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**LITTORAL COMBAT SHIP (LCS)
MANPOWER REQUIREMENTS ANALYSIS**

by

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December 2004

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**LITTORAL COMBAT SHIP (LCS)
MANPOWER REQUIREMENTS ANALYSIS**

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ABSTRACT

The Littoral Combat Ship's (LCS) minimally manned core crew goal is 15 to 50 manpower requirements and the threshold, for both core and mission-package crews, is 75 to 110. This dramatically smaller crew size will require more than current technologies and past lessons learned from reduced manning initiatives. Its feasibility depends upon changes in policy and operations, leveraging of future technologies and increased Workload Transfer from sea to shore along with an increased acceptance of risk.

A manpower requirements analysis yielded a large baseline (~200) requirement to support a notional LCS configuration. Combining the common systems from the General Dynamics and Lockheed Martin designs with other assumed equipments (i.e. the combined diesel and gas turbine (CODAG) engineering plant) produce the notional LCS configuration used as the manpower requirements basis. The baseline requirement was reduced through the compounded effect of manpower savings from Smart Ship and OME and suggested paradigm shifts. A Battle Bill was then created to support the notional LCS during Conditions of Readiness I and III.

An efficient force deployment regime was adopted to reduce the overall LCS class manpower requirement. The efficiency gained enables the LCS force to "flex" and satisfy deployment requirements with 25% to 30% fewer manpower requirements over the "one-for-one" crewing concept. An annual manpower savings of \$80M to \$110M if each requirement costs \$60K.

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EXECUTIVE SUMMARY

The Navy's new LCS, with many novel approaches to ship design and operations, will consist of a hull (or seaframe) that is augmented with either an MIW, ASW, or SUW focused mission module -- with the mission modules rapidly interchangeable to allow the LCS to operate across a broad spectrum of conflict. For operational flexibility, the Navy plans 119 modules to support 56 seaframes.

To keep operating costs low, the LCS (seaframe plus module) is promised to operate with "minimal manning" - originally specified at 75. Questioning the viability of this number, we estimated LCS manning requirements and concluded that if the Navy pursued "business as usual", the crew would be far larger than 75. Past reduced manning initiatives like Smart Ship and Fleet Optimal Manning Experiments will not be enough. A set of "paradigm shifts" were then explored to further reduce the manpower requirements. Each requirement was analyzed for impact from Navy policy, technology leverage and workload management. Even with these new business practices with associated manpower requirement estimates (~45 for seaframe, ~55 for MIW module, ~50 for ASW module, and ~45 for SUW module) the totals sum to about 90-100 manpower requirements, or 15-25 more than the original threshold of 75.

Lastly, because more modules need to be deployable than will actually be deployed - e.g., about 32 deployable for 15 deployed - options for organizing the "module squadron" personnel were considered to avoid potential

waste of valuable human capital. Observing that there are many similar systems among the different warfare modules, we analyzed ways to de-link the module personnel from the packaged module systems, so that many of the same personnel could quickly flex from one warfare module to another. This flexible approach has the potential to reduce the Navy-wide module manning by about 25%, when compared to a traditional approach.

I. INTRODUCTION

The Littoral Combat Ship (LCS) along with the DD(X) and CG(X) is among the first of the 21st century combatant ships to be acquired by the United States Navy. The LCS program is an aggressive acquisition program that started in FY03 with the first Flight 0 ships scheduled for delivery in 2007.

The LCS adopts a unique modular concept for operations in the littorals. The concept begins with a seaframe augmented with a mission package to produce a focused mission LCS in one of the three littoral warfare areas. The seaframe itself has some inherent self-defense capabilities that do not equate to a particular warfare area. To conduct operations in a particular littoral warfare area, the LCS seaframe is complimented with a mission package for either mine warfare (MIW), anti-submarine warfare (ASW), or surface warfare (SUW). The mission package consists of transportable focused mission package (FMP) modules and their pack-up kits (PUK).

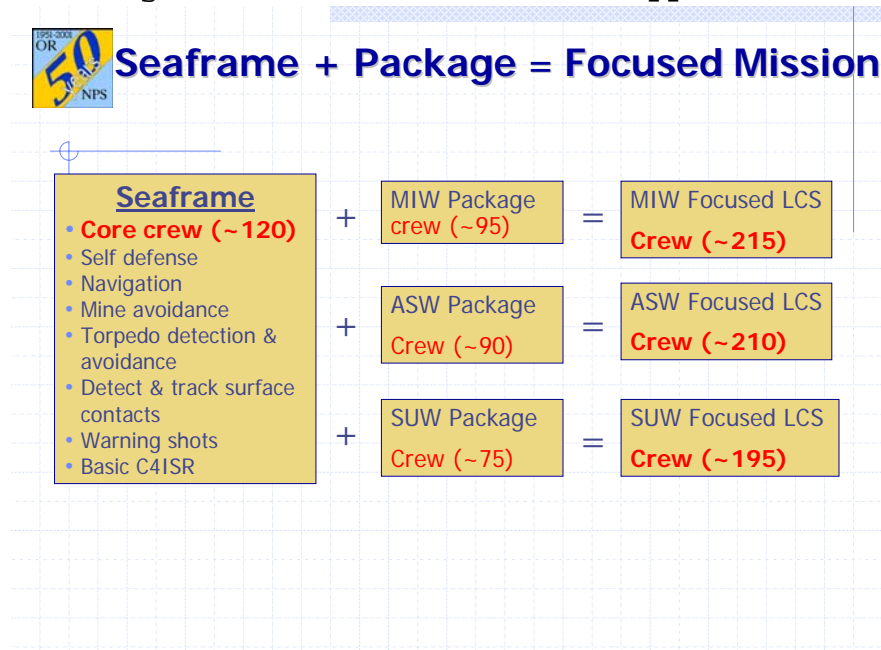
Overall, the LCS program plans to acquire 56 seaframes and 119 FMPs, designed to be rapidly changed to allow the LCS to quickly adapt to new missions. If 15 LCS were deployed at a given time, this suggests that about 32 FMPs would be deployable at the same time.

Each FMP module has specific hardware, software and manpower requirements (RQMTS) to conduct operations in a particular littoral warfare area. The modules will include one H-60 series helicopter, unmanned aerial vehicles (UAVs), unmanned surface vehicles (USVs), unmanned underwater vehicles (UUVs) as well as sensors and weapons

for these vehicles. With the sensor and weapon systems onboard, the unmanned vehicles (UVs) will be employed on an unprecedented scale as the littoral combat ship's principal extended sensor and weapon delivery vehicles.

Figure 1 depicts the components of a warfare focused LCS. For example, the MIW focused LCS is the augmentation of the seaframe with the MIW package. Note that the warfare package also includes a crew of about 95, if the Navy adopted its legacy approach to manning this module. When the manning requirements for a package are combined with the manning requirements for the seaframe, the total MIW focused LCS manning would then be approximately 215. Similar estimates apply to the ASW focused LCS with manning around 210, and the SUW which has about 195. Overall, the average manning for the warfare focused LCS would be about 207.

Figure 1. **LCS Modular Approach**



This level of manning is judged to be too large, and so the LCS program is aggressively pursuing minimally manned seaframes and FMPs - the minimum required to accomplish the mission. To assist in this goal, the crews will be supported by "just-in time training, distance learning, distant support and maintenance." LCS will not have "the wide variety of skills necessary to maintain all shipboard equipment." [Ref 1]

The LCS seaframe crew (called the core crew) is expected to operate the seaframe and installed systems, while the FMP crew (called the mission-package crew) will operate and maintain FMP vehicles, systems, sensors and weapons. Both the core and mission-package crews are to interface with one another through common open system architecture.

Through Spiral Development, LCS ships will:
Leverage automation, "smart systems," and human systems integration principles in engineering, damage control, combat systems, ship control, messing, and other ship systems tied into an extensive local area network to optimize and integrate the capabilities of the ship and core crew. [Ref 1: pg 42]

Furthermore, crew knowledge, skills and abilities (KSA) are expected to be refined and enhanced through Human Factors Engineering developments like the "expert agent" used in the mission planning and decision-making process.

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II. BACKGROUND

Legacy Ship Manpower Documents (SMDs) manpower requirements are determined by, but are not limited to, the following development elements [Ref 5]:

1. Required Operational Capability and Projected Operational Environment (ROC/POE) parameters and analysis,
2. Directed manpower requirements (Master Chief Petty Officer of the Command, Safety, Career Counselor, etc.),
3. Watch stations,
4. Preventive Maintenance,
5. Corrective Maintenance,
6. Facilities Maintenance,
7. Application approved staffing standards (when applicable),
8. On-site workload measurement and analysis,
9. Utility tasking (underway replenishment, flight operations, sea and anchor detail, etc.),
10. Allowances (service diversions, productivity allowance, etc.),
11. Development of officer requirements, and
12. Fleet review of draft documents.

The most critical element in developing manpower documents is the ROC/POE document. The ROC provides a precise definition of the unit's mission statement. The POE is a description of the specific operating environment in which the unit is expected to operate [Ref 5]. The ROC/POE for LCS is still in the development phase, and was

not available to support this study. For this reason, part of the thesis research was aimed at deriving a representative ROC/POE.

The Navy's at-sea workload is another key element used in calculating manpower requirements. The workload is computed on a workweek with 168 hours. Of the 168 hours, only 81 hours are available for duty or work. The 81 hours include 70 hours of Productive work, 7 hours of Training and 4 hours of Service Diversion. Table 1 summarizes the workweek hours for at-sea. The workload is different for "shore-based deployable units" [Ref 5].

Table 1. **Navy Afloat (Wartime) Workweek For Military Personnel (From Ref 4)**

| Category | Hours |
|-------------------------------------|------------|
| Non-Available Time | |
| Sleep | 56 |
| Messing | 14 |
| Personal Needs | 14 |
| Sunday Free | 3 |
| Available Time | |
| Training | 7 |
| Service Diversion | 4 |
| Productive Work | 70 |
| Total Hours Available Weekly | 168 |

Unlike the LCS seaframe, the FMP modules will be "shore-based deployable units." The module RQMTS will be defined in the Fleet Manpower Document (FMD) similar to the SMD.

From the manpower perspective, the Navy's most demanding requirements (RQMTS) are at sea during Condition

of Readiness I (Battle Readiness) for 24 hours and Condition of Readiness III (wartime/increased tension or forward deployed cruising readiness) for 60 days with opportunity for 8 hours of rest provided per [person] per day [Ref 5].

While in Condition I, the ship must be capable of meeting the following criteria:

1. Able to perform all offensive and defensive functions simultaneously,
2. Able to keep all installed systems manned and operating for maximum effectiveness,
3. Required to accomplish only minimal maintenance - that routinely associated with watch standing and urgent repairs,
4. Perform self-defense measures, and
5. Evolutions such as replenishment, law enforcement or [helicopter] operations are not appropriate unless the evolution stations are co-manned by manpower from other battle stations.

Condition III requires reduced defensive systems and manning to a level sufficient to counter pop-up threats. While in Condition III, the ship must be capable of meeting the following criteria:

1. Able to keep installed systems manned and operating as necessary to conform with prescribed ROCs, and
2. Able to accomplish all normal underway maintenance, support and administrative functions.

All new ship (i.e., LCS seaframe) and aircraft (i.e., RQ-8B Fire Scout VTUAV) acquisitions must be supported by the development of their manpower documents to determine the initial RQMTS. The Program Manager is responsible for developing these documents using the Navy Manpower Requirements System (NMRS) maintained by NAVMAC.

Numerous past studies and experiments have examined the feasibility and effectiveness of reduced manning, although not specifically focused on LCS. One of the studies, the Surface Combatant of the 21st Century (SC-21) Manning Reduction Initiatives [Ref 8], evaluated the potential for minimal manning (95 personnel in that case) and concluded:

1. Reduced manning is feasible if technological advances are realized,
2. Ships lose multi-warfare depth with 95-man crew,
3. Incorporating moderate-risk technology can effect significant manning reductions (45%),
4. We still have unresolved issues (e.g., shore infrastructure),
5. Tradeoffs between minimum manning, quality of life, and mission efficiency must be carefully weighed, and
6. We need an activity to lead/coordinate the manning effort.

However, the bottom line recommendation from that study was to proceed cautiously concluding that a crew of 170 is more achievable than a crew of 95 for the SC-21 family of ships.

Another study, Optimal Manning and Technological Change [Ref 7], evaluated "future trends in naval technology and in civilian labor forces" and concluded:

1. Technological advances will probably require a more skilled, rather than less skilled, workforce,
2. Also, the Navy must use care in automating warfighting because routine peacetime tasks can be automated more easily than inherently chaotic and complex combat evolutions,
3. Skills of the Navy's enlisted force will change markedly as familiar tasks are automated and workload moves from operational units to the infrastructure,
4. Sailors will need new, or different, skills to support collaboration between human and machine, introduction of more COTS technology, and the development of generalists rather than specialists,
5. Damage Control is more difficult to automate because of unpredictable requirements, and
6. Future sailors will understand the general principles in their areas of expertise, will be technically literate, and have strong problem-solving, decision-making, and communication skills.

Reduced manning experiments like the "Smart Ship" program on USS Yorktown (CG-48) and USS Rushmore (LSD-47) and the Fleet Optimal Manning Experiment on USS MILIUS (DDG-69), USS Mobile Bay (CG-51) and USS Boxer (LHD-4) were efforts designed to test Navy culture and technology to

reduce the manpower requirements. The Smart Ship experiment successfully introduced seven systems that have the potential to produce significant reductions in manning. However, "technology [alone] did not produce a reasonable return on investment. [T]he technologies were critical to the policy and procedural changes" [Ref 9].

Fleet Manning Experiments (FME) or Optimal Manning Experiments (OME) successfully reduced manning through policy and operational changes with minimal technology installs. The administrative functions were relocated ashore to the Pay and Personnel Ashore (PAPA) detachments. This removed most of the administrative personnel leaving only the minimum to help coordinate ship's force with the PAPA detachment. Regarding optimal manning, VADM LaFleur writes:

Optimal manning works. We will apply what we learn in these experiments--both to our current force, and to sizing the force of the future--to more efficiently man our ships and reinvest the resultant manpower savings into the type of transformational technologies required for our 21st-century force [Ref 11].

Another attempt to reduce manning involved the Oliver Hazard Perry (FFG-7) class frigates and the Consolidated Maintenance Package (CMP). The FFG-7 was originally designed to operate with minimal manning. The concept was supported by a consolidated maintenance package designed to reduce the ship's maintenance requirements and replace critical parts before at regular intervals regardless of their status. This reduced manning attempt suffered a setback when budget constraints forced CMP workload back onboard and removed the critical parts replacement plan. This setback ultimately increased the FFG's RQMTS which

increased berthing requirements and removed crew lounges. The overall effect was a decreased quality of life for those onboard. The failure of the FFG-7 minimal manning project was due to the lack of understanding of the integration of the manpower requirements, acquisition, design capabilities and maintenance process, in short, a failure of human system integration.

DOD transformation efforts and an increasingly squeezed budget have now produced an environment where minimal manning is a necessity, perhaps accelerating its realization. Transformation calls for changes in how the U.S. Navy has been doing business and allocating limited resources. One of the biggest cost drivers for the Navy is the cost of manpower. The Navy can no longer afford to make manpower considerations an afterthought to system design. A less-flexible budget coupled with increasing personnel cost have raised the importance of manpower considerations throughout the system acquisition process. If minimal manning is to be a reality, the U.S. Navy must also change its manpower requirements determination philosophy and emphasize manpower and human factors implications throughout the acquisition process.

Skilled manpower is an indispensable factor in the successful deployment of new ships, aircraft, equipment, and most other new hardware systems. The human element must be an integral part of system design and logistic support at the earliest acquisition phase. Although there is considerable uncertainty early in the acquisition process, every effort shall be made to use the best available data and techniques in developing manpower estimates. These estimates shall be continuously refined, as the system progresses, to form the basis for operational and maintenance manpower requirements' descriptions, personnel selection and training, training devices and

simulator design, and other planning related to MPT. NAVMAC will review and compare these estimates with current manpower requirements associated with similar existing systems, and for consistency with applicable MPT policies [Ref 5].

III. PROBLEM AND OBJECTIVE

A. PROBLEM

The seaframe and module manpower requirements (RQMTS) for LCS are highly constrained by the crew accommodation threshold. The LCS critical design parameter for manning is of particular interest. In the preliminary requirements document, the combined (seaframe plus mission module) RQMTS is limited by the threshold of 75 [Ref 2].

Since the release of the critical design document (CDD) in May 2004, the crew accommodation threshold has been increased to 110, reflecting the difficulty of the manning problem. This increase added 35 additional bunks, and has eased the constraint for the combined manpower requirements considerably. However, this relaxed threshold remains much lower than legacy RQMTS, and is still a significant challenge. Addressing this challenge is the problem at hand.

B. OBJECTIVE

This study has two objectives. The first objective is to determine the aggressiveness of the different approaches to achieve the specified manning levels. The baseline, or "business as usual", estimates were derived using a methodology similar to the NMRS used to determine new construction RQMTS. This approach is not as aggressive in looking for ways to reduce the RQMTS or to efficiently manage the personnel. Because of this, we looked carefully at reduced manning initiatives, as well as to evaluate some "paradigm shifts" that would cause the Navy to significantly change its manning practices.

The second objective is to evaluate options for organizing the module personnel. Because there are many more modules than seaframes (119 modules for 56 seaframes, or perhaps 32 deployable modules for 15 deployed seaframes), the assignment of one crew per FMP module would equate to a very large, and very inefficient, LCS force.

Two concepts of mission-package personnel management were evaluated: "pre-packaged" and "flexed". The "pre-packaged" concept is the assignment of one crew per module, much as the Navy assigns personnel to ships. The "flexed" alternative is the collection of all personnel into a single pool, and then organized into generalist and specialist detachments. The module RQMTS are then satisfied with the assignment of the detachments as they are needed.

IV. ASSUMPTIONS

Because most of the LCS program remains in the development stages, the data required for this analysis is very limited or restricted. Numerous assumptions were therefore made to help frame this manpower requirements analysis.

For both the seaframe and modules, the appropriate manpower requirement is the number needed to support the most demanding notional ROC/POE requirements during Condition I and III for 24-hours and 60 days respectively.

A. NOTIONAL LCS SEAFRAME

There are currently two competing shipbuilding teams (General Dynamics and Lockheed Martin), and the actual configuration details for both team's LCS designs are still proprietary. In view of that, this study used information that was publicly available to approximate the two designs, from which a composite "notional" seaframe was developed.

However the information available does not include the engineering plant and other critical items like the aircraft handling and UV launch and recovery systems. Based upon the assumption that LCS is to operate efficiently at both high and low speeds in shallow water, a combined diesel and gas turbine (CODAG) with water jet propulsion was assumed.

Other equipment added includes a common unmanned vehicle launch and recovery system as well as aircraft handling systems on the flight deck. Table 2 summarizes the "notional" seaframe, based upon the available design data.

Table 2. Notional LCS Seaframe Configuration

| System | General Dynamics | Lockheed Martin | Notional LCS SeaFrame |
|--------------------------------|---------------------------|------------------|----------------------------------|
| Bridge | Integrated Command Center | | Integrated Command Center |
| Combat Management System (CMS) | AMS CMS | | AMS CMS |
| Gun System | Bofors 57mm | Bofors 57mm | 57mm BOFORS |
| CIWS | | | CIWS 1B |
| Low caliber gun | .50 cal (4) | .50 cal (4) | .50 cal (4) |
| Missile System | RAM | RAM | RAM |
| Search RADAR | Sea Giraffe | Air Search RADAR | Search RADAR |
| Air Decoy | SRBOC (6) NULKA(4) | | SRBOC (6) NULKA(4) |
| Torpedo Decoy Launcher | Torpedo Decoy Launcher(2) | | Torpedo Decoy Launcher (2) |
| SONAR | Retractable Mine Sonar | | Retractable Mine Avoidance SONAR |
| MP Propulsion | | | LM2500(2) and Diesel (2) |
| Auxiliary | | | Diesel(2) |
| Propulsor | | | Water Jet |
| RHIB | | | 1 |
| UV Handling System | | | Common SV/USV/UUV L/R Sys |
| Miscellaneous | | | RAST Port |
| | | | UCAR Starboard |

The seaframe's organization was assumed to be similar to the five legacy ships used in this study. The legacy ships are the CG, DDG, FFG, MCM and MHC classes, and were chosen as "proxies" for some of the LCS functions because the seaframe, for the most part, will have the same shipboard organization and regulations. Their systems and RQMTS have proven their effectiveness through countless missions accomplished. Therefore, their configuration will be used as the basis to estimate or approximate the RQMTS

for the notional LCS system. Each ship, including the assumed LCS seaframe, is organized into five departments:

1. Executive,
2. Operations,
3. Combat Systems,
4. Engineering, and
5. Supply.

The LCS seaframe Executive Department is akin to legacy executive departments consisting of the commanding and executive officers as well as administrative support. The executive department's administrative functions are greatly supported by the advances of the Pay and Personnel Ashore (PAPA) detachment. The PAPA detachment is a concept that has proven to be a key element of Fleet Manning Experiments like Optimal Manning Experiments (OME). With this detachment ashore, most of the administrative, pay and personnel functions have been transferred off the ship.

The LCS seaframe Operations Department is similar to the operations department of single mission ships like the MCM and MHC ships although the LCS seaframe will be equipped with bigger guns and missiles. It is assumed that the RQMTS from these single-mission ships can be translated into the RQMTS to support the focused-mission LCS. Additionally, the LCS RQMTS will be divided between the seaframe and module. The module will bring onboard additional personnel to support operations in the individual warfare areas.

The LCS seaframe Combat Systems Department is different from legacy Combat Systems Department because the

systems themselves are somewhat but not entirely different. See Table 3 for the LCS systems and the closest legacy system. These legacy systems will be used as proxies for the LCS system that is emerging or does not yet exist.

Table 3. **LCS Seaframe System and Proxy**

| <u>System</u> | <u>Proxy</u> |
|-------------------------------|---------------------|
| 57mm BOFORS | 5/54 gun |
| CIWS | Actual |
| .50 cal (4) | Actual |
| RAM | Actual |
| Search RADAR | SPS-49 |
| Air Decoy | Actual |
| Torpedo Decoy Launcher | SVTT |
| Mine Avoidance SONAR | SQS-53C |

Therefore, it is assumed that the notional LCS systems the represent, will have the same manpower requirements as the legacy system. For example, the legacy RAM system has manpower requirements of less than one. It is assumed that the RAM system on the notional LCS will also have manpower requirements less than one.

The LCS seaframe Engineering Department with the CODAG design is assumed to be similar to the most demanding legacy gas turbine designs. All legacy gas turbine ships will be potential proxies for the assumed LCS. However, all the legacy engineering plants are of a single configuration (i.e., either gas turbine or diesel main propulsion engines). Therefore, it is further assumed that legacy ships with diesel engineman (EN) RQMTS are a better proxy than those without EN. The auxiliary diesel

mechanics are further assumed to be capable of working on main diesel engines after proper training.

The LCS seaframe Supply Department is similar to the legacy Supply Departments using all available advances in technology to allow electronic disbursing and the PAPA detachment supported functions.

B. BATTLE BILL

The most demanding manpower requirements are during Conditions I and III for 24-hours and 60 days respectively. The Operational Manning is the requirement driver for supporting these conditions of readiness.

The battle bill delineates the watch stations required to support the different control stations to satisfy the requirements of the Required Operational Capabilities and Projected Operational Environment (ROC/POE) documents. There are eight control stations common to all legacy ships:

1. ship control,
2. communication control,
3. operations control,
4. combat system casualty control,
5. weapons control,
6. engineering control,
7. damage control, and
8. support control.

It is assumed that the LCS will share these common control stations. Additionally, these control stations will be supported with technology similar to the seven core Smart Ship systems (e.g., Integrated Bridge System and Machinery Control System).

The Smart Ship project on USS Yorktown successfully completed numerous demanding assessments, and all concluded that Yorktown "performed consistently well". Yorktown, with the installed Smart Ship technologies, revised policy and procedures and improved maintenance methods, was assessed by NAVMAC and OPTEVFOR. Both concluded that Yorktown was able to satisfy all the ROC/POE requirements [Ref 9].

It is assumed that the favorable assessments and successful completion of a Counter-Narcotics deployment immediately afterwards have rendered the Smart Ship technologies as effective. These systems, along with the revised policy and maintenance procedures, are assumed to be reliable for unrestricted use onboard the LCS seaframe and FMP modules.

OME for USS Milius reduced its RQMTS by changing policy and operational procedures with limited technology installs. The successful completion of OME was determined by the ship's performance throughout the Inter-Deployment and Training Cycle (IDTC) and mission accomplishment during deployment. USS Milius successfully completed all assessments and the deployment immediately following the experiment with the reduced manning.

It is assumed that the success of the USS Milius has paved the way for OME philosophies and methodology for the

LCS. One of the key elements of OME was the PAPA detachment conducting supporting a majority of the ship's routine administrative functions ashore. It is further assumed that LCS administrative functions will also be supported by a PAPA detachment.

The composition concept was also used frequently to change the watch standing philosophies during the reduced manning experiments. For example, the DDG had two RQMTS for a NIXIE Operator and a NIXIE Repairman before the experiment. After OME, the DDG required only one NIXIE Operator/Repairman. The concept assumes that the workload for both the NIXIE Operator and Repairman was able to be reduced by 50%. Table 4 lists some of the legacy compositions from the DDG OME. The LCS composition concept, based upon the DDG NIXIE RQMTS, will also assume the workload of two RQMTS can be reduced by 50%. For example, the LCS EN who has been trained to do the GSM function will be required to support only 50% of both the EN and GSM workload.

Furthermore, the composition of the operator and repairman has enabled greater flexibility of operational personnel. The operator has the skills required to adjust the system to operational requirements without minimal outside assistance. However, the system operator will be the system maintainer while the operator is not standing watch. This further necessitates the requirement to reduce the administrative workload for the operator/repairman or offload any additional responsibilities.

Table 4. **Legacy Compositions From DDG OME**
 (From Refs 8-9)

| Legacy Rate Composition From OME | |
|---|--------------------------|
| Before | After |
| Quartermaster | Bridge Specialist |
| Signalman | |
| NIXIE Operator | NIXIE Operator/Repairman |
| NIXIE Repairman | |
| Operator | Operator/Monitor |
| Monitor | |

The Composite Sailor concept is both a policy and operational change item. This concept not only allows the combination of watch stations, it also allows the combination of the rates and functions. For example, a diesel mechanic (engineman or EN rate) who is assigned to the LCS will also be trained to work on gas turbine engines similar to the gas turbine mechanical (GSM) rate. Rates with similar job descriptions onboard the LCS were considered for composition. These rates include, but are not limited to these ratings: BM, CTT, DC, EN, ET, GS, HT, MM, MR, OS, QM, STG and TM. See Appendix O for rate descriptions and Table 5 below for proposed rate combinations.

