus crew's tasks and functions, such as those where dual responsibility exists, should enable the Navy to decrease nucleus crew manpower. This would permit the use of enlisted men's skills (particularly for those ratings and rates of which there are shortages) for longer periods of time in the operating fleet" [12:10].

The GAO finding that the Navy had not adequately evaluated work requirements to determine the composion of a nucleus was based on the fact that no in-depth study had ever been made of nucleus crews as well as the lack of attention given the area by the Navy's internal audit organization [12].

The Navy took a number of actions to resolve the issues relative to new construction manning addressed by GAO. In April 1970, the Navy established an ad hoc panel

> "to study and recommend solutions to problems associated with delivery of new construction ships and their introduction into the fleet" [12:31].

The Navy conducted a manpower survey to better evaluate work requirements and determine the skills by rate and rating which should be included in a nucleus crew. A manpower survey of the nucleus crew and balance crew of ships of the DE-1052 and LST-1179 Classes was conducted. Also, for the purpose of evaluating manning requirements, a reduced nucleus crew was utilized for two ships of the LST-1179 Class [12].

To ensure information was obtained concerning the utilization of nucleus crews, PCO's were required to submit comments on nucleus crew utilization as part of the monthly progress reporting system already in effect. The staffing plan for new construction ships that developed as a result of Navy review and self-evaluation was promulgated in June 1971 in the form of a Navy directive, OPNAVINST 3500.23A [12]. Figure 2-1 is from the most current revision of that directive.

C. DEVELOPMENT OF THE FLEET INTRODUCTION TEAM (FIT) CONCEPT

Concurrent with the GAO review of assignment of personnel to new construction ships, the Navy developed the concept of a FIT team. Under the FIT concept, a cadre of qualified personnel would be assigned to the construction site on a perm-

anent basis to accomplish those functions normally the responsibility of the nucleus crew. As a result, the nucleus crew could be assigned for a shorter period. The reduction in the amount of time personnel would be assigned to the nucleus crew was intended to result in savings in two areas: First, there would be savings in man-months due to reduction in the amount of time nucleus crew members would be assigned and the time these members would remain available to the fleet. Second, there was expected to be a reduction in per diem costs since the FIT would be permanently assigned and not entitled to per diem, whereas members of the nucleus crew are entitled to per diem due to their temporary duty status [12].

The Navy proposal concerning the utilization of the FIT concept stated that

> "A stable permanently assigned FIT, not requiring the repetitive indoctrination/orientation period needed by each ship's company, would soon develop the technical proficiency (learning curve), knowledge of shipyard operations, range of personal contacts, and procedural expertise, rarely if ever accumulated by a nucleus crew. This talent, coupled with a continually growing fund of experience and feedback from the fleet and type commanders, should produce cost efficiencies in manpower utilization far beyond the gross savings accruing from implementation of the Team itself. An additional side effect would be the improved sea-shore rotation for several ratings presently considered in the deprived category" [12:20].

D. NAVY FIT PILOT PROGRAMS

The Navy established two FIT pilot programs, one at National Steel and Shipbuilding Company, San Diego, California

and one at Avondale Shipyards, Inc., Westwigo, Louisiana. The shipbuilding programs involved were the LST-1179 Class and DE-1052 Class, respectively. The mission of the FIT's was

> "to provide continuity, liaison, on-site training, administrative assistance and other support for the PCOs and nucleus crews in connection with the orderly introduction of the ships to the fleet" [3:Encl 1].

Assigned tasks of the Teams as specified by the Chief of Naval Operations are contained in Appendix E [3].

The two FIT pilot programs provided a basis for evaluation of the FIT concept. The final evaluation report of the FIT involved with the LST-1179 Class program, formed 5 May 1971 and disestablished on 30 June 1972, provided an in-depth analysis of the FIT concept, including advantages as well as areas where improvements could be made. In addition to recommendations for improvement and addressing intangible benefits of the FIT concept, the final evaluation report of the LST-1179 FIT also included a man-day and dollar cost analysis of the FIT concept. Under the LST-1179 FIT concept, the nucleus crew reported to the construction site two months prior to delivery vice four months prior to delivery under the traditional nucleus crew concept. The savings represented by the two month delay in reporting equated to 1,628 man-days and a savings in salaries and per diem of $238,089. Computations made in arriving at the above man-day and dollar cost savings are shown in Figure 2-4 [17].

FIGURE 2-4

MAN-DAY AND COST COMPARISON: LST 1179 FIT

MAN-DAYS:	FIT CONCEPT	OLD WAY (4 Mo.)	OLD WAY (If 6 Mo.)
	23 Men (FIT) 12 Months 22 Man-Days/Mo.	25 Men (Nucleus) 4 Months/Ship 7 Ships 22 Man-Days/Mo.	25 Men (Nucleus) 6 Months/Ship 7 Ships 22 Man-Days/Mo.
	25 Men (Nucleus) 2 Months/Ship 7 Ships 22 Man-Days/Mo.		
TOTAL	13,772 Man-Days	15,400 Man-Days	23,100 Man-Days
		1,628 Man-Days Saved	9,328 Man-Days Saved

COST:

FIT	$225,718.00
+Nucleus Crews (2 Months each)	463,807.00
	$689,525.00

	OLD WAY (4 Mo.)	OLD WAY (If 6 Mo.)
	$927,614.00	$1,391,421.00
	-689,525.00	-689,525.00
Salaries (incl. Per Diem) Saved	$238,089.00	$701,896.00

The final evaluation report of the FIT pilot program involved with the LST-1179 program indicated that the FIT concept was a viable approach to fleet introduction. Having a permanent on-site representative (acting for the PCO and crew as well as the type commander) was beneficial for a number of reasons. One of the main benefits of the FIT concept was the savings in amount of time the balance crew would be assigned as well as the corresponding savings in salaries and per diem. Benefits are also realized due to the stable, continuous monitoring capability, standardization and efficiency in development of ship doctrines, manuals, and instructions, and an enhanced supply assistance/outfitting function. The FIT also provides crew indoctrination and training as well as a reservoir of experienced personnel to be assigned to ships of the class upon completion of their tours at the FIT. The final recommendation made as a result of the LST-1179 FIT pilot program was to

> "Continue the FIT concept in all multiple ship contracts with a FIT properly tailored to the tasks involved" [17].

Subsequent to the utilization of the FIT concept for fleet introduction of the LST-1179 Class and DE-1052 Class, a FIT for the thirty ship DD-963 Class was established at Ingall's Shipbuilding Division of Litton Industries, Pascagoula, Mississippi. This FIT has been in existence from August 1973 until present. A three team FIT for fleet introduction of ships of the FFG-7 Class has also been established in late

1978 and early 1979 at each of the three building sites; Bath Iron Works, Bath, Maine and Todd Pacific Shipyard Corporation at both Los Angeles, California and Seattle, Washington.

E. THE CG 47 MANNING CONCEPT

1. Characteristics of the CG 47 Class

The CG 47 Class guided missile cruiser (initially designated a guided missile destroyer, DDG) is a derivative of the DD 963 Class destroyer, having the same hull and gas-turbine propulsion system. The major characteristics of the CG 47 Class are shown in Figure 2-5 [17].

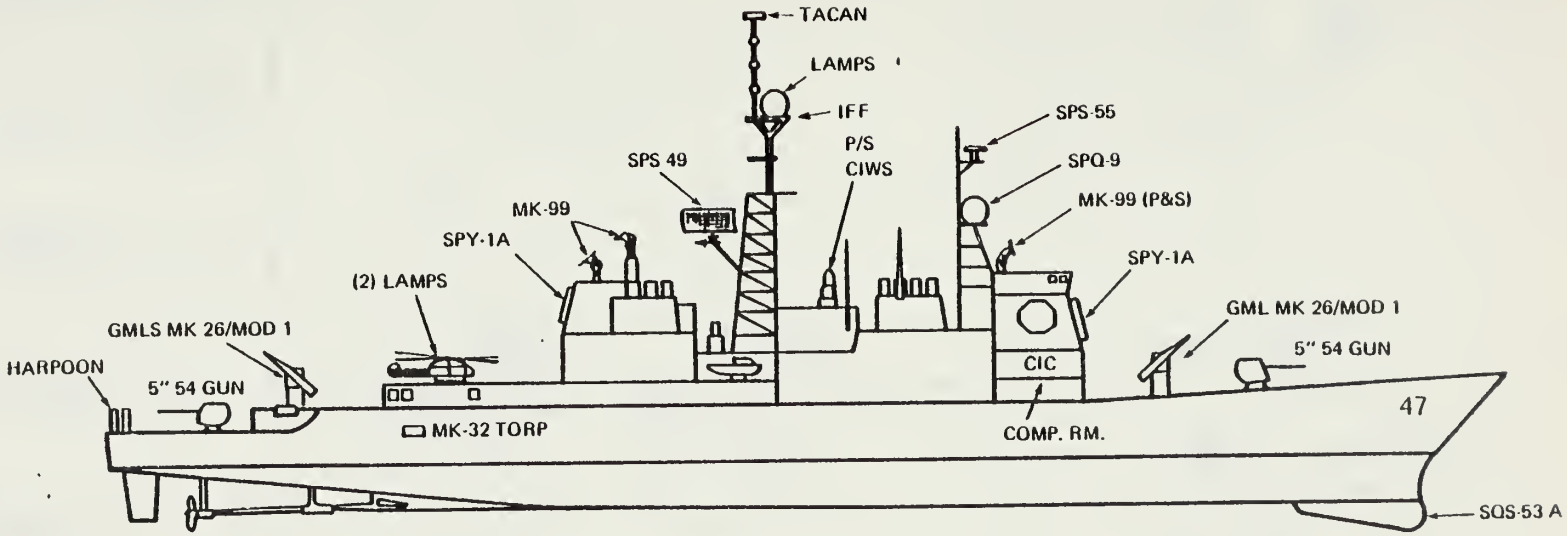
A significant deviation from the DD 963 Class destroyer is the addition of the Aegis Combat System to the CG 47 Class. The Aegis Combat System provides a means of coordinating and controlling air, surface, and subsurface surveillance engagements, thereby providing a highly effective multi-mission ship and an enhanced anti-air warfare capability. The components of the Aegis Combat System are shown in Figure 2-6. The operation, maintenance, and logistics support required by the Aegis Combat System results in an increase in manning over the 18 officers and 258 enlisted of the DD 963 Class to 21 officers and 302 enlisted [17].

2. Delivery schedule and crew phasing

The CG 47 Class is intended to consist of twenty-four ships. The first ship of the class, the USS TICONDEROGA

FIGURE 2-5

CG 47 MAJOR CHARACTERISTICS



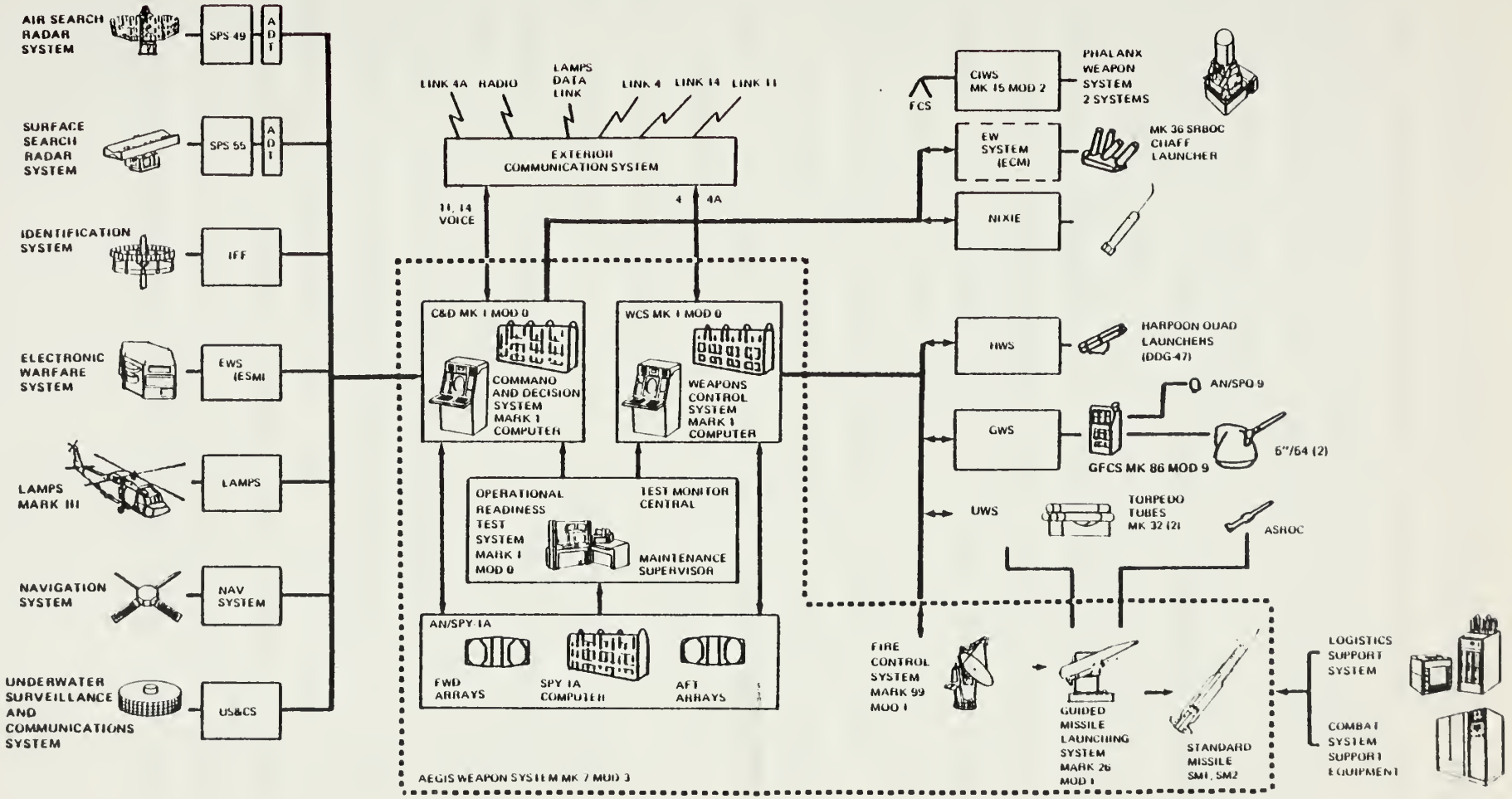
LENGTH (LBP)	529.0'
BEAM	55.0'
DRAFT (KEEL)	21.4'
DISPL F.L.	8910 L.T.
SHAFTS	2
DRAFT (FWD.–NAV)	31'-0"
DRAFT (AFT–NAV)	28'-5"