Table 5. **Suggested Rate Combination**

| Legacy Rate | LCS Rate |
|--------------------|-----------------|
| BM, EN, MM and QM | BM |
| CTT, ET | ET |
| DC, HT, MR | DC |
| EN, GS | EN/GS |
| OS, QM | OS |
| STG, TM | STG |

The LCS Boatswain's Mate (BM) rate will consist of KSAs from the Engineman (EN), Machinist's Mate (MM) and Quartermaster (QM) rates. Small boat coxswains have traditionally been the BMs. When a small boat is deployed, it is required to have an EN rate onboard. Since BMs are capable of maintaining deck machinery, it is assumed that BMs can also maintain the small boat engines of which they are the coxswain. Similarly, the EN rate should also be able to perform duties as the small boat coxswain. On the bridge, BMs have traditionally stood the watch as the Boatswain's Mate of the watch (BMOW). Today, they are standing watch as the Officer of the Deck (OOD) and Junior Officer of the Deck (JOOD) during Condition III operations. It is assumed that they are now capable of carrying out the duties as the navigator as well when on the bridge, thus removing the requirement for the QM.

Cryptologic Technician, Technical (CTTs) are "advanced [Electronic Technicians (ETs)] who do wiring, circuit testing and repair. They determine performance levels of electronic equipment, install new components, modify existing equipment and test, adjust and repair equipment cooling systems [Ref 6]". Under the assumption that ETs are able to perform these advanced functions, the ETs will replace the CTT RQMTS.

The engineering rates of Damage Controlman (DC), Hull Maintenance Technician (HT) and Machinery Repairman (MR) are very similar. Thus, the LCS DC rate will possess the KSAs from the HT and MR rate. The DC knowledge of damage control can be greatly advanced with the skills of the HT and MR.

In general, The Operations Specialist (OS) rate is responsible for managing secondary charts and performing radar navigation in support of the QM who performs the visual navigation. These two rates are similar, using GPS data to update their positions. The voyage management system (VMS) is capable of updating positions as well as voyage planning using GPS and radar inputs and steering the ship along the planned tracks. Thus, it is assumed the QM rating can be replaced by the VMS and watchstanders in the piloting control stations and supported by the OS in CIC. This also assumes digital charts and permanent electronic recording of ship's movement are acceptable in lieu of hardcopy charts, and the VMS along with the ECDIS are authorized for unrestricted use.

The LCS SONAR Technician (Surface) (STG) rate will possess the KSAs of both the STG and the Torpedoman's Mate (TM). For LCS, the TMs are required for torpedo

countermeasures. By extending the ordnance capability to the STG rate, the torpedo countermeasures can be covered by the STG.

1. Ship Control

With respect to ship control, it is assumed that the Smart Ship Integrated Bridge System (IBS) and Voyage Management System (VMS) will have matured enough to reduce the LCS piloting control stations to just the OOD and JOOD watches. Both the IBS and VMS systems would be integrated into the notional Integrated Command Centers (ICC).

Furthermore, it is also assumed that the chart coverage provided by the VMS and Electronic Chart Display Information System (ECDIS) will be sufficient to require only minimal paper charts onboard the LCS. If not, the Operations Specialist (OS) is assumed to be capable of preparing and managing the paper charts without the Quartermasters (QM). Operations Specialists (OS) have consistently been the secondary navigation team supporting the Quartermasters (QM). These skills combined with the VMS and IBS can be used to conduct all the LCS seaframe's voyage planning requirements.

The LCS bridge watchstanders will be the primary watchstanders responsible for the safe navigation of the ship. Using the IBS, VMS and ECDIS systems, the Officer-of-the-Deck (OOD) and Junior OOD will be able to receive real-time ship's position and other pertinent navigation data to support their decision-making abilities.

It is assumed that the LCS pilot house will give the bridge watchstanders the ability to see all around the

ship. On the bridge with a 360-degree viewing capability, the LCS OOD and JOOD are able to safely navigate and handle the ship without additional lookouts.

These Ship Control assumptions will allow the bridge watch stations to be reduced to just two. The Officer of the Deck (OOD) and the Junior Officer of the Deck (JOOD) is assumed capable of safe ship operations with the IBS, VMS and an all-around viewing capability.

2. Operations Control

It is assumed that the LCS seaframe Combat Information Center (CIC) will incorporate the use of multi-modal consoles (MMC) along with an integrated Weapons Control Console (WCC). The MMC is an emerging system that, in the interim, may require the use of legacy sensor and weapon consoles. It is also assumed that the MMC will make available all the sensor inputs (e.g., Search RADAR, EO/IR, SLQ-32, etc.) to the watchstanders.

Decoy controls are assume to be integrated into either the WCC or IBS console. CIC watchstanders will have primary decoy (air, surface and underwater) controls with the secondary controls located in the pilot house's IBS.

Traditional CIC watches required watchstanders to operate stations predominantly dedicated to a single sensor or weapon system. These Operations Control assumptions will consolidate most of the sensor inputs and weapon controls into a few consoles. This will greatly reduce the number of watchstanders down to perhaps only two or three watchstanders using the MMC and WCC.

3. Communication Control

It is assumed that the LCS Battle Bill Communication Control stations are similar to legacy Communication Control stations. These watchstanders will maintain communication, tactical and LAN systems.

The communication systems of legacy ships involved the use of many different circuits. Most of these circuits had dedicated handsets which resulted in some difficulty in differentiation. Onboard the LCS, it is assumed that these different circuits are patched into a common system where the executives and watchstanders will be able to access the different circuits with a visual aid to identify the status of the different circuits.

Moreover, the LCS will leverage remote monitoring and sensing systems to reduce the manpower requirements for monitors. The systems are assumed to replace legacy monitoring personnel (i.e., missile launcher monitors) thus allowing the system operators and casualty control personnel the ability to remote monitor all systems and respond as they are needed.

Communications systems are greatly improved through advances in computing technology and commercial off the shelf (COTS) systems. These improvements combined with the Smart Ship fiber optics LAN system, have greatly reduced the need for human monitors to check system performance and security. With the ability to remotely monitor machinery and conditions, a dedicated monitor will not be required. Thus communication systems have the potential to be unmanned.

4. Combat Systems/Electronics Casualty Control

It is assumed that the LCS Battle Bill Combat Systems/Electronics Casualty Control stations are similar to legacy Combat Systems/Electronics Casualty Control stations where the RQMTS respond to combat system casualties as well as electronic system casualties.

However, the assumed LCS will have personnel capable of operating and maintaining their systems. This will greatly reduce the requirement for a separate operator and maintainer. For example, the NIXIE system demonstrated that the requirements for a NIXIE Operator and NIXIE Repairman can be consolidated into a single NIXIE Operator/Maintainer.

5. Weapons Control

The 57MM, RAM, CIWS and decoy controls are assumed integrated into a single Weapons Control Console (WCC) console located in CIC with several back-up consoles located nearby. Additionally, each weapon system will have the local control capability (i.e., CIWS will have an operator at the Local Control Panel).

During Condition I, .50-caliber machine guns on the port and starboard sides will be manned and ready. Each mount will require one operator and one ammo loader. These personnel will also act as decoy loaders in support of the CIC watchstanders who are controlling the decoy launchers. The other two mounts will be augmented by standing down other watchstanders, and the ammo loader will support both mounts on their respective sides.

These assumptions will reduce the requirement for dedicated watch stations and systems. By integrating more than one system into a console, the potential exists to reduce the watch-stander requirements.

The seaframe crew is responsible for the safe launching and recovery of unmanned surface and underwater vehicles. The assumed launch and recovery system is based upon an enlarged variant of the Swedish Visby corvette's UV launch and recovery system. The current U.S. Navy boat launching and recovery systems like the gravity davits found on legacy ships are manpower intensive. The system proposed for LCS is the overhead rail system assisted with electrical winches and controls that spot the UVs to the launch/recovery station and then back its storage station. This system requires only one winch operator assisted by the personnel responsible for the UVs as tenders and assistants. Thus, the boat launching and recovery apparatus onboard LCS may require only one operator.

UAVs will be the responsibility of the aviation detachment personnel. Aviation detachment personnel are responsible for the UAVs spot to the flight deck and then back to the hangar. The seaframe crew will be responsible for the launch and recovery flight operations.

6. Engineering Control

The engineering plant is assumed to be of the combined diesel and gas turbine (CODAG) configuration. The fuel efficiency of the diesel engine at slow speed and the power of the gas turbine engine at high speed make this propulsion system ideal for the LCS. The engineers

assigned onboard LCS will not be watchstanders. Their primary function is the maintenance and safe operation of the engineering plant and associated machinery.

Engineers will assist the bridge watchstanders in the start-up and shut-down of engineering systems. Bridge and CIC watchstanders will have the ability to remote start the main engines as well as auxiliary equipment from the bridge or CIC through the Machinery Control System accessible on the fiber optics LAN system. This will allow the bridge and CIC watchstanders to control vital engineering equipments required to safely operate and fight the ship without degradation.

During Condition III steaming, watchstanders are not required in the engineering spaces. All engineers are maintainers during Condition III. The EOOW and their assistant will be the watchstanders during Condition I with a monitor in the main engineroom. This could reduce the LCS engineering watchstanders by 25% to 50% over the legacy engineering watches.

The position of the JP5 Pump Room Operator is not required if it is able to be remotely operated from Central Control Station (CCS). JP5 nozzleman will also have the redundant ability, from CCS, to start and stop the pumps from the flight deck area.

7. Damage Control

It is assumed that primary Damage Control Central (DCC) will be located in the Central Control Station (CCS), and secondary DCC will be remotely located on the bridge.

The damage control function relies on the extensive use of the Smart Ship Damage Control System (DCS) and installed shipboard firefighting technology that is available today. For example, the installed AFFF and CO2 systems inside critical spaces such as the main engineering and ordnance spaces.

The Damage Control Officer (DCO) and Damage Control Assistant (DCA) will monitor and control damages from CCS while coordinating damage control efforts with the Engineering Officer of the Watch (EOOW). To facilitate ease of communication and efficiency, the DCO, DCA and the damage control party will be co-located in the same space.

The damage control party will be reduced commensurate with the acceptable risk level and technology leverage. In general, the damage control party will consist of a scene leader, investigators, nozzleman and hoseman. These will be the positions on the Rapid Response Team (RRT).

The damage control philosophy is to engage the RRT to the scene immediately after the casualty. The RRT will estimate the damage and augmentation required. If the damage is beyond their capability, then the decision must be made whether or not to use the automation and installed firefighting system to isolate the damage. This is important especially if the affected space is a critical space. If the damage is too large for the RRT and the decision is made not to use the installed firefighting system, then additional personnel will be required by standing down watch stations that are deemed non essential to the operation at hand.

If the damage is excessively large for the augmented damage control party, then the decision must be made to either continue the operation until it is time to abandon or disengage from the operation.

By changing the Damage Control philosophy, the legacy Damage Controls of 80 personnel can be reduced by 50% to 75%.

8. Support Control

LCS seaframe Support Control is assumed to be the same in all respects as the legacy Support Control stations and their functions.

The assumed LCS Supply Department is assumed to use advanced inventory systems like the scanners and commercial inventory management programs. These technologies can reduce the amount of personnel required to locate and issue as well as the time required. Another assumption is that the self-service food line function is capable of reducing the CS requirement by about 25% to 50%.

C. AVIATION DETACHMENT

The aviation detachment manpower requirement (RQMTS) is based upon the NAVAIR 1.2 LCS Alternative Aviation Support Study for the MH-60R/S and RQ-8B VTUAV system [Ref 21]. Table 6 shows the different NAVAIR manning level estimates and their level of risk.

Table 6. **NAVAIR Manning Option Risk Assessment**
(From Ref 21)

| Type | Manning Level | H-60 Flt Hours Achieved | RQ-8B Flt Hours Achieved | Risk to Meeting Flight Scheduled Events |
|---------|---------------|-------------------------|--------------------------|---|
| MIW | 57 | 98 | 177 | LOW |
| | 44 | 98 | 177 | LOW |
| | 34 | 83 | 177 | MEDIUM |
| | 28 | 42 | 136 | HIGH |
| ASW/SUW | 52 | 110 | 180 | LOW |
| | 40 | 106 | 175 | LOW |
| | 30 | 95 | 175 | MEDIUM |
| | 25 | 50 | 139 | HIGH |
| | 22 | 50 | 139 | HIGH |

It is assumed that the aviation detachment RQMTS will be from the MEDIUM risk category. This means that the MIW module aviation detachment has 34 RQMTS to support 83 manned flight hours and 177 unmanned flight hours. The ASW/SUW modules have 30 RQMTS each and support 95 manned and 175 unmanned flight hours.

Additionally, it is assumed the operators and support elements of the aviation detachment can be organized into the generalist and specialist detachments where:

1. Operator of MH-60R cannot operate MH-60S,
2. Operator of MH-60S cannot operate MH-60R,
3. Operator for MH-60R/S can operate RQ-8B VTUAV. The opposite would not be true,
4. Maintainers of MH-60R can maintain MH-60S and vice versa, and

5. Maintainers of MH-60R/S can maintain RQ-8B and vice versa.

The aviation generalists and specialists are assumed to be independent detachments. This assumption will allow the aviation component to be considered separately in alternative module force structure analysis.

D. FOCUSED MISSION PACKAGES

LCS mission packages will include the FMP and its PUK. The FMP modules will consist of the manpower required to operate and maintain the package equipment along with the additional manpower to augment the seaframe crew for messing, administration and medical support [Ref 1].

Figure 2 lists the different modules and their systems. Because a majority of the module systems (i.e., the Advanced Deployable System and the Remote Mine-hunting Vehicle) are emerging systems, the proxy methodology is used to estimate these RQMTS. The module systems are itemized in Table 7 along with the basis for their manning estimates.

Table 7.

Figure 2. FMP Modules and Systems



FMP Modules and Systems

| MIW Modules | QTY | ASW Modules | QTY | SUW Modules | QTY |
|--------------------------|----------------|-------------------------------|----------------|-------------------------------------|----------------|
| USV with MIW System(s) | 1 | USV with ASW Systems | 2 | USV with EO/IR Gun Package | 2 |
| VTUAV | 1 set (3 UAVs) | VTUAV | 1 set (3 UAVs) | Missile Package | 1 |
| COBRA | 2 | MH-60R with Torpedo | 1 set | VTUAV with EO/IR Rocket/Gun/Missile | 1 set (3 UAVs) |
| MH-60S with OASIS System | 1 | Sonar | set | MH-60R with EO/IR | 1 set |
| ALMDS | 2 | Sonobuoys | set | Gun/Rockets | set |
| AQS-20A | 2 | AN/WLD-1 RMV with ASW Systems | 2 | Hellfire | set |
| RAMICS | 2 | Periscope Detection | 1 | Netfires | 1 |
| AMNS | 2 | ACES/EER/IEER/AEER family | 1 | Intermediate Caliber Gun Module | 2 |
| AN/WLD-1 RMV | 2 | Torpedo Countermeasures | 1 | Non-Lethal Weapon | 2 |
| AQS-20A | 2 | ADS | 1 | | |
| Periscope Detection | 1 | Towed Array | 2 | | |
| EOD Det | 1 | | | | |
| BPAUV (Set) | 1 | | | | |
| SCULPIN (set) | 1 | | | | |

COBRA – Coastal Battlefield Reconnaissance & Analysis
 EOD Det – Explosives Ordnance Disposal Detachment
 OASIS – Organic Airborne & Surface Influence Sweep
 RAMICS – Rapid Airborne Mine Clearance System
 RMV – Remote Minehunting Vehicle
 SCULPIN – Autonomous Bottom Mapping UUV system
 USV – Unmanned Surface Vehicle
 BPAUV – Battlespace Preparation Autonomous Underwater Vehicle
 VTUAV – Vertical Take-off Unmanned Aerial Vehicle

Table 8. FMP Module System and Proxy

| System | Proxy |
|---------------------------|-----------------|
| USV | RHIB |
| VTUAV | NAVAIR |
| MH-60 R/S | |
| AN/WLD-1 RMV | MNV |
| Periscope Detection | Search Radar |
| EOD Detachment or NSCT | EOD Detachment |
| BPAUV | NIXIE |
| SCULPIN | |
| ACES/EER/IEER/AEER Family | Sonobuoys |
| Torpedo Countermeasure | NIXIE |
| ADS | Sonobuoys |
| Towed Array | TACTAS |
| Intermediate Caliber Gun | 25MM Bushmaster |

Module systems and their support personnel are assumed to be independent components of a FMP module. Thus, these systems and personnel can be organized into groups of generalists and specialists. Generalists are non-warfare specific personnel, capable of operating with different module systems or in different warfare areas. They must be able to operate in at least two different warfare areas (e.g., RMV Support personnel can maintain the RMV across the MIW and ASW warfare areas). Specialists are system or mission specific personnel (e.g., mission C4 and MH-60S pilots) who, because of their specialty skill, are limited in system or operational flexibility. They are assigned to one particular system or warfare area. Specialists are assumed to have no more than two main specialties. For example, an engineman (EN) is limited to operating and supporting the diesel and gas turbine engines only.

For module command, control, computers and communications (C4), every FMP will have an Officer-in-charge (OIC) and the administrative and support requirements. The mission C4 may also consist of watchstanders who will help integrate the module systems into the LCS seaframe's architecture and be the standby watchstanders to support the various module systems.

The module generalists and specialists are assumed to be independent detachments. This assumption will allow the individual detachments to be considered in alternative module force structure analysis.

E. MAINTENANCE

LCS maintenance will be based upon Condition-based Maintenance (CBM), Engineered Reliability Centered Maintenance (RCM) and the CMP from the FFG. Assume LCS initially utilizes the same maintenance schedule similar to a CONUS-based FFG. Then, the maintenance factor will 1.00 which means LCS will be in the deployment cycle 100% of the time during a 20-month period.

With a shore-based module force and a squadron organization, the LCS has the potential to transfer some of its routine maintenance workload ashore. While in homeport, the LCS can remove failing or suspect equipment and parts and replace them with those already serviced by the supporting shore infrastructure. This will require the shore infrastructure to use some of the LCS force while ashore to perform maintenance that would have been time consuming and non-essential during operations.

Some of the rates assumed to perform routine maintenance work onboard the LCS seaframe include the FC, GM, EM and EN rates. When the workload is transferred ashore, the RQMTS associated with them are also transferred. These RQMTS will be filled by personnel who have just returned from deployment or who are available during the inter-deployment training cycle (IDTC).

These maintenance assumptions have the potential to sustain, and even increase, the reliability of the assumed LCS systems and machinery. Moreover, they have the potential to reduce the manning onboard the seaframe.

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V. SCOPE AND LIMITATIONS

This study focused on the RQMTS for the LCS seaframe and FMP modules as well as the efficient organization of the module personnel.

Analysis of legacy Ship Manpower Documents (SMD) for the cruisers, destroyers, frigates, mine countermeasure and coastal mine-hunting ships provided the best estimation of the baseline RQMTS for the LCS seaframe and modules. The study showed how the baseline RQMTS can be reduced by compounding the effects of reduced manning initiatives and paradigm shifts. The reduced manning initiatives analyzed in this study were limited to the Smart Ship project on the CG and OME on the DDG. The paradigm shifts are key culture, policy and procedural items taken from past studies and quantifying their effects.

Quantifying the effect of the paradigm shift was a subjective but key element of this analysis. A subject matter expert was used to verify and validate the quantified effects [Ref 22].

The methodology began with the baseline RQMTS and then reduced that RQMTS by compounding the effects from the reduced manning initiatives and paradigm shifts. The methodology was first applied to the seaframe RQMTS, and then was applied to the individual RQMTS. The resulting reduced RQMTS were the minimum RQMTS possible under the assumptions of this thesis.

After compounding all the effects, the resulting reduced module RQMTS were used to explore several personnel management options for the module personnel. The first

option was to "pre-package" them, and the second was to "flex" them. The best option led to a more efficient use of the module personnel, and reduced the overall module RQMTS producing even more savings.

Ultimately, the study determined if the LCS minimal manning objective was feasible, and under what level of aggressiveness. It also determined if further savings could be realized by organizing the module personnel more efficiently.

VI. METHODOLOGY

The baseline RQMTS estimate for the seaframe and modules began with the analysis of the legacy Ship Manpower Documents (SMD) for the Ticonderoga (CG-47), Arleigh Burke (DDG-51), Oliver Hazard Perry (FFG-7), Avenger (MCM-1) and Osprey (MHC-51) classes of ships and their respective configuration. Using these ships as proxies for various functions of LCS, the analysis produced the RQMTS and systems data required for the optimization equations used in this study.

To estimate the baseline RQMTS for the seaframe, the notional LCS systems were itemized similar to the legacy systems data. If the notional system was found as a legacy system, then the minimum associated legacy RQMTS were used as the RQMTS for that particular system. If the system was an emerging system or does not yet exist, then the closest proxy from the legacy system was used to represent the RQMTS for that particular system.

Using a system of optimization equations in EXCEL®, the total seaframe RQMTS were estimated and used as the seaframe baseline RQMTS. The resulting baseline RQMTS was from the "business as usual" approach.

The seaframe baseline RQMTS was then reduced through the compounded effects of the reduced manning initiatives and suggested paradigm shifts. Reduced manning initiatives include the Smart Ship and Optimal Manning Experiments (OME), and paradigm shifts includes Composite Sailor, Technology Leverage and Workload Transfer concepts.

The Smart Ship savings realized were based on the analysis of the CG SMD with no Smart Ship (CG (NS)) and with Smart Ship (CG (SS)), and the actual rate and overall savings was applied to the seaframe's baseline RQMTS estimate. Similarly, the DDG OME savings from the DDG without OME (DDG (NO)) and DDG with OME (DDG (OME)) SMDs were analyzed and then applied to the LCS seaframe baseline estimate on the individual rate level. The reduction effects were compounded.

The first paradigm shift was a recommended policy and training procedure change referred to as the Composite Sailor concept. This concept allowed the sailor to gain additional expertise outside their assigned rate, e.g., allowing an engineman trained to work on main diesel engines to also work on main gas turbine engines.

The next paradigm shift was a greater reliance on technology called the Technology Leverage concept. The Smart Ship program successfully introduced several manpower saving technologies like the Integrated Bridge System (IBS), Voyage Management System (VMS), fiber optic Local Area Network (LAN), Damage Control System (DCS), Integrated Condition and Assessment System (ICAS), wireless communication system and the Machinery Control System (MCS). When used to their design capability, these seven core Smart Ship systems promise to further reduce the LCS seaframe RQMTS.

The last paradigm explored the maintenance and workload changes called the Workload Transfer concept where the main theme was to reduce the workload onboard the seaframe and deploying modules. This was similar to the "pit stop" concept used in automotive racing. Through this

concept, a greater shift of labor intensive, repetitive and extensive maintenance and workload requirements are performed ashore. The bottom line was removing as much of the workload as possible to allow both the core and mission-package crews to focus upon operational matters with sufficient focus on maintenance of critical combat readiness systems.

The paradigm shift effects were then quantified and reviewed by a manpower technical expert, CDR Charlie Gowen (USN, retired) from AmerInd Inc, who has been determining manpower requirements for both U.S. Navy and U.S. Coast Guard vessels for the past 25 years, and has the qualifications and experience to validate the quantified paradigm shift effects used in this study [Ref 22].

The resulting RQMTS, after applying the effects from the reduced manning initiatives and paradigm shift approaches, was the feasible minimal manning level for the seaframe's core crew.

The last half of the first objective was to estimate the baseline RQMTS for the module. All modular systems were itemized similar to the legacy ships and seaframe. Most of the systems in the modules were either emerging or do not yet have RQMTS determined. If the system was a legacy system, then the minimum associated legacy RQMTS was used as the baseline RQMTS. Otherwise, the proxy method was used to estimate the system's baseline RQMTS. Similar to the seaframe, a system of optimization equation was used in EXCEL® to estimate each warfare module's baseline RQMTS.

Individual module RQMTS were then reduced by applying the paradigm shifts effect. Of the three suggested

paradigm shifts, only the Composite Sailor concept provided any significant reduction in the module RQMTS. The other two paradigm shifts appear to have negligible effects. The Technology Leverage concept produced insignificant reductions because most of the module systems were new and emerging technologies. Similarly, the Workload Transfer concept produced very little savings because the modules were shore-based. They were only deployed when needed. Thus, a majority of their maintenance and workload was accomplished ashore while only minimal maintenance and supporting workload went with the module when deployed. Therefore, only the Composite Sailor paradigm shift had the potential to substantially reduce the module RQMTS.

After the module RQMTS have been reduced, the resulting minimum RQMTS were organized into a single "module squadron". Because only a small percentage of the modules acquired actually deploy at a given time, the "pre-packaged" crewing concept lead to inefficient use of valuable human capital. An alternative concept called the "flexed" concept was studied to determine if efficiencies can be gain by deploying the module personnel in detachments as they were needed. The detachments consisted of generalists and specialists. Generalists were personnel capable of supporting more than one specified warfare area, and specialists were limited to supporting a particular warfare area. An organization of these detachments lead to a more efficient employment of the module personnel.

VII. FORMULATION AND DATA

The core and mission-package crew baselines RQMTS as well as the module "flexed" crewing concept RQMTS were estimated using a system of optimization equations.

A. FORMULATION

1. Indices

| | | |
|-----|--|--------------------|
| c | <i>Class of ship (includes LCS / FMPs)</i> | $c = 0, \dots, 9$ |
| d | <i>Department / Detachment</i> | $d = 0, \dots, 17$ |
| s | <i>System</i> | $s = 0, \dots, 22$ |

A detail listing of the indices can be found in Appendix D.

2. Parameters

| | |
|--------------------------|---|
| $X_{c=1, \dots, 5, d=1}$ | Executive Department RQMTS of legacy ship classes |
| $X_{c=1, \dots, 5, d=2}$ | Operations Department RQMTS of legacy ship classes |
| $X_{c=1, \dots, 5, d=4}$ | Engineering Department RQMTS of legacy ship classes |
| $X_{c=1, \dots, c, d=5}$ | Supply Deptment RQMTS ratio of legacy ship classes |
| $N_{c,s}$ | Number of system s on ship class c |
| $N_{c=6}$ | Number of LCS seaframes |
| $N_{c=7}$ | Number of MIW FMP modules |
| $N_{c=8}$ | Number of ASW FMP modules |
| $N_{c=9}$ | Number of SUW FMP modules |

3. Decision Variable

| | | | |
|-------------|-----------|-----------------------|-----|
| $X_{c,d,s}$ | RQMTS for | ship of class | c |
| | | department/detachment | d |
| | | system | s |

4. Objective Function

The first objective was to estimate the LCS seaframe (equation 6) and modules (equation 10) baseline RQMTS. The seaframe RQMTS was calculated using the following series of optimization equations:

$$\min(X_{c=1,\dots,5,d=1}) \quad (\text{equation 1})$$

$$\min(X_{c=4,5,d=2}) \quad (\text{equation 2})$$

$$\sum_{s=1}^8 N_s \min(X_s) \quad (\text{equation 3})$$

$$\min(X_{c=1,2,3,d=4}) \quad (\text{equation 4})$$

$$\min(X_{c=1,\dots,5,d=5}) \quad (\text{equation 5})$$

$$\text{Seaframe RQMTS} = \left(\min(\text{Exec}_{c=1,\dots,5}) + \min(\text{Ops}_{c=4,5}) + \sum_{s=1}^8 Q_s \min(X_s) + \min(\text{Eng}_{c=1,2,3}) \right) \left(1 + \min(\text{Supply}_{c=1,\dots,5}) \right) \quad (\text{equation 6})$$

Equations used to estimate the individual module baseline RQMTS are equations 7 (MIW FMP) through 9 (SUW FMP). The total module RQMTS was the sum of three individual equations (equation 10).

$$\sum_{s=10}^{21} N_{c=7,s} X_s \quad (\text{equation 7})$$

$$\sum_{s=10}^{21} N_{c=8,s} X_s \quad (\text{equation 8})$$

$$\sum_{s=10}^{21} N_{c=9,s} X_s \quad (\text{equation 9})$$

$$\text{Total module RQMTS} = \sum_{s=10}^{21} N_{c=7,s} X_s + \sum_{s=10}^{21} N_{c=8,s} X_s + \sum_{s=10}^{21} N_{c=9,s} X_s$$

$$\text{Total module RQMTS} = \sum_{c=7}^9 \sum_{s=10}^{21} N_{c,s} X_s \quad (\text{equation 10})$$

The third and final, objective function was used to determine the "flexed" module RQMTS:

$$\text{Total "flexed" module RQMTS} = \sum_{d=6}^{17} \sum_{c=7}^9 (G_d N_{c=6} X_d + S_d N_c X_d) \quad (\text{equation 11})$$

5. Constraints

$$X_{c,d,r,s,w} \geq 0 \quad \forall_{c,d,r,s,w}$$

B. DATA

The configuration data for legacy platforms were gathered from unclassified and public sources.

The Ship Manpower Document (SMD) provided ship's manpower requirements (RQMTS). Section II of the SMD provided the manpower summary by department, officer and enlisted. Section III provided the manpower requirements by billet sequence numbers. The data extracted were the quantity of each rate required. Section IV was the battle bill by watchstation numbers. The watchstation numbers provided the RQMTS to support a particular watchstation including the systems. Section V provided the functional workload totals for each division [Refs 6-12].

The data for the aviation detachment RQMTS came from NAVAIR 1.2 LCS Alternative Aviation Support Study Final Briefout of 14 June 2004 [Ref 21].

The final data source was the aforementioned subject matter expert.

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VIII. ANALYSIS

A. "BUSINESS AS USUAL" ANALYSIS

The analysis first looked at the RQMTS of legacy ships. The most demanding RQMTS was during Condition I, and these RQMTS were used to estimate the seaframe's baseline RQMTS. The RQMTS for the five legacy platforms were derived from section IV of the respective Ship Manning Document (SMD). Because of the Smart Ship and OME, the study used the SMD for the CG before and after Smart Ship as well as the SMD for the DDG before and after OME. Therefore, there were two variants of the CG and DDG legacy RQMTS. The RQMTS analysis for the legacy ships are summarized in Table 8.

Table 9. Legacy Manpower Requirements (RQMTS)
(From Refs 14-20)

| Dept | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|-------------|--------|--------|-----|----------|-----|-----|-----|
| Executive | 19 | 19 | 15 | 15 | 13 | 5 | 4 |
| Operations | 91 | 92 | 101 | 79 | 73 | 48 | 30 |
| Combat Sys | 104 | 104 | 105 | 95 | 42 | 0 | 0 |
| Engineering | 68 | 54 | 66 | 62 | 46 | 25 | 16 |
| Supply | 57 | 57 | 53 | 45 | 42 | 7 | 5 |
| Total | 339 | 326 | 340 | 296 | 216 | 85 | 55 |

Note: 1) Executive department includes medical

2) Operations department includes deck and navigation

The minimally manned LCS seaframe's baseline RQMTS was calculated based upon the minimum legacy RQMTS for each department or system that has a configuration similar to the notional LCS. Minimum legacy RQMTS for the Executive Department came from the MHC which has a manning of four.

Using the MHC RQMTS directly supports the LCS because both are focused mission ships. The Operations Department for LCS is similar, again, to the MCM and MHC Operations Departments because all are focused mission ships. The minimum RQMTS for the LCS Operations Department came from the MHC which has 30 RQMTS. The LCS Combat Systems Department, however, had more combat systems than the MCM and MHC (i.e., the 57MM gun and the RAM). Therefore, the legacy departmental minimum would not work for the LCS. Rather, a system-specific methodology was used to estimate the total Combat Systems Department RQMTS. Using the proxies, the core LCS combat systems RQMTS are summarized in the right hand section of Table 9 below.

Table 10. **Combat Systems RQMTS (From Refs 14-20)**

| System | Proxy | CG | CG (SS) | DDG | DDG (OME) | FFG | MCM | MHC | Minimum |
|-------------------------------|--------------|-----------|----------------|------------|------------------|------------|------------|------------|----------------|
| 57mm BOFORS | 5/54 gun | 10 | 10 | 11 | 11 | 6 | 0 | 0 | 6 |
| CIWS | Actual | 5 | 5 | 6 | 6 | 5 | 0 | 0 | 5 |
| .50 cal (4) | Actual | 0 | 0 | 0 | 8 | 8 | 8 | 8 | 8 |
| RAM | Actual | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| Search RADAR | SPS-49 | 3 | 3 | 0 | 3 | 3 | 2 | 0 | 2 |
| Air Decoy | Actual | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Torpedo Decoy Launcher | SVTT | 1 | 1 | 2 | 1 | 2 | 0 | 0 | 1 |
| Mine Avoidance SONAR | SQS-53C | 6 | 6 | 7 | 5 | 6 | 7 | 6 | 5 |
| | TOTAL | 26 | 26 | 27 | 34 | 31 | 17 | 14 | 29 |

The LCS Combat System Department has a total of 29 RQMTS which includes the RQMTS for the CIWS 1B gun system which was not a part of the two industry team's LCS designs.

The LCS Engineering Department is both similar and different from its legacy counterparts. The LCS engineering plant was the combined diesel and gas turbine (CODAG) propulsion system. All the legacy ships in this

study have a single type of propulsion (i.e., diesel or gas turbine) but not both. The Engineering RQMTS were based upon the most demanding legacy engineering plant which is the gas turbine. Only the CG, DDG and FFG have gas turbines, and the minimum RQMTS comes from the FFG which has 46 RQMTS. Of the 46 RQMTS, there are 10 diesel mechanics to support the auxiliary diesel engines. This thesis assumes that these 10 mechanics can also be trained to support main propulsion diesel engines. Therefore, the LCS Engineering Department has 46 RQMTS.

Lastly, the LCS Supply Department RQMTS was calculated using the minimum ratio instead of the minimum legacy Supply Department RQMTS. The Supply Ratio used was calculated by dividing the number of Supply RQMTS by the total number of Non-Supply RQMTS:

$$\text{Supply Ratio} = \frac{\text{Supply RQMTS}}{\text{Total Non-Supply RQMTS}} \quad (\text{equation 12})$$

Of the five legacy Supply Ratios, the MHC had the smallest ratio. Using this Supply Ratio, the number of LCS Supply RQMTS was calculated by multiplying it with the total Non-Supply RQMTS onboard the LCS. Therefore, the calculated LCS Supply Department RQMTS was:

$$\text{MHC Supply Ratio} = \frac{5}{50} = 0.10.$$

$$\text{LCS Supply RQMTS} = 0.10 * (109) = 10.9 \approx 11 \text{ RQMTS}$$

The LCS seaframe baseline RQMTS by department and systems is summarized in Table 10 below.

Table 11. **LCS Seaframe Baseline RQMTS (business as usual)**

| | | | Core LCS Combat System | Qty | Manning |
|-------------------------|----------------------------------|------------------|---------------------------|-----|---------|
| Department | Crew | Proxy | 57 mm gun/.50 cal | 1 | 14 |
| Executive ^a | 4 | MHC | RAM | 1 | 1 |
| Operations ^b | 30 | MHC | Search radar | 1 | 2 |
| Combat Systems | 24 + 5 ^b = 29 | ← | Surface decoy | 2 | 1 |
| Engineering | 46 | FFG | Air decoy | 3 | |
| Supply | 11 | MHC ^a | Torpedo decoy launcher | 2 | 1 |
| Total | 115 + 5^b = 120 | | Mine avoidance sonar | 1 | 5 |

a. Scaled proportionately to smaller crew size using MHC supply ratio

b. CIWS is not included in current Flight-0 LCS designs. Estimated manning level of 5

The estimated seaframe (without mission module) RQMTS of 115-120 clearly exceeds the threshold of 110 that applies to the composite seaframe and module. Recalling that just the aviation components of the mission modules will require 30-34 personnel, we conclude that this baseline will have to be substantially reduced.

B. REDUCED MANNING INITIATIVES

The lessons learned and savings from Smart Ship and OME are the first steps in reducing the LCS seaframe baseline RQMTS. The policies, procedures and technology changes affected every aspect of shipboard routine and organization. The final saving estimates were calculated by analyzing the changes in the rates contained in Section VI (Summary of Manpower Requirements) of the SMD. [Refs 14

to 17] The effects of Smart Ship and OME on the individual departments are summarized in Table 11.

Table 12. **Smart Ship and OME Reductions By Department**
(From Refs 14-17)

| Department | SmartShip | OME |
|-------------|-----------|-------|
| Executive | 0.0% | 0.0% |
| Operations | 1.1% | 27.8% |
| Combat Sys | 0.0% | 10.5% |
| Engineering | 25.9% | 6.5% |
| Supply | 0.0% | 17.8% |

However, the overall effects were somewhat sobering. Smart Ship had an overall savings, after analyzing the CG (NS) and CG (SS) SMDs, of 4% while OME overall savings, after analyzing the DDG and DDG (OME) SMDs, was three times that at 12.9%.

1. Smart Ship

For the CG, Smart Ship savings were realized throughout several rates. The affected rates are summarized in Table 12.

Table 13. **Smart Ship Effect by Rate (From Refs 14 and 15)**

| Rate | Original | New | Change | Saving Percentage |
|-------------------------------|----------|-----|--------|-------------------|
| Boatswain's Mate (BM) | 7 | 8 | +1 | -14.3% |
| Damage Controlman (DC) | 10 | 8 | -2 | 20.0% |
| Electrician's Mate (EM) | 6 | 5 | -1 | 16.7% |
| Fireman (FN) | 12 | 9 | -3 | 25.0% |
| Gas Turbine, Electrical (GSE) | 20 | 12 | -8 | 40.0% |

When the effects were applied to the LCS seaframe baseline RQMTS, the 4% Smart Ship savings removed the RQMTS

for an EM, DC and three GSs. The overall LCS manning level of 120 was thus reduced to 115 - not nearly enough of a reduction to accommodate required additional module personnel.

2. Fleet Optimal Manning Experiment (OME)

For the DDG, OME also affected every facet of the ship's organization. Most reductions were accomplished by policy and procedural changes supported with minimal technology leveraging. The overall OME savings for the DDG was 12.9%. [Refs 8 and 9] Compared to the Smart Ship effects, OME definitely had a bigger effect. Table 13 summarized the effects of OME across the different rates including officers (i.e., 1110, 6120 and 7120).


Table 14. **Fleet Optimal Manning Experiment Savings by Rate**
(From Ref 16 and 17)

| Rate | Original | After OME | Change | Percentage |
|---|----------|--------------|--------|------------|
| Surface Warfare Officer, Qualified (1110) | 11 | 10 | -1 | -9.1% |
| Surface Warfare Officer, Training (1160) | 5 | 8 | +3 | 37.5% |
| Medical Officer (2100) | 1 | 0 | -1 | -100.0% |
| Limited Duty Officer, Deck (6120) | 1 | 0 | -1 | -100.0% |
| Limited Duty Officer, Surface Engineer (6130) | 1 | 0 | -1 | -100.0% |
| Warrant Officer, Surface Operations Tech (7120) | 0 | 1 | +1 | 100.0% |
| Warrant Officer, Surface Engineer (7130) | 0 | 1 | +1 | 100.0% |
| Command, Master Chief Petty Officer (CMD) | 0 | 1 | +1 | 100.0% |
| Electrician's Mate (EM) | 5 | 7 | +2 | 40.0% |
| Electronic Technician (ET) | 11 | 14 | +3 | 27.3% |
| Fire Controlman (FC) | 39 | 36 | -3 | -7.7% |
| Gunner's Mate (GM) | 17 | 13 | -4 | -23.5% |
| Gas Turbine Tech, Electrical (GSE) | 7 | 6 | -1 | -14.3% |
| Gas Turbine Tech, Mechanical (GSM) | 19 | 14 | -5 | -26.3% |
| Hospital Corpsman (HM) | 2 | 3 | +1 | 50.0% |
| Hull Maintenance Tech (HT) | 4 | 3 | -1 | -25.0% |
| Interior Communications Electrician (IC) | 7 | 4 | -3 | -42.9% |
| Information Systems Tech (IT) | 14 | 12 | -2 | -14.3% |
| Culinary Specialist (CS) | 15 | 11 | -4 | -26.7% |
| Operations Specialist (OS) | 31 | 22 | -9 | -28.1% |
| Quartermaster (QM) | 5 | 6 | +1 | 20.0% |
| Ship's Serviceman (SH) | 7 | 4 | -3 | -42.9% |
| Storekeeper (SK) | 10 | 8 | -2 | -20.0% |
| Signalman (SM) | 6 | 1 | -5 | -83.3% |
| Seaman (SN) | 31 | 26 | -5 | -16.1% |
| SONAR Technician, Surface (STG) | 20 | 17 | -3 | -15.0% |
| Yeoman (YN) | 6 | 2 | -4 | -66.7% |

When the OME effects were compounded with the Smart Ship effects, it reduced the post-Smart Ship LCS seaframe RQMTS from 115 to 96. See Appendix R. OME produced an additional $\frac{115-96}{115}=16.5\%$ reduction of the baseline RQMTS.

After the compounded savings from Smart Ship and OME were applied to the original seaframe baseline RQMTS, the reduced LCS manning level of 96 would be feasible against the threshold of 110, except that it still left very little room for module personnel. The reduced manning initiative effects are summarized in Figure 3.

Figure 3. **LCS Seaframe RQMTS Before Paradigm Shift**
(From Refs 14 - 20)



Objective #1: Seaframe RQMTS

| Department | Proxy | Business as usual | Reduced Manning Initiatives | |
|----------------|-----------------|-------------------|-----------------------------|-----------------|
| | | | SmartShip | Optimal Manning |
| Executive | MHC | 4 | 4 | 4 |
| Operations | MHC | 30 | 29 | 23 |
| Combat Systems | System specific | 29 | 29 | 24 |
| Engineering | FFG | 46 | 42 | 36 |
| Supply | MHC | 11 | 11 | 9 |
| Total | - | 120 | 115 | 96 |

Knowing that the modules will require in excess of 30-34 additional personnel, the seaframe RQMTS must be reduced even more. This required some "out of the box" paradigm shifts to further reduce the RQMTS. The paradigm shifts considered were the Composite Sailor, Technology Leverage and Workload Transfer concepts.

C. PARADIGM SHIFTS

"[OME] accomplished [the manpower] reductions by combining watch stations underway, by creating and relying on shore detachments to handle routine preventive maintenance and administrative requirements, and by developing and taking

advantage of other efficiencies such as self-service laundry and food lines [Ref 9]".

Changes from "business as usual" can accelerate the advances supporting the minimal manning concept. The OME manpower reduction methods can be grouped into three categories of Composite Sailor, Technology Leverage and Workload Transfer. Composite Sailor capitalizes on the watch station combinations and extends that to rates that are similar in function and responsibility. Technology Leverage aggressively uses the Smart Ship technologies to further reduce the RQMTS. Similarly, Workload Transfer builds upon the supporting precepts of the PAPA detachment and ERM. Workload Transfer seeks to reduce the administrative and routine workload onboard the LCS. This concept also supports the Composite Sailor to allow the ship's commanding officer more control of the crew's time.

1. Composite Sailor

The seaframe's post-reduction manning initiatives RQMTS was then analyzed for the effects of the Composite Sailor concept. The Composite Sailor RQMTS reductions are:

OPS: QM (2)

CS: GUN/ORD OFF, STG (3)

ENG: MPA, AUXO, EN (4), HT (2), MR
and GS (3)

See Appendix R for the detail listing of RQMTS affected by the Composite Sailor concept.

The Composite Sailor reduced the RQMTS from 96 to 78. Part of the reduction includes the GUN/ORD, MPA and

AUXILIARY officer positions. These are assumed covered by the senior FC, GM, GS and EN onboard respectively.

2. Technology Leverage

From the Integrated Bridge System (IBS) to the self-service food lines, technology that supports manpower reductions already exists as evidenced by USS Yorktown's and USS Milius' successful completion of their experiments and the subsequent deployments.

Key technologies used in this study include:

- 1) Smart Ship technologies
- 2) Multi-modal consoles (an emerging technology)
- 3) Automated damage control devices including the automated mechanical and electrical isolation systems as well as the installed firefighting systems such as the CO2, AFFF and HALON firefighting systems.

The remaining RQMTS were analyzed for reductions effects from each of the technologies listed above. The Technology Leverage reductions are:

OPS: QM, OS (5), BM (2), CTT and IT

CS: STG (3), FC (4)

ENG: DCA OFF, EN (2), DC (2), GS (2)

SUPPLY: SK (2), CS (2)

3. Workload Transfer (Ship to Shore)

Routine workload or routine maintenance was moved ashore to the shore infrastructure co-located with the LCS

module personnel. By conducting the routine items ashore, more time was recapitalized by the crew, saving time and RQMTS onboard the LCS. Some of the routine items included those conducted by the EM, EN, FC, GM, and SK rates. The seaframe crew had the ability to "reach-back" to homeport or other technical supporting sites for assistance, thereby reducing the number of specialties RQMTS onboard the LCS.

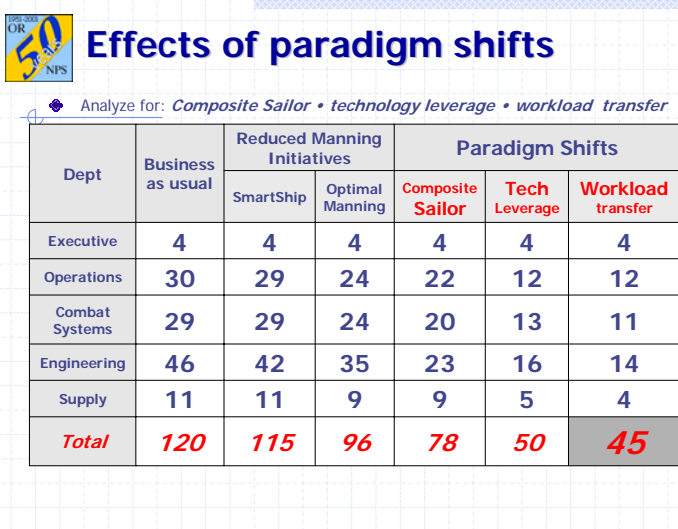
Each RQMTS, after the Technology Leverage, was then analyzed for the effects of transferring workload ashore. The Workload Transfer concept reduced the following RQMTS:

| | |
|---------|--------|
| CS: | GM, FC |
| ENG: | EM, EN |
| SUPPLY: | SK. |

D. CORE CREW ANALYSIS

Figure 4 summarizes the analysis of the seaframe RQMTS as detailed in Appendix R. Table 14 below summarizes the seaframe manning.

Figure 4. **Effects of Paradigm Shifts on LCS Seaframe Manning**



The image shows a presentation slide titled "Effects of paradigm shifts" with a "50 Years NPS" logo. Below the title, it says "Analyze for: Composite Sailor • technology leverage • workload transfer". The slide contains a table with the following data:

| Dept | Business as usual | Reduced Manning Initiatives | | Paradigm Shifts | | |
|----------------|-------------------|-----------------------------|-----------------|------------------|---------------|-------------------|
| | | SmartShip | Optimal Manning | Composite Sailor | Tech Leverage | Workload transfer |
| Executive | 4 | 4 | 4 | 4 | 4 | 4 |
| Operations | 30 | 29 | 24 | 22 | 12 | 12 |
| Combat Systems | 29 | 29 | 24 | 20 | 13 | 11 |
| Engineering | 46 | 42 | 35 | 23 | 16 | 14 |
| Supply | 11 | 11 | 9 | 9 | 5 | 4 |
| Total | 120 | 115 | 96 | 78 | 50 | 45 |

Table 15. **LCS Seaframe Manning (Reduced)**

| | | Core LCS Combat System | | Qty | Manning |
|-------------------------|--------------------------------|------------------------|------------------------|-----|---------|
| Department | Crew | | | | |
| Executive ^a | 4 | | 57 mm gun/.50 cal | 1 | 2 |
| Operations ^b | 12 | | RAM | 1 | 1 |
| Combat Systems | 9 + 2 ^b = 11 | ← | Search radar | 1 | 2 |
| Engineering | 14 | | Surface decoy | 2 | 1 |
| | | | Air decoy | 3 | |
| Supply | 4 | | Torpedo decoy launcher | 2 | 1 |
| Total | 43 + 2^b = 45 | | Mine avoidance sonar | 1 | 2 |

a. Scaled proportionately to smaller crew size using MHC supply ratio

b. CIWS is not included in current Flight-0 LCS designs. Estimated manning level of 2

Of the 45 RQMTS, 15 are Condition III watchstanders, and the remainders are day-workers. Condition III has four watch stations: OOD, JOOD, TAO and ATAO. The watchstanders and recommended positions are summarized in Table 15.

Table 16. **Seaframe Condition III Watch**

| Watch-stander | Condition III Watch |
|------------------------|----------------------------|
| OPS OFF, CSO and CHENG | TAO |
| BM | OOD, JOOD |
| CTT | AIC/ASTAC/ATAO |
| GM | OOD, JOOD |
| OS | TAO, AIC/ASTAC/ATAO |
| STG | AIC/ASTAC/ATAO |

The seaframe RQMTS analysis suggested that a level of 45 RQMTS was possible for the seaframe within the threshold of 110 that must also accommodate a mission package crew.

Next, the analysis determined the individual module RQMTS as well as the total module RQMTS. The modules augment the seaframe with a specific warfare capability. With this added capability comes additional systems and manning. The next section presents the analysis of individual module's systems and their RQMTS.


E. MISSION PACKAGE CREW ANALYSIS

The mission package crew was based on the module RQMTS. The RQMTS was calculated using the same methodology as for seaframe. Using the legacy SMD data and an expert opinion, the module's baseline RQMTS (larger total) and reduced RQMTS (smaller total) was estimated and validated. With the exception of the aviation component, most of the module systems were emerging (i.e., SPARTAN, RMV and Periscope Detection). The RQMTS for these emerging systems

were estimated using the proxy methodology with legacy data. For example, the SPARTAN was a USV based upon the RHIB seaframe and the RMV was assumed to be similar to the legacy MNV onboard the MCM and MHC ships.

The module baseline RQMTS were estimated using the optimization equation 7, 8 and 9. The first, and perhaps the biggest, module in the analysis is the mine warfare (MIW) module. The module's component systems and estimated manning are itemized in Figure 5.

Figure 5. MIW Module RQMTS



| MIW Module RQMTS | | | |
|---|----------------|-----------|--|
| System | Baseline RQMTS | Reduced | Comments |
| USV (1) W/ MIW System(s) | 8 | 3 | 2 Operators/Maintainers 1 – 6 Maintainer |
| VTUAV 1 set (3 UAVs) COBRA (2) | 57 | 34 | NAVAIR/NPS study Equipment Operators part of Air Det |
| MH-60S (1) OASIS Sys (2) ALMDS (2) ALQ-20A (2) RAMICS (2) AMNS (2) | | | |
| AN/WLD-1 RMV (2) ALQ-20A (2) | | | |
| Periscope det (1) | 10 | 5 | 5 Operators/Maintainers 0 – 5 Maintainer |
| EOD Det or NSCT | 8 | 4 | Covered by RMV operators |
| BPAUV (1 set) | 2 | 1 | Based on EOD det size |
| SCULPIN (1 set) | 2 | 1 | 1 – 2 Operator/Maintainers Covered by RMV operators |
| MIW Mission C4 | 6 | 5 | 1 – 2 Operator/Maintainers Covered by RMV operators |
| MIW Mission C4 | 6 | 5 | 5 - 6 OINC & Support |
| Total Personnel | 93 | 53 | |

The baseline sum of the individual MIW systems was 93 RQMTS. The biggest RQMTS driver was the aviation component at 57 RQMTS which is over half of the entire module RQMTS. When this sum of 93 was added to the seaframe RQMTS of 45, the MIW focused LCS has 138 RQMTS which was more than the

threshold allows. Hence, further reduction must occur. Of the three approaches (Business As Usual, Reduced Manning Initiative and three Paradigm Shifts), only one was applicable here. That was the Composite Sailor paradigm shift.

The Composite Sailor allowed the combination of the Operator and Maintainer RQMTS as well as the suggested rate combinations suggested earlier in Table 5 (Suggested Rate Combination). Table 16 below summarized the suggested rate combinations for the modules.


Table 17. **Suggested Rate Combination For Modules**

| Legacy Rate | LCS Rate |
|-------------|----------|
| BM, EN, MM | BM |
| EM, TM, STG | STG |
| SK, YN | SK |

Once all the RQMTS were analyzed for the effects of the Composite Sailor, the resulting reduced MIW module had 53 RQMTS. When added to the seaframe's reduced RQMTS, the MIW focused LCS has 98 RQMTS which was within the threshold of 110.

The same methodology was applied to the littoral anti-submarine (ASW) and surface warfare (SUW) modules. The principal differences between these modules and the MIW module are the manned helicopter, which is the MH-60R, and the two USVs. The modules baseline and reduced RQMTS are summarized in Figure 6 and 7.