SPEED (SUST)	30.0KT
PROP	GAS TURB 4 LM 25000 80000 SHP

ACCOMMODATIONS		MANNING
OFFICER	33	21
CPO	21	17
OTHER		
ENL	306	285
SUBTOTAL	360	323
LAMPS DET		20
UNIT COMMANDER		12
TOTAL		355

FIGURE 2-6

CG 47 CLASS AEGIS COMBAT SYSTEM, FUNCTIONAL BLOCK DIAGRAM



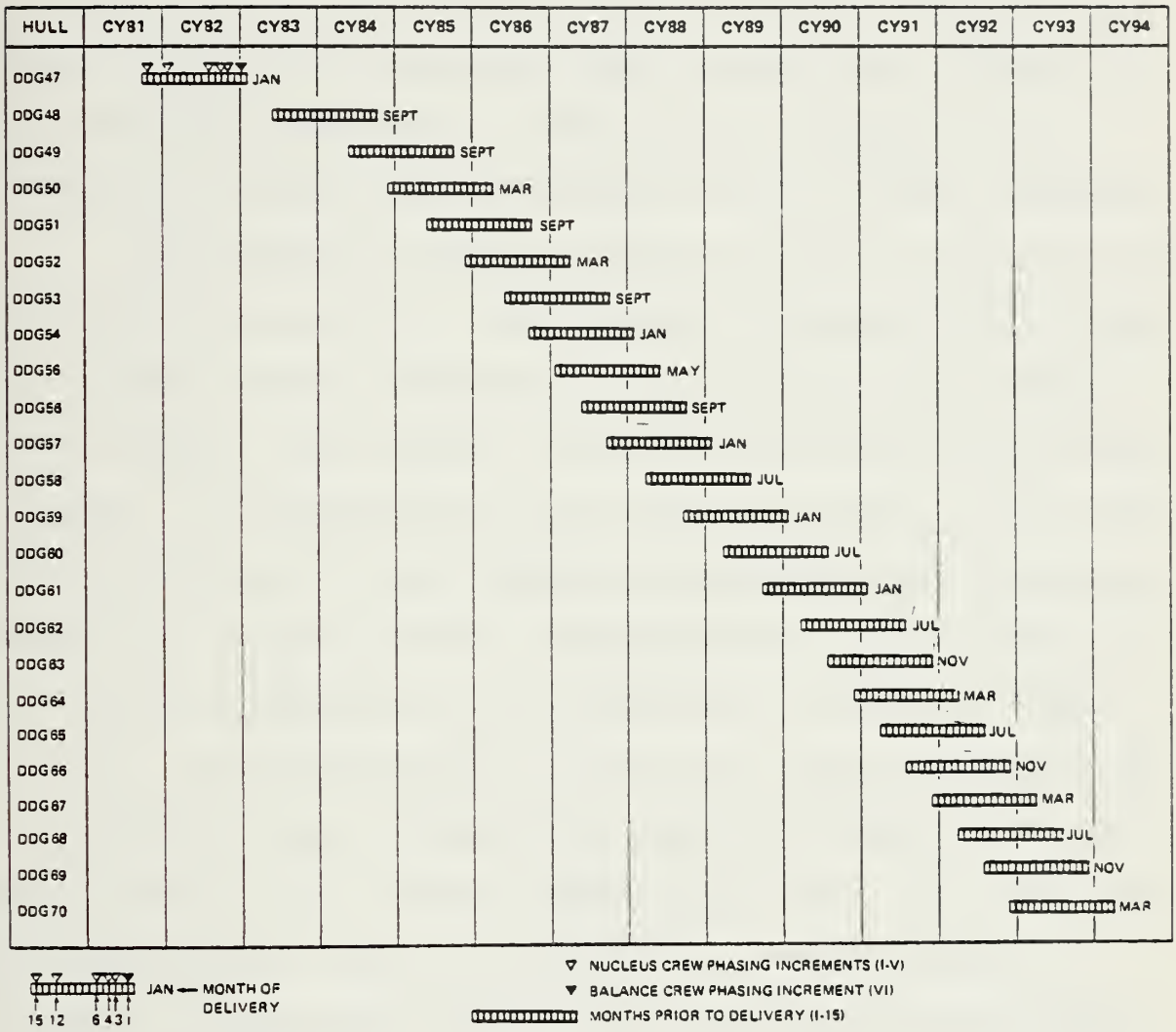
(CG 47), is scheduled to be delivered in calendar year 1983. Delivery dates of subsequent ships of the class extend over an eleven year period with the last ship of the class to be delivered in calendar year 1994. Figure 2-7 is the delivery schedule for the CG 47 Class [17].

The lead ship of the CG 47 Class will be manned utilizing the same manning concept as that employed in nuclear powered ship construction programs [17]. The manning of nuclear powered ships begins fifteen months prior to delivery due to the unique aspects of the power plant and requirement that the Navy crew assigned to the ship operate the nuclear propulsion plant during all dockside testing and sea trials. Additionally, the ship is placed "In Service" approximately two weeks prior to the first sea trials; at that time, the Prospective Commanding Officer accepts responsibility for and custody of all fissionable materials [5].

The determination to utilize a crew phasing plan for the CG 47 similar to that used for nuclear powered surface ships was due to the sophistication of the Aegis Combat System and the Navy's desire to improve the readiness of the ships at delivery and subsequently when introduced into the fleet, especially in the propulsion area. The two objectives of the resulting CG 47 Manning Concept are to first, ensure the delivery of better ships to the fleet and second, minimize the time and effort required to have a ship ready for fleet operations [17].

FIGURE 2-7

CG 47 CLASS DELIVERY SCHEDULE



[1]The CG 47 Class was formerly designated a DDG.

The phasing of CG 47 personnel to the building site will be accomplished in five phases. Phase I, the first increment of the nucleus crew, will report fifteen months prior to delivery; subsequent increments (II through V) will continue to report up to three months prior to delivery with the balance crew reporting one month prior to delivery. Figure 2-8 reflects the composition of each manning increment [17]. (Figure 2-7 includes the scheduled phasing of each increment.)

The method of manning follow-on ships of the CG 47 Class has not been specified. Other methods of manning which could be utilized include utilization of the conventional nucleus crew, balance crew concept, as well as utilization of the FIT concept. A recommendation as to the composition of a FIT for the CG 47 Class has been made by the Commander Naval Surface Force, U.S. Atlantic Fleet (COMNAVSURFLANT). The composition of the FIT recommended by COMNAVSURFLANT is shown in Figure 2-9 [17]. The practicality of utilizing a FIT concept would be contingent upon a substantial number of ships of the class being built at one or more construction sites. To date, only the construction site of the CG 47 has been determined (Ingall's Shipbuilding Division of Litton Industries, Pascagoula, Mississippi).

In summary, this chapter has reviewed the composition of nucleus crews and the tasks nucleus crews normally perform. GAO findings concerning personnel assigned to ships under construction were discussed, as well as the development of

FIGURE 2-8

CG 47 CREW PHASING

Reporting Dates For Each Phase

Phase	Group	Months Prior to Ship Delivery	Officer	Enlisted
I	Nucleus Crew	15	4	25
II	Nucleus Crew	12	1	30
III	Nucleus Crew	6	10	35
IV	Nucleus Crew	4	–	30
V	Nucleus Crew	3	–	20
VI	Balance Crew	1	6	162
	Totals		21	302

Enlisted/Officer Personnel In Each Phase

Officer	Enlisted		
Phase I			
Prospective Commanding Officer	FTM (8)	EW (1)	IC (1)
Fire Control Officer	FTG (2)	GMM (1)	HT (1)
System Test Officer	ET (2)	GMG (2)	GSM (3)
Engineer Officer	STG (2)	EM (1)	GSE (1)
Phase II			
Combat Systems Officer	FTM (9)	STG (4)	PN (1)
	FTG (1)	IC (1)	YN (1)
	GMM (2)	GSM (2)	
	GMG (2)	GSE (1)	
	ET (3)	SK (2)	
	3M Coordinator (1)		
Phase III			
Executive Officer	FTM (5)	GSM (5)	YN (1)
Operations Officer	GMG (2)	GSE (6)	IC (3)
Combat Information Center Officer	STG (4)	EN (2)	HT (3)
	EW (1)	EM (3)	
Weapons Control Officer			
Electronics Material Officer			
Anti-Submarine Warfare Officer			
Main Propulsion Assistant			
Damage Control Assistant			
Electrical Officer			
Supply Officer			
Phase IV			
None	FTM (4)	EW (2)	SM (2)
	GMM (6)	PN (1)	OS (5)
	GMG (2)	TM (1)	RM (2)
	STG (3)	QM (2)	
Phase V			
None	FTM (2)	RM (2)	ET (6)
	FTG (6)	STG (3)	TM (1)
Phase VI			
Navigator/Administrative Officer	Enlisted Balance Crew (162)		
Communications Officer			
1st Lieutenant			
Electronics Warfare Officer			
Ordnance Officer			
Disbursing Officer			

FIGURE 2-9

PROPOSED CG 47 FLEET INTRODUCTION TEAM

OIC	CAPTAIN
OPERATIONS/ADMIN	LCDR 1 YNC 1 YN1 3 YNSN 1 OSC 1 HMC 1 RM1 1 QM1
ENGINEERING	LT/LCDR POST ENGINEER OFFICER TOUR 1 GSMC 1 GSEC 1 HTC 1 EMC (REQUIRED SINCE GSE's ARE BECOMING PROPULSION CONTROL EXPERTS) 1 BMC
COMBAT SYSTEMS	LDO LT (618X) 1 GMMC 1 GMGC (MAGAZINE SPRINKLERS) 1 FTMC 1 FTGC 1 DSC 1 ETC
SUPPLY	LT (NEW CONSTRUCTION EXPERIENCE) 1 SKC 1 SK1
TOTAL	5 OFFICERS/22 ENLISTED

the FIT concept, FIT pilot programs, and circumstances when utilization of the FIT concept is most appropriate. The characteristics of the CG 47 Class guided missile cruiser, the delivery schedule of the Class, and crew phasing to the construction site under the CG 47 Manning Concept was also discussed.

III. DEVELOPMENT OF THE ANALYSIS

Chapter II discussed the conventional nucleus crew, balance crew concept for manning new construction ships in preparation for fleet introduction as well as the development and use of the Fleet Introduction Team (FIT) concept. It also described the CG 47 Manning Concept, patterned after the manning concept used for nuclear powered surface ships. This chapter will develop scenarios for manning the CG 47 Class under the conventional nucleus crew, balance crew and FIT concepts. Criteria for evaluating alternatives will be discussed, as well as the method of analyzing effectiveness. The costs associated with each alternative will also be discussed.

A. ALTERNATIVE METHODS FOR FLEET INTRODUCTION OF THE CG 47 CLASS

The scenarios developed for manning of the CG 47 Class under each alternative will deal with the method and timing of assignment of personnel to the construction site. The manning levels for the ship determined by the Navy and the proposed composition of a Fleet Introduction Team for the CG 47 Class will be considered as optimal in this analysis.

The manning concept to be used for fleet introduction of the first ship of the CG 47 Class (known as the CG 47 Manning Concept) has been determined; the manning concept to be utilized on the remaining 23 ships of the class has not been

determined, but could be the same concept as that used on the CG 47. In spite of this, for purposes of this analysis, all 24 ships of the Class will be evaluated under each alternative. The CG 47 Manning Concept was extensively discussed in Chapter II; Figure 2-7 shows the phasing of nucleus crew increments and balance crew phasing and Figure 2-8 shows the composition of each increment. It should be noted that the CG 47 Manning Concept involves crew members being assigned to the construction site for a much longer period, of 15 months, than the conventional nucleus crew, balance crew concept of four months, or FIT concept of one and a half months.

Assignment of personnel to the construction site of the CG 47 under the conventional nucleus crew, balance crew concept was proposed as consisting of five officers and five enlisted personnel four months prior to delivery, five officers and 53 enlisted personnel two months prior to delivery, and the balance crew, 11 officers and 244 enlisted, two weeks prior to delivery. The actual composition of the nucleus crew by rank and rate to be phased to the construction site at four months and two months prior to delivery was never determined by the Navy [17].