Figure 6. ASW Module RQMTS



ASW Module RQMTS

| System | Baseline RQMTS | Reduced | Comments |
|---|----------------|-----------|--|
| USV (2) W/ ASW System(2) | 10 | 5 | 3 Operators/Maintainers 2 – 7 Maintainer |
| VTUAV 1 set (3 UAVs) MH-60R Torpedo set Sonar set Sonobuoys set | 52 | 30 | NAVAIR/NPS study Air Crew and Ordnanceman provided by Air Det |
| AN/WLD-1 RMV (2) W/ ASW System(2) | 8 | 5 | 5 Operators/Maintainers 0 – 3 Maintainer |
| Periscope detection | | | Covered by RMV operators |
| ACES/EER/IEER/AEER family | 5 | 3 | 3 - 5 Oper/Maint |
| Torpedo Countermeasures | 3 | 1 | 1 - 3 STGs; Assumed covered by Seaframe Torpedo Countermeasures |
| ADS | 5 | 2 | 2 - 5 Operator/Maintainers |
| Towed Array (2) | 0 | | Assumed covered by Seaframe Torpedo Countermeasures |
| ASW Mission C4 | 6 | 5 | 5 - 6 OINC & Support |
| Total Personnel | 89 | 51 | |

Figure 7. SUW Module RQMTS



SUW Module RQMTS

| System | Baseline RQMTS | Reduced | Comments |
|---|----------------|-----------|---|
| USV w/EO/IR (2) Gun package Missile Package | 10 | 6 | 3 Operators/Maintainers 3 – 7 Maintainers Includes 1-2 GMs; assumes seaframe cannot cover this |
| VTUAV w/EO/IR 1 set (3 UAVs) Rocket/Gun/Missile set MH-60R EO/IR set Gun/Rockets set Hellfire set | 52 | 30 | NAVAIR/NPS study Air Crew and Ordnanceman provided by Air Det |
| Netfires | | | Covered by mission C4 |
| Intermediate Caliber Gun Module (2) | 4 | | Assume 25mm bushmaster brought onboard |
| Non-Lethal Weapon (2) | 0! | | TBD |
| SUW Mission C4 | 6 | | 6 OINC & Support |
| Total Personnel | 72 | 45 | |

After all the module baselines were reduced, the LCS modules had RQMTS ranging from 45 in the SUW to the large MIW of 53. The maximum RQMTS for a focused mission LCS is 98, and the minimum RQMTS was 90.

F. LCS MODULE FORCE ANALYSIS

The Navy plans to procure 56 LCS seaframes, 47 MIW, 34 ASW and 30 SUW FMPs (total of 111 FMPs). The FMPs do not include the 8 FMPs procured during the development phase. It is assumed that these 8 additional FMPs are 3 MIW, 3 ASW and 2 SUW FMPs. When these eight additional FMPs are added with the 111, the sum is 119 FMPs (50 MIW, 37 ASW and 32 SUW). However, not all of the seaframes and FMPs will be deployable at any given time. To assign RQMTS to each FMP, even while not deployed, would be an inefficient use of critical human capital. A better way to assign manpower is by skills vice an entire module. This will allow greater flexibility in manpower assignment and reduce the overall LCS force RQMTS.

Under the "Business As Usual" approach, the LCS force would be a relatively large "pre-packaged" force. "Pre-packaged" means the traditional one-crew one-ship (or in this case, one-module) assignment. The converse is the "flexed" concept where the crew is deployed as needed regardless of the module. Looking ahead to where 56 seaframes and 119 FMP modules are planned, the estimated LCS manpower force size, under the "pre-packaged" approach would be:

*56 seaframes * 45 RQMTS = 2520 RQMTS*

*50 MIW Modules * 53 RQMTS = 2650 RQMTS*

*37 ASW Modules * 51 RQMTS = 1887 RQMTS*

*32 SUW Modules * 45 RQMTS = 1440 RQMTS*

Total LCS Force = 2520 + 2650 + 1887 + 1440 = 8497 RQMTS

8497 RQMTS was a relatively large force size, and this large LCS force size could potentially under-utilize talented human capital. Therefore, more efficient force utilization was assumed under the "flexed" concept.

Lessons learned from Smart Ship and OME include changes in watchstanding philosophies to reduce the workload and, ultimately, reduce manning. Smart Ship's innovative core/flex watchstanding philosophies permitted the ship to meet the spirit of the ROC/POE requirements while improving quality of life and better personnel management. The core/flex watch concept was again used onboard the USS Milius for OME. Similarly, the LCS module force will be organized and "flexed" to meet operational requirements. The module personnel are organized into twelve (12) different detachments of generalists and specialists. Table 17 summarized the different detachments.

Table 18. LCS Module Force Flexed Detachments

| <u>Generalists</u> | |
|---------------------------|------------|
| RMV Support | |
| USV Support | |
| Air Det Support | |
| <u>Specialists</u> | |
| FMP Mission C4 | |
| USV Oper | |
| USV Weapons | |
| RMV Operator | |
| MIW Specialistts | |
| | BPAUV |
| | SCULPIN |
| | EOD |
| ASW Specialist | |
| ACES/EER/IEER/AEER Family | |
| | Torpedo CM |
| | ADS |
| SUW Specialist | |
| MH-60S & UAV Oper | |
| MH-60R & UAV Oper | |

The detachments were similar to the Smart Ship “flexed” watchstanders who were called upon when they were needed. When the detachments were needed to conduct a particular littoral warfare operation, they were deployed with the modules to the seaframe or theater.

However, the number of deployable modules was much less than 119. Only 25% of the 56 seaframes will be deployable at any given time. Suppose there are 15 deployable seaframe, which is approximately 25% of the 56 seaframes planned, then the number of modules required will also be about 25% of the 119 planned. To properly determine the number of MIW, ASW and SUW modules required, first calculate the ratio of each module against the total modules planned.

$$\text{MIW modules: } \frac{50}{119} = 42\%$$

$$\text{ASW modules: } \frac{37}{119} = 31\%$$

$$\text{SUW modules: } \frac{32}{119} = 27\%$$

Next, multiply each ratio by the number of deployable seaframes (in this case 15) to determine the number of FMP modules required.

$$\text{MIW modules: } 42\% * 15 \text{ Seaframes} = 13.4 \approx 13 \text{ MIWModules}$$

$$\text{ASW modules: } 31\% * 15 \text{ Seaframes} = 9.9 \approx 10 \text{ ASWModules}$$

$$\text{SUW modules: } 27\% * 15 \text{ Seaframes} = 8.6 \approx 9 \text{ SUWModules}$$

Therefore, 32 modules are required to support 15 deployable seaframes. The "pre-packaged" deployable LCS force for the 15 seaframes and 32 modules would have 2279 RQMTS, of which 1604 would be required for the FMPs.

$$15 \text{ seaframes} * 45 \text{ RQMTS} = 675 \text{ RQMTS}$$

$$13 \text{ MIWModules} * 53 \text{ RQMTS} = 689 \text{ RQMTS}$$

$$10 \text{ ASWModules} * 51 \text{ RQMTS} = 510 \text{ RQMTS}$$

$$9 \text{ SUWModules} * 45 \text{ RQMTS} = 405 \text{ RQMTS}$$

$$\text{Total Deployable LCS Force} = 675 + 689 + 510 + 405 = 2279 \text{ RQMTS}$$

The "flexed" deployable LCS module force would only consist of module personnel. The seaframe RQMTS must be "pre-packaged" with the seaframe, but the module RQMTS are more flexible because they are shore-based until needed. Ashore, the module force is organized into the 12 detachments seen earlier in Table 17. Appendix V summarizes the "flexed" detachments, supported warfare and the quantity of each rate within the detachment. If a particular rate supports at least two warfare areas, then

it is considered a generalist. Otherwise, it is a specialist.

To calculate the total "flexed" RQMTS, the optimization equation 11 was used.

$$\text{Total "flexed" module RQMTS} = \sum_{d=6}^{17} \sum_{c=7}^9 (G_d N_{c=6} X_d + S_d N_c X_d) \quad (\text{equation 11})$$

For example, to estimate the "flexed" RQMTS for the RMV Support detachments, first determine the number of warfare areas supported. In this case, there are two, the MIW and ASW warfare, which makes it a generalist. Therefore, the "flexed" RQMTS for this detachment is the product of the detachment size and the number of seaframes.

$$\text{RMV Support "flexed" RQMTS} = G_{d=11} N_{c=6} X_{d=11} = 1 * 15 * 3 = 45 \text{ RQMTS}$$

By applying this calculation and methodology to all twelve detachments across the three littoral warfare areas, the 32 total "flexed" modules (13 ASW, 10 MIW, 9 SUW) have 1151 RQMTS, as compared to 1604 RQMTS when "pre-packaged". Table 18 summarized the comparison of the two manpower force structures.

Table 19. **Deployable Module Force Structure Comparison**

| | With Air Det | W/o Air Det | Air Det |
|--------------------------------------|--------------|-------------|---------|
| Pre-packaged, total | 1604 | 592 | 1012 |
| Flexed, total | 1151 | 493 | 658 |
| Personnel Saving | 453 | 99 | |
| Reduction | 71.8% | 83.3% | |
| Savings | 28.2% | 16.7% | |
| Cost @ \$60K per person (\$M) | \$ 96.2 | \$ 35.5 | |
| Savings @ \$60K personnel cost (\$M) | \$ 69.1 | \$ 29.6 | |

"Flexed" option has 453 fewer RQMTS than the 1604 "pre-packaged" RQMTS. In the end, the savings is approximately \$27.2M per deployment cycle. This estimate used the conservative personnel cost of \$60K per RQMT. By multiplying the savings and the deployment rotational factor of 3 to 4, the potential savings range from \$80M to \$110M.

IX. SUMMARY

The "business as usual" approach estimated the RQMTS for a focused mission LCS from 195 to 215. Of these numbers, the seaframe has a baseline RQMTS of 120 and the MIW, ASW and SUW modules have 95, 90 and 75 RQMTS respectively. These requirements clearly exceed the LCS total RQMTS of 110.

Applying the lessons learned and savings gained from reduced manning initiatives like Smart Ship and Fleet Optimal Manning Experiments (OME) help, but not enough to meet the targeted manning levels set for LCS. Smart Ship reduced the seaframe baseline RQMTS by 4.2% or from 120 RQMTS to 115; additionally, OME's overall savings of 15.8% reduced that even further to 96. The requirements are within the threshold of 110, but does not include the module RQMTS. More reduction measures are needed to accommodate the module RQMTS.

Additional measures explored were paradigm shifts in policy and operations called the Composite Sailor, Technology Leverage and Workload Transfer concepts. The Composite Sailor reduced the seaframe RQMTS an additional 15.0% down to 78 RQMTS; Technology Leverage yielded the largest reduction at 23.3% reducing the seaframe RQMTS to 50; and Workload Transfer produced the final 4.2% reduction to achieve the minimal manning of 45 RQMTS.

The module baseline RQMTS were reduced using only the paradigm shift Composite Sailor concept. The MIW module RQMTS was reduced by 43% from 93 to 53 RQMTS; the ASW

module was reduced by 42.7% from 89 to 51; and the SUW module was reduced by 37.5% from 72 to 45.

Combining the reduced seaframe and module RQMTS, the RQMTS for a focused mission LCS was reduced from the average values of 207 to 95. The reduced seaframe RQMTS was 45 with the MIW, ASW and SUW module RQMTS at 53, 51 and 45 respectively. Therefore, the MIW focused LCS has 98 RQMTS; ASW focused LCS has 96 RQMTS; and SUW focused LCS has 90 RQMTS. These requirements are within the LCS total RQMTS threshold of 110, and the first objective appeared feasible.

Additionally, the study's second objective looked at the LCS force-wide implications of the results from the first objective. The LCS force was expected to have 56 seaframes and 119 FMP modules. The estimated total seaframe RQMTS was 2,520 for the fleet of 56 seaframes. With the estimated module breakout of 50 MIW, 37 ASW and 32 SUW modules, the estimated total module RQMTS was 5977. Therefore, the estimated total LCS force had 8,497 RQMTS.

By de-linking the systems and RQMTS from the different modules, a more efficient way to manage the module personnel is possible. By organizing the module personnel into 12 detachments, the LCS module force could be deployed with greater flexibility and reduced its RQMTS. Using the optimization equations to minimize the module force total RQMTS, the "flexed" concept has proven that it can produce a savings of ~28% over the "pre-packaged" concept for, for example, 15 seaframes with 32 modules. In this example, the LCS module force has 1,604 RQMTS under the "pre-packaged" concept, and it has 1151 RQMTS under the "Flexed" concept. The difference is 453 RQMTS. This means, at a

conservative cost of \$60K per sailor, the potential saving is ~\$27M. When the rotation factor of 3-4 is considered, the saving is ~\$80M to ~\$110M per deployment cycle. By flexing the LCS module force, the Navy can gain, on average, 25% to 30% of its LCS module manpower cost. This translates into a potential monetary savings of \$80M to \$110M.

This is one of the ways of "harvesting efficiencies to invest in the Navy of the future [Ref 22]".

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X. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This thesis supported the minimally manned concept for the LCS seaframe and FMP modules. The top down manpower analysis used SMDs for legacy ships with "business as usual" approach and yielded a focus mission LCS with an average manning of approximately 207. This estimate, though large, was used as the RQMTS baseline estimate. When reducing the RQMTS baseline, previous manning reduction initiatives like Smart Ship and OME are not enough. The Navy can have minimally manned LCS seaframes and FMP modules if, and only if, the suggested paradigm shifts of Composite Sailor, Technology Leverage and Workload Transfer are pursued. The pursuit could yield an LCS seaframe with 45 RQMTS and the mission-package RQMTS of 45 to 53. The result is a focused mission LCS that meets the threshold limit.

However, the means to reduce the total RQMTS for a focused mission LCS to 75 or less was not readily identifiable.

Additionally, this study has also demonstrated that a "flexed" concept of module personnel management could potentially yield manpower annual cost savings of 25% to 30% or roughly \$80M to \$110M over the one-crew per module or "pre-packaged" concept.

B. RECOMMENDATIONS

The minimally manned LCS seaframe and modules can be realized if, and only if, the assumed paradigm shifts with

the supporting technologies are pursued. The Smart Ship technologies have proven they can advance changes in policy and operations especially in the areas of ship operation, training, maintenance and administrative support.

Recommendation: Pursue the Composite Sailor, Technology Leverage, and Workload Transfer paradigm shifts as well as advancing the technologies assumed in this study. The technologies appear readily available to support the minimal manning concept intended for LCS.

Recommendation: The Composite Sailor paradigm shift requires the synergy of the BM, CTT, DC, EN, ET, GS, HT, MM, MR, OS, QM, STG and TM rates. Examine the KSAs of these rates to determine the Composite Sailor's actual requirements for the BM (combination of BM, EN, MM and QM), ET (combination of CTT and ET), DC (combination of DC, HT and MR), EN/GS and STG/TM rates that have been suggested for the LCS.

Recommendation: Conduct a study to determine the optimal training curriculum for the above rates. A series of schools training time and KSA requirements data will support an optimized training pipeline to train these personnel effectively and efficiently to support the minimal manning concept. Minimal manning onboard LCS will require the ability of this training path to respond to manning shortfalls.

Recommendation: Combine watch-station requirements of Operator and Maintainer into a single Operator/Maintainer requirement to facilitate increased personnel flexibility. This will greatly support flexed organizations like the

Smart Ship Core/Flex watch philosophy as well as the "flexed" module force concept.

Recommendation: Pursue the Integrated Bridge System (IBS) and Voyage Management System (VMS). Increased digital chart coverage could add to the feasibility of the IBS/VMS system. Use the Integrated Bridge System (IBS) along with the Voyage Management System (VMS) more liberally. Supporting this is the recommendation to increase the coverage provided by digital/electronic charts to reduce the time consuming task of chart preparations and management. When combined with other technologies such as bow thrusters, the IBS/VMS could reduce the ship control requirements down to just a few personnel unlike the crowded legacy ship control requirements.

Recommendation: Pursue the Integrated Condition Assessment System (ICAS) and Machinery Control System (MCS) with the improved On-Board Trainer (OBT). Change philosophy to allow ship control and/or operations control personnel to operate and configure ship machinery as required to support operations and changing tactical requirements.

Recommendation: Advance the integrated sensor and communications multi-modal consoles (MMC) and the integrated weapons and decoy Weapons Control Consoles (WCC). The MMC assumes all communication and sensors are integrated into a single station for greater effectiveness. The WCC assumes the control functions of the 57MM, CIWS, RAM, Torpedo Decoy Launcher, Air Decoy Launcher and TACTAS combat systems can be integrated into a single location. These systems can significantly add to the watch station reductions, and manpower reduction, in the Combat Information Center (CIC). More importantly it gives the

decision-maker the ability to access all of the ship's assets to make timely and informed decisions.

Recommendation: Pursue a UV launch and recovery system that is similar to an overhead rail system with automated winches and controls operable by only one person. Use Visby Swedish Corvette as a model.

Recommendation: Pursue automation technology. The SONAR can only be supported by two Operator/Maintainers if the log-keeping is automated. Similar to the flight data recorders onboard commercial aircrafts, the log-keeping of the SONAR equipment can be automated. This will allow a more accurate data storage and facilitate data for follow-on analysis. Recommend pursuing this technology.

Recommendation: Operate with unmanned engineering spaces during Condition III steaming. This will leverage the technology to allow the engineers more control of their time. Personnel will only be required for start-ups, shutdowns and condition-based maintenance requirements. The spaces do not have to be manned after start-up and shut-down evolutions. During Condition I, engineering spaces will only require a monitor in the critical engineering spaces (i.e., main engine room and electrical generation rooms) to respond and stabilize from casualties. Operating in this manner will also permit bridge and CIC watchstanders to operate the engineering plant in direct support of mission readiness without delay.

Recommendation: Operate with reduced Damage Control party requirements and increase reliance on technology/automation. The Rapid Response Team (RRT), or minimum fire party, requires a scene leader, investigators,

nozzleman and hoseman. Employ the RRT initially and augment as required.

Primary DCC should be located near machinery controls which is assumed to be in CCS, and secondary should be located near the decision makers either in the pilot house or CIC. In this case, recommend secondary CCS in the pilot house to facilitate greater control and less workload increase in CIC.

Recommendation: Organize the shore infrastructure to support the reduced maintenance onboard the LCS using concepts similar to a "pit stop." Reduce the workload onboard the seaframe. Determine the workload of 45 personnel, and remove the remainder if possible. Conduct as much routine and large maintenance requirements ashore as possible. Both critical and routine spares and parts need to be readily available to sustain the LCS operational availability and reliability.

Recommendation: Assign future LCS personnel to an operational LCS seaframe for indoctrination. With a limited indoctrination period, every LCS sailor must be afforded the opportunity to get familiar with an LCS for a short period of time prior to assignment to either the LCS or the modules. With the largest combined manpower RQMT of 98, a focused LCS can accommodate additional personnel onboard for training and indoctrination with minimal impact on the core crew accommodations. A trainer would be required to manage the training curriculum.

In conclusion, personnel assigned to LCS must be trained and qualified to the fullest extent possible. There is very limited flexibility in the LCS force

structure to support gaps beyond a reasonable length of time. If a sailor is unable to fulfill their function onboard LCS, a replacement must be ready and available for immediate relief. Otherwise, mission readiness will quickly become an adverse factor.

XI. FUTURE STUDY

During the operation of LCS Flight 0 ships, data will be collected on human performance, incidence of human errors and near misses, accidents and mishaps, situations of excessive workload, and habitability/quality-of-life problems. These data will be used in Flight I system design and development to improve human-machine interfaces, and ship and system design for operability, maintainability, supportability, survivability, usability and safety [Ref 1].

A. FATIGUE STUDY ON LCS FLIGHT "0"

A key element to sustain the minimal manning concept is fully functioning sailor. Personnel effectiveness is highly dependent upon the amount and quality of sleep. Sleep is a force enabler, and a regimented sleeping program to allow optimal sleep will prove vital to enable the crew to perform at the peak effectiveness. For this study, the critical personnel (i.e., bridge and combat information center watchstanders) predicted effectiveness goal was assumed to be 80% with the threshold at 65%.

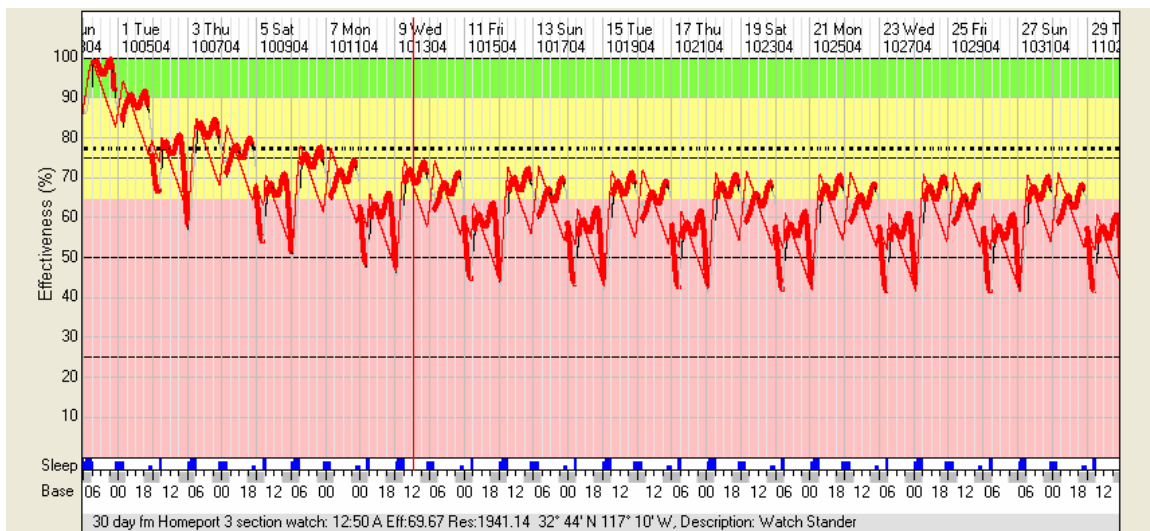
Table 20. **Critical Personnel Effectiveness (Hursh FAST & SAFTE model)**

| | Threshold | Goal |
|-------------------------------|-----------|------|
| Personnel Effectiveness Level | 80% | 95% |

On average, to be totally effective, a sailor requires 7-9 hours of moderate to excellent quality sleep. If the sailor is only getting moderate quality sleep, effectiveness will decline. Moderate sleep is defined as that which is almost undisturbed with some tossing and turning. Moderate to excellent sleep will help the sailors sustain, and even regain, their effectiveness. Excellent sleep is defined as undisturbed sleep where all sleep stages, including rapid eye movement (REM), can occur. A regimented sleep program is vital to sustain the sailor's performance, especially in situations of reduced manning.

When a sailor is getting moderate to excellent sleep before getting underway, their average peak effectiveness during waking hours is 95%-99%. Once underway and getting only moderate sleep from 2200-0600, the same individual's average effectiveness drops down to 55%-60%. See Figure 7.

Figure 8. **Typical Personnel Effectiveness After Underway (From FAST Program)**

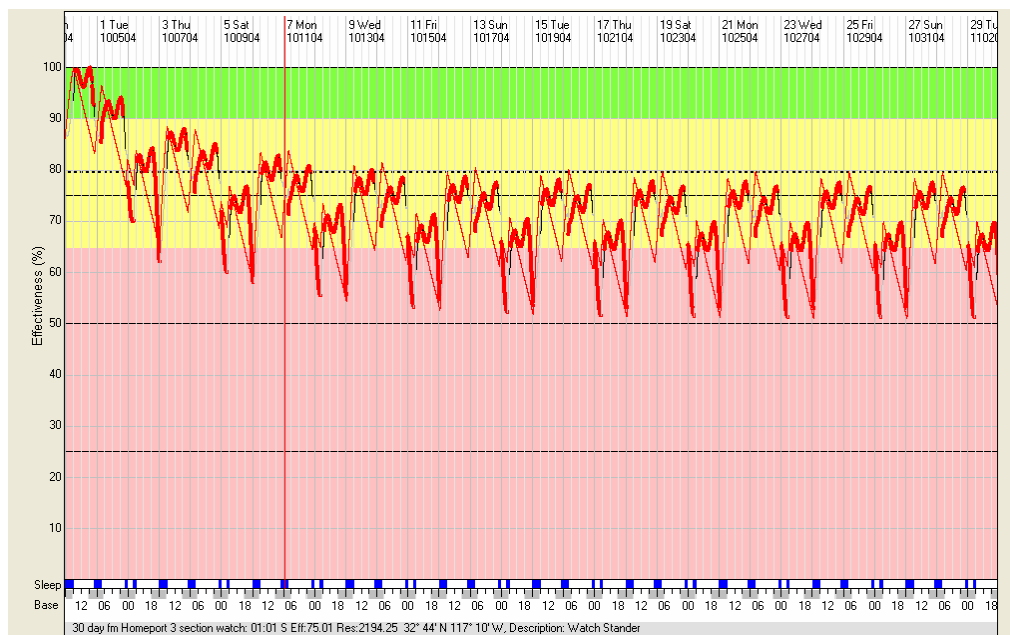


The effectiveness plot reaches the steady state of about 60% after 10 days underway from port. During the steady state, the biggest degradation in effectiveness occurs during the watch hours of midnight-0400 and 2000-2400. During these watches the personal effectiveness level is dangerously low at around 50%.

Overall, this notional daily routine is considered marginal (average effectiveness is 66%) if safe personnel effectiveness level is assumed 65% or above. A regimented sleep program will be required to improve personnel effectiveness to, for example, 75%. This is especially important for minimally manned ships like LCS.

The recommended sleep regiment to obtain 75% personnel effectiveness level is the same from 2200-0600. However, this would require that every sleeping moment be excellent sleep quality. It is also recommended that naps be included into the daily routine from 1200-1300. A 45 to 60 minute nap will improve the original effectiveness from 66% to 70%. Thirty minute naps only improved the original effectiveness by 2%.

Figure 9. **Personnel Effectiveness After Underway (With Auto Sleep) (From FAST Program)**



The topic of sleep and fatigue is a growing concern, and the fatigue study has the potential to add value to the understanding crew requirements especially onboard a minimally manned ship like the LCS.

B. TASK ANALYSIS ON LCS FLIGHT "0"

One of the key elements used in the current manpower requirements determination process is the workload measured in hours. The workload data was not available to support this manpower study. However, workload data can be gathered after the delivery of the two LCS Flight 0 ships.

A future study to gather the workload data, in hours, by conducting on-site data collection would be useful. The data will then be used to validate manpower estimates from this study and improve the manning requirements for LCS Flight I ships.

C. LCS MANPOWER COST BENEFIT ANALYSIS

Although this study suggested ways to save manpower costs, the actual cost to pursue the suggested paradigm shifts was not studied. The cost benefit analysis (CBA) of this pursuit would also add to the feasibility of the minimal manning concept as well as predict a more accurate cost savings. The CBA study is expected to produce better (more) savings than the conservative \$60K personnel cost used in this study.

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APPENDIX A. NOTIONAL PROJECTED OPERATIONAL ENVIRONMENT

1. The LCS XX Class littoral combat ship's mission is to operate offensively in a high density, multi-threat environment as an integral member of a Carrier Strike Group, Surface Action Group or Expeditionary Strike Group. In addition, the LCS XX provides its own limited Air Defense (AD), limited Surface Warfare (SUW), limited Mine Warfare (MIW) and Undersea Warfare (USW) self-defense, and can effectively provide some local subsurface and surface area protection to the Group or Force.

2. The most demanding operating environment anticipated for the LCS XX Class is forward deployed wartime operations within the littoral battlespace in cooperation with designated joint/allied forces, including operations involving coordination of land and sea-based aviation. These operations are frequently characterized by confined and congested water and air space occupied by friends, adversaries, and neutrals -- making rapid identification and efficient coordination profoundly difficult. In this environment, adversaries can concentrate and layer their defenses.

3. Peacetime forward operations in littoral areas are also very demanding. In an era characterized by the proliferation of sophisticated weaponry, coupled with the advance of the global war on terrorism, the LCS XX Class can anticipate surprise attack by submarines, coastal missiles, mines, sea-skimming cruise missiles, and theater ballistic missiles, terrorist and other asymmetrical threats. A substantial percentage of operations will be conducted within the highly variable littoral.

4. LCS XX is capable of performing all assigned primary mission areas simultaneously while maintaining Readiness Condition I, II, III (wartime/forward deployment cruising readiness), IV (peacetime training underway operations) or V (in port training and maintenance).

5. In an environment in which repair facilities are limited, the ability of the Carrier/ Expeditionary Strike Group and LCS XX Class ship to be self-sufficient is of paramount importance. While operating within a Strike Group, the LCS XX may be called upon, on an infrequent basis, to provide repair assistance to other units. This assistance is provided by existing ship's force personnel,

specifically, by Sailors in billets requiring Journeyman-level skills. Battle Force Intermediate Maintenance Activity (BFIMA) NECs, proficiency-based Journeyman level NECs attained at Fleet Maintenance Activities, are assigned to enhance the capabilities of the Carrier/Expeditionary Strike Group and own unit to be self-sufficient. Specific BFIMA NECs assignments follow:

| <u>RATING</u> | <u>SKILL AREA</u> | <u>NEC</u> |
|---------------|----------------------------------|------------|
| BM | Rigger/Weight Tester | BM-0120 |
| EN | Valve Repair Tech | MM-4540 |
| EN | Diesel Engine Repair Tech | EN-4340 |
| GSM | Hydraulics Repair Tech | MM-4541 |
| GSM | Pump Repair Tech | MM-4222 |
| GSM | Gas Turbine Repair Tech | GS-4140 |
| EN | A/C & R Tech | MM-4223 |
| EM | Outside Electrical Repair Tech | EM-4651 |
| IC | Interior Communications Tech | IC-4781 |
| ET | Module Test and Repair (2M) Tech | ET-1591 |

APPENDIX B. NOTIONAL REQUIRED OPERATIONAL CAPABILITY

1. The LCS XX Class ship's mission is to operate offensively in a high-density multi-threat environment as an integral member of a Carrier Strike Group, Surface Action Group or Expeditionary Strike Group. In addition it provides its own limited Air Defense (AD), limited Surface Warfare (SUW) and Undersea Warfare (USW) self-defense and can effectively provide some local area protection to the Force, Group or other military shipping against subsurface and surface threats. Accordingly, the following primary and secondary warfare mission areas are assigned:

P = Primary PF = Primary with FMP S = Secondary

| LCS XX CLASS | | | | | | | | | | | | |
|--------------|-----|-----|-----|-----|------------------|-----|-----|-----|-----|-----|-----|-----|
| AAW | AMW | SUW | ASW | CCC | C ² W | FSO | INT | LOG | MIW | MOB | MOS | NCO |
| S | S | PF | PF | P | P | S | S | S | PF | P | P | S |

2. The LCS XX is not capable of providing facilities for an embarked warfare commander and staff.

3. Required Operational Capabilities (ROCs) are reported under readiness conditions having major significance in determining the unit's total manpower requirements. The following summarizes conditions covered:

Condition I: Battle Readiness

While in Condition I (Battle Readiness), the ship shall be capable of meeting the following criteria: able to perform all offensive and defensive functions simultaneously; able to keep all installed systems manned and operating for maximum effectiveness; required to accomplish only minimal maintenance - that routinely associated with watch standing and urgent repairs. For the LCS XX, this condition means self-defense measures are being performed. Evolutions such as replenishment, law enforcement or helo operations are not appropriate unless the evolution stations are co-manned by personnel from other battle stations. The maximum expected continuous crew endurance for Condition I is 24 hours.

Condition II: Modified Battle Readiness

Condition II is Condition I Battle Readiness modified to meet particular imminent threats that are situation-dependent. As such, Condition II is a subset of Condition I that stands up particular Condition I capabilities at the discretion of the task force or group commander, or commanding officer. While in Condition II, the ship shall be capable of meeting the following criteria: able to simultaneously perform those offensive and defensive functions necessary to counter specific imminent, limited threats; able to keep required operational systems continuously manned and operating; able to perform other command and control functions relevant to the threat which are not required to be accomplished simultaneously; able to accomplish urgent underway Planned Maintenance and support functions. The maximum expected continuous duration for Condition II is 10 days, with a minimum of 4 to 6 hours of rest provided per man per day. Since scenarios can't be fixed in advance for all foreseeable combinations of circumstances other than full general quarters, a Condition II column is not portrayed in the table of ROCs.

Condition III: Wartime/Increased Tension/Forward Deployed Cruising Readiness

Reduced defensive systems are manned to a level sufficient to counter pop-up threats. While in Condition III, the ship shall be capable of meeting the following criteria: able to keep installed systems manned and operating as necessary to conform with prescribed ROCs; able to accomplish all normal underway maintenance, support and administrative functions. To determine manpower requirements, the minimum expected crew endurance for Condition III is 60 days, with opportunity for 8 hours of rest provided per man per day.

Condition IV: Training Cruising Readiness

While in Condition IV, the ship shall be capable of meeting the following criteria: able to keep installed systems manned and operating only to the extent necessary for safe and effective ship control, propulsion and security; able to accomplish all normal underway maintenance, support and administrative functions. Maximum advantage is taken of training and exercise opportunities. Expected endurance is not constrained by personnel. Ability to immediately change readiness posture to Condition I, II or III is expected.

Condition V: In port Readiness

Designated maintenance and training period. While in Condition V, the ship shall be capable of meeting the following criteria: able to keep installed systems manned and operating to the extent necessary for effective operation as dictated by the existing situation; able to man watch stations as required to provide adequate security; able at all times to meet anticipated in-port emergencies and to perform in-port functions as prescribed by unit ROCs; able to accomplish all required maintenance, support, and administrative functions. Maximum advantage is taken of training and exercise opportunities. Subject to the foregoing requirements the crew will be provided maximum opportunity for rest, leave and liberty.

4. ROC symbols are used to specify the desired level of achievement of readiness or other work for or during a particular readiness condition. Readiness normally applies to watches and/or evolutions, while other work refers to non-watch activity such as performing maintenance or running the galley.

CAPABILITIES

"F" = "Full" The capability is to be fully achieved. For operational functions (watches), this means that installed equipment or systems will be fully manned to design capability. For support functions, sufficient manning is provided to ensure effective accomplishment of all included tasks. The achievement is to be sustained for the duration of the condition unless modified by an "A" or "E."

"L" = "Limited" The capability is to be only partially realized. (Note: "P" for "Partial" is no longer a symbol.). Even though only limited capability is realized, it is to be sustained for the duration of the condition unless modified by an "A" or "E." A limiting statement specifying the limitation must support every "L".

MODIFIERS

"A" = "Augmentation" The capability is to be either fully or partially achieved for a **limited time** during the condition. The capability is achieved by using off-watch or off-duty personnel to achieve the required degree of capability. This symbol is always associated with an "F" or "L" and establishes a requirement for personnel to be trained, available and on call to augment existing watch stations as required.

"E" = "Special Team" The capability is to be either fully or partially achieved for a **limited time** during the condition. The capability is achieved by using off-watch special teams or details. This symbol is always associated with an "F" or "L" and denotes a capability that does not require continuous watch manning. Teams and details as set may either supplement or replace all or part of the existing watch organization. Man overboard and replenishment details are two examples.

| | | CAPABILITY | |
|----------|--------|---|---|
| MODIFIER | | FULL | LIMITED |
| | None ➤ | Manned to design capacity for duration of condition | Manned to less than design capacity for duration of condition |
| | A ➤ | Temporarily manned to design capacity using off-watch personnel | Temporarily manned to less than design capacity using off-watch personnel |
| | E ➤ | Temporarily manned to design capacity using a special team | Temporarily manned to less than design capacity using a special team |

Ship's Company and External Personnel Resources. Normally, using an "A" or an "E" requires no embellishing statement as their meanings are predefined. However, in the case of the FFG as well as other classes that routinely embark external resources, the meaning may not be clear as to whether ship's company or the external resource should provide the augmentation.

This ROC/POE instruction shows:

- If the resource is ship's company, no elaboration or statement is provided.
- If the resource is external for "F," a Note is added to the ROC stating the resource.
- If the resource is external for "L," the resource is added to the capability limiting statement.

REQUIRED OPERATIONAL CAPABILITIES

| LCS XXCLASS | | I | III | IV | V |
|-------------------------------|--|----------|------------|-----------|----------|
| ANTI-AIR WARFARE (AAW) | | | | | |
| AAW 1 | PROVIDE AIR DEFENSE INDEPENDENTLY OR IN COOPERATION WITH OTHER FORCES. | | | | |
| AAW 1.2 | <p>Conduct air self-defense using missile, gun, electronic or physical systems (e.g., chaff, flares).</p> <p>NOTE: No missile capabilities.</p> <p>III(L) - Man MK 92 FCS and 76 mm mount (without magazine crew). CIWS operated by WCC Operator.</p> <p>IV, V(L) - Plan and train.</p> | F | L | L | L |
| AAW 1.3 | <p>Coordinate air defense planning and act as AAW Commander (AAWC) for joint/BG/convoy/expeditionary/amphibious/replenishment operations.</p> <p>NOTE: Functioning as AAWC may limit capabilities in other primary warfare areas.</p> <p>I, III(L) - Capable of functioning as AAWC for a limited duration in emergent situations for a small area/group operations only.</p> <p>IV, V(L) - Plan and train.</p> | L | L | L | L |
| AAW 1.7 | <p>Engage air targets during joint/group operations.</p> <p>NOTE: No missile capabilities.</p> <p>III(L) - Man MK 92 FCS and 76mm mount (without magazine crew). CIWS operated by WCC Operator.</p> <p>IV, V(L) - Plan and train.</p> | F | L | L | L |
| AAW 1.9 | <p>Plan/direct engagement of targets during group operations in cooperation with naval/joint/combined forces.</p> <p>NOTE: Plan/direct engagement of targets of a small area/group operations may limit capabilities in other primary warfare areas.</p> <p>I, III(L) – Capable of functioning as AAWC for a limited duration in emergent situations for a small area/group operations only.</p> <p>IV, V(L) - Plan and train.</p> | L | L | L | L |

| LCS XXCLASS | | | I | III | IV | V |
|---|---|--|---|-----|-----|---|
| AAW 6 DETECT, IDENTIFY AND TRACK AIR TARGETS. | | | | | | |
| AAW 6.1 | Measure aircraft altitude by fade chart. V(L) - Plan and train. | | F | F | F | L |
| AAW 6.2 | Recognize by sight friendly and enemy aircraft. III, IV(L) – Capability provided by bridge watch team and aft lookout. | | F | L | L | |
| AAW 6.3 | Maintain an accurate air plot. V(L) - Plan and train. | | F | F | F | L |
| AAW 6.4 | Measure aircraft altitude by radar. | | F | F | F | |
| AAW 6.5 | Detect, identify and track air targets with radar and/or cooperative sensors. | | F | F | F | |
| AAW 6.6 | Acquire and track air targets with Gunfire Control Systems/Missile Fire Control Systems (GFCS/MFCS). NOTE: Missile Fire Control System not functional. V(L) - Plan and train. | | F | F | F/A | L |
| AAW 6.13 | Identify air targets as friendly/non-friendly using transponder interrogation equipment. V(L) – Plan and train. | | F | F | F | L |
| AAW 9 ENGAGE AIRBORNE THREATS USING SURFACE-TO-AIR ARMAMENT. | | | | | | |
| AAW 9.4 | Engage low/medium altitude airborne threats with gunfire. III(L) - Man MK 92 FCS and 76 mm mount (without magazine crew). CIWS operated by WCC Operator. IV, V(L) - Plan and train. | | F | L | L | L |
| AAW 9.5 | Engage airborne threats using installed anti-air weapons. NOTE: No missile capabilities. III(L) - Man MK 92 FCS and 76 mm mount (without magazine crew). CIWS operated by WCC Operator. IV, V(L) - Plan and train. | | F | L | L | L |
| AAW 9.6 | Engage airborne threats utilizing soft-kill weapons systems (i.e., chaff/decoys). III(L) – MK 50 DLS not manned. IV, V(L) - Plan and train. | | F | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--|---|-----|-----|----|---|
| AAW 9.7 | Engage airborne threats using portable missile systems. NOTE: Only when portable missile system detachment embarked. IV, V(L) - Plan and train. | F/E | F/E | L | L |
| AAW 11 REPAIR OWN UNIT'S AAW EQUIPMENT. | | L | F | F | F |
| NOTE: During Condition III and IV, full capability provided by off-watch personnel. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | | | | | |
| AAW 12 CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S AAW CAPABILITIES. | | L | L | L | L |
| I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. III, IV(L) - Man Combat System Operational Sequencing System (CSOSS) watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor. V(L) - Plan and train. | | | | | |
| AMPHIBIOUS WARFARE (AMW) | | | | | |
| AMW 12 PROVIDE AIR CONTROL AND COORDINATION OF AIR OPERATIONS IN THE AOA. | | | | | |
| AMW 12.2 | Provide coordination of AAW, ASU and ASW air assets for protection of the force in the AOA. NOTE: Functioning as AAWC may limit capabilities in other primary warfare areas. I, III(L) - Capable of functioning as AAWC for a limited duration in emergent situations for a small area/group operations only. IV, V(L) - Plan and train. | L | L/A | L | L |

| LCS XXCLASS | | I | III | IV | V |
|---|---|------------|------------|------------|----------|
| AMW 12.3 | <p>Control search and rescue (SAR) air operations in the AOA.</p> <p>NOTE: Functioning as AAWC may limit capabilities in other primary warfare areas.</p> <p>I, III(L) - Capable of functioning as AAWC for a limited duration in emergent situations for a small area/group operations only.</p> <p>IV, V(L) - Plan and train.</p> | L | L/A | L | L |
| AMW 12.4 | <p>Coordinate air assets in the AOA with Supporting Arms to prevent conflicting actions.</p> <p>NOTE: Functioning as AAWC may limit capabilities in other primary warfare areas.</p> <p>I, III(L) - Capable of functioning as AAWC for a limited duration in emergent situations for a small area/group operations only.</p> <p>IV, V(L) - Plan and train.</p> | L | L/A | L | L |
| AMW 15 PROVIDE AIR OPERATIONS TO SUPPORT AMPHIBIOUS OPERATIONS | | | | | |
| AMW 15.1 | <p>Launch fixed wing and/or rotary wing aircraft.</p> <p>NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as Own Unit Support (OUS) and only supports logistic helicopter operations.</p> | F/E | F/E | F/E | |
| AMW 15.2 | <p>Recover fixed wing and/or rotary wing aircraft.</p> <p>NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations.</p> | F/E | F/E | F/E | |
| AMW 15.9 | <p>Load/unload ordnance within required aircraft turnaround times.</p> <p>NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel.</p> <p>IV(L) - Plan and train.</p> | F/E | F/E | L/E | |

| LCS XXCLASS | | I | III | IV | V |
|---|--|----------|------------|-----------|----------|
| AMW 20 REPAIR OWN UNIT'S AMW EQUIPMENT. | | L | F | F | F |
| <p>NOTE: During Condition III and IV, full capability provided by off-watch personnel.</p> <p>I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space.</p> | | | | | |
| AMW 43 CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S AMW CAPABILITIES. | | L | L | L | L |
| <p>I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space.</p> <p>III, IV(L) - Man Combat System Operational Sequencing System (CSOSS) watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor.</p> <p>V(L) - Plan and train.</p> | | | | | |
| ANTISURFACE SHIP WARFARE (ASU) | | | | | |
| ASU 1 USING ANTISURFACE ARMAMENTS, ENGAGE SURFACE THREATS. | | | | | |
| ASU 1.5 | <p>Engage surface ships with intermediate caliber gunfire (i.e., 3"/75, 76mm).</p> <p>III(L) - Man 76 mm mount (without magazine crew).</p> <p>IV, V(L) - Plan and train.</p> | F | L | L | L |
| ASU 1.6 | <p>Engage surface ships with minor caliber gunfire (i.e., 25mm, 20mm, .50 cal.)</p> <p>NOTE: Requires securing personnel from other battle stations.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |
| ASU 1.9 | <p>Engage surface ships with small arms gunfire.</p> <p>NOTE: Requires securing personnel from other battle stations.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|---|----------|------------|-----------|----------|
| ASU 1.10 | <p>Conduct close-in surface self-defense using crew operated machine guns (i.e., 25mm, 20mm, .50 cal, .30 cal).</p> <p>NOTE: Requires securing personnel from other battle stations.</p> <p>III(L) – Man self-defense weapons by using off-watch personnel or stand down other non-essential functions.</p> <p>IV, V(L) - Plan and train.</p> | F | L/E | L | L |
| ASU 1.11 | <p>Employ self-defense torpedo countermeasures using:</p> <p>(a) NIXIE (zz) Other - LEAD/ADC's</p> <p>NOTE: Streaming and retrieval of NIXIE performed by standing down other Condition I watch stations or using off-watch personnel during Condition III.</p> <p>IV, V(L) - Plan and train.</p> | F | F/A | L | L |
| ASU 1.12 | <p>Plan/direct engagement of surface threats.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |
| ASU 1.14 | <p>Direct embarked or non-organic armed helo to engage surface ships.</p> <p>IV(L) - Plan and train.</p> | F | F | L | |
| ASU 2 | ENGAGE SURFACE TARGETS IN COOPERATION WITH OTHER FORCES. | | | | |
| ASU 2.1 | <p>Conduct ASU as a member of a multiship CSG, SAG, URG, or amphibious force [e.g., ESG, ARG(MEU)].</p> <p>NOTE: Limited to gun and helo capabilities.</p> <p>III, IV(L) – Man MK 92 FCS and 76mm Gun Mount (without magazine crew).</p> <p>V(L) - Plan and train.</p> | F | L | L | L |
| ASU 2.2 | <p>Conduct ASU to support surface forces.</p> <p>NOTE: Limited to gun and helo capabilities.</p> <p>III, IV(L) – Man MK 92 FCS and 76mm Gun Mount (without magazine crew).</p> <p>V(L) - Plan and train.</p> | F | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------|---|---|-----|-----|---|
| ASU 2.3 | Engage surface targets within assigned antisurface sector. NOTE: Limited to gun and helo capabilities. III, IV(L) – Man MK 92 FCS and 76mm Gun Mount (without magazine crew). V(L) - Plan and train. | F | L | L | L |
| ASU 2.5 | Plan/direct engagement of surface targets during group operations by surface, subsurface and/or air assets or in coordination with naval/joint/combined forces. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 3 | PROVIDE ASU DEFENSE OF A GEOGRAPHICAL AREA (E.G., AOA, BARRIER) INDEPENDENTLY OR IN COOPERATION WITH OTHER FORCES. | | | | |
| ASU 3.1 | Provide ASU defense of a geographic area. NOTE: Limited to gun and helo capabilities. III, IV(L) – Man MK 92 FCS and 76mm Gun Mount (without magazine crew). V(L) - Plan and train. | F | L | L | L |
| ASU 4 | DETECT, IDENTIFY, LOCALIZE AND TRACK SURFACE SHIP TARGETS. | | | | |
| ASU 4.1 | Detect, localize and track surface contacts with radar. V(L) - Plan and train. | F | F | F | L |
| ASU 4.3 | Detect, localize and track surface contacts with active sonar. V(L) - Plan and train. | F | F | F/A | L |
| ASU 4.4 | Detect, identify, classify and track surface contacts visually. III, IV(L) – Capability provided by bridge watch team and aft lookout. | F | L | L | |
| ASU 4.6 | Detect, identify, classify and track surface contacts by ESM. III(L) - ESM Operator only. System operation primarily for Anti-Ship Cruise Missile (ASCM) defense. IV, V(L) - Plan and train. | F | L | L | L |
| ASU 4.7 | Identify surface contacts. NOTE: Full capability requires augmentation from off-watch personnel. V(L) - Plan and train. | F | F/A | F/A | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------|--|---|-----|-----|---|
| ASU 4.9 | Detect, localize, classify and track surface contacts with tactical towed arrays. NOTE: TMA requires augmentation from off-watch personnel. V(L) - Plan and train. | F | F/E | F/E | L |
| ASU 5 | CONDUCT ACOUSTIC WARFARE (AW) AGAINST SURFACE CONTACTS. | | | | |
| ASU 5.1 | Employ Acoustic Warfare Support Measures (ACSM) against surface contacts. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 5.2 | Employ Acoustic Countermeasures (ACM) against surface contacts. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 5.4 | Plan/direct employment of ACSM, ACM and/or Acoustic Counter-countermeasures (ACCM) against surface contacts. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 6 | DISENGAGE, EVADE AND AVOID SURFACE ATTACK. | | | | |
| ASU 6.1 | Employ countermeasures. (a) Surface decoys (b) Lighting configuration (c) Hull markings III, IV(L) – MK 50 DLS not manned. V(L) - Plan and train. | F | L | L | L |
| ASU 6.2 | Employ evasion techniques. V(L) - Plan and train. | F | F | F | L |
| ASU 6.3 | Employ EMCON procedures. V(L) - Plan and train. | F | F | F | L |
| ASU 6.4 | Detect, identify and track surface targets to perform contact avoidance using Electronic Support Measures (ESM) or Radio Direction Finding (RDF/Combat DF/OUTBOARD). III(L) - ESM Operator only. System operation primarily for ASCM defense. IV, V(L) - Plan and train. | F | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------|--|-----|-----|-----|---|
| ASU 8 | PROVIDE AIR OPERATIONS TO SUPPORT SURFACE ATTACKS. | | | | |
| ASU 8.1 | <p>Launch fixed and/or rotary wing aircraft.</p> <p>NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations.</p> | F/E | F/E | F/E | |
| ASU 8.2 | <p>Recover fixed and/or rotary wing aircraft.</p> <p>NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations.</p> | F/E | F/E | F/E | |
| ASU 8.5 | <p>Provide conventional ordnance within required aircraft turnaround times.</p> <p>NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel.</p> <p>IV(L) - Plan and train.</p> | F/E | F/E | L/E | |
| ASU 8.8 | <p>Control aircraft under all conditions of active jamming.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |
| ASU 8.9 | <p>Load/unload ordnance within required aircraft turnaround times.</p> <p>NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel.</p> <p>IV(L) - Plan and train.</p> | F/E | F/E | L/E | |
| ASU 8.10 | <p>Provide air strike control to direct or assist attack aircraft.</p> <p>NOTE: Function performed by Antisubmarine Tactical Air Controller (ASTAC) and will require standing down other air control functions.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |
| ASU 8.11 | <p>Conduct Precision Radar Controlled Approaches (PRCA) for aircraft under all weather conditions.</p> <p>V(L) - Plan and train.</p> | F | F | F/A | L |
| ASU 8.12 | <p>Plan/direct air operations to support surface attacks.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|---------------|---|-----|-----|-----|---|
| ASU 8.13 | Control fixed wing or rotary wing ASU aircraft during coordinated search or attack operations including Over the Horizon Targeting (OTHT). NOTE: Function performed by ASTAC and will require standing down other air control functions. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 8.14 | Render safe hazardous explosive ordnance during flight operations and ordnance loading/unloading evolutions. NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel. IV(L) - Plan and train. | F/E | F/E | L/E | |
| ASU 8.15 | Provide air strike control to direct or assist naval, combined or joint attack aircraft. NOTE: Function performed by ASTAC and will require standing down other air control functions. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 10 | CONDUCT AIRBORNE OPERATIONS TO SUPPORT SURFACE ATTACK OPERATIONS. | | | | |
| ASU 10.5 | Provide OTHT information to support air ASU operations. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 10.6 | Plan/direct airborne operations to support group or naval/joint/combined ASU operations. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 11 | PERFORM DUTIES OF AIRCRAFT CONTROL UNIT (ACU) FOR AIRCRAFT INVOLVED IN ASU OPERATIONS. | | | | |
| ASU 11.1 | Perform aircraft control for aircraft involved in ASU operations. NOTE: Function performed by ASTAC and will require standing down other air control functions. V(L) - Plan and train. | F | F | F | L |
| ASU 12 | SUPPORT/CONDUCT ESCORTING AND INDEPENDENT ASU OPERATIONS. | | | | |
| ASU 12.1 | Conduct ASU operations while escorting a convoy and/or URG. NOTE: Limited to gun and helo capabilities. IV, V(L) - Plan and train. | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|------------------------------------|---|----------|------------|-----------|----------|
| ASU 12.2 | Conduct ASU operations while escorting an amphibious force [e.g., ESG, ARG(MEU)]. NOTE: Limited to gun and helo capabilities. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 12.3 | Conduct independent ASU operations. NOTE: Limited to gun and helo capabilities. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 13 | CONDUCT PREATTACK DECEPTION IN SUPPORT OF ASU OPERATIONS. | | | | |
| ASU 13.1 | Perform preattack deception in support of ASU operations. IV, V(L) - Plan and train. | F | F | L | L |
| ASU 14 | REPAIR OWN UNIT'S ASU EQUIPMENT. NOTE: During Condition III and IV, full capability provided by off-watch personnel. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | L | F | F | F |
| ASU 17 | CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S ASU CAPABILITIES. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. III, IV(L) - Man CSOSS watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor. V(L) - Plan and train. | L | L | L | L |
| ANTISUBMARINE WARFARE (ASW) | | | | | |
| ASW 1 | PROVIDE ASW DEFENSE FOR SURFACE FORCES, GROUPS AND UNITS. | | | | |
| ASW 1.1 | Defend a convoy (military or mercantile). IV, V(L) - Plan and train. | F | F | L | L |
| ASW 1.2 | Defend a BG or task force. IV, V(L) - Plan and train. | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--|--|----------|------------|-----------|----------|
| ASW 1.3 | Defend amphibious forces or an URG. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 1.5 | Operate in associated support of surface forces. (a) Picket (b) Choke point patrol (c) Barrier patrol IV, V(L) – Plan and train. | F | F | L | L |
| ASW 1.6 | Operate independently as a Search and Attack Unit (SAU). IV, V(L) - Plan and train. | F | F | L | L |
| ASW 2 PROVIDE ASW DEFENSE OF A GEOGRAPHIC AREA. | | | | | |
| ASW 2.1 | Operate as an open ocean or choke point ASW search/barrier unit. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 2.3 | Operate as an AOA ASW defense barrier unit. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 2.4 | Defend a group or groups operating in a fixed geographic area (e.g., AOA). IV, V(L) - Plan and train. | F | F | L | L |
| ASW 2.5 | Sanitize an area of threat submarines in preparation for use by a surface force. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 2.8 | Operate as a littoral water ASW barrier. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 2.9 | Conduct shallow water ASW operations (less than 100 fathoms). IV, V(L) - Plan and train. | F | F | L | L |
| ASW 3 CONDUCT INDEPENDENT ASW OPERATIONS. | | | | | |
| ASW 3.1 | Support/conduct area search and destroy operations. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 3.2 | Support/conduct vectored intercept operations. IV, V(L) - Plan and train. | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------|---|-----|-----|-----|---|
| ASW 5 | PROVIDE FOR AIR OPERATIONS IN SUPPORT OF AIRBORNE ANTISUBMARINE OPERATIONS. | | | | |
| ASW 5.1 | Launch fixed wing aircraft and/or rotary wing aircraft. NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations. | F/E | F/E | F/E | |
| ASW 5.2 | Recover fixed wing aircraft and/or rotary wing aircraft. NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations. | F/E | F/E | F/E | |
| ASW 5.4 | Provide conventional ordnance within required aircraft turnaround times. NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel. IV(L) - Plan and train. | F/E | F/E | L/E | |
| ASW 5.6 | Conduct operations during all EMCON conditions. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 5.7 | Load/unload ordnance within required aircraft turnaround times. NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel. IV(L) - Plan and train. | F/E | F/E | L/E | |
| ASW 5.8 | Control aircraft under all conditions of active jamming. V(L) - Plan and train. | F | F | F | L |
| ASW 5.13 | Render safe hazardous explosive ordnance during flight operations and ordnance loading/unloading evolutions NOTE: Ship's force not certified for aviation ordnance handling; requires aviation detachment personnel. IV(L) - Plan and train. | F/E | F/E | L/E | |
| ASW 5.14 | Conduct PRCA for embarked/controlled fixed wing aircraft or helos under all weather conditions. V(L) - Plan and train. | F | F | F/A | L |