Since the actual composition by rank and rate of a conventional nucleus crew to be phased to the construction site of the CG 47 was never specified by the Navy, a possible composition has been developed and is shown in Figure 3-1. The composition of this nucleus crew was based on the DD 963 Class

FIGURE 3-1

CG 47 MANNING UNDER CONVENTIONAL
NUCLEUS CREW, BALANCE CREW CONCEPT

Nucleus Crew:

Four months prior to delivery -

	Billet	Rank	Desig.
1.	Commanding Officer	CAPT	1110
2.	Engineering Officer	LCDR	1110
3.	Operations Officer	LCDR	1110
4.	Supply Officer	LT	3100
5.	Systems Test Officer	WO3	7160

Enlisted

1. GSCM
2. FTCM
3. SKCS
4. STGC
5. GMMC

Two months prior to delivery -

1.	Combat System Officer	CDR	1110
2.	Fire Control Officer	LT	1110
3.	Main Propulsion Assistant	LT	1110
4.	Damage Control Assistant	LTJG	1110
5.	Electrical Officer	WO3	7130

Enlisted

1.	STG1	11.	FTM1	21.	GMM1
2.	STG1	12.	FTM1	22.	GMG1
3.	STG2	13.	FTM1	23.	GMG2
4.	STG2	14.	FTM1	24.	GSMC
5.	ETC	15.	FTM1	25.	GSM1
6.	ET1	16.	FTM2	26.	GSM1
7.	ET1	17.	FTM2	27.	GSM2
8.	EW1	18.	FTG1	28.	GSEC
9.	FTMC	19.	FTG2	29.	GSE1
10.	FTM1	20.	GMM1	30.	GSE2

31. EM1	41. MSC	51. SM1
32. EM2	42. YN1	52. BMC
33. IC1	43. PN1	53. BM1
34. HTC	44. QM1	
35. HT1	45. 3M(POCM)	
36. EN1	46. HMC	
37. EN2	47. OSCS	
38. SK1	48. OS1	
39. SH1	49. RMCS	
40. DK2	50. RM1	

Balance crew: Two weeks prior to delivery -

	Billet	Rank	Design.
1.	Executive Officer	CDR	1110
2.	Weapons Control Officer	LCDR	1110
3.	Navigator/Admin Officer	LT	1110
4.	CIC Officer	LT	1110
5.	Electronics Officer	LT	6180
6.	ASW Officer	LTJG	1110
7.	Communications Officer	LTJG	1110
8.	First Lieutenant	LTJG	1110
9.	Electronic Warfare Officer	LTJG	1110
10.	Ordnance Officer	LTJG	1110
11.	Disbursing Officer	ENS	3100

Remaining enlisted, 244 personnel.

nucleus crew, shown in Figure 2-2, manning increments for the CG 47 shown in Figure 2-8, and the proposed Fleet Introduction Team for the CG 47 Class which is shown in Figure 2-9. Development of a conventional nucleus crew composition based on the above seems reasonable since: 1. The CG 47 Class is similar to the DD 963 in the propulsion, hull, mechanical, and electrical areas. The majority of the combat system is in fleet use at present; only the Aegis MK-7 system, requiring 27 FT's, is new. 2. The CG 47 Manning Concept, by specifying those personnel to report earliest to the construction site, provides a priority listing of how personnel should be ordered to the construction site. 3. There is assumed to be considerable similarity between the FIT composition recommended for the CG 47 Class and a CG 47 Class conventional nucleus crew; the DD 963 Class FIT Teams each comprised a DD 963 Class nucleus crew [17].

The third alternative for manning of the CG 47 Class involves utilization of the FIT concept. The composition of a FIT for the CG 47 Class as recommended by Commander Naval Surface Force, U.S. Atlantic Fleet, is represented by Figure 2-9. Under the FIT concept, the nucleus crew would report to the construction site much later; the nucleus crew of the DD 963 Class reported to the construction site in three increments; 18 crew members shortly before builder's trials (BT) to ride the ship and observe BT, 32 crew members prior to acceptance trials (AT) to ride the ship during AT for

purposes of familiarization and identification of discrepancies, and 20 crew members immediately after AT for purposes of assisting with the loadout of equipage, operating space items, consumables and provisions, and to ensure all essential services were functioning when the balance crew arrived. Under this plan, the 18 crew members arrived 44 days prior to delivery, the 32 crew members arrived 30 days prior to delivery, the 20 personnel arrived 25 days to delivery, and the balance crew arrived 10 days prior to delivery [10]. Figure 3-2 shows the composition of these increments which were developed in much the same manner as the conventional nucleus crew composition. This was discussed in the second alternative and is based primarily on the DD 963 Class phasing of personnel and the personnel increments comprising the CG 47 Manning Concept.

As discussed above, the three alternatives for accomplishing fleet introduction of the CG 47 Class are as follows: 1. The CG 47 Manning Concept, based on the manning of nuclear powered surface ships. Under this concept, increments of the nucleus crew would begin to be assigned to the construction site 15 months prior to delivery. 2. The conventional nucleus crew, balance crew concept whereby the nucleus crew is assigned to the construction site in two phases (four months prior to delivery and two months prior to delivery) with the balance crew reporting two weeks prior to delivery. 3. The FIT

FIGURE 3-2

CREW PHASING UNDER THE FIT CONCEPT

18 crew members 44 days prior to delivery to observe builder's trials:

	Billet	Rank	Desig.
1.	Commanding Officer	CAPT	1110
2.	Combat Systems Officer	CDR	1110
3.	Operations Officer	LCDR	1110
4.	Engineering Officer	LCDR	1110
5.	Supply Officer	LT	3100
6.	Fire Control Officer	LT	1110
7.	Main Propulsion Assistant	LT	1110
8.	Electronics Officer	LT	6180
9.	Damage Control Assistant	LTJG	1110
10.	Electrical Officer	WO3	7130
11.	System Test Officer	WO3	7160

Enlisted

12.	FTCM	16.	QM1
13.	SKCS	17.	QMSN
14.	OSCS	18.	YN1
15.	OS1		

32 crew members (including 20 work center supervisors for training and PMS installation) 30 days prior to delivery to observe acceptance trials:

1.	STGC	11.	GSM2	21.	RM2
2.	ETC	12.	GSEC	22.	BMC
3.	FTMC	13.	GSE1	23.	BM1
4.	FTG1	14.	EM1	24.	QM1
5.	GMMC	15.	HTC	25.	QM2
6.	GMM1	16.	HT3	26.	3M(POCM)
7.	GMG1	17.	HTFN	27.	SK1
8.	GSCM	18.	EN1	28.	SH1
9.	GSMC	19.	EN3	29.	SH2
10.	GSM1	20.	RMCS	30.	MSC
				31.	MS1
				32.	MS2

20 crew members 25 days prior to delivery (immediately after acceptance trials) to assist with loadout:

1.	Disbursing Officer	ENS		3100
2.	MS1	11.	SN	
3.	MS2	12.	SN	
4.	MS2	13.	SN	
5.	SH3	14.	SN	
		15.	SN	
6.	SHSN	16.	SN	
7.	MS3	17.	FN	
8.	MSSN	18.	FN	
9.	MSSN	19.	FN	
10.	SN	20.	FN	

Balance crew, 253 personnel, arrive 10 days prior to delivery.

concept whereby a permanent group of personnel are assigned to the construction site and the nucleus crew reports in three incrments beginning 44 days prior to delivery with the balance crew arriving 10 days prior to delivery.

B. CRITERIA FOR EVALUATING ALTERNATIVES

Four criteria have been selected for evaluating the alternative methods of accomplishing fleet introduction. The first criterion selected was all dollar costs which could be identified with each alternative. The second and third criteria are both related to the extent personnel are lost to the fleet: Total man-months lost to the fleet, the second criteria, does not indicate the impact of personnel lost to the fleet from critical ratings; the third criteria, a critical rating index, was developed as a means of evaluating the alternatives on the basis of the extent to which personnel in critical ratings are lost to the fleet. The fourth and final criteria selected was the intangible benefits of each alternative and the extent to which such benefits could be identified with each alternative.

Each of the criteria to be used in evaluating the alternatives will be discussed at length in following sections of Chapters III and IV: dollar costs are discussed in the final section of this chapter, the other criteria are the subject of Chapter IV.

C. EFFECTIVENESS ANALYSIS FACTORS

The effectiveness of each alternative will be determined on the basis of the criteria introduced in the preceding paragraph; dollar costs, man-months lost to the fleet, the extent to which personnel in critical ratings are lost to the fleet, and intangible benefits. The three alternatives will be ranked from one to three based on how well each alternative meets the criteria as well as its standing relative to the other alternatives. The determination as to which alternative is most effective will be accomplished using a ranking system resulting in an overall numerical value (criteria being considered to be of equal importance in accomplishing fleet introduction). The overall evaluation of alternatives will be accomplished in Chapter IV.

D. COST FACTORS

Cost factors associated with the manning of new construction ships discussed in this section include military personnel costs (such as pay and allowances), per diem, contractual costs, administrative expenses, and transportation costs.

The most significant costs associated with the manning of new construction ships for fleet introduction purposes are personnel costs. There are at least three methods of computing military personnel costs. The least differentiated method is based on the Five Year Defense Plan, derived by dividing the total Military Pay, Navy appropriation direct dollars by

the total direct man years of Navy personnel. The result is a fiscal year pay and allowances figure and PCS figure for officers and enlisted personnel. No distinction is made between officer grades or community/designator nor enlisted ratings or pay grades [16].

A second method of computing personnel costs is based on an annual Notice promulgated by the Comptroller of the Navy (NAVCOMPTNOTE 7041) which contains composite standard military, permanent change of station, and basic allowance for quarters rates by officer and enlisted pay grade. The rates are based on the annual budget submission to the office of the Secretary of Defense. This method of determining personnel costs makes no distinction between various ratings (e.g., all E-6's, regardless of whether they are an ET, RM, or BM, are reflected at the same cost) or by officer community/designator [8].

The most comprehensive method of determining Navy personnel costs is by utilizing life cycle billet costs. These billet costs are more inclusive than the previously discussed methods of determining personnel costs, not being limited to only appropriation and budget figures. Life cycle billet costs include direct costs such as base pay, allowances, hazardous duty pay, proficiency pay, and medical costs; training and retirement costs amortized over the number of years personnel are expected to remain in the services, including reenlistment bonuses; and overhead costs incurred for such items as maintaining medical and training facilities. The

cost factors included in life cycle billet costs are shown in Figure 3-3 for officers and Figure 3-4 for enlisted [13] [14]. Of the three methods of computing personnel costs, life cycle billet costs result in the highest cost because more cost factors are included in the computations. Life cycle billet costs, being the most encompassing method of accounting for personnel costs, most closely reflect the opportunity cost associated with the manning of new construction ships in terms of the cost of personnel lost to the fleet. A significant advantage of using life cycle billet costs for purposes of cost comparisons is that there are separate figures provided by rating and pay grade for enlisted personnel and by rank and community/designator for officer personnel. For purposes of this analysis, life cycle billet costs have been utilized.

Another major personnel cost to be considered is per diem. Per diem is paid to Navy personnel who are in a temporary duty status or travel status. The impact of per diem on this analysis is due to the fact that nucleus crew and balance crew personnel are entitled to per diem since they are in a temporary duty status; entitlement to per diem ceases when messing and berthing commences aboard ship, temporary duty status officially terminating when the ship is placed in commission. FIT personnel are not entitled to per diem since they are permanently assigned to the construction site.

Contractual costs of the three alternative methods of accomplishing fleet introduction are virtually impossible to

FIGURE 3-3

FACTORS INCLUDED IN THE OFFICER BILLET COST MODEL (OBCM) COMPUTATIONS

Data Element	Action/Source
Base Pay	1 Oct 1978 OASD(MRA&L) MPP
Clothing Allowance	MNP/Pay Manual[a]
Command and Administration	O&MN
Commissary	O&MN
Death Gratuity	MPN
Dental Pay	MPN
Dependent School	DoD Dependent School Office
Disability	MPN
Family Separation Allowance	MPN
FICA	6.02% of first $17,500 from SSA
Hazard Pay	MPN
Insurance/Housing (FHA)	DoD McClary Report
Medical Costs	BUMED Comptroller; O&MN, Budget Activity 8
Medical/Veterinarian Pay	MPN
Messing Subsistence	MPN/Pay Manual
Overseas Station Allowance	MPN
Prisoner Apprehension	MPN
Personnel Procurement	MPN
Quarters Allowance	Imputed value from MPN for MILCON equivalent for base housing; MPN Pay Table for off-base housing
Reenlistment/Continuance Pay	FY 1979 Congressional Submit MPN/O&MN
Retirement	Computed from force statistics and entitlements from Pay Manual
School Training	NITRAS/RMS
Sea and Foreign Duty Pay	MPN
Severance/Readjustment Pay	MPN
Travel/Transportation	MPN tied to move patterns by grade

[a]MPN/O&MN budgets are from Congressional Submit., January 1978; Pay Manual is DoD Military Pay, Entitlements, Allowance Manual, 1968, as amended.