| LCS XXCLASS | | | I | III | IV | V |
|--------------|--|--|---|-----|-----|---|
| ASW 6 | ENGAGE SUBMARINES INDEPENDENTLY OR IN COOPERATION WITH OTHER FORCES. | | | | | |
| ASW 6.1 | Operate as a member of a multiship SAU. IV, V(L) - Plan and train. | | F | F | L | L |
| ASW 6.2 | Operate as a member of a combined surface and aviation SAU. IV, V(L) - Plan and train. | | F | F | L | L |
| ASW 6.4 | Detect, localize and track subsurface contacts with active sonar. V(L) - Plan and train. | | F | F | F | L |
| ASW 6.5 | Detect, localize, classify and track subsurface contacts with passive sonar. V(L) - Plan and train. | | F | F | F | L |
| ASW 6.6 | Detect, localize and track subsurface contacts with active sonobuoys. IV, V(L) - Plan and train. | | F | F | L | L |
| ASW 6.7 | Detect, localize, classify and track subsurface contacts with passive sonobuoys. IV, V(L) - Plan and train. | | F | F | L | L |
| ASW 6.8 | Detect, localize and track subsurface contacts which are at periscope depth visually or with radar. III, IV(L) – Visual capability provided by the Bridge watch team and Aft lookout. V(L) - Plan and train. | | F | L | L | L |
| ASW 6.9 | Detect, localize, classify and track submarines assisted by real time passive acoustic analysis. NOTE: TMA requires augmentation from off-watch personnel. V(L) - Plan and train. | | F | F/E | F/E | L |
| ASW 6.10 | Classify subsurface contacts. V(L) - Plan and train. | | F | F | F | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|--|----------|------------|------------|----------|
| ASW 6.12 | <p>Detect, localize, classify and track subsurface contacts with Tactical Towed Arrays.</p> <p>NOTE: TMA requires augmentation from off-watch personnel.</p> <p>V(L) - Plan and train.</p> | F | F/E | F/E | L |
| ASW 6.14 | <p>Detect, identify, classify and track subsurface contacts that are at periscope depth by ESM.</p> <p>III(L) - EW Supervisor and ESM Operator positions only. Location and targeting require TMA augmentation.</p> <p>IV(L) - ESM Operator only.</p> <p>V(L) - Plan and train.</p> | F | L | L | L |
| ASW 7 | ATTACK SUBMARINES WITH ANTISUBMARINE ARMAMENT. | | | | |
| ASW 7.6 | <p>Attack with torpedoes.</p> <p>NOTE: Full capability for torpedo attack is provided by on-call TM with SVTT loaded and charged.</p> <p>IV, V(L) - plan and train.</p> | F | F | L | L |
| ASW 7.9 | <p>Attack with guns.</p> <p>III(L) - Man MK 92 FCS and 76mm mount (without gun or magazine crew).</p> <p>IV, V(L) - Plan and train.</p> | F | L | L | L |
| ASW 7.11 | <p>Attack with conventional air-to-surface ordnance.</p> <p>I, III(L) - Direct armed helo or fixed-wing aircraft.</p> <p>IV, V(L) - Plan and train.</p> | L | L | L | L |
| ASW 7.12 | <p>Plan/direct attack of submarines.</p> <p>IV, V(L) - Plan and train.</p> | F | F | L | L |
| ASW 8 | DISENGAGE, EVADE, AVOID AND DECEIVE SUBMARINES. | | | | |
| ASW 8.1 | <p>Employ torpedo countermeasures and evasion techniques including:</p> <p>(a) NIXIE</p> <p>(zz) Other - LEAD/ADC's</p> <p>NOTE: Streaming and retrieval of NIXIE performed by standing down other Condition I watch stations or using off-watch personnel during Condition III.</p> <p>IV, V(L) - Plan and train.</p> | F | F/A | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|---|----------|------------|-----------|----------|
| ASW 8.2 | Employ ACM against submarines. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 8.3 | Employ ACCM against submarines. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 8.4 | Conduct deception operations in support of ASW operations. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 9 | REPAIR OWN UNIT'S ASW EQUIPMENT. NOTE: During condition III and IV, full capability provided by off-watch personnel. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | L | F | F | F |
| ASW 10 | PERFORM DUTIES OF AIRCRAFT CONTROL UNIT (ACU) FOR AIRCRAFT INVOLVED IN ANTISUBMARINE OPERATIONS (REQUIRES ANTISUBMARINE AIR CONTROLLERS (ASACS)). | | | | |
| ASW 10.1 | Control fixed wing and/or rotary wing ASW aircraft in conjunction with coordinated search and/or attack operations. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 10.2 | Control helicopter screen. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 10.3 | Provide positive and/or advisory control of ASW aircraft. IV, V(L) - Plan and train. | F | F | L | L |
| ASW 10.4 | Function as MPA Control Unit (MPACU). IV, V(L) - Plan and train. | F | F | L | L |
| ASW 13 | CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S ASW CAPABILITIES. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. III, IV(L) - Man CSOSS watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor. V(L) - Plan and train. | L | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|---|---|---|-----|-----|---|
| COMMAND AND CONTROL AND COMMUNICATIONS (CCC) | | | | | |
| CCC 2 | COORDINATE AND CONTROL THE OPERATIONS OF THE TASK ORGANIZATION OR FUNCTIONAL FORCE TO CARRY OUT ASSIGNED MISSIONS. | | | | |
| | NOTE: Concurrent assignment of multiple Commander functions is not recommended because ship is not configured for embarked staff. | | | | |
| CCC 2.1 | Coordinate the reconnaissance of multiple surface, subsurface and/or air contacts. V(L) - Plan and train. | F | F | F/A | L |
| CCC 2.2 | Function as AAWC for force or sector. NOTE: Functioning as AAWC may limit capabilities in other primary warfare areas. I, III(L) - Capable of functioning as AAWC for a limited duration in emergent situations for a small area/group operations only. IV, V(L) - Plan and train. | L | L | L | L |
| CCC 2.3 | Function as ASW commander (ASWC) for force or sector. I, III(L) - Can accomplish only for short periods of time if assigned other Command/Coordination responsibilities. IV, V(L) - Plan and train. | L | L/A | L | L |
| CCC 2.4 | Function as SAU or SAG commander. IV, V(L) - Plan and train. | F | F | L | L |
| CCC 2.5 | Operate as contact area commander to coordinate multitype search and attack operations. IV, V(L) - Plan and train. | F | F | L | L |
| CCC 2.6 | Function as force or sector Officer in Tactical Command (OTC)/Composite Warfare Commanders (CWC) (or alternate) to coordinate and control BG/task force operations. I, III(L) - Can accomplish only for short periods of time if assigned other Command/Coordination responsibilities. IV, V(L) - Plan and train. | L | L/A | L | L |
| CCC 2.8 | Function as on-scene commander for a SAR operation. V(L) - Plan and train. | F | F/A | F/A | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|--|----------|------------|------------|----------|
| CCC 2.11 | Control close air support aircraft in support of amphibious operations in coordination with other supporting arms. NOTE: Function performed by ASTAC and will require standing down other air control functions. IV, V(L) - Plan and train. | F | F | L | L |
| CCC 2.12 | Coordinate and control air SAR operations in the AOA. I, III(L) - Back up TACGRU or TACRON. IV, V(L) - Plan and train. | L | L | L | L |
| CCC 2.15 | Function as one or more of the following coordinators for force or sector. (d) Screen coordinator (SC) (e) Electronic warfare coordinator (EWC) (f) Force air track coordinator (g) Force surface track coordinator (FSTC) (h) Force track coordinator (FTC) (j) Force OTH track coordinator (FOTC) (n) Helicopter element command (HEC) I, III, IV(L) - Unable to perform all functions simultaneously. V(L) - Plan and train. | L | L/A | L/A | L |
| CCC 2.16 | Assist in the planning of AAW, ASU and ASW for the coordination of air operations in the AOA. | F | F | F | F |
| CCC 2.18 | Function as an Anti-Surface Warfare Commander (ASUWC) for force or sector. I, III(L) - Can accomplish only for short periods of time if assigned other Command/Coordination responsibilities. IV, V(L) - Plan and train. | L | L/A | L | L |
| CCC 3 | PROVIDE OWN UNIT'S COMMAND AND CONTROL FUNCTIONS. | | | | |
| CCC 3.1 | Maintain a CIC or CDC capable of collecting, processing, displaying, evaluating and disseminating tactical information. | F | F | F | F |
| CCC 3.3 | Provide all personnel services, programs and facilities to safeguard classified material and information. | F | F | F | F |
| CCC 3.4 | Carry out emergency destruction of classified material and equipment rapidly and efficiently. III, IV, V(L) - Plan and train. | F | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|--|----------|------------|-----------|----------|
| CCC 3.5 | Employ Identification Friend or Foe/Selective Identification Feature (IFF/SIF) including secure IFF Mode 4. V(L) - Plan and train. | F | F | F | L |
| CCC 3.7 | Maintain a CIC or CDC capable of supporting a TAO. | F | F | F | F |
| CCC 4 | MAINTAIN NAVY TACTICAL DATA SYSTEM (NTDS) OR DATA LINK CAPABILITY. | | | | |
| CCC 4.3 | Transmit/receive and support Link 11. V(L) - Plan and train. | F | F | F | L |
| CCC 4.4 | Receive data link information from airborne ASW aircraft. V(L) - Plan and train. | F | F | F | L |
| CCC 4.5 | Receive and process data link information from Satellite Communication (SATCOM). V(L) - Plan and train. | F | F | F | L |
| CCC 4.6 | Receive and process data link information from high frequency (HF) systems. V(L) - Plan and train. | F | F | F | L |
| CCC 4.11 | Receive data link tracks from airborne AAW aircraft. V(L) - Plan and train. | F | F | F | L |
| CCC 4.12 | Manage, coordinate and direct air assets (airwing, group or joint aircraft) in ASUW/STW using data links. V(L) - Plan and train. | F | F | F | L |
| CCC 4.13 | Transmit/Receive data via Global Command and Control System - Maritime (GCCS-M). V(L) - Plan and train. | F | F | F | L |
| CCC 6 | PROVIDE COMMUNICATIONS FOR OWN UNIT. | | | | |
| CCC 6.1 | Maintain tactical voice communications. V(L) - Communications on harbor common and other voice circuits as directed. | F | F | F | L/A |
| CCC 6.2 | Maintain visual communications. I(L) - Work one contact and maintain log. III, IV(L) – Initial limited response to visual signal provided by Bridge area watch team. Experienced visual specialist on-call. V(L) - Work one contact for administrative traffic. | L | L | L | L/A |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|---|----------|------------|-----------|----------|
| CCC 6.3 | Maintain multichannel cryptographically covered teletype/data receive circuits. | F | F | F | |
| CCC 6.5 | Maintain full duplex cryptographically covered HF teletype/data circuits (simplex for submarines and patrol combatants). | F | F | F | F/A |
| CCC 6.6 | Process messages. | F | F | F | F |
| CCC 6.7 | Maintain underwater communications. | F | F | F | |
| CCC 6.8 | Maintain automatic relay communications. | F | F | F | F/A |
| CCC 6.10 | Maintain voice/teletype/computer data cryptographically covered satellite communication circuits. | F | F | F | F/A |
| CCC 6.11 | Establish and maintain fixed combat communications and relay support for NSW operations. IV, V(L) - Plan and train. | F | F | L | L |
| CCC 6.12 | Maintain internal communications systems. | F | F | F | F |
| CCC 6.13 | Maintain capability for Low Probability of Intercept (LPI) HF communications. | F | F | F | |
| CCC 6.14 | Maintain capability for LPI satellite communications. | F | F | F | |
| CCC 6.15 | Maintain frequency database. | F | F | F | F |
| CCC 6.19 | Maintain tactical, secure voice or data communications. | F | F | F | F/A |
| CCC 6.21 | Provide Officer-in-Tactical Command Information Exchange Subsystem (OTCIXS). | F | F | F | F/A |
| CCC 9 | RELAY COMMUNICATIONS. | | | | |
| CCC 9.1 | Relay visual communications. I(L) - Work one contact and maintain log. III, IV(L) - Initial limited response to visual signal provided by Bridge area watch team. Experienced visual specialist on-call. V(L) - Work one contact for administrative traffic. | L | L | L | L/A |
| CCC 9.2 | Relay acoustic communications. | F | F | | |
| CCC 9.3 | Relay electronic communications. V(L) - Capability limited to single point-to-point circuit. | F | F/A | F/A | L/A |
| CCC 11 | CONDUCT ONE OR MORE OF THE FOLLOWING CONTROL FUNCTIONS: | | | | |
| CCC 11.1 | MPACU. IV, V(L) – Plan and train. | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--|---|----------|------------|-----------|----------|
| CCC 11.2 | Air Raid Reporting Control Ship (ARRCS). IV, V(L) – Plan and train. | F | F | L | L |
| CCC 11.3 | Aircraft Control Unit for AAW, ASW, ASU and/or STW. I, III(L) – Capabilities limited due to reduction of air controllers on board. IV, V(L) – Plan and train. | L | L/A | L | L |
| CCC 11.4 | Positive Identification Radar Advisory Zone (PIRAZ)/Strike Support Ship. IV, V(L) – Plan and train. | F | F | L | L |
| CCC 11.5 | NTDS Link 11 Net Control Ship/Station (NCS). IV, V(L) – Plan and train. | F | F | L | L |
| CCC 19 | REPAIR OWN UNIT'S CCC EQUIPMENT. NOTE: During condition III and IV, full capability provided by off-watch personnel. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | L | F | F | F |
| CCC 20 | CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S CCC CAPABILITIES. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. III, IV(L) - Man CSOSS watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor. V(L) - Plan and train. | L | L | L | L |
| COMMAND AND CONTROL WARFARE (C²W) AND INFORMATION WARFARE (IW) | | | | | |
| C²W 1 | CONDUCT ELECTRONIC WARFARE SUPPORT (ES) OPERATIONS. | | | | |
| C ² W 1.1 | Search for and intercept electromagnetic and directed energy signals and emissions. I, III, IV(L) - Location and targeting of non-communication emitters requires TMA/plotting team per C ² W 1.4. V(L) - Plan and train. | L | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|-------------------------|--|----------|------------|-----------|----------|
| C ² W 1.2 | Identify Command and Control (C ²) and weapons systems' signals. V(L) - Plan and train. | F | F | F | L |
| C ² W 1.3 | Identify threat platforms' communications and weapons signal sources. V(L) - Plan and train. | F | F | F | L |
| C ² W 1.4 | Provide location or targeting information of threat weapons/C ² /platforms/signal sources. I, III, IV(L) - TMA/plotting team personnel required for non-communication emitters only. V(L) - Plan and train. | L | L | L | L |
| C ² W 1.5 | Provide timely threat alert for actions involving Electronic Attack (EA), Electronic Protect (EP), EMCON, avoidance, deception and targeting. V(L) - Plan and train. | F | F | F | L |
| C ² W 1.6 | Conduct ES for self-defense. NOTE: Conduct EP and EA. IV, V(L) - Plan and train. | F | F | L | L |
| C ² W 1.8 | Identify and coordinate tactical C ² W information requirements and disseminate information derived from ES and other sources to CWC, warfare commanders and naval/combined/joint forces. V(L) - Plan and train. | F | F | F | L |
| C²W 2 | CONDUCT ELECTRONIC ATTACK (EA) OPERATIONS. | | | | |
| C ² W 2.2 | Conduct electronic jamming of target acquisition/target tracking/fire control/missile seeker radars. IV, V(L) - Plan and train. | F | F | L | L |
| C ² W 2.7 | Conduct electronic deception of target acquisition/target tracking/fire control/missile seeker radars. IV, V(L) - Plan and train. | F | F | L | L |
| C²W 3 | CONDUCT ELECTRONIC PROTECTION (EP) OPERATIONS. | | | | |
| C ² W 3.1 | Detect, identify, and protect against electronic jamming of electromagnetically controlled and/or dependent systems. IV, V(L) - Plan and train. | F | F | L | L |

| LCS XXCLASS | | I | III | IV | V |
|--------------------------|--|---|-----|----|---|
| C ² W 3.2 | Detect, identify and protect against electronic deception of electromagnetically controlled and/or dependent systems. IV, V(L) - Plan and train. | F | F | L | L |
| C²W 4 | PLAN AND IMPLEMENT OPERATIONS SECURITY (OPSEC) MEASURES. | | | | |
| C ² W 4.1 | Implement appropriate/ directed electromagnetic/acoustic EMCON condition. | F | F | F | F |
| C ² W 4.2 | Transition rapidly from one EMCON condition to another. | F | F | F | F |
| C ² W 4.3 | Monitor own unit compliance with EMCON condition in effect. | F | F | F | F |
| C ² W 4.4 | Monitor task group/force compliance with EMCON condition in effect. I, III, IV(L) - Non-communication emitters only unless Combat-DF installed. V(L) - Plan and train. | L | L | L | L |
| C ² W 4.9 | Manage electromagnetic/acoustic and/or other emissions to minimize mutual interference among friendly systems. V(L) - Plan and train. | F | F | F | L |
| C ² W 4.11 | Plan, coordinate and control implementation of OPSEC measures. V(L) - Plan and train. | F | F | F | L |
| C²W 14 | REPAIR OWN UNIT'S C²W EQUIPMENT. NOTE: During condition III and IV, full capability provided by off-watch personnel. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | L | F | F | F |
| C²W 16 | CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S C²W CAPABILITIES. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. III, IV(L) - Man CSOSS watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor. V(L) - Plan and train. | L | L | L | L |

| LCS XXCLASS | | | I | III | IV | V |
|---------------------------------------|---|--|-----|-----|-----|---|
| FLEET SUPPORT OPERATIONS (FSO) | | | | | | |
| FSO 1 | REPAIR AND OVERHAUL SHIPS, AIRCRAFT AND ASSOCIATED EQUIPMENT. | | | | | |
| FSO 1.4 | Provide inspection, test, calibration and repair services for: (k) Test measurement and diagnostic equipment. III, IV, V(L) - Requirement applies to own ship's equipment only. | | | L | L | L |
| FSO 4 | CONDUCT IN-FLIGHT REFUELING. | | | | | |
| FSO 4.1 | Provide day/night in-flight refueling for helicopters. NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations. | | F/E | F/E | F/E | |
| FSO 6 | SUPPORT/CONDUCT SEARCH AND RESCUE (SAR) OPERATIONS IN A COMBAT/NONCOMBAT ENVIRONMENT. | | | | | |
| FSO 6.1 | Support/conduct combat/noncombat SAR operations by fixed or rotary wing aircraft. | | F | F | F | |
| FSO 6.2 | Conduct combat/noncombat SAR operations by surface ships. | | F | F | F | |
| FSO 6.4 | Recover man overboard. NOTE: During Condition I, search and recovery requires augmentation by securing other battle stations. During Condition III, search and recovery requires augmentation from off- watch personnel. | | F/E | F/E | F/E | F |
| FSO 6.5 | Support/perform planeguard/lifeguard functions. NOTE: During Condition I, search and recovery requires augmentation by securing other battle stations. During Condition III, search and recovery requires augmentation from off- watch personnel. | | F/E | F/E | F/E | |
| FSO 6.6 | Conduct search and rescue operations (including operations involving submarine disasters/rescues). NOTE: During Condition I, search and recovery requires augmentation by securing other battle stations. During Condition III, search and recovery requires augmentation from off- watch personnel. | | F/E | F/E | F/E | |
| FSO 6.7 | Conduct general surveillance. | | F | F | F | |
| FSO 6.8 | Acquire and display distress data. | | F | F | F | |
| FSO 6.9 | Report situation assessment. | | F | F | F | |

| LCS XXCLASS | | I | III | IV | V |
|---------------|---|---|-----|-----|---|
| | FSO 6.10 Coordinate SAR operations. | F | F | F | |
| | FSO 6.11 Conduct multi-unit SAR operations. | F | F | F | |
| FSO 9 | PROVIDE MEDICAL CARE TO ASSIGNED AND EMBARKED PERSONNEL. | | | | |
| | FSO 9.1 Conduct sick call. | | F | F | F |
| | FSO 9.4 Conduct basic ward care. I, III, IV(L) - For use in emergency cases where MEDEVAC is not possible or where return to duty can be expected in a short time. | L | L | L | |
| | FSO 9.5 Conduct sanitation and safety inspections. | | F | F | F |
| | FSO 9.6 Conduct occupational health/safety and preventive medicine programs and training using the following personnel: (a) Hospital corpsman | | F | F | F |
| | FSO 9.8 Conduct pharmacy services requiring the following personnel: (a) Hospital corpsman | | F | F | F |
| | FSO 9.9 Conduct associated administrative/maintenance services: (a) Maintain adequate medical supplies for appropriate level health care. (c) Provide patient/casualty administrative services. (d) Perform routine medical administrative services. | | F | F | F |
| | FSO 9.10 Conduct on-site emergency medical treatment during hazardous evolutions including flight quarters, underway replenishment/refueling and amphibious assault boat operations. | | F/A | F/A | |
| | FSO 9.17 Identify, equip and maintain suitable spaces to provide medical care. | F | F | F | F |
| | FSO 9.19 Provide medical care, triage and resuscitation commensurate with health care provider credentials using the following personnel: (a) Independent duty corpsman | F | F | F | F |
| FSO 10 | PROVIDE FIRST AID ASSISTANCE. | | | | |
| | FSO 10.1 Identify, equip and maintain appropriate first aid spaces. | F | F | F | F |
| | FSO 10.2 Train assigned and embarked personnel in first aid, self and buddy aid procedures. | | F | F | F |
| | FSO 10.3 Train stretcher-bearers. | | F | F | F |
| FSO 11 | PROVIDE TRIAGE OF CASUALTIES /PATIENTS. | | | | |
| | FSO 11.1 Identify, equip and maintain suitable triage spaces. | F | F | F | F |

| LCS XXCLASS | | I | III | IV | V |
|--------------------|--|----------|------------|------------|------------|
| FSO 11.2 | Train assigned and embarked personnel in triage care. | | F | F | F |
| FSO 11.4 | Train designated non-medical personnel to assist in triage management care for CBR contamination casualties. | | F | F | F |
| FSO 11.5 | Train designated non-medical personnel in CBR casualty decontaminated procedures. | | F | F | F |
| FSO 11.7 | Provide medical treatment for chemical, biological radiological casualties. I, III, IV, V(L) - Emergency cases where MEDEVAC is not possible or where return to duty can be expected in a short time. | L | L | L | L |
| FSO 12 | PROVIDE MEDICAL/SURGICAL TREATMENT FOR CASUALTIES/PATIENTS. | | | | |
| FSO 12.1 | Identify, equip and maintain suitable resuscitation spaces. | F | F | F | F |
| FSO 12.2 | Train assigned and embarked personnel in resuscitation. | | F | F | F |
| FSO 12.5 | Identify, equip and maintain suitable spaces for emergency minor surgery. | F | F | F | F |
| FSO 13 | PROVIDE MEDICAL, SURGICAL, POST-OPERATIVE AND NURSING CARE FOR CASUALTIES/PATIENTS. | | | | |
| FSO 13.2 | Provide hospital beds: (b) Ward I, III, IV(L) - For use in emergency cases where MEDEVAC is not possible or where return to duty can be expected in a short time. | L | L | L | |
| FSO 13.7 | Provide surgery by Primary Care Medical Officer. I, III, IV, V(L) - Medical Officer is reserve augmentation requirement. Supporting medical equipment and supplies must accompany doctor. Routine medical service during deployment is provided by independent duty corpsman. | L | L | L | L |
| FSO 20 | PROVIDE FLEET TRAINING SERVICES. | | | | |
| FSO 20.1 | Act as target for submarines. | | | F | |
| FSO 20.5 | Act as school ship for gunnery training. | | | F/A | F/A |
| FSO 20.6 | Act as delivery or receiving ship for underway replenishment training. | | | F/E | |
| FSO 20.8 | Recover exercise torpedoes/drones. | | | F/E | |
| FSO 20.67 | Act as school ship for ASW training. | | | F/A | F/A |
| FSO 20.68 | Act as school ship for engineering training. | | | F/A | F/A |

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|--------------------|--|--|---|-----|-----|---|
| FSO 51 | REPAIR OWN UNIT'S FSO-RELATED EQUIPMENT. | | L | F | F | F |
| | NOTE: During condition III and IV, full capability provided by on-call/off-watch personnel. | | | | | |
| | I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | | | | | |
| FSO 55 | MAINTAIN READINESS BY PROVIDING FOR TRAINING OF OWN UNITS PERSONNEL. | | | F | F | F |
| INTELLIGENCE (INT) | | | | | | |
| INT 1 | SUPPORT/CONDUCT INTELLIGENCE COLLECTION. | | | | | |
| | INT 1.1 | Support/conduct electronic intelligence information collection. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| | INT 1.2 | Support/conduct acoustic intelligence information collection. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| | INT 1.3 | Support/conduct imagery intelligence information collection. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| | INT 1.5 | Support/conduct radar intelligence information collection. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| | INT 1.7 | Collect remote sensor information. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| | INT 1.11 | Maintain radar scope photography capability. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| INT 2 | PROVIDE INTELLIGENCE. | | | | | |
| | INT 2.1 | Maintain intelligence summary plots on air, surface and subsurface activities. | F | F/A | F/A | L |
| | | V(L) - Plan and train. | | | | |
| | INT 2.2 | Evaluate and disseminate intelligence information. | F | F | F | L |
| | | V(L) - Plan and train. | | | | |

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|--------------------|--|----------|------------|-----------|----------|
| INT 2.4 | <p>Establish and maintain access to naval and national intelligence sources.</p> <p>I, III(L) – Only intelligence support is from GCCS-M and message traffic.</p> <p>IV, V(L) – Plan and train.</p> | L | L | L | L |
| INT 3 | CONDUCT SURVEILLANCE AND RECONNAISSANCE. | | | | |
| INT 3.2 | <p>Conduct overt surveillance and reconnaissance operations.</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 4 | CONDUCT OCEAN SURVEILLANCE OPERATIONS AGAINST TARGETS OF INTEREST. | | | | |
| INT 4.1 | <p>Detect and locate targets of interest.</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 4.2 | <p>Classify and identify targets of interest.</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 4.3 | <p>Track targets of interest.</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 5 | PROCESS OCEAN SURVEILLANCE INFORMATION. | | | | |
| INT 5.1 | <p>Integrate and correlate ocean surveillance information with other source information and intelligence</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 6 | CONDUCT SURFACE RECONNAISSANCE. | | | | |
| INT 6.1 | <p>Conduct surface patrols or barriers.</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 6.3 | <p>Conduct reconnaissance of surface forces.</p> <p>V(L) - Plan and train.</p> | F | F | F | L |
| INT 6.7 | <p>Recognize by sight friendly and enemy aircraft, ships, submarines, and potential naval fire support targets which may be encountered in the expected operating areas.</p> <p>III, IV(L) – Capability provided by bridge watch team and aft lookout.</p> <p>V(L) - Plan and train.</p> | F | L | L | L |

| LCS XXCLASS | | I | III | IV | V |
|------------------------|---|----------|------------|------------|----------|
| INT 17 | REPAIR OWN UNITS INTELLIGENCE-RELATED EQUIPMENT. NOTE: During condition III and IV, full capability provided by on-call/off-watch personnel. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. | L | F | F | F |
| INT 19 | CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S INT CAPABILITIES. I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space. III, IV(L) - Man CSOSS watch organization with CSOOW/Combat Systems Maintenance Supervisor and Electronics Support Supervisor. V(L) - Plan and train. | L | L | L | L |
| LOGISTICS (LOG) | | | | | |
| LOG 1 | CONDUCT UNDERWAY REPLENISHMENT. | | | | |
| LOG 1.12 | (U) Replenish other units underway with limited fuel, provisions, munitions, potable and feed water. III, IV(L) – Provide fuel to patrol craft (PC) in company after mission-specific contingency astern refueling equipment has been temporarily installed and the crew has been provided with requisite training. V(L) – Plan and train. | | L/E | L/E | L |

| LCS XXCLASS | | I | III | IV | V |
|---|---|---|-----|----|---|
| MINE WARFARE (MIW) | | | | | |
| MIW 4 CONDUCT MINE COUNTERMEASURES (MCM). | | | | | |
| | <p>Note: It is intended that the ship remain outside of mined/suspected waters before and during MCM operations. Below capabilities are intended to 1) permit ROV or Airborne MCM operations from a standoff position when no dedicated MCM assets are available, and 2) to enhance self-defense capability if providing point defense for dedicated MCM assets or if transiting a swept or an unconditional channel.</p> | | | | |
| MIW 4.1 | <p>Detect, classify and plot sea mines.</p> <p>NOTE: Full capability applies only to FFGs equipped with specifically designed MCM systems (not including installed sonar systems).</p> <p>I, III(L) - For all other FFGs: Visually or using installed sonar, detect mines for self-defense mine avoidance.</p> <p>IV, V(L) - Plan and train.</p> | L | L | L | L |
| MIW 4.11 | <p>Detect and avoid mines using organic sensors.</p> <p>I, III(L) - Visually or using installed sonar, detect mines for self-defense mine avoidance.</p> <p>IV, V(L) - Plan and train.</p> | L | L | L | L |
| MIW 6 CONDUCT MAGNETIC SILENCING (DEGAUSSING, DEPERMING, ETC.) | | | | | |
| MIW 6.7 | Maintain magnetic signature limits. | F | F | F | F |
| MIW 6.8 | Maintain own unit's degaussing readiness. | F | F | F | F |
| MIW 13 REPAIR OWN UNIT'S MIW EQUIPMENT. | | L | F | F | F |
| | <p>NOTE: During condition III and IV, full capability provided by off-watch personnel.</p> <p>I(L) - Emergency repairs to equipment critical to ship's mission. All critical Combat System spaces manned with at least one technician in each space.</p> | | | | |
| MOBILITY (MOB) | | | | | |
| MOB 1 OPERATE SHIP'S PROPULSION PLANT TO DESIGNED CAPABILITY. | | | | | |
| MOB 1.1 | Operate ship's propulsion plant at full power. | F | F | F | |
| MOB 1.2 | Operate ship's propulsion plant with split plant operations | F | F | F | |

| LCS XXCLASS | | I | III | IV | V |
|---|--|-----|-----|-----|-----|
| MOB 1.5 | Operate at sustained BG/SAG/URG/amphibious force speeds. | F | F | F | |
| MOB 1.6 | Maintain necessary machinery redundancy to enhance survival in high threat areas. | F | F | F | F |
| MOB 1.7 | Transit at high speed. | F | F | F | |
| MOB 3 PREVENT AND CONTROL DAMAGE. | | | | | |
| MOB 3.1 | Control fire, flooding, electrical, structural, propulsion and hull/airframe casualties. | F | F/E | F/E | F/E |
| MOB 3.2 | Counter and control chemical, biological and radiological (CBR) contaminants/agents. | F | F/E | F/E | F/E |
| MOB 3.3 | Maintain security against unfriendly acts. | F | F | F | F |
| MOB 3.5 | Provide damage control security/surveillance. | F | F | F | F |
| MOB 3.8 | Provide emergency breathing devices per ship's allowance. | F | F | F | F |
| MOB 5 MANEUVER IN FORMATION. | | F | F | F | |
| NOTE: Capability is supported by Officer of the Deck (OOD)/Junior Officer of the Deck (JOOD) and combined Quartermaster of the Watch (QMOW)/Boatswain's Mate of the Watch (BMOW). | | | | | |
| MOB 6 REFUEL IN THE AIR. | | | | | |
| MOB 6.3 | Deliver fuel in day/night ship-to-air refueling. | F/E | F/E | F/E | |
| NOTE: Rotary wing aircraft only. During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail, and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS and only supports logistic helicopter operations. | | | | | |
| MOB 7 PERFORM SEAMANSHIP, AIRMANSHIP AND NAVIGATION TASKS. | | | | | |
| MOB 7.1 | Navigate under all conditions of geographic location, weather and visibility. | F | F/E | F/E | |
| MOB 7.2 | Conduct precision anchoring. | F/E | F/E | F/E | |
| NOTE: During Condition I, stand down other battle stations. During Condition III, requires augmentation from off-watch personnel. | | | | | |
| MOB 7.3 | Get underway, moor, anchor and sortie with duty section in a safe manner. | | | | L/E |
| V(L) - Deployed, duty section fully capable. Not deployed, recall of personnel is required. | | | | | |
| MOB 7.5 | Utilize programmed evasive steering. | F | F | L | |
| IV(L) - Plan and train. | | | | | |

| LCS XXCLASS | | I | III | IV | V |
|---|--|-----|-----|-----|---|
| MOB 7.6 | Abandon/scuttle ship rapidly. III, IV, V(L) - Plan and train. | F | L | L | L |
| MOB 7.7 | Provide life boat/raft capacity in accordance with unit's allowance. | F | F | F | F |
| MOB 7.8 | Tow or be towed (towing engine not required). NOTE: Requires securing personnel from other battle stations in Condition I. | F/E | F/E | F/E | |
| MOB 7.9 | Operate day and night and under all weather conditions. | F | F | F | |
| MOB 7.10 | Conduct undetected transits. | F | F | F | |
| MOB 7.15 | Operate in a chemically contaminated environment. | F | F | F | F |
| MOB 7.16 | Recover man overboard (shipboard, boat or helicopter). NOTE: During Condition I, search and recovery requires augmentation by securing other battle stations. During Condition III, search and recovery requires augmentation from off-watch personnel. | F/E | F/E | F/E | F |
| MOB 10 REPLENISH AT SEA. | | | | | |
| MOB 10.1 | Receive vertical replenishment. | | F/E | F/E | |
| MOB 10.2 | Receive fuel while underway (alongside method). | | F/E | F/E | |
| MOB 10.3 | Receive munitions and provisions while underway. | | F/E | F/E | |
| MOB 10.4 | Receive potable and/or feed water while underway. | | F/E | F/E | |
| MOB 10.5 | Receive COD/VOD aircraft. NOTE: VOD aircraft only. | | F/E | F/E | |
| MOB 10.6 | Receive fuel while underway (astern method). | | F/E | F/E | |
| MOB 12 MAINTAIN THE HEALTH AND WELL-BEING OF THE CREW. | | | | | |
| MOB 12.1 | Ensure all phases of food service operations are conducted consistent with approved sanitary procedures and standards. I(L) - Battle messing. Requires securing food distribution personnel from Condition I stations at Commanding Officer's discretion. | L | F | F | F |
| MOB 12.2 | Ensure the operation of the potable water system in a manner consistent with approved sanitary procedures and standards. | F | F | F | F |
| MOB 12.3 | Monitor and/or maintain the environment to ensure the protection of personnel from overexposure to hazardous levels of radiation, temperature, noise, vibration and toxic substances per current instructions. | F | F | F | F |
| MOB 12.4 | Maintain closed atmosphere within prescribed specifications. | F | F | F | F |

| LCS XXCLASS | | I | III | IV | V |
|---------------|---|---|-----|-----|---|
| MOB 12.5 | Monitor the health and well-being of the crew to ensure that habitability is consistent with approved habitability procedures and standards. | | F | F | F |
| MOB 12.6 | Ensure the operation and maintenance of all phases of shipboard environmental protection systems do not create a health hazard and are consistent with other naval directives pertaining to the prevention of pollution of the environment. | | F | F | F |
| MOB 12.8 | Provide individual protective clothing and equipment to sufficiently protect shipboard personnel identified being at risk in a CBR-contaminated environment. III, IV, V(L) - Plan and train. | F | L | L | L |
| MOB 12.9 | Provide individual protective clothing and equipment to sufficiently protect assigned medical personnel aboard a ship at risk in a CBR-contaminated environment. III, IV, V(L) - Plan and train. | F | L | L | L |
| MOB 12.12 | Provide antidotes to ship's company that will counteract the effects caused by a CBR-contaminated environment. III, IV, V(L) - Plan and train. | F | L | L | L |
| MOB 12.13 | Train designated medical supervisors and non-medical personnel to detect CBR-contaminated casualties. | | F | F | F |
| MOB 12.14 | Train designated non-medical personnel to decontaminate CBR casualties. | | F | F | F |
| MOB 12.15 | Identify, supply and maintain decontamination stations. | F | F | F | F |
| MOB 17 | PERFORM ORGANIZATIONAL LEVEL REPAIRS TO OWN UNIT'S MOB EQUIPMENT. I(L) - Emergency repairs to equipment critical to ship's mission. May require standing down selected personnel from their Condition I stations. | L | F | F | F |
| MOB 18 | CONDUCT CASUALTY CONTROL PROCEDURES TO MAINTAIN/RESTORE OWN UNIT'S MOB CAPABILITIES. NOTE: During Condition I, emergency repairs to equipment critical to ship's mission. During Condition III and IV, immediate response by existing watchstanders with complete restoration supported by augmentation from off-watch personnel. V(L) - Plan and train. | F | F/A | F/A | L |

| LCS XXCLASS | | | I | III | IV | V |
|--------------------------------|--|--|---|-----|-----|-----|
| MISSIONS OF STATE (MOS) | | | | | | |
| MOS 1 | PERFORM NAVAL DIPLOMATIC PRESENCE OPERATIONS. | | | | | |
| MOS 1.1 | Establish a sovereign, mobile sea base in a forward area. IV, V(L) - Plan and train. | | F | F | L | L |
| MOS 1.2 | Conduct force/unit tour for foreign dignitaries. | | | F/A | F/A | F/A |
| MOS 1.3 | Conduct systems/weapons demonstrations for foreign dignitaries. | | | F/E | F/E | F/E |
| MOS 1.4 | Conduct foreign port calls. | | | | | F |
| MOS 1.5 | Conduct force/unit tours for foreign citizens during port calls. | | | | | F/A |
| MOS 1.6 | Conduct receptions for foreign dignitaries during port calls. | | | | | F/A |
| MOS 1.7 | Provide volunteers for small project assistance during port calls. | | | | | F/A |
| MOS 1.8 | Participate in military exercises with allied nations. | | | F | F/A | F/A |
| MOS 1.9 | Participate in military exercises with nonallied nations. | | | F | F/A | F/A |
| MOS 1.10 | Participate in or provide participants for foreign/allied commemorative or ceremonial events. | | | | F/E | F/E |
| MOS 1.11 | Provide lift of opportunity for foreign or national diplomatic material. III, IV, V(L) - Small quantities that do not interfere with the regular combat capabilities or logistics load. | | | L | L | L |
| MOS 2 | PROVIDE HUMANITARIAN ASSISTANCE. | | | | | |
| MOS 2.1 | Deliver relief material. III, IV, V(L) - Small quantities that do not interfere with the regular combat capabilities or logistics load. | | | L | L | L |
| MOS 2.2 | Provide emergency flooding/fire fighting assistance. | | | F/E | F/E | F/E |
| MOS 2.4 | Provide disaster assistance and evacuation. | | | F/E | F/E | F/E |
| MOS 2.5 | Clear and repair utilities and facilities damaged by natural disaster, fire, and civil disturbance; decontaminate CBR effects. | | | | | F/E |
| MOS 2.9 | Plan, direct and coordinate disaster assistance evacuation. | | | F/A | F/A | F/A |
| MOS 2.10 | Support/provide for the evacuation of noncombatant personnel in areas of civil or international crisis. | | | F/A | F/A | F/A |
| MOS 2.11 | Support/conduct helicopter/boat evacuation of noncombatant personnel as directed by higher authority from areas of civil or international crisis. | | | F/A | F/A | F/A |
| MOS 2.12 | Provide for embarkation, identification and processing of evacuees. | | | F/A | F/A | F/A |

| LCS XXCLASS | | I | III | IV | V |
|-----------------------------------|--|----------|------------|-----------|----------|
| MOS 2.13 | Provide care, feeding and berthing of evacuees. | | F/A | F/A | F/A |
| MOS 2.14 | Provide transportation for evacuees to designated safe havens or onward processing centers. | | F/A | F/A | F/A |
| MOS 2.15 | Plan/direct the evacuation of noncombat personnel in areas of civil or international crisis in both a permissive and non-permissive environment (including joint/combined operations). NOTE: During Condition I, stand down other battle stations to man Flight Deck, Rescue Boat Detail and Crash & Salvage Detail. During other Conditions of Readiness, in addition to flight deck crew, boat detail and crash & salvage detail, other off-watch personnel will be required for non-combat personnel processing. | F/E | F/E | F/E | F/E |
| MOS 3 PERFORM PEACEKEEPING | | | | | |
| MOS 3.2 | Provide logistics support for a joint/allied peacekeeping force. NOTE: During Condition I, stand down other battle stations to man Flight Deck, Rescue Boat Detail and Crash & Salvage Detail. During other Conditions of Readiness, in addition to flight deck crew, boat detail and crash & salvage detail, other off-watch personnel will be required for non-combat personnel processing. | F/E | F/E | F/E | F/E |
| MOS 3.3 | Provide direct participation in a joint/allied peacekeeping force within a foreign country/region. IV, V(L) - Plan and train. | F | F | L | L |
| MOS 4 PERFORM INTERDICTION | | | | | |
| MOS 4.1 | Conduct naval blockade. IV, V(L) - Plan and train. | F | F/A | L | L |
| MOS 4.2 | Conduct quarantine operations. IV, V(L) - Plan and train. | F | F/A | L | L |
| MOS 4.3 | Enforce sanction enforcement operations. IV, V(L) - Plan and train. | F | F/A | L | L |

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|-----------------------------------|---|----------|------------|-----------|----------|
| MOS 4.4 | <p>Conduct Maritime Interception Operations (MIO) and or Visit, Board, Search and Seizure (VBSS) operations with naval/combined /joint forces.</p> <p>NOTE: FFG capable of initial MIO/VBSS operations. However, ship unable to maintain sustained operations or security team without support of MIO Detachment.</p> <p>I(L) - Requires standing down selected watch stations, unless MIO Detachment is embarked.</p> <p>III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment.</p> | L/E | L/E | L/E | |
| MOS 5 | PROVIDE FOREIGN INTERNAL DEFENSE (FID) ASSISTANCE | | | | |
| MOS 5.4 | <p>Conduct tactical operations in close cooperation with the host nation that focus on neutralizing and destroying the insurgent threat in the maritime environment.</p> <p>IV, V(L) - Plan and train.</p> | F | F/A | L | L |
| MOS 8 | PROVIDE ANTITERRORISM ASSISTANCE | | | | |
| MOS 8.1 | Ensure that the physical security of important persons, facilities and events meets acceptable standards. | | F/A | F/A | F/A |
| MOS 8.2 | Provide training and advice on how to reduce vulnerability to terrorism and other threats, particularly in the maritime environment. | | F | F | F |
| MOS 10 | CONDUCT SPECIAL ACTIVITIES AS GOVERNED BY EXECUTIVE ORDER 12333 AND IN ACCORDANCE WITH A PRESIDENTIAL FINDING AND CONGRESSIONAL OVERSIGHT | L | L | L | L |
| | <p>I, III(L) - Provide covering action for Marine or SOC forces.</p> <p>IV, V(L) - Plan and train.</p> | | | | |
| NONCOMBAT OPERATIONS (NCO) | | | | | |
| NCO 2 | PROVIDE ADMINISTRATIVE AND SUPPLY SUPPORT FOR OWN UNIT. | | | | |
| NCO 2.1 | <p>Provide supply support services.</p> <p>I(L) - Provide emergency supply support only.</p> | L | F | F | F |
| NCO 2.2 | Provide clerical services. | | F | F | F |
| NCO 2.3 | Provide disbursing services. | | F | F | F |
| NCO 2.4 | Provide post office services. | | F | F | F |

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| NCO 2.5 | Provide messing facilities. I(L) - Battle messing requires securing food distribution personnel from Condition I stations at Commanding Officer's discretion. | L | F | F | F |
| NCO 2.6 | Provide ships service facilities. | | F | F | F |
| NCO 2.7 | Provide inventory and custodial services. | | F | F | F |
| NCO 2.8 | Provide personnel for living space maintenance. | | F | F | F |
| NCO 2.9 | Provide personnel for area command security. | F | F | F | F |
| NCO 2.11 | Provide personnel for fuels support. | F | F | F | F |
| NCO 3 | PROVIDE UPKEEP AND MAINTENANCE OF OWN UNIT. | | | | |
| NCO 3.1 | Provide organizational level preventive maintenance. | | F | F | F |
| NCO 3.2 | Provide organizational level corrective maintenance. I(L) - Emergency repairs to equipment critical to ship's missions. May require standing down selected personnel from their Condition I stations. | L | F | F | F |
| NCO 3.3 | Provide small arms storage area. | F | F | F | F |
| NCO 3.4 | Maintain preservation and cleanliness of topside and internal spaces. | | F | F | F |
| NCO 3.5 | Provide for proper storage, handling, use and transfer of hazardous materials. | | F | F | F |
| NCO 4 | PROVIDE CLOSED-CIRCUIT TELEVISION SUPPORT FOR OWN UNIT. | | F | F | F |
| NCO 5 | CONDUCT METEOROLOGICAL, HYDROGRAPHIC AND/OR OCEANOGRAPHIC COLLECTION OPERATIONS OR SURVEYS. | | | | |
| NCO 5.1 | Collect and disseminate meteorological information. | F | F | F | F |
| NCO 5.2 | Collect and disseminate hydrographic information. NOTE: Depth only. | F | F | F | |
| NCO 5.3 | Collect and disseminate oceanographic information including bathythermograph operations. | F | F | F | |
| NCO 7 | PROVIDE SPECIAL TECHNICAL RESEARCH. | | | | |
| NCO 7.1 | Serve as a platform for special technical research operations. | | F | F | F |
| NCO 7.2 | Conduct special technical research operations. III, IV, V(L) - Embarkation of technical support personnel required. | | L | L | L |

| LCS XXCLASS | | | I | III | IV | V |
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| NCO 8 | SERVE AS A PLATFORM FOR OPERATIONAL TEST AND EVALUATION OF SYSTEMS, EQUIPMENT, AND TACTICS | | | | | |
| NCO 8.1 | Provide technical assistance for installed test and evaluation equipment. | | | F | F | F |
| NCO 8.2 | Perform the test and evaluation functions set forth in the appropriate test plans. III, IV, V(L) - Support projects as required with ship's company as long as primary mission areas are not degraded. | | | L/A | L/A | L/A |
| NCO 8.3 | Perform the evaluation functions set forth in appropriate TACMEMOS. III, IV, V(L) - Support projects as required with ship's company as long as primary mission areas are not degraded. | | | L/A | L/A | L/A |
| NCO 8.4 | Provide range safety as set forth in appropriate test plans during missile operational tests. | | | F | F | |
| NCO 10 | PROVIDE EMERGENCY/DISASTER ASSISTANCE. | | | | | |
| NCO 10.1 | Provide emergency flooding/fire fighting assistance to another unit. I(L) - Requires securing personnel from other battle stations. | L/E | F/E | F/E | F/E | F/E |
| NCO 10.4 | Provide disaster assistance and evacuation. I(L) - Requires securing personnel from other battle stations. | L/A | F/A | F/A | F/A | F/A |
| NCO 11 | SUPPORT/PROVIDE FOR THE EVACUATION OF NONCOMBATANT PERSONNEL IN AREAS OF CIVIL OR INTERNATIONAL CRISIS. | | | | | |
| NCO 11.1 | Support/conduct helicopter/boat evacuation of noncombatant personnel as directed by higher authority from areas of civil or international crisis. I(L) - May require securing personnel from other battle stations. | L/E | F/E | F/E | F/E | F/E |
| NCO 11.2 | Provide for embarkation, identification and processing of evacuees. I(L) - May require securing personnel from other battle stations. | L/A | F/A | F/A | F/A | F/A |
| NCO 11.3 | Provide care, feeding and berthing of evacuees. I(L) - May require securing personnel from other battle stations. | L/A | F/A | F/A | F/A | F/A |

| LCS XXCLASS | | I | III | IV | V |
|--|---|----------|------------|-----------|----------|
| NCO 11.4 | Provide transportation for evacuees to designated safe havens or onward processing centers. I(L) - May require securing personnel from other battle stations. | L/A | F | F | |
| NCO 16 PROVIDE ANTI-TERRORISM/FORCE PROTECTION DEFENSE. | | | | | |
| NCO 16.1 | Assimilate and disseminate intelligence on terrorist activities directed at U.S. Navy installations, ships and personnel. | F | F | F | F |
| NCO 16.2 | Request and/or provide a threat assessment. | F | F | F | F |
| NCO 16.3 | Declare general warnings of possible terrorist activity (THREATCON). | F | F | F | F |
| NCO 16.4 | Anticipate and provide defenses against terrorist activities directed at ships, installations, facilities and personnel. (a) Include provisions for barriers, access control, surveillance, intruder detection, and electronic security systems. (b) Train and exercise the unit's AT response force to include tactical room/space entry. (c) Implement local FPCON measures. (d) Implement unit terrorist incident response plan. (e) Operate electronic security systems (ESS). (f) Operate duress systems. (g) Train and exercise designated marksman for defense of HVA, boat crews and security personnel. | | F | F | F |
| NCO 16.5 | Conduct screening of non-assigned personnel and materials entering the unit or facility using: (a) Logical means (validation of identification, documentation, personal recognition, etc.) (b) Physical means (searches, metal detection, explosive detection, etc.) | | F | F | F |
| NCO 16.6 | Provide waterside barriers/patrols during port calls and anchorage. NOTE: May require rigid-hull inflatable boats (RHIB) and crews. May require augmentation by Mobile Security Detachment (MSD). | | F/E | F/E | F/E |
| NCO 16.7 | Determine, maintain and enforce port, harbor and anchorage limited access areas. NOTE: May require rigid-hull inflatable boats (RHIB) and crews. May require augmentation by MSD. | | F/E | F/E | F/E |

| LCS XXCLASS | | I | III | IV | V |
|--|---|----------|------------|-----------|----------|
| NCO 16.8 | Conduct surveillance and interdiction operations of swimmers/swimmer delivery vehicles. NOTE: May require rigid-hull inflatable boats (RHIB) and crews. May require augmentation by MSD. | | F/E | F/E | F/E |
| NCO 16.9 | Provide AT information and voluntary training to dependents visiting units in foreign ports/locations. | | | | F |
| NCO 16.10 | Publish/Disseminate anti-terrorism defense instructions that include provisions for appropriate perimeter barriers, access control, surveillance and intruder detection, AT response force including a crisis action team, and evacuation. | | F | F | F |
| NCO 16.11 | Conduct hostage survival and Code of Conduct training. | | F | F | F |
| NCO 16.12 | Direct, conduct and assess unit AT exercises consistent with potential and/or actual threat environment. | | F | F | F |
| NCO 19 CONDUCT MARITIME LAW ENFORCEMENT OPERATIONS. | | | | | |
| | NOTE: For those requirements involving interdiction, visit, board, search and seizure of vessels the FFG is capable of initial operations. However, sustained operations and or maintenance of a security team require embarked law enforcement personnel (i.e., Coast Guard detachment or MIO detachment). | | | | |
| NCO 19.1 | Detect and identify noncombatant vessels. | F | F | F | F |
| NCO 19.2 | Conduct boarding and inspection of noncombatant vessels. I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked. III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment. | L/E | L/E | L/E | |
| NCO 19.3 | Provide assistance to other law enforcement forces. I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked. | L/E | F/E | F/E | |
| NCO 19.4 | Provide surveillance and protection of maritime resources. | F | F | F | |
| NCO 19.6 | Conduct seizure of noncombatant vessels. I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked. III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment. | L/E | L/E | L/E | |

| LCS XXCLASS | | I | III | IV | V |
|--|--|-----|-----|-----|---|
| NCO 19.9 | <p>Conduct drug traffic suppression and interdiction operations.</p> <p>I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked.</p> <p>III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment.</p> | L/E | L/E | L/E | |
| NCO 19.13 | <p>Support enforcement of fisheries law and treaties.</p> <p>I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked.</p> <p>III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment.</p> | L/E | L/E | L/E | |
| NCO 19.14 | <p>Support enforcement of offshore mining and gas/oil drilling laws.</p> <p>I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked.</p> <p>III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment.</p> | L/E | L/E | L/E | |
| NCO 19.15 | <p>Support drug traffic suppression and interdiction operations.</p> <p>I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked.</p> <p>III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment.</p> | L/E | L/E | L/E | |
| NCO 19.16 | <p>Support illegal entry suppression operations.</p> <p>I(L) - Requires standing down selected watch stations, unless law enforcement detachment is embarked.</p> <p>III, IV(L) - Requires supplement from embarked law enforcement personnel/equipment.</p> | L/E | L/E | L/E | |
| NCO 24 SUPPORT/CONDUCT ROTARY WING AIRCRAFT OPERATIONS. <p>NOTE: During Condition I, stand down other battle watch stations to man Flight Deck, Rescue Boat Detail and Crash & Salvage Detail. During Condition III, flight deck operations workload is collected as OUS.</p> | | | | | |
| NCO 24.1 | Support/conduct day rotary wing aircraft flight operations. | F/E | F/E | F/E | |
| NCO 24.2 | Support/conduct night rotary wing aircraft flight operations. | F/E | F/E | F/E | |
| NCO 24.3 | Support/conduct rotary wing aircraft flight operations during all EMCON conditions. | F/E | F/E | F/E | |

| LCS XXCLASS | | I | III | IV | V |
|---------------|--|-----|-----|-----|-----|
| NCO 24.4 | Support/conduct rotary wing aircraft hot and cold refueling operations. | F/E | F/E | F/E | |
| NCO 24.5 | Provide electrical power for rotary wing aircraft starting, testing, etc. | F/E | F/E | F/E | |
| NCO 25 | CONDUCT MARINE ENVIRONMENTAL PROTECTION. | | | | |
| NCO 25.1 | Detect oil or hazardous chemical spill. | F | F | F | F |
| NCO 25.2 | Report spills to proper authority. | F | F | F | F |
| NCO 25.3 | Conduct pollution abatement operations. | | F/E | F/E | F/E |
| NCO 32 | CONDUCT COUNTERNARCOTIC AND OTHER LAW ENFORCEMENT SUPPORT OPERATIONS IN CONJUNCTION WITH OTHER FORCES. | | | | |
| NCO 32.1 | Conduct/support operations with Coast Guard units. | F | F | F | |
| NCO 32.2 | Conduct/support operations with other federal law enforcement agencies. | F | F | F | |
| NCO 32.4 | Conduct operations with other national governments. | F | F | F | |
| NCO 33 | SUPPORT/PROVIDE COUNTERNARCOTICS AND OTHER LAW ENFORCEMENT SUPPORT PATROL OF A FIXED GEOGRAPHIC AREA. | | | | |
| NCO 33.1 | Operate as choke point patrol unit. | F | F | F/A | |
| NCO 33.2 | Operate as an open ocean patrol unit. | F | F | F/A | |
| NCO 34 | IN SUPPORT OF COUNTERNARCOTICS AND OTHER LAW ENFORCEMENT OPERATIONS, DETECT AND MONITOR SUSPECT SURFACE CONTACTS. | | | | |
| NCO 34.1 | Detect and monitor surface contacts with radar. | F | F | F | |
| NCO 34.2 | Detect and monitor surface contacts visually. III, IV(L) – Capability provided by bridge watch team and aft lookout. | F | L | L | |
| NCO 34.3 | Detect and monitor surface contacts with infrared equipment. III, IV(L) – Capability provided by bridge watch team and aft lookout. | F | L | L | |
| NCO 34.4 | Detect and monitor surface contacts with electronic surveillance methods. | F | F | F | |
| NCO 34.5 | Detect and monitor surface contacts with passive sonar. NOTE: TMA requires augmentation from off-watch personnel. | F | F/E | F/E | |
| NCO 34.6 | Detect and monitor surface contacts with active sonar. | F | F | F | |