FIGURE 3-4

FACTORS INCLUDED IN BILLET COST MODEL COMPUTATIONS

Data Element	Action/Source
Base Pay	1 Oct 1979 OASD(MRA&L) MPP
Clothing Allowance	MPN/Pay Manual[a]
Command and Administration	O&MN
Commissary	O&MN
Death Gratuity	MPN
Dependent School	DoD Dependent School Office
Disability	MPN
E-7 Clothing Allowance	MPN
Family Separation Allowance	MPN
FICA	6.02% of first $17,500 from SSA
Hazard Pay	MPN
Insurance/Housing (FHA)	DoD McClary Report
Medical Costs	BUMED Comptroller; O&MN, Budget Activity 8
Messing Subsistence	MPN/Pay Manual
Overseas Station Allowance	MPN
Prisoner Apprehension	MPN
Procurement Personnel	MPN
Pro-Pay	Not updated, not available from JUMPS yet (small variations in ratings this year)
Quarters Allowance	Imputed value from MPN for MIL-CON equivalent for base housing; MPN Pay Table for off-base housing
Recreation Facilities	In Command/Administration above
Recruiting Costs	O&MN
Reenlistment Bonus	Computed from JUMPS data by rating[b]
Retirement	Computed from force statistics and entitlements from Pay Manual
School Costs	O&MN
Sea and Foreign Duty Pay	MPN
Severance	MPN
Travel	MPN tied to move patterns by grade

[a]MPN/O&MN budgets are from Congressional Submit., January 1979; Pay Manual is DoD Military Pay, Entitlements, Allowance Manual, 1968, as amended.

[b]JUMPS is Joint Uniform Military Pay Systems.

assess. Provisions are normally made in shipbuilding contracts for office space and other support for the nucleus crew at the construction site. The implications of having a nucleus crew at the construction site for an extended period or a FIT on a permanent basis could have an impact on contractual costs; however, the FIT at NASSCO for the LST 1179 program was allowed to join the nucleus crew at no additional expense/charge to the contract and the DD 963 FIT took the place of the nucleus crew from a contractual stand-point at no additional cost [17]. A possibly more significant contractual implication results due to the CG 47 Manning Concept including the nuclear power "in service" manning concept, intended to include extensive ship's company involvement including operation of equipment during trials. The cost of contract modifications to implement this aspect of the nuclear power concept to the CG 47 Manning Concept could be significant but is not known and is impossible to assess at this time. For purposes of this analysis, contractual implications/costs of the alternatives have been ignored.

Administrative expenses, such as the requirement for office equipment and supplies, telephone service, and vehicle utilization have been assumed to be of minor consequence in this analysis, such costs varying very slightly between alternatives.

Transportation costs differ by alternative. Under the conventional nucleus crew concept, PCS costs are paid to personnel from their last permanent duty station to the

homeport to which the ship will be assigned; while at the construction site, crew members are in a temporary duty status, entitled to per diem but not to the payment for shipment of household goods or travel of dependents to the construction site which are PCS costs. However, if the period of temporary duty is intended to be or becomes greater than six months due to slippages in ship delivery which extends the nucleus crew at the construction site, personnel are entitled to a PCS move to the construction site. Personnel are ordered to a FIT on a permanent basis and are entitled to all PCS benefits.

Travel/transportation costs are included in the life cycle billet costs used in this analysis. However, such costs are not separately identified. Therefore, the PCS costs by officer and enlisted developed for use in the Five Year Defense Plan projections were used as an additional cost for alternatives which include permanent change of station moves to the construction site.

In summary, this chapter developed scenarios for manning the CG 47 Class utilizing the conventional nucleus crew, balance crew concept and FIT concept including the phasing of personnel to the construction site. Criteria for evaluating alternatives and the means of determining effectiveness was discussed. Finally, the costs associated with each alternative were delineated.

IV. EVALUATION OF ALTERNATIVE FLEET INTRODUCTION METHODS

The previous chapter discussed the various methods of accomplishing fleet introduction of the CG 47 Class. This chapter will address the cost comparison of each alternative as well as man-months lost to the fleet. A critical rating index is developed for evaluating each alternative on the basis of duration that personnel in ratings identified as critical by the Navy are lost to the fleet. Breakeven analysis is used to compare alternatives as well as cost per ship delivered assuming various delivery rates. Sensitivity analysis is conducted on the basis of a one month slippage in delivery schedule. Present value analysis is accomplished using a 10% discount rate while projecting increases in life cycle billet costs, per diem, and permanent change of station costs. A method is developed for evaluating non-quantifiable aspects of the three alternatives and an overall evaluation of the three alternatives is then made on the basis of the criteria described.

A. EVALUATION OF QUANTIFIABLE FACTORS

The costs associated with each alternative are shown in Figures 4-1, 4-2, and 4-3. Life cycle billet cost computations for Increment One of the CG 47 Manning Concept are shown in Figure 4-4 as an example of how life cycle billet costs were determined for each alternative. Figure 4-5 is a cost summary

FIGURE 4-1

COSTS UNDER CG 47 MANNING CONCEPT

Increment/Months Prior to Delivery	OFF/ENL	Life Cycle Billet Costs	Per Diem[1] Minimum	Per Diem[1] Maximum	PCS Costs[2]	Man-Months
One- 15 months	4/25	1,070,215	-	-	25,100	435
Two- 12 months	1/30	798,280	-	-	22,900	372
Three- 6 months	10/35	519,099	47,438	326,700	-	270
Four- 4 months	0/30	246,289	7,875	138,600	-	120
Five- 3 months	0/20	131,555	3,750	66,000	-	60
Six- 1 month	6/162	214,499	7,875	110,880	-	168
Total-	21/302	2,979,937	66,938	642,180	48,000	1,425

[1]Minimum per diem computed as $20/day for officers, $2.50/day for enlisted. Maximum per diem computed as $44/day for both officers and enlisted. Per diem ceases two weeks prior to delivery.

[2]PCS costs based on Five Year Defense Plan estimates, $1,900 for officers, $700 for enlisted.

FIGURE 4-2

COSTS UNDER CONVENTIONAL

NUCLEUS CREW, BALANCE CREW CONCEPT

Months Prior to Delivery	OFF/ENL	Life Cycle Billet Costs	Per Diem[1] Minimum	Per Diem[1] Maximum	PCS Costs	Man-Months
4	5/5	114,273	11,812	46,200	-	40
2	5/53	258,912	10,463	114,840	-	116
.5	11/244	193,143	-	-	-	128
Total-	21/302	566,328	22,275	161,040	-	284

[1]Minimum per diem computed as $20/day for officers, $2.50/day for enlisted.
Maximum per diem computed as $44/day for both officers and enlisted.
Per diem ceases two weeks prior to delivery.

FIGURE 4-3

COSTS UNDER FIT CONCEPT

Months Prior to Delivery	OFF/ENL	Life Cycle Billet Costs	Per Diem[1] Minimum	Per Diem[1] Maximum	PCS Costs	Man-Months
44 days	11/7	68,032	8,075	26,928	-	26.4
30 days	0/32	65,438	1,600	28,160	-	32
25 days	1/19	19,543	1,013	13,200	-	16.7
10 days	9/244	136,345	-	-	-	84.3
Total-	21/302	289,358	10,688	68,288	-	159.4

Costs associated with FIT personnel:

Annual Life Cycle Billet Costs-	753,180	Man-months lost to fleet- (5 officers, 22 enlisted)	324
PCS costs[2]	12,450		
Total annual costs	765,630		

[1]Minimum per diem computed as $20/day for officers, $2.50/day for enlisted. Maximum per diem computed as $44/day for both officers and enlisted. Per diem ceases 10 days prior to delivery.

[2]PCS costs based on Five Year Defense Plan estimates, $1,900 for officers, $700 for enlisted.

FIGURE 4-4

LIFE CYCLE BILLET COST COMPUTATIONS

CG 47 Manning Concept: Increment One, 15 Months Prior to Delivery

Billet	Rank	Desig.	Life Cycle Billet Costs
Commanding Officer	CAPT	1110	$ 43,931
Fire Control Officer	LT	1110	27,674
System Test Officer	WO3	7160	34,619
Engineering Officer	LCDR	1110	32,331

Enlisted:

Rate	Life Cycle Billet Costs	Rate	Life Cycle Billet Costs
STGC	43,150	GMMC	29,241
STG1	31,914	GMG1	23,300
ETC	28,550	GMG2	18,430
ET1	22,644	GSCM	33,083
EW1	22,931	GSM1	23,561
FTCM	39,371	GSM1	23,561
FTMC	43,927	GSE1	23,561
FTM1	33,062	EM2	19,429
FTM1	33,062	IC1	23,204
FTM2	32,518	HT1	23,408
FTM2	32,518		
FTG1	26,495		
FTG2	20,573		
FTM1	33,062		
FTM1	33,062		

Total Life Cycle Billet Costs (LCBC) = $ 856,172 (annually)

LCBC of Increment One = Annual LCBC x (Report date of Increment One prior to delivery in months ÷ 12)

$$\text{LCBC of Increment One} = \$\ 856{,}172 \times \frac{15}{12}$$

LCBC of Increment One = $1,070,215

FIGURE 4-5

COST SUMMARY BY ALTERNATIVE

COSTS TO DELIVER ONE SHIP:

Alternative	Life Cycle Billet Costs	Per Diem Minimum	Per Diem Maximum	PCS Costs	Total Costs with Per Diem Minimum	Total Costs with Per Diem Maximum	Man-Months
CG47 Manning Concept	2,979,937	66,938	642,180	48,000	3,094,875	3,670,117	1,425
Conventional Nucleus Crew, Balance Crew	566,328	22,275	161,040	-	588,603	727,368	284
FIT Concept							
Crew Costs-	289,358	10,688	68,288	-			159.4
FIT Costs[1]	376,590	-	-	6,225			162
Total-	665,948	10,688	68,288	6,225	682,861	740,461	321.4

COSTS TO DELIVER 24 SHIPS:

Alternative	With Per Diem Minimum	With Per Diem Maximum	Man-Months
CG 47 Manning Concept	$ 74,277,000	$ 88,082,808	34,200
Conventional Nucleus Crew, Balance Crew	14,126,472	17,456,832	6,816
FIT Concept	16,388,664	17,771,064	7,714

[1]FIT costs on an annual basis have been divided by 2 assuming 2 ship deliveries per year (24 ships over approximately 12 years). (Sensitivity analysis includes other delivery rates.) FIT costs also include 6 months of start-up costs.

by alternative, including costs to deliver one ship under each alternative as well as costs to delivery 24 ships under each alternative. As can be seen in Figure 4-5, total costs under the conventional nucleus crew, balance crew concept and the FIT concept are very similar while the costs under the CG 47 Manning Concept are much higher.

Life cycle billet costs and man-months lost to the fleet under each alternative are manifestations of the same factor, the loss of personnel to the fleet. Life cycle billet costs measure the loss in dollars which provides some indication of the skill level lost whereas man-months do not. As evident in Figure 4-5, the direction (increasing as more personnel are assigned to the construction site) of the two measures is the same; however, the rate of increase is different under each alternative because the mix of personnel being assigned on the basis of skill level is different. For that reason, the two factors, life cycle billet costs and man-months lost to the fleet, can both be considered valid factors for evaluating the alternatives. Additionally, it might be argued that for purposes of fleet introduction, life cycle billet costs are irrelevant because those costs would be incurred in any event, the same personnel remaining in the fleet. However, such costs are legitimate considerations in new construction programs since those personnel removed from the fleet and assigned to new construction billets must be replaced. Also, from a macro standpoint, the costs become more a consideration of where

incurred rather than whether they are incurred at all. For those reasons, life cycle billet costs deserve consideration in this analysis.

The number of personnel lost to the fleet under each alternative is a most important consideration. The filling of certain billets is becoming increasingly difficult, particularly those billets requiring skilled Petty Officers. Navy manpower forecasting data provides projections which indicate manpower shortages "will continue to plague the Navy" [15:V]. The Navy Personnel Research and Development Center (NPRDC), San Diego, California, under the sponsorship of the Deputy Chief of Naval Operations (OP-01), has identified those ratings and pay grades which are in severe short supply. The study included those ratings projected to have a shortfall of twenty percent or more within any pay grade from E-4 through E-7 during the period FY 79 through FY 85.

Combined data from the above study for pay grades E-4 through E-9 for each rating have been applied to the three alternative methods for accomplishing fleet introduction to further evaluate the impact of personnel lost to the fleet due to fleet introduction requirements. Since personnel in lower pay grades are often assigned to billets intended to be filled by personnel in higher pay grades, composite shortages of pay grades E-4 through E-9 vice shortages of each pay grade by rate were applied to each alternative. Each billet was reviewed and if the rating was between E-4 and E-9

and included in the NPRDC study as critical, the composite shortage figure expressed as a decimal was multiplied by the number of months or fraction or a month the billet would be required to be filled for fleet introduction purposes. Since the first ship of the CG 47 Class is scheduled for delivery in early calendar year 1983, FY 83 shortage figures from the study were used. Figure 4-6 contains the figures for the rate of operations specialist (OS) from the NPRDC study as an example of how the shortage figures were used. Whenever the rate of operations specialist (E-4 through E-9) appeared as a billet in any of the fleet introduction scenarios, the composite shortage percentage of 24.64% expressed in decimal form as .25 was used as described above. The critical rating index for a FIT team are shown in Figure 4-7 as an example of how the index was determined for each alternative. The rating of OSC with a composite shortage figure of .25 will be noted as appearing in Figure 4-7. The results of these computations are shown in Figure 4-8 in the form of a critical rating index for each alternative.

As shown in Figure 4-8, the FIT concept becomes the alternative with the lowest critical rating index (CRI) when three ships are delivered per year; a CRI of 25.59 for three ships under the FIT concept as opposed to a CRI of 29.67 or 3 ships at a CRI of 9.89 each for the conventional nucleus crew, balance crew concept. The CRI for the CG 47 Manning Concept is 52.71 per ship, much higher than the other two alternatives.

FIGURE 4-6

OPERATIONS SPECIALIST (OS) MANPOWER PROJECTIONS

Rate	FY79	FY80	FY81	FY82	FY83	FY84	FY85
E-1/3	3048	3101	3137	3275	3356	3267	3194
	1.75	1.52	1.55	1.52	1.63	1.63	1.71
	----	----	----	----	----	----	----
	----	----	----	----	----	----	----
E-4	1715	1526	1351	1443	1421	1506	1487
	3.17	3.15	3.17	3.04	3.07	3.11	3.15
	2216	2257	2285	2389	2437	2366	2366
	-22.61	-32.39	-40.88	-39.60	-41.69	-36.35	-37.15
E-5	1738	1736	1624	1520	1505	1464	1587
	5.22	5.41	5.50	5.51	5.48	5.52	5.50
	1937	1952	1984	1995	1985	1981	1981
	-10.27	-11.07	-18.15	-23.81	-24.18	-26.10	-20.04
E-6	1015	1129	1273	1424	1514	1528	1535
	10.33	9.54	9.05	8.95	9.09	9.52	9.90
	1598	1652	1686	1680	1680	1677	1677
	-36.48	-31.66	-24.50	-15.24	-9.88	-8.88	-8.47
E-7	596	592	594	591	591	580	580
	16.52	16.53	16.27	16.20	15.73	15.63	15.37
	616	619	622	620	620	617	617
	-3.25	-4.36	-4.50	-4.68	-4.68	-6.00	-6.00
E-8	173	170	171	170	171	163	165
	19.70	20.11	20.35	20.68	20.48	20.76	20.56
	190	190	190	190	190	183	183
	-8.95	-10.53	-10.00	-10.53	-10.00	-10.93	-9.84
E-9	54	54	55	56	58	59	61
	23.69	24.39	25.10	25.50	25.43	25.30	24.02
	67	66	66	66	68	70	70
	-19.40	-18.18	-16.67	-15.15	-14.71	-15.71	-12.86

FIGURE 4-6 (cont'd)

OPERATIONS SPECIALIST (OS) MANPOWER PROJECTIONS

Rate	FY79	FY80	FY81	FY82	FY83	FY84	FY85
E-4/9	5291	5207	5068	5204	5260	5300	5412
	7.47	7.58	7.75	7.69	7.73	7.78	7.83
	6624	6736	6833	6940	6980	6894	6894
	-20.12	-22.70	-25.83	-25.01	-24.64	-23.12	-21.50
Total	8339	8308	8205	8479	8616	8567	8606
	5.38	5.32	5.38	5.31	5.35	5.44	5.56
	6624	6736	6833	6940	6980	6894	6894
	----	----	----	----	----	----	----

Explanation: Within the cells for each rate and rating by fiscal year, the data are presented as follows; for example, for the OS E-4 in FY80, the estimates are:

End Strength	1526	(Projected number of men at end of FY)
Mean LOS	3.15	(Average Length of Service)
Manpower Requirements	2257	(CNO estimates of number required)
End Strength Status	-32.39	(Percentage over or under requirements)

FIGURE 4-7

CRITICAL RATING INDEX COMPUTATIONS

FIT Concept

Rate	Composite[1] Shortage Figure
YNC	-
YN1	-
YNSN	-
YNSN	-
YNSN	-
OSC	.25
HMC	-
RM1	.02
QM1	-
GSMC	-
GSEC	-
HTC	.23
EMC	-
BMC	-
GMMC	.18
GMGC	.03
FTMC	.05
FTGC	.05
DSC	.05
ETC	.04
SKC	-
SK1	-
Total-	.90

Critical Rating Index (CRI) = Composite Shortage Figure x Number of Months Personnel Lost to Fleet

CRI = .9 x 12 (CRI for FIT computed on a one year basis)

CRI = 10.80

[1]Composite Shortage Figure is the percentage each rating is projected to be undermanned in FY 83 expressed as a decimal.

FIGURE 4-8

CRITICAL RATING INDEX,
NPRDC STUDY

Alternative			Critical Rating Index (CRI)
CG 47 Manning Concept			52.71/ship
Conventional Nucleus Crew, Balance Crew Concept			9.89/ship
FIT Concept			
1 ship/year:			
FIT		10.80	
Crew		4.93	
	Total-	15.73	15.73/ship
2 ships/year:			
FIT		10.80	
Crew (2 x 4.93)		9.86	
	Total-	20.66	10.33/ship
3 ships/year:			8.53/ship
4 ships/year:			7.63/ship

The NPRDC study is one of a number of reports the Navy has developed for projecting personnel availability. The Chief of Naval Operations (OP 122) produces management reports which compare approved authorizations of personnel by rate and paygrade to projected inventory. To determine if the data contained in the Chief of Naval Operations (CNO) report would produce different results from those obtained using the NPRDC study, a CRI was computed using the CNO report entitled "Enlisted Problem Skill Detection Report" as of 21 May 1980. A CRI for each alternative was computed in the same manner as described above using the NPRDC data. The results of these computations are shown in Figure 4-9. As can be seen in Figure 4-9, each alternative maintains the same relative standing although the CRI increases considerably. The CRI computed for each alternative using the data contained in the NPRDC study, Figure 4-8, will be used in the remainder of the analysis.

There are a number of breakeven analysis computations which can be made to compare the three alternatives. Over a one year period, 7.4 ships can be delivered under the FIT concept at the same cost as one ship under the CG 47 Manning Concept, assuming minimum per diem paid to crew members (7.8 ships assuming maximum per diem) and that shipyard production and SCN funding could support such a delivery rate. Similarly, 5.3 ships can be delivered utilizing the conventional nucleus crew, balance crew concept at the same cost as one ship under the CG 47

FIGURE 4-9

CRITICAL RATING INDEX,
CNO REPORT

Alternative			Critical Rating Index (CRI)
CG 47 Manning Concept			96.02/ship
Conventional Nucleus Crew, Balance Crew Concept			14.33/ship
FIT Concept			
1 ship/year:			
FIT		14.64	
Crew		7.12	
	Total-	21.76	21.76/ship
2 ships/year:			
FIT		14.64	
Crew (2 x 7.12)		14.24	
	Total-	28.88	14.44/ship
3 ships/year:			12.00/ship
4 ships/year:			10.78/ship

Manning Concept assuming minimum per diem paid to crew members (5.0 ships assuming maximum per diem).

A more meaningful comparison entails computing the cost per ship delivered while varying the rate of delivery during a one year period. Figure 4-10 shows the results of these computations. Cost per ship delivered under the CG 47 Manning Concept and conventional nucleus crew, balance crew concept remain constant regardless of the rate of delivery. However, under the FIT concept, cost per ship delivered decreases rapidly as the rate of delivery increases, cost per ship being less than the conventional nucleus crew, balance crew method when three or more ships are delivered per year. Computations in Figure 4-10 are based on one FIT Team of 5 officers and 22 enlisted personnel being adequate to perform all necessary tasks and functions required to deliver 4 ships per year. The cost of an additional FIT Team (same composition) was included for 5-8 ships being delivered per year and a third team was added for 9-12 ships per year.

B. SENSITIVITY ANALYSIS

Sensitivity analysis consists of considering the effects of slippages in scheduled deliveries; per diem costs comprise the majority of dollar costs associated with such a slippage. Figure 4-11 shows the effect of a one month delay in the delivery of one ship on dollar costs, man-months lost to the fleet, and the critical rating index (CRI) for each alternative.

FIGURE 4-10

COST PER SHIP BASED ON DELIVERY RATE

Alternative

CG 47 Manning Concept: Rate of delivery has no impact on cost per ship.

With per diem minimum -	$ 3,094,875 per ship
With per diem maximum -	3,670,117
Man-months lost to fleet -	1,425
Critical rating index -	52.71

Conventional Nucleus Crew, Balance Crew Concept: Rate of delivery has no impact on cost per ship.

With per diem minimum -	$ 588,603 per ship
With per diem maximum -	727,368
Man-months lost to fleet -	284
Critical rating index -	9.89

FIT Concept:	Number of ships delivered per year[1]			
	1	2	3	4
With per diem minimum -	$ 1,081,627	698,812	571,207	507,405
With per diem maximum -	1,139,227	756,412	628,807	565,005
Man-months lost to fleet -	490.15	328.15	274.15	247.15
Critical rating index -	15.73	10.33	8.53	7.63
	5	6	7	8
With per diem minimum -	638,199	587,157	550,698	523,355
With per diem maximum -	695,799	644,757	608,298	580,955
Man-months lost to fleet -	302.50	280.90	265.50	253.90
Critical rating index -	9.25	8.53	8.02	7.63
	9	10	11	12
With per diem minimum -	603,108	577,587	556,706	539,306
With per diem maximum -	660,708	635,187	614,306	596,906
Man-months lost to fleet -	287.65	276.85	268.01	260.65
Critical rating index -	8.53	8.17	7.88	7.63

[1]One FIT Team (5 officers, 22 enlisted) through 4 ships per year, two FIT Teams for 5 - 8 ships per year, three FIT Teams for 9 - 12 ships per year.

FIGURE 4-11

COSTS PER MONTH OF DELAY

Alternative	Costs with[1] Per Diem Minimum	Maximum	Man-Months	CRI
CG 47 Manning Concept	$579,560	$970,670	323	310.5
Conventional Nucleus Crew, Balance Crew	579,560	970,670	323	310.5
FIT Concept				
Crew Costs	579,560	970,670	323	310.5
FIT Costs[2]	64,866	64,866	27	27.0
Total-	644,426	1,035,536	350	337.5

[1]Additional PCS costs which could become a consideration if schedule slippages extend crew temporary duty at the construction site beyond 6 months have not been included. Costs include life cycle billet costs, per diem, and PCS costs as previously computed.

[2]FIT costs are based on one FIT Team.

Computations were based on all ship's personnel having reported to the construction site, assuming the slippage in delivery schedule was not known far enough in advance to modify the phasing of personnel through training. Whether at the construction site or at the Fleet Training Centers, per diem would accumulate at approximately the same rate and the impact on man-months lost to the fleet and the CRI would be the same.

As can be seen in Figure 4-11, schedule slippages are more costly under the FIT concept. However, the fact that the CG 47 Manning Concept is much more costly on a per ship basis means a three to four month slippage under either of the other two alternatives would still not result in costs (life cycle billet costs, per diem, and PCS) or man-months exceeding those under the CG 47 Manning Concept without a slippage.

C. PRESENT VALUE ANALYSIS

In order to assess the effects of increases in life cycle billet costs (LCBC) over the period of construction and delivery of the CG 47 Class, an annual increase of 7% in LCBC was assumed. It was also assumed that per diem and PCS costs will double by the time the last ship is delivered. Although probably not entirely accurate, these increases appear reasonable and permit a more realistic evaluation of each alternative. After these increases in costs were computed, a 10% discount rate was applied in accordance with current Department of Defense policy, assuming an even cash flow over the eleven

year period [7]. The results of these computations are shown below:

Alternative	Costs as Given With Per Diem		Costs Increased and Discounted, Per Diem	
	Minimum	Maximum	Minimum	Maximum
CG 47 Manning Concept	74,277,000	88,082,808	80,448,941	93,278,935
Conventional Nucleus Crew, Balance Crew	14,126,472	17,456,832	15,150,018	18,393,666
FIT Concept	16,388,664	17,771,064	16,871,580	17,728,040

As can be seen from the above, the impact of projecting increases in LCBC, per diem, and PCS costs and computing the present value of each alternative has no effect on the relative standing of the alternatives and results in final costs very similar to those originally computed.

D. NON-QUANTIFIABLE FACTORS

The method of evaluating non-quantifiable aspects of the three methods for fleet introduction was accomplished as follows: First, a listing of all non-quantifiable factors, in some cases more appropriately functions, related to fleet introduction and the alternatives being evaluated was developed. These factors were developed by reviewing various Navy instructions concerning new construction and fleet introduction, reports evaluating FIT pilot programs, the GAO report cited earlier, and Navy internal memorandum discussing fleet introduction methods and philosophy. The list was then

reviewed, items consolidated, and four categories developed: Category A, factors impacting directly on the objective of fleet introduction which is to introduce into the fleet on schedule a fully operational ship with a well-trained crew; Category B, factors impacting on the utilization of personnel or other resources; Category C, factors impacting on Navy personnel such as morale and retention; and Category D, miscellaneous factors. These factors are listed by category in Appendix F.

After assignment of factors to a category, each was then assigned an importance value based on how important that factors was considered to be to fleet introduction of new construction ships or the Navy in general. The assignment of importance values was based on subjective judgment by the author with a value of five being assigned if the factor was considered highly important, a value of three assigned if considered of medium importance, or a value of one assigned if considered of low importance.

The three alternative methods of accomplishing fleet introduction were then evaluated on the basis of the extent to which each demonstrated the previously described factors. The same scale was used as in assigning importance values, a five being assigned if an alternative was judged to highly demonstrate a factor, a three if demonstrated to a medium extent, and a one if demonstrated to a low extent. Appendix F comprises a list of factors developed, importance values

assigned to each factor, and evaluation of each alternative as to the extent each demonstrates the factors. Appendix G is a mathematical summary used to calculate the total values assigned to each alternative the highest value being preferred. As shown in Appendix G, the CG 47 Manning Concept receives a numerical value of 308, the conventional nucleus crew, balance crew concept 250, and the FIT concept 422.

E. OVERALL EVALUATION OF ALTERNATIVES

The overall evaluation of alternatives was accomplished by using the four criteria discussed in the analysis; total dollar costs (LCBC, per diem, and PCS costs), man-months lost to the fleet, the critical rating index (CRI) developed, and non-quantifiable factors. Each alternative was ranked from one to three based on how well that alternative met the criteria as well as its standing relative to the other alternatives. The results of this evaluation is contained in Figure 4-12.