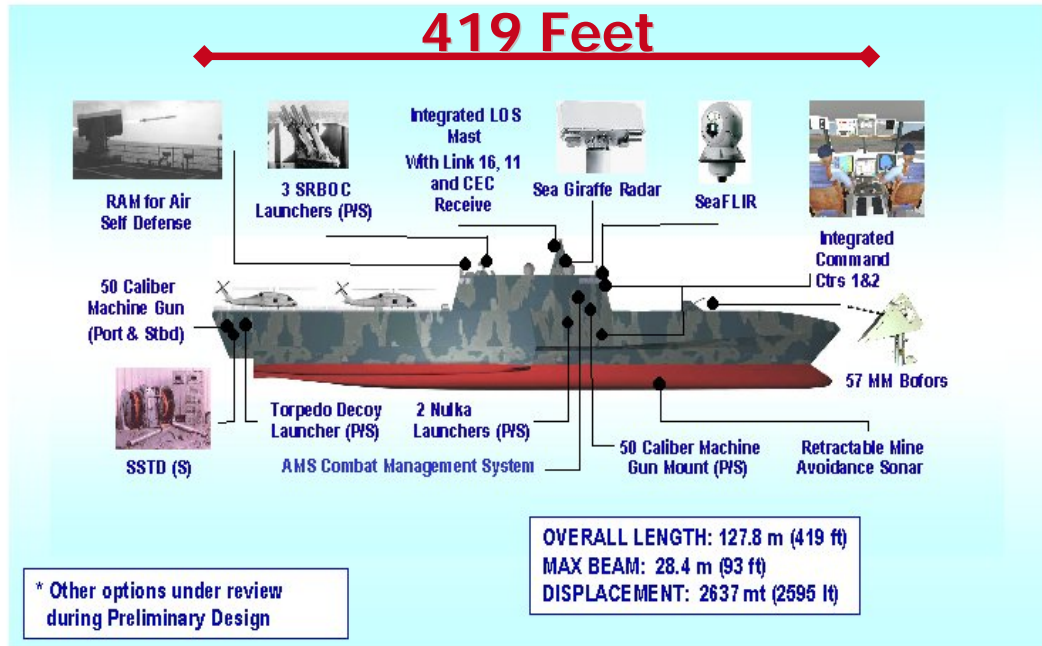
| LCS XXCLASS | | I | III | IV | V |
|---------------|--|---|-----|-----|-----|
| NCO 34.7 | Detect and monitor surface contacts with surveillance towed arrays. NOTE: TMA requires augmentation from off-watch personnel. | F | F/E | F/E | |
| NCO 36 | IN SUPPORT OF COUNTERNARCOTICS AND OTHER LAW ENFORCEMENT OPERATIONS, DETECT AND MONITOR SUSPECT AIR CONTACTS. | | | | |
| NCO 36.1 | Detect and monitor air contacts with radar. | F | F | F | |
| NCO 36.2 | Detect and monitor air contacts visually. III, IV(L) – Capability provided by bridge watch team and aft lookout. | F | L | L | |
| NCO 36.3 | Detect and monitor air contacts by electronic surveillance measures. | F | F | F | |
| NCO 37 | EMBARK AND SUPPORT LAW ENFORCEMENT DETACHMENTS. | F | F/A | F/A | F/A |
| NCO 38 | RECEIVE, DISPLAY AND MAINTAIN COUNTERNARCOTIC INTELLIGENCE DATA. | F | F | F | F/A |

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APPENDIX C. LCS DESIGNS



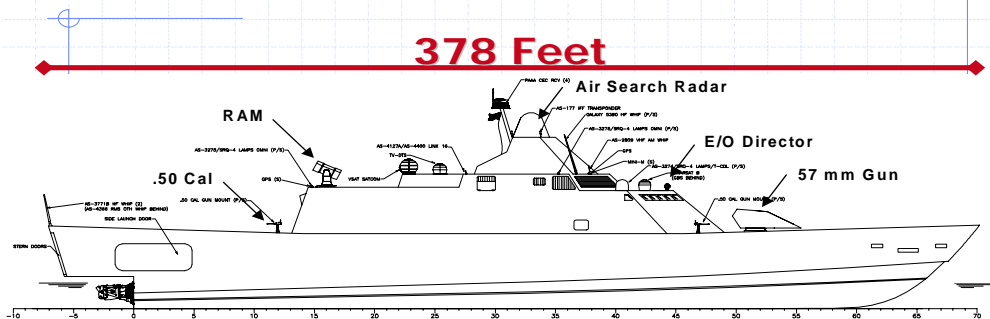
General Dynamics Current Core Mission and Combat System*



34



Lockheed Martin Seaframe



35

APPENDIX D. FORMULATION INDICES

| <i>c</i> <i>Class of ship</i> | <i>d</i> <i>Department / Detachment</i> | <i>s</i> <i>System</i> |
|-------------------------------|---|---------------------------------|
| 0=N/A | 0 = N/A | 0=N/A |
| 1=CG | 1 = Executive | 1 = Main Gun |
| 2=DDG | 2 = Operations | 2=CIWS |
| 3=FFG | 3 = Combat Systems | 3 = .50 Cal |
| 4=MCM | 4 = Engineering | 4=RAM |
| 5=MHC | 5 = Supply | 5=Search RADAR |
| 6=LCS | 6 = FMP/Mission C4 | 6 = Air Decoy |
| 7=MIWFMP | 7 = USV Operator | 7 = Torpedo Decoy Launcher |
| 8=ASWFMP | 8 = USV Support | 8=SONAR |
| 9=SUWFMP | 9 = USV Weapons | 9=Engineering Plant |
| | 10 = RMV Oper | 10=FMP C4 |
| | 11 = RMV Support | 11 = Aviation |
| | 12 = MIW Specialist | 12=USV |
| | 13 = ASW Specialist | 13=RMV |
| | 14 = SUW Specialist | 14=BPAUV |
| | 15 = MH-60R & UAV Operator | 15=SCULPIN |
| | 16 = MH-60S & UAV Operator | 16=EOD |
| | 17 = Air Det Composite Support | 17 = ACES/EEER/IEER/AEER family |
| | | 18=Torpedo CounterMeasures |
| | | 19=ADS |
| | | 20=Towed Array |
| | | 21 = Intermediate Cal Gun |
| | | 22=Non-lethal Weapon Det |

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APPENDIX E. LEGACY SHIP MANPOWER REQUIREMENTS

| | Rate | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|----------|--------|--------|--------|-----|----------|-----|-----|-----|
| OFFICER | 1110 | 11 | 11 | 11 | 10 | 9 | 3 | 3 |
| | 1140 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | 1160 | 8 | 8 | 5 | 8 | 4 | 1 | 0 |
| | 1190 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| | 2100 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 3100 | 3 | 3 | 2 | 2 | 2 | 1 | 0 |
| | 4100 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 6120 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 6130 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 6160 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| | 6180 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| | 7120 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 7130 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| | 7440 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| ENLISTED | BM | 7 | 8 | 9 | 9 | 9 | 0 | 0 |
| | CMD | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| | CTA | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | CTM | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| | CTO | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| | CTR | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| | CTT/EW | 7 | 7 | 7 | 7 | 4 | 0 | 0 |
| | DC | 10 | 8 | 9 | 9 | 6 | 3 | 2 |
| | DK | 2 | 2 | 2 | 2 | 1 | 0 | 0 |
| | EM | 6 | 5 | 5 | 7 | 6 | 5 | 3 |
| | EN | 10 | 10 | 9 | 9 | 10 | 10 | 7 |
| | ET | 16 | 16 | 11 | 14 | 9 | 4 | 3 |
| | FC | 43 | 43 | 39 | 36 | 9 | 0 | 0 |
| | FN | 12 | 9 | 12 | 12 | 4 | 4 | 2 |
| | GM | 13 | 13 | 17 | 13 | 4 | 0 | 0 |
| | GS | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| | GSE | 6 | 6 | 7 | 6 | 5 | 0 | 0 |
| | GSM | 20 | 12 | 19 | 14 | 11 | 0 | 0 |
| | HM | 2 | 2 | 2 | 3 | 2 | 1 | 1 |
| | HN | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | HT | 3 | 3 | 4 | 3 | 3 | 1 | 0 |
| | IC | 5 | 5 | 7 | 5 | 3 | 2 | 1 |
| | IS | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| | IT/RM | 12 | 12 | 14 | 12 | 10 | 5 | 4 |
| | MA | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| | MR | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| | MS/CS | 14 | 14 | 15 | 11 | 10 | 5 | 3 |
| | NC | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| | OS/MN | 28 | 28 | 31 | 22 | 21 | 20 | 13 |
| | PC | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| | PN | 4 | 4 | 3 | 3 | 2 | 1 | 0 |
| | PO | 2 | 2 | 2 | 2 | 2 | 0 | 0 |
| | QM | 7 | 7 | 5 | 6 | 4 | 4 | 2 |
| | RP | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | SH | 6 | 6 | 7 | 4 | 5 | 0 | 0 |
| | SK | 11 | 11 | 10 | 8 | 8 | 2 | 2 |
| | SM | 0 | 0 | 6 | 1 | 1 | 1 | 1 |
| | SN | 24 | 24 | 31 | 26 | 30 | 12 | 5 |
| | STG | 16 | 16 | 20 | 17 | 11 | 0 | 0 |
| | TM | 2 | 2 | 2 | 2 | 2 | 0 | 0 |
| | YN | 2 | 2 | 6 | 2 | 2 | 1 | 1 |
| TOTAL | | 339 | 326 | 340 | 296 | 216 | 89 | 55 |

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APPENDIX F. LEGACY CONDITION I CONTROL STATION SUMMARY

| Control Station (Officer) | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|---------------------------|-----------|-----------|-----------|-----------|-----------|----------|----------|
| Ship | 4 | 4 | 3 | 4 | 4 | 3 | 2 |
| Operations | 9 | 9 | 6 | 7 | 5 | 1 | 1 |
| Communications | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electronics Casualty | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Weapons | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| ASW/MIW | 2 | 2 | 0 | 1 | 2 | 1 | 0 |
| MIO | 0 | 0 | 0 | 1 | 2 | 0 | 0 |
| Engineering | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| Damage | 3 | 2 | 3 | 2 | 1 | 1 | 0 |
| Support | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 21 | 20 | 15 | 19 | 16 | 8 | 5 |

| Control Station (Enlisted) | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|----------------------------|------------|------------|------------|------------|------------|------------|-----------|
| Ship | 22 | 21 | 24 | 21 | 17 | 11 | 8 |
| Operations | 35 | 34 | 27 | 24 | 18 | 4 | 5 |
| Communications | 12 | 12 | 11 | 11 | 10 | 4 | 3 |
| Electronics Casualty | 39 | 39 | 43 | 35 | 13 | 2 | 0 |
| Weapons | 41 | 41 | 37 | 47 | 33 | 4 | 4 |
| ASW/MIW | 34 | 32 | 10 | 29 | 49 | 38 | 20 |
| MIO | 24 | 24 | 0 | 24 | 24 | 0 | 0 |
| Engineering | 57 | 50 | 74 | 53 | 43 | 9 | 3 |
| Damage | 77 | 64 | 80 | 82 | 65 | 41 | 24 |
| Support | 8 | 8 | 8 | 5 | 7 | 3 | 2 |
| Total | 349 | 325 | 314 | 331 | 279 | 116 | 69 |

| Control Station (Total) | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|-------------------------|------------|------------|------------|------------|------------|------------|-----------|
| Ship | 26 | 25 | 27 | 25 | 21 | 14 | 10 |
| Operations | 44 | 43 | 33 | 31 | 23 | 5 | 6 |
| Communications | 12 | 12 | 11 | 11 | 10 | 4 | 3 |
| Electronics Casualty | 40 | 40 | 44 | 36 | 13 | 2 | 0 |
| Weapons | 41 | 41 | 37 | 48 | 33 | 5 | 5 |
| ASW/MIW | 36 | 34 | 10 | 30 | 51 | 39 | 20 |
| MIO | 24 | 24 | 0 | 25 | 26 | 0 | 0 |
| Engineering | 59 | 52 | 76 | 55 | 45 | 10 | 4 |
| Damage | 80 | 66 | 83 | 84 | 66 | 42 | 24 |
| Support | 8 | 8 | 8 | 5 | 7 | 3 | 2 |
| Total | 370 | 345 | 329 | 350 | 295 | 124 | 74 |

| Control Station | Min | Max | Range |
|----------------------|-----|-----|-------|
| Ship | 10 | 27 | 17 |
| Operations | 5 | 44 | 39 |
| Communications | 3 | 12 | 9 |
| Electronics Casualty | 0 | 44 | 44 |
| Weapons | 5 | 48 | 43 |
| ASW/MIW | 10 | 51 | 41 |
| MIO | 0 | 26 | 26 |
| Engineering | 4 | 76 | 72 |
| Damage | 24 | 84 | 60 |
| Support | 2 | 8 | 6 |

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APPENDIX G. LEGACY CONDITION III CONTROL STATION SUMMARY

| Control Station (Officer) | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|---------------------------|----------|----------|----------|----------|----------|----------|----------|
| Ship | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| Operations | 5 | 5 | 3 | 4 | 1 | 0 | 0 |
| Communications | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electronics Casualty | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Weapons | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ASW/MIW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MIO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Engineering | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Damage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Support | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 7 | 7 | 5 | 6 | 3 | 1 | 1 |

| Control Station (Enlisted) | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Ship | 3 | 3 | 10 | 3 | 4 | 3 | 5 |
| Operations | 20 | 20 | 17 | 16 | 9 | 3 | 2 |
| Communications | 4 | 4 | 4 | 4 | 2 | 1 | 1 |
| Electronics Casualty | 3 | 3 | 6 | 6 | 3 | 0 | 0 |
| Weapons | 3 | 3 | 4 | 3 | 0 | 0 | 0 |
| ASW/MIW | 4 | 4 | 5 | 4 | 3 | 0 | 0 |
| MIO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Engineering | 11 | 5 | 7 | 8 | 7 | 5 | 2 |
| Damage | 3 | 2 | 3 | 2 | 1 | 0 | 0 |
| Support | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 51 | 44 | 56 | 46 | 29 | 12 | 10 |

| Control Station (Total) | CG(NS) | CG(SS) | DDG | DDG(OME) | FFG | MCM | MHC |
|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Ship | 5 | 5 | 12 | 5 | 6 | 4 | 6 |
| Operations | 25 | 25 | 20 | 20 | 10 | 3 | 2 |
| Communications | 4 | 4 | 4 | 4 | 2 | 1 | 1 |
| Electronics Casualty | 3 | 3 | 6 | 6 | 3 | 0 | 0 |
| Weapons | 3 | 3 | 4 | 3 | 0 | 0 | 0 |
| ASW/MIW | 4 | 4 | 5 | 4 | 3 | 0 | 0 |
| MIO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Engineering | 11 | 5 | 7 | 8 | 7 | 5 | 2 |
| Damage | 3 | 2 | 3 | 2 | 1 | 0 | 0 |
| Support | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 58 | 51 | 61 | 52 | 32 | 13 | 11 |

| Control Station | Min | Max | Range |
|----------------------|-----|-----|-------|
| Ship | 4 | 12 | 8 |
| Operations | 2 | 25 | 23 |
| Communications | 1 | 4 | 3 |
| Electronics Casualty | 0 | 6 | 6 |
| Weapons | 0 | 4 | 4 |
| ASW/MIW | 0 | 5 | 5 |
| MIO | 0 | 0 | 0 |
| Engineering | 2 | 8 | 6 |
| Damage | 0 | 3 | 3 |
| Support | 0 | 0 | 0 |

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APPENDIX H. CG (NS) BATTLE BILL REQUIREMENTS

| Control Station | | Condition I | | Condition III | |
|------------------------------|----------------------------|-------------|----------|---------------|----------|
| Ship Control | | Officer | Enlisted | Officer | Enlisted |
| | Pilot House | 4 | 13 | 2 | 2 |
| | Lookouts | 0 | 3 | 0 | 1 |
| | Steering Aft | 0 | 3 | 0 | 0 |
| | Signal Bridge | 0 | 3 | 0 | 0 |
| Operations Control | | | | | |
| | Air Control | 0 | 3 | 0 | 2 |
| | Display and Decision | 7 | 8 | 5 | 4 |
| | Surface/Subsurfaces | 1 | 5 | 0 | 3 |
| | Tactical Information | 0 | 9 | 0 | 7 |
| | CCSS | 1 | 10 | 0 | 4 |
| Communications Control | | | | | |
| | Radio Central | 0 | 8 | 0 | 3 |
| | Information Security | 0 | 4 | 0 | 1 |
| Electronics Casualty Control | | | | | |
| | Combat Sys Maint Central | 1 | 8 | 0 | 1 |
| | Computer Rm (SPY 1) | 0 | 2 | 0 | 2 |
| | EW Equipment Rm | 0 | 2 | 0 | 0 |
| | SPS 49 Radar Rm | 0 | 3 | 0 | 0 |
| | SPS 55/Mk 99 Mod 4 xmtr Rm | 0 | 2 | 0 | 0 |
| | Aegis Radar Rm 1 | 0 | 2 | 0 | 0 |
| | Aegis Radar Rm 2 | 0 | 2 | 0 | 0 |
| | Aegis Radar Rm 3 | 0 | 3 | 0 | 0 |
| | Aegis Radar Rm 4 | 0 | 2 | 0 | 0 |
| | Aegis Radar Rm 5 | 0 | 3 | 0 | 0 |
| | Radio xmtr Rm | 0 | 4 | 0 | 0 |
| | CIC (SPY 1) | 0 | 2 | 0 | 0 |
| | Sonar Repair (SQQ-89(v)6) | 0 | 2 | 0 | 0 |
| | NIXIE Repair | 0 | 1 | 0 | 0 |
| | Gun Repair | 0 | 1 | 0 | 0 |
| Weapons Control | | | | | |
| | MT 51 Loader Drum Rm | 0 | 2 | 0 | 1 |
| | MT 51 Handling Rm | 0 | 8 | 0 | 0 |
| | MT 52 Loader Drum Rm | 0 | 2 | 0 | 0 |
| | MT 52 Handling Rm | 0 | 8 | 0 | 0 |
| | Mk 41 VLS Launcher | 0 | 5 | 0 | 1 |
| | Tomahawk | 0 | 5 | 0 | 1 |
| | CIWS MT 1 | 0 | 5 | 0 | 0 |
| | CIWS MT 2 | 0 | 4 | 0 | 0 |
| | Harpoon Missile Sys | 0 | 2 | 0 | 0 |
| Total | | 14 | 149 | 7 | 33 |

1/13 augmented

Note:

Augmented by off-watch or standing down other watches

Different from CG SS

| Control Station | | Condition I | | Condition III | |
|-----------------------------|--|-------------|----------|---------------|----------|
| ASW Control | | Officer | Enlisted | Officer | Enlisted |
| Sonar Control (SQQ 89(v)6) | | 0 | 6 | 0 | 4 |
| Mk 32 SVTT enclosed | | 0 | 2 | 0 | 0 |
| SQR-19 Control (SQQ 89) | | 0 | 1 | 0 | 0 |
| Helo Control Station | | 1 | 0 | 0 | 0 |
| Flight Deck Control | | 0 | 6 | 0 | 0 |
| Ready Life Boat | | 0 | 9 | 0 | 0 |
| RAST Control (LAMPS III) | | 1 | 0 | 0 | 0 |
| Crash and Salvage | | 0 | 8 | 0 | 0 |
| AFFF Generator Station | | 0 | 1 | 0 | 0 |
| JP5 Pump Room | | 0 | 1 | 0 | 0 |
| MIO | | | | | |
| Boarding Team (co-manned) | | 0 | 15 | 0 | 0 |
| Divert Team | | 0 | 9 | 0 | 0 |
| Engineering Control | | | | | |
| Central Control Station | | 1 | 2 | 0 | 5 |
| ENG Rm Fwd | | 0 | 5 | 0 | 2 |
| ENG Rm Aft | | 0 | 5 | 0 | 2 |
| Aux Machinery Rm 1 | | 0 | 4 | 0 | 2 |
| Aux Machinery Rm 2 | | 0 | 1 | 0 | 0 |
| Generator Rm 3 | | 0 | 2 | 0 | 0 |
| IC and Gyro Rm Fwd | | 0 | 2 | 0 | 0 |
| IC and Gyro Rm Aft | | 0 | 2 | 0 | 0 |
| Converter Rm Aft | | 0 | 1 | 0 | 0 |
| Repair 5 | | 1 | 33 | 0 | 0 |
| Damage Control | | | | | |
| Damage Control Central | | 1 | 10 | 0 | 2 |
| Oil Lab | | 0 | 1 | 0 | 1 |
| Repair 2 | | 0 | 24 | 0 | 0 |
| Repair 3 (sec DCC) | | 1 | 30 | 0 | 0 |
| Battle Dressing Station Fwd | | 0 | 6 | 0 | 0 |
| Battle Dressing Station Aft | | 1 | 6 | 0 | 0 |
| Support Control | | | | | |
| Battle Messing | | 0 | 5 | 0 | 0 |
| Emergency Issue | | 0 | 3 | 0 | 0 |
| Total | | 7 | 200 | 0 | 18 |
| Overall Total | | 370 | | 58 | |

Note:

Augmented by off-watch or standing down other watches

Different from CG SS

APPENDIX I. CG (SS) BATTLE BILL REQUIREMENTS

| Control Station | | Condition I | | Condition III | | |
|------------------------------|----------------------------|-------------|----------|---------------|----------|-----------------|
| Ship Control | | Officer | Enlisted | Officer | Enlisted | |
| | Pilot House | 4 | 12 | 2 | 2 | 1/12 augmented |
| | Lookouts | 0 | 3 | 0 | 1 | |
| | Steering Aft | 0 | 3 | 0 | 0 | |
| | Signal Bridge | 0 | 3 | 0 | 0 | |
| Operations Control | | | | | | |
| | Air Control | 0 | 3 | 0 | 2 | |
| | Display and Decision | 7 | 8 | 5 | 4 | |
| | Surface/Subsurfaces | 1 | 5 | 0 | 3 | |
| | Tactical Information | 0 | 8 | 0 | 7 | Less one talker |
| | CCSS | 1 | 10 | 0 | 4 | |
| Communications Control | | | | | | |
| | Radio Central | 0 | 8 | 0 | 3 | |
| | Information Security | 0 | 4 | 0 | 1 | |
| Electronics Casualty Control | | | | | | |
| | Combat Sys Maint Central | 1 | 8 | 0 | 1 | |
| | Computer Rm (SPY 1) | 0 | 2 | 0 | 2 | |
| | EW Equipment Rm | 0 | 2 | 0 | 0 | |
| | SPS 49 Radar Rm | 0 | 3 | 0 | 0 | |
| | SPS 55/Mk 99 Mod 4 xmtr Rm | 0 | 2 | 0 | 0 | |
| | Aegis Radar Rm 1 | 0 | 2 | 0 | 0 | |
| | Aegis Radar Rm 2 | 0 | 2 | 0 | 0 | |
| | Aegis Radar Rm 3 | 0 | 3 | 0 | 0 | |
| | Aegis Radar Rm 4 | 0 | 2 | 0 | 0 | |
| | Aegis Radar Rm 5 | 0 | 3 | 0 | 0 | |
| | Radio xmtr Rm | 0 | 4 | 0 | 0 | |
| | CIC (SPY 1) | 0 | 2 | 0 | 0 | |
| | Sonar Repair (SQQ-89(v)6) | 0 | 2 | 0 | 0 | |
| | NIXIE