The FIT concept received a higher total evaluation only if the delivery rate reaches or exceeds three ships per year; the conventional nucleus crew, balance crew concept would have a higher total evaluation if less than three ships are delivered per year. The CG 47 Manning Concept received the lowest overall total evaluation.

FIGURE 4-12

OVERALL EVALUATION OF ALTERNATIVES

Alternative	Criteria[1] Total Dollar Costs: LCBC, Per Diem, PCS	Man-Months Lost to Fleet	Critical Rating Index	Non-Quantifiable Factors	Total
CG 47 Manning Concept	1	1	1	2	5
Conventional Nucleus Crew, Balance Crew	3	3	3	1	10
FIT Concept[2]	3	3	3	3	12

[1]Numbers in matrix assigned to each alternative are a rank value, 1 being the lowest ranking, 3 the highest.

[2]The FIT Concept was given a ranking of 3 based on cost/values which are better than those under the conventional nucleus crew, balance crew concept when the delivery rate reaches or exceeds 3 ships per year.

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

Chapter I provided background information concerning methods for accomplishing fleet introduction of new construction ships. Chapter II reviewed the use of nucleus crew personnel and some of the problems inherent in the conventional nucleus crew, balance crew concept. It also presented data on the development of the Fleet Introduction Team (FIT) concept, FIT pilot programs, advantages of the FIT concept, circumstances when utilization of the FIT concept is most appropriate, and described the CG 47 Class Guided Missile Cruiser and CG 47 Manning Concept. Chapter III developed scenarios for manning the CG 47 Class utilizing the conventional nucleus crew, balance crew concept and FIT concept, and discussed costs associated with each alternative. Chapter IV analyzed the various costs of each alternative as well as non-quantifiable factors important to fleet introduction. An overall evaluation of the three alternatives was also made on the basis of the criteria described. This chapter will now present conclusions.

B. CONCLUSIONS

1. The conventional nucleus crew, balance crew concept for fleet introduction of new construction ships is becoming obsolete

An attempt to reduce per diem costs and use manpower

more efficiently resulted in the development of the FIT concept. Increasingly sophisticated weapons systems and cases of deficiencies in propulsion plant operation at delivery have resulted in the development of the CG 47 Manning Concept, patterned after the method of manning nuclear powered surface ships. Combinations of methods have been used as well; the lead ship of the FFG 7 Class was delivered two years prior to subsequent ships of the class and a nucleus crew, balance crew concept supported by a small FIT at each of the three building sites has been employed for the remainder of the class. The method of accomplishing fleet introduction of new construction ships appears to be unique by program; use of the conventional nucleus crew, balance crew concept is becoming more an exception than the rule.

2. The utilization of the FIT concept should be given more consideration in new construction programs

Of the alternatives considered, the FIT concept is the best alternative for fleet introduction of new construction ships having the characteristics of the CG 47 Class when three or more ships are to be delivered annually at one construction site. This conclusion is based on the following criteria: total dollar costs (life cycle billet costs, per diem, and permanent change of station costs); number of man-months personnel are lost to the fleet; the critical rating index developed; and non-quantifiable factors related to fleet introduction. Depending on the number of ships to be

delivered at a single construction site and the rate of delivery, utilization of the FIT concept for fleet introduction of the CG 47 Class would appear to be more advantageous than any other method.

Since the CG 47 will be manned in a manner patterned after the method of manning nuclear powered surface ships, evaluation of the success and benefits derived as opposed to the costs of the CG 47 Manning Concept will be essential. Whether additional benefits are realized through use of the CG 47 Manning Concept will be a most important consideration since the period that personnel are lost to the fleet, particularly those personnel in undermanned ratings, is much greater under the CG 47 Manning Concept than under alternative methods.

3. The decision as to how new construction ships are to be manned for fleet introduction purposes needs to be made as soon as possible

The training sequence or pipeline involved in preparing personnel to serve aboard ships with complex weapons and propulsion systems is lengthy: When added to the fleet introduction period, personnel can be unavailable to the fleet for two to three years prior to the delivery date of a new construction ship to which they are assigned. Any vacillation on the part of the Navy as to how a new construction program is to be manned can force the decision by default. Although other factors such as funding or slippages in delivery can also impact on the amount of time personnel are lost to the fleet, every effort should be made to ensure personnel

are not lost to the fleet due to the lack of a decision as to how to man a new construction program.

C. FINAL THOUGHT

To summarize the thesis, the author's research and method of comparing the alternatives has shown;

1) the nucleus crew, balance crew concept is becoming obsolete,

2) use of the FIT concept should be expanded,

3) there is a need for early decisions relative to manning new construction ships.

The introduction of new ships into the fleet is a lengthy and costly process. Advanced planning is a prerequisite and decision by default must be avoided if the United States Navy is to use its resources effectively.

APPENDIX A

GLOSSARY OF ABBREVIATIONS

ADMIN	ADMINISTRATION/ADMINISTRATIVE
AE	AMMUNITION SHIP
AMMO	AMMUNITION
AOA	AMPHIBIOUS OBJECTIVE AREA
AOR	REPLENISHMENT OILER
ARFCOS	ARMED FORCES COURIER SERVICE
AT	ACCEPTANCE TRIALS
BT	BUILDER'S TRIALS
BUMED	BUREAU OF MEDICINE AND SURGERY
BUPERS	BUREAU OF NAVAL PERSONNEL
CAPT	CAPTAIN
C&D	COMMAND AND DECISION (SYSTEM)
CDR	COMMANDER
CG	GUIDED MISSILE CRUISER
CIC	COMBAT INFORMATION CENTER
CINC	COMMANDER-IN-CHIEF
CIWS	CLOSE-IN WEAPONS SYSTEM
CMIO	COMMUNICATIONS MATERIAL ISSUING OFFICE
CMS	COMMUNICATIONS SECURITY MATERIAL SYSTEM
CNO	CHIEF OF NAVAL OPERATIONS
CO	COMMANDING OFFICER
COMSIX	COMMANDER, SIXTH NAVAL DISTRICT
CPO	CHIEF PETTY OFFICER
CRI	CRITICAL RATING INDEX
CVAN	NUCLEAR-POWERED ATTACK AIRCRAFT CARRIER
CY	CALENDAR YEAR
DC	DAMAGE CONTROL
DD	DESTROYER
DDG	GUIDED MISSILE DESTROYER
DE	DESTROYER ESCORT
DE-RAT	DE-RATIFICATION
DET	DETACHMENT
DISPL	DISPLACEMENT
DLGN	NUCLEAR-POWERED GUIDED MISSILE DESTROYER
DOD	DEPARTMENT OF DEFENSE
DSD	DATA SYSTEMS DIVISION

ECM	ELECTRONIC COUNTERMEASURES
ENL	ENLISTED
ENS	ENSIGN
ESM	ELECTRONIC SUPPORT MEASURES
EW	ELECTRONIC WARFARE
EWS	ELECTRONIC WARFARE SYSTEM
FCS	FIRE CONTROL SYSTEM
FFG	GUIDED MISSILE FRIGATE
FICA	FEDERAL INSURANCE CONTRIBUTIONS ACT (SOCIAL SECURITY TAX)
FHA	FEDERAL HOUSING ADMINISTRATION
FIT	FLEET INTRODUCTION TEAM
F.L.	FULLY LOADED
FOSAT	FITTING-OUT SUPPLY ASSISTANCE TEAM
FREQ	FREQUENCY
FTC	FLEET TRAINING CENTER
FWD	FORWARD
FY	FISCAL YEAR
GAO	GENERAL ACCOUNTING OFFICE
GFCS	GUNFIRE CONTROL SYSTEM
GML	GUIDED MISSILE LAUNCHER
GMLS	GUIDED MISSILE LAUNCHING SYSTEM
GUCL	GENERAL USE CONSUMABLE LISTING
GWS	GUN WEAPONS SYSTEM
HAB	HABITABILITY
HELO	HELICOPTER
HOMER	HOMING
HWS	HARPOON WEAPON SYSTEM
I-COG	NAVY PUBLICATIONS AND FORMS (GENERIC TERM)
IFF	IDENTIFICATION FRIEND OR FOE (SYSTEM)
INST	INSTRUCTION
INSURV	INSPECTION AND SURVEY
ISD	INGALLS SHIPBUILDING DIVISION
JAX	JACKSONVILLE, FLORIDA
JUMPS	JOINT UNIFORM MILITARY PAY SYSTEM
KT	KNOTS
LAMPS	LIGHT AIRBORNE MULTI-PURPOSE SYSTEM (HELICOPTER)
LCBC	LIFE CYCLE BILLET COSTS
LCDR	LIEUTENANT COMMANDER
LF	DESIGNATION FOR NAVY FORMS
LOE	LIGHT-OFF EXAMINATION
LOS	LENGTH OF SERVICE
LP	DESIGNATION FOR NAVY PUBLICATIONS

LPD	AMPHIBIOUS TRANSPORT DOCK
LST	LANDING SHIP, TANK
LT	LIEUTENANT
LTJG	LIEUTENANT (JUNIOR GRADE)
LTR	LETTER
3M	MAINTENANCE AND MATERIAL MANAGEMENT (SYSTEM)
MILCON	MILITARY CONSTRUCTION (APPROPRIATION)
MK	MARK
MOD	MODIFICATION
MPN	MILITARY PERSONNEL NAVY (APPROPRIATION)
MPP	MILITARY PAY PROCEDURES (MANUAL)
NAFC	NAVY ACCOUNTING AND FINANCE CENTER
NAS	NAVAL AIR STATION
NASSCO	NATIONAL STEEL AND SHIPBUILDING COMPANY
NAV	NAVIGATION
NAVCOMPT	COMPTROLLER OF THE NAVY
NFSSO	NAVY FOOD SERVICE SYSTEMS OFFICE
NITRAS	NAVY INTEGRATED TRAINING RESOURCES AND ADMINISTRATION SUBSYSTEM
NMMFO	NAVY MAINTENANCE MANAGEMENT FIELD OFFICE
NORVA	NORFOLK, VIRGINIA
NPFC	NAVAL PUBLICATIONS AND FORMS CENTER
NPRDC	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER
NRSO	NAVY RESALE SYSTEMS OFFICE
NSC	NAVAL SUPPLY CENTER
OASD(MRA&L)	OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (MANPOWER, RESERVE AFFAIRS AND LOGISTICS)
OFF	OFFICER
O&MN	OPERATIONS AND MAINTENANCE, NAVY (APPROPRIATION)
OP	INTERNAL CODE WITHIN THE OFFICE OF THE CHIEF OF NAVAL OPERATIONS
OPNAVINST	OFFICE OF THE CHIEF OF NAVAL OPERATIONS INSTRUCTION
OPS	OPERATIONS
OSI	OPERATING SPACE ITEM
PCO	PROSPECTIVE COMMANDING OFFICER
PCS	PERMANENT CHANGE OF STATION
PMS	PLANNED MAINTENANCE SYSTEM
POD	PLAN OF THE DAY
PQS	PERSONNEL QUALIFICATION STANDARDS
PRECOM	PRECOMMISSIONING/PRECOMMISSIONING DETAIL
PROP	PROPULSION
P/S	POWER SECTION
PSO	PROSPECTIVE SUPPLY OFFICER
PU	PICK UP
PXO	PROSPECTIVE EXECUTIVE OFFICER
PYRO	PYROTECHNICS

QD	QUARTER DECK
RMS	RESOURCES MANAGEMENT SYSTEM
RTT CERT	RADIO TELETYPE CERTIFICATION
SCN	SHIP CONSTRUCTION, NAVY (APPROPRIATION)
SDIEGO	SAN DIEGO, CALIFORNIA
S/F	SHIP'S FORCE
SHP	SHAFT HORSEPOWER
SIF	SELECTIVE IDENTIFICATION FEATURE
SM	STANDARD MISSILE
SOS	SUPERVISOR OF SHIPBUILDING
SPS	SEARCH (SURFACE OR AIR) RADAR SYSTEM
SPY	PHASED ARRAY RADAR (AEGIS SYSTEM)
SQS	SONAR SYSTEM
SRBOC	SUPER RAPID BLOOMING OFF-BOARD CHAFF
SSBN	NUCLEAR-POWERED FLEET BALLISTIC MISSILE SUBMARINE
SSN	SOCIAL SECURITY NUMBER
SSN	NUCLEAR-POWERED ATTACK SUBMARINE
SUPSHIP	SUPERVISOR OF SHIPBUILDING
SURFLANT	COMMANDER NAVAL SURFACE FORCES, U.S. ATLANTIC FLEET
SURFPAC	COMMANDER NAVAL SURFACE FORCES, U.S. PACIFIC FLEET
SUST	SUSTAINED
SSA	SOCIAL SECURITY ADMINISTRATION
TACAN	TACTICAL AIR NAVIGATION (SYSTEM)
TORP	TORPEDO
TURB	TURBINE
TYCOM	TYPE COMMANDER
US&CS	UNDERWATER SURVEILLANCE AND COMMUNICATIONS SYSTEM
UWS	UNDERWATER (WEAPONS) SYSTEM
WCS	WEAPONS CONTROL SYSTEM
WEPS	WEAPONS
W&R	WELFARE AND RECREATION
XO	EXECUTIVE OFFICER

APPENDIX B

GLOSSARY OF TERMS

This glossary contains words and phrases used in the text. Their meaning is presented here as intended in the text.

1. Acceptance trials - Trials conducted at sea by the builder to prove the readiness of a ship for acceptance by the Navy.
2. Builder's trials - Trials conducted at sea by the builder to prove the readiness of a ship for preliminary acceptance trials.
3. Class - A number of vessels built alike (or nearly so).
4. Consumables - Materials intended to be expended or used.
5. Equipage - General term used to designate material of a non-consumable nature which must be aboard for a ship to perform its mission properly.
6. Fitting-out - Supplying a ship (placing on board) equipment required for service.
7. Fleet Commander - Commander of an organization of ships, aircraft, marine forces, and shore-based fleet activities. May include operational as well as administrative control.
8. Government mess - The place where government meals are prepared and served. Navy messes are located aboard ship as well as at shore activities.
9. Government quarters/berthing - Those quarters or berths provided by the government in lieu of a monetary allowance

for quarters. Navy quarters and berths are located aboard ship and at shore activities in the form of bachelor officer and enlisted quarters as well as family housing units.

10. Mark - Indication of major development of equipment.

11. Modification - Minor improvement to equipment, shown after the mark number.

12. Operating space items - Items required to be in a working space for a ship to be operational (i.e., tools).

13. Paygrade - Level of military pay, from E-1 (recruit) to E-9 (master chief petty officer) for enlisted; from W-1 to W-4 for warrant officers; and from 0-1 (ensign) to 0-10 (fleet admiral) for officers.

14. Per diem - Additional expense money for a person on temporary duty or in a travel status.

15. Provisions - Food and drink required for operating a government mess.

16. Rate - Level of proficiency within a rating which includes paygrade.

17. Rating - Designation of enlisted personnel according to military skills (see APPENDIX C).

18. Type Commander - Commander of an administrative subdivision of a number of ships of the same type (basic characteristics).

APPENDIX C

GLOSSARY OF ENLISTED RATING ABBREVIATIONS[1]

Abbreviation	Title
AG	AEROGRAPHER'S MATE
AC	AIR TRAFFIC CONTROLLER
PR	AIRCREW SURVIVAL EQUIPMENTMAN
AN	AIRMAN
AW	AVIATION ANTISUBMARINE WARFARE OPERATOR
AW	Aviation Antisubmarine Warfare Operator (Acoustic)
AW	Aviation Antisubmarine Warfare Operator (Helicopter)
AW	Aviation Antisubmarine Warfare Operator (Non-Acoustic)
AX	AVIATION ANTISUBMARINE WARFARE TECHNICIAN (includes AVCM)
AB	AVIATION BOATSWAIN'S MATE
ABE	Aviation Boatswain's Mate (Launching and Recovery Equipment)
ABF	Aviation Boatswain's Mate (Fuels)
ABH	Aviation Boatswain's Mate (Aircraft Handling)
AE	AVIATION ELECTRICIAN'S MATE (includes AVCM)
AT	AVIATION ELECTRONICS TECHNICIAN (includes AVCM)
AQ	AVIATION FIRE CONTROL TECHNICIAN (includes AVCM)
AD	AVIATION MACHINIST'S MATE (includes AFCM)
AZ	AVIATION MAINTENANCE ADMINISTRATIONMAN
AO	AVIATION ORDNANCEMAN
AK	AVIATION STOREKEEPER
AM	AVIATION STRUCTURAL MECHANIC (includes AFCM)
AME	Aviation Structural Mechanic (Safety Equipment)
AMH	Aviation Structural Mechanic (Hydraulics)
AMS	Aviation Structural Mechanic (Structures)
AS	AVIATION SUPPORT EQUIPMENT TECHNICIAN
ASE	Aviation Support Equipment Technician (Electrical)
ASH	Aviation Support Equipment Technician (Hydraulics and Structures)
ASM	Aviation Support Equipment Technician (Mechanical)

[1]The last page of this appendix contains a further explanation of the enlisted rating structure.

BM	BOATSWAIN'S MATE
BT	BOILER TECHNICIAN
BU	BUILDER (includes CUCM)
CE	CONSTRUCTION ELECTRICIAN (includes UTCM)
CN	CONSTRUCTIONMAN
CM	CONSTRUCTION MECHANIC (includes EQCM)
CT	CRYPTOLOGIC TECHNICIAN
DP	DATA PROCESSING TECHNICIAN
DS	DATA SYSTEMS TECHNICIAN
DN	DENTALMAN
DT	DENTAL TECHNICIAN
DT	Dental Technician (General)
DT	Dental Technician (Prosthodontics)
DT	Dental Technician (Repair)
DK	DISBURSING CLERK
EM	ELECTRICIAN'S MATE
ET	ELECTRONICS TECHNICIAN
EW	ELECTRONICS WARFARE TECHNICIAN
EA	ENGINEERING AID (includes CUCM)
EN	ENGINEMAN
EO	EQUIPMENT OPERATOR (includes EQCM)
FT	FIRE CONTROL TECHNICIAN
FTB	Fire Control Technician (Ballistic Missile Fire Control)
FTG	Fire Control Technician (Gun Fire Control)
FTM	Fire Control Technician (Surface Missile Fire Control)
FN	FIREMAN
GS	GAS TURBINE SYSTEM TECHNICIAN
GSE	Gas Turbine System Technician (Electrical)
GSM	Gas Turbine System Technician (Mechanical)
GM	GUNNER'S MATE
GMG	Gunner's Mate (Guns)
GMM	Gunner's Mate (Missiles)
GMT	Gunner's Mate (Technician)
HM	HOSPITAL CORPSMAN
HN	HOSPITALMAN
HT	HULL MAINTENANCE TECHNICIAN
DM	ILLUSTRATOR DRAFTSMAN
IM	INSTRUMENTMAN (includes PICM)
IS	INTELLIGENCE SPECIALIST
IC	INTERIOR COMMUNICATIONS ELECTRICIAN (includes EMCM)
JO	JOURNALIST
LN	LEGALMAN
LI	LITHOGRAPHER
MR	MACHINERY REPAIRMAN
MM	MACHINIST'S MATE
MA	MASTER-AT-ARMS
MS	MESS MANAGEMENT SPECIALIST
MN	MINEMAN

MT	MISSILE TECHNICIAN
ML	MOLDER
MU	MUSICIAN
NC	NAVY COUNSELOR
OT	OCEAN SYSTEMS TECHNICIAN
OS	OPERATIONS SPECIALIST
OM	OPTICALMAN (includes PICM)
PM	PATTERNMAKER (includes MLCM)
PN	PERSONNELMAN
PH	PHOTOGRAPHER'S MATE
PC	POSTAL CLERK
QM	QUARTERMASTER
RM	RADIOMAN
RP	RELIGIOUS PROGRAM SPECIALIST
SN	SEAMAN
SH	SHIP'S SERVICEMAN
SM	SIGNALMAN
ST	SONAR TECHNICIAN
STG	Sonar Technician (Surface)
STS	Sonar Technician (Submarine)
SW	STEELWORKER (includes CUCM)
SK	STOREKEEPER
TM	TORPEDOMAN'S MATE
	Torpedoman's Mate (Submarine)
	Torpedoman's Mate (Surface)
	Torpedoman's Mate (Technician)
TD	TRADEVMAN
UT	UTILITIESMAN
YN	YEOMAN

Rating abbreviations will normally appear followed by a number to designate petty officer level or a "C" to designate chief petty officer status. The rate of Operations Specialist (OS) has been used below to demonstrate how enlisted rate abbreviations designate petty officer levels which correspond to particular pay grades (E-1 through E-9). The combination of rating and paygrade is a rate.

Rating		Paygrade
SR-	Seaman Recruit	E-1
SA-	Seaman Apprentice	E-2
SN-	Seaman	E-3
OSSN-	A "designated striker" in Navy Parlance, a seaman who has been designated as meeting qualifications for serving as an Operations Specialist through formal schooling or other training (self-study, on-the-job training).	

OS3-	Operations Specialist Third Class (Third Class Petty Officer)	E-4
OS2-	Operations Specialist Second Class (Second Class Petty Officer)	E-5
OS1-	Operations Specialist First Class (First Class Petty Officer)	E-6
OSC-	Chief Operations Specialist (Chief Petty Officer)	E-7
OSCS-	Senior Chief Operations Specialist (Senior Chief Petty Officer)	E-8
OSCM-	Master Chief Operations Specialist (Master Chief Petty Officer)	E-9

APPENDIX D

DD-963 CLASS FIT TASKS/FUNCTIONS

ADMIN/MEDICAL/COMM/POSTAL/QUARTERMASTER

WKS TO ACCEPTANCE TRIALS	MILESTONES
-24 WKS	Disbursing send ltr to CNO Code 09B18, requesting establishment of Post Office on subject ship. Copy of ltr to S/F Postal Office.
-20 WKS	Receive reply from CNO on Post Office. CNO notifies New York Truck Terminal and Sommerville, NJ.
-18 WKS	QM initiate request to place sub ship on appropriate local Notice to Mariners Distribution.
-16 WKS	Order Medical Supplies/Equipment.
-14 WKS	QM order commissioning chart allowance from DMAHC Wash, DC.
-12 WKS	Mail FIT produced package (Ships Inst, Dept Inst, Letters of Designation, DC Booklets and School of the Ship Books) to PRECOM. Advise ship to ensure that Data Bank keeper has Secret clearance. When ship receives mini-admin package, advise PXO/OPS that any changes/new instructions be in smooth to FIT at time of BT. At first contact with prospective CMS Custodian advise custodian to complete CMS-10 (Section III) including PCO signature. Further advise custodian to prepare ARFCOS 10's. Send "DO LISTS" to PRE COM.

WKS TO ACCEPTANCE TRIALS	MILESTONES
-12 WKS (Cont'd)	Commence Receiving Medical Supplies/ Equipment: check for breakage/shelf life/damage and inventory.
	Commence official message file for ship.
-10 WKS	Start compiling General msg file.
-8 WKS	Inventory postal material as received and place on inventory list.
	QM contact appropriate team Ops to ensure S/F QM and OS are on station to receive package.
	POD, C.O.'s personal stationary, franked envelopes, ship's letterhead, mailing labels, invitations envelopes, plastic covers sent to Government Representative (John Fitzgerald) for printing.
-7 WKS	TYCOM package ordered (SURFLANT, SURFPAC).
	Receive Navy Department Instruction and Notices from NPFC. Commence making changes and inventory.
-6 WKS	Receive printed material from Navy printer. Inventory for completeness. Commence typing ships and departmental instructions.
	Make changes to Postal Pubs as received.
	S/F QM on station in Pascagoula for correction of Navigation package. QM order shortages and additional desired navigation items.
-5 WKS	Send FIT produced package to company printer for printing (30 copies ships inst, 20 departmental inst).
	S/F prepare clearance ltr for use during "BT" and "AT" and provide to FIT.

WKS TO ACCEPTANCE TRIALS	MILESTONES
-4 WKS	Admin mail shortage list to NPFC. S/F provide FIT with required changes to instructions for printing. FIT send msg request to establish CMS Account. Receive clearance list from ship's PRE-COM. S/F provide names for letters of designation.
-3 WKS	Receive TYCOM package. Commence making changes and inventory.
-2 WKS	Receive (Instructions and Forms package) printed material from company printer. Inventory for completeness. Place in folders and prepare for loadout. FIT send msg request for RTT cert. When CMS Account number received, S/F hand deliver CMS-10 (Section III) to CMIO and mail ARFCOS Form 10's (East Coast: JAX and CHARLESTON; West Coast: NORVA, JAX and SDIEGO) FIT requisition Ammo/Pyro required for ship safety.
-1 WK	Shortage list to TYCOM.
-1 to +1 WKS	This time is spent doing final inventory on both Navy and TYCOM packages to ensure all shortages have been ordered, filing/ updating instructions received from various shortage lists, plus ensuring that tickler cards are complete, training manuals received, etc. Talk with XO about security watch requirements.

WKS TO ACCEPTANCE TRIALS	MILESTONES
+0 DAYS	Acceptance Trial.
+3 DAYS	FIT send msg to COMSIX requesting secure stowage certification.
+4 DAYS	S/F coordinate with FIT and send msg for assignment of TACAN channel, identifier, Helo Homer Freq, SIF, PU number.
+7 DAYS	Medical Load.
	Admin Load. (Ensure that Admin Load includes ltrs for message pickup/releasing authority).
+8 DAYS	Admin Load.
+9 DAYS	Navigational Load.
+10 DAYS	QM initiate FIT ltr requesting subject ship be placed on NODAL crossing distribution list.
+19 DAYS	Postal Load.
+23 DAYS	Controlled Medicinal Turnover.
+37 DAYS	De-Rat Inspection.
+47 DAYS	Commissioning.

FIT SUPPLY DEPARTMENT MILESTONES

WKS TO ACCEPTANCE TRIALS	MILESTONES
-32 WKS	Initiate Institute of Heraldry ltr for Ship's Crest design.
-20 WKS	Monitor status of construction with weekly/monthly reports to FIT Supply Officer.
	Identify Supply Officer, Disbursing Officer, DK & SKC by name and SSN.
	Notify NAVCOMPT of intent to establish Disbursing. Request Symbol Number.
	Request Accountable Supply positions from NAFC, Wash, DC.
-16 WKS	Order blank U.S. Treasury Checks.
	Verify shipping date of GUCL/OSI material from NSC.
	Match GUCL inventory document against SOS Baseline Master.
	Request establishment of Imprest Fund. (E. coast only)
	Request establishment of Agent Cashier.
	Request Boat Letters.
	Review CRASP for "poor" status on GUCL/ OSI material.
	Initiate letter for establishment of Post Office. (Includes Money Orders & Stamps)
	Receive firm ship crest design & send to Plaza Photo for prints.

WKS TO ACCEPTANCE TRIALS	MILESTONES
-12 WKS	Request specialized rubber stamps from PSO. Forward package to NSC Charleston via SUPSHIPS Code 500.
	Order emblematic ship's store stock.
	Request vending machines from NRSO.
	Commence inventory of GUCL/OSI material.
	Initiate request for Official Representation Funds. (PCO or FIT)
	Request safety shoes input from PSO. Forward info to NSC Charleston via Code 500 SUPSHIPS.
	Order Ship's Plaques.
	Request Consolidated Ship's Store Contract Bulletin.
	Request ship's store afloat material and publications.
	Request for ship's store renovation and improvement.
	Presentation silver request (ship initiate).
-8 WKS	Order ship store stock.
	Notify NRSO of intention to establish ships store.
	Notify NFSSO of intention to establish a general mess.
	Order provisions from NAS Pensacola.
	Verify shipment of I-Cog package, LF's from NSC, LP's from NPFC.

WKS TO ACCEPTANCE TRIALS	MILESTONES
-4 WKS	Builders Trials-submit appropriate BT cards.
	Inventory and receive Lock Package from contractor.
	Coordinate OSI critical with SOS.
	Acceptance Trials-submit AT cards to SOS - attend AT Card Screening Conference.
	Receive I-Cog material and commence departmental sorting.
	Inform ship to request W&R funds for crew in Pascagoula prior to Commissioning. (In addition to following item)
	Ensure W&R check has been initiated by BUPERS and PCO is given status.
	Generate GUCL shortage list & assign GUCL critical items.
	Generate I-Cog critical items.
	Generate GUCL load document.
	Update and run Supply Loadout Memorandum.
	Submit top-off provisions request to NAS Pensacola.
	Establish Supply Department records & files (SH,MS,SK,DK).
	Sort lock package for load.
	Per Diem W&R request.
	Pick up/inventory TACAN CRYSTALS from SUPSHIPS Code 500.

WKS TO ACCEPTANCE TRIALS	MILESTONES
-4 WKS (cont'd)	Inventory electronic tools & set up tool boxes in 11A. Follow-up on receipt of Library books.
-1 WK	Finalize controlled equipage cards. Order provisions from local contracts for loadout delivery. Letter of introduction to local bank for Disbursing Funds.
+1 WK	LOADOUT a. LOADOUT BRIEF b. Vending machines onboard c. GUCL spaces accepted d. GUCL prestaged e. OSI spaces accepted f. OSI load g. Mortise lock installation h. Furniture inventory i. Key & lock turnover j. YNC Admin load k. NAV load l. Medical load m. DK load n. I-Cog load o. COSAL AT cards signed off p. Dry provisions loaded q. Frozen provisions loaded r. Subcontractor turnovers s. Vendor ship store load t. FIT ship's store load from 11A u. Tool box load v. W&R load w. Library load x. Installation of typewriters y. Vendor check & repair of duplicating machines z. Hab inspection aa. Fresh provisions loaded

WKS TO ACCEPTANCE TRIALS	MILESTONES
+1 WK (cont'd)	ab. Milk & bread loaded
	ac. Mattress load
	ad. Helo certification
	ae. OCS classified load
	af. FIT misc load 11A cleared
	ag. ISD Craft turnover
	ah. DSD Craft turnover
-1 to +3 WKS	FULL CREW ARRIVAL
	a. Commence ship's store operation
	b. Commence feeding crew
	c. Bank run for Disbursing Funds
	d. Commence Disbursing function
	e. Letter of notification for commencement of Disbursing, Ship's Store, and Food Service (PCO function)
	f. Postal load
	g. FOSAT visit and inventory of SRI
	h. Measure for QD awning. Receipt in 2 wks.
	i. Loadout discrepancy resolution complete
	k. Warranty guarantee brief
+4 WKS	DELIVERY
	a. QD awning received
	b. Hab funds spent
	c. Provisions top off
	d. Load small arms and ammunition
	e. Shipouts
	f. Final shortage list received by ship
	g. All SUPSHIP purchase orders signed by PSO
	h. Nuclear Weps Matl ltr to Ship
+7 WKS	COMMISSIONING
	a. Hardhats returned to FIT ... signed 1148 if necessary for shortages
	b. Tables used for commissioning returned to FIT
	c. Depart Pascagoula

APPENDIX E

FLEET INTRODUCTION TEAM CNO ASSIGNED TASKS

1. Act as liaison between Fleet CINC/TYCOM/CHNAVPERS prior to arrival of the PCO. Monitor the progress of shipyard work in the latter stages of construction. Prepare reports normally required of the PCO until he arrives.

2. Provide administrative support to the nucleus crew and PCO as each reports to the construction site. Establish diaries, correspondence files, and provide related personnel services as performed by PCO's.

3. Working with the Supervisor, FTC, TYCOM and other appropriate activities, establish a training program to familiarize the nucleus crew with their ship and its equipment. Include on board (within contractural constraints) and classroom instruction.

4. Receive and evaluate problem area identification and recommend appropriate action of problem areas reported by recently completed ships of the same or similar class.

5. Receive and catalogue contractor furnished publications and documents as received by the Supervisor.

6. Monitor long lead time items, safety equipment, crew comfort materials, etc. Ensure these items are placed on order sufficiently in advance to provide timely delivery, i.e., prior to sea trials.

7. Maintain close liaison with the FOSAT.

8. Prepare turn-over information for nucleus crew to include status of construction, reoccurring INSURV items from recently completed ships of the class and potential INSURV items, etc.

9. Maintain close liaison with the TYCOM and/or the Navy Maintenance Management Field Office (NMMFO) and Navy Manpower and Material Analysis Center concerning installation of the PMS package.

10. Assist the Prospective Commanding Officer in Developing Departmental Organization/Operating Manuals, and other items relating to the administrative organization. Develop a Ship's Organization and Regulations Manual. Develop Battle Bills and basic Watch, Quarter and Station Bills utilizing the Ship Manning Document where applicable.

11. Maintain background and information files concerning preparation for commissioning ceremonies. Acting for the PCO before he arrives, make necessary preliminary preparations with the Accepting Authority and other commands as appropriate.

APPENDIX F

NON-QUANTIFIABLE FACTORS RELATED TO FLEET INTRODUCTION

Factor	Importance Value	Alternative Evaluation: CG 47 Manning Concept	Alternative Evaluation: Nucleus Crew/ Balance Crew	Alternative Evaluation: FIT
Category A: Factors impacting directly on the objective of fleet introduction (to introduce into the fleet on schedule a fully operational ship with a well-trained crew).				
A-1: Monitoring of the progress of construction, outfitting, tests, and trials of each ship [4].	5	5	3	5
A-2: Thoroughness and consistency in the submission of progress and readiness reports to higher authority, including reports of trials [4].	3	3	3	5
A-3: Quality assurance effort.	3	5	3	5

Factor	Importance Value	Alternative Evaluation: CG 47 Manning Concept	Alternative Evaluation: Nucleus Crew/ Balance Crew	Alternative Evaluation: FIT
A-4: Type commander representation for support to the PCO in initial organization, administration, and training of nucleus and balance crew [4].	3	3	1	5
A-5: Crew proficiency and ability to attain crew certification based on: development of training to be performed at construction site; scheduling of personnel through this training; scheduling of post delivery drills and exercises in preparation for crew certification (LOE); and maintenance of training materials and aids (including documentation) [4] [11].	5	5	3	5
A-6: Effectiveness in coordinating the pre-commissioning training programs of both the nucleus and balance crews [4].	3	5	3	5
A-7: Amount of re-work after trials and success of trials [17].	5	5	1	1

Factor	Importance Value	Alternative Evaluation: CG 47 Manning Concept	Alternative Evaluation: Nucleus Crew/ Balance Crew	Alternative Evaluation: FIT
A-8: Amount of continuity in the management and administration of pre-commissioning facilities and activities at the construction site (reduction of confusion and disruption at the construction site) [3] [4].	3	3	1	5
A-9: Learning curve benefits - knowledge of shipyard operations, personal contacts, procedural expertise [12].	3	3	1	5
A-10: Improved administration of shipbuilding programs [6].	3	3	1	5
A-11: Develop and maintain standardized administrative, organizational, and procedural manuals, bills, and directives for a Class of ships.	3	1	1	5
A-12: Coordination of the procurement, staging, and maintenance of directives, files, records, and forms required for administrative outfitting.	3	3	1	5

Factor	Importance Value	Alternative Evaluation: CG 47 Manning Concept	Alternative Evaluation: Nucleus Crew/ Balance Crew	Alternative Evaluation: FIT
A-13: Coordination of the procurement and installation of 3-M software and PQS software [4].	3	3	3	5
A-14: Requisitioning of items not on outfitting lists ("PCO select," i.e., ship's plaque, other long lead time items) [2].	3	3	1	5
A-15: Expediting action [2].	3	3	3	5
A-16: Identification, analysis, and resolution of Class problems including the request of changes based on safety, ship's mission, or required insofar as operability, habitability, or maintainability is concerned [2].	5	3	3	5
A-17: Centralized repository of turn-over information such as Class problems and INSURV items [3].	3	3	3	5

Factor	Importance Value	Alternative Evaluation: CG 47 Manning Concept	Alternative Evaluation: Nucleus Crew/ Balance Crew	Alternative Evaluation: FIT
Category B: Factors impacting on the utilization of personnel or other resources.				
B-1: Crew continuity versus turn-over; how long personnel are assigned to the ship (personnel will leave the ship earlier if they are assigned to the construction site earlier) [17].	3	1	5	5
B-2: Amount (reservoir) of experienced personnel available to be assigned to ships of the Class (i.e., when their tour of shore duty with FIT is completed) [17].	3	1	1	5
B-3: Duplication of effort (between FIT and SUPSHIP, FIT and Nucleus crew, or Nucleus crew and SUPSHIP) [12].	3	3	5	1
B-4: Ability to assess precommissioning manning (of nucleus crew, balance crew) [2] [12].	3	5	3	1
B-5: Interchange of personnel between nucleus crew and balance crew to optimize their training and utilization [1].	3	5	3	1

Factor	Importance Value	Alternative Evaluation: CG 47 Manning Concept	Alternative Evaluation: Nucleus Crew/ Balance Crew	Alternative Evaluation: FIT
Category C: Factors impacting on Navy personnel (morale, retention).				
C-1: Family separation [9].	5	1	3	5
C-2: Improved sea/shore rotation for some ratings [6] [12].	5	1	1	5
C-3: Crew morale and attitude (as a result of perceiving FIT in a negative light).	3	5	3	1
Category D: Miscellaneous factors.				
D-1: Benefits derived as a function of number of ships in program at one building site [4].	5	1	3	5
D-2: Rate of delivery [4].	5	1	3	5
D-3: Sensitivity to slippages in delivery.	5	3	3	1

APPENDIX G

NON-QUANTIFIABLE FACTORS EVALUATION SUMMARY

		Alternative Evaluation			Total Evaluation		
(1)	(2)	(3)	(4)	(5)	COL (2)x(3)	COL (2)x(4)	COL (2)x(5)
FACTOR	Importance Value	CG 47 Manning Concept	Nucleus Crew/ Balance Crew	FIT	CG 47 Manning Concept	Nucleus Crew/ Balance Crew	FIT
A-1	5	5	3	5	25	15	25
A-2	3	3	3	5	9	9	15
A-3	3	5	3	5	15	9	15
A-4	3	3	1	5	9	3	15
A-5	5	5	3	5	25	15	25
A-6	3	5	3	5	15	9	15
A-7	5	5	1	1	25	5	5
A-8	3	3	1	5	9	3	15
A-9	3	3	1	5	9	3	15
A-10	3	3	1	5	9	3	15
A-11	3	1	1	5	3	3	15

		Alternative Evaluation			Total Evaluation		
(1)	(2)	(3)	(4)	(5)	COL (2)x(3)	COL (2)x(4)	COL (2)x(5)
FACTOR	Importance Value	CG 47 Manning Concept	Nucleus Crew/ Balance Crew	FIT	CG 47 Manning Concept	Nucleus Crew/ Balance Crew	FIT
A-12	3	3	1	5	9	3	15
A-13	3	3	3	5	9	9	15
A-14	3	3	1	5	9	3	15
A-15	3	3	3	5	9	9	15
A-16	5	3	3	5	15	15	25
A-17	3	3	3	5	9	9	15
B-1	3	1	5	5	3	15	15
B-2	3	1	1	5	3	3	15
B-3	3	3	5	1	9	15	3
B-4	3	5	3	1	15	9	3
B-5	3	5	3	1	15	9	3
C-1	5	1	3	5	5	15	25
C-2	5	1	1	5	5	5	25

		Alternative Evaluation			Total Evaluation		
(1)	(2)	(3)	(4)	(5)	COL (2)x(3)	COL (2)x(4)	COL (2)x(5)
FACTOR	Importance Value	CG 47 Manning Concept	Nucleus Crew/ Balance Crew	FIT	CG 47 Manning Concept	Nucleus Crew/ Balance Crew	FIT
C-3	3	5	3	1	15	9	3
D-1	5	1	3	5	5	15	25
D-2	5	1	3	5	5	15	25
D-3	5	3	3	1	15	15	5
				TOTAL -	308	250	422

REFERENCES

1. Chief of Naval Operations Instruction 3500.23B, Subj: "Assembly, Organization and Training of Crews for U.S. Navy Ships Commissioned in Time of Peace," 5 May 1972.

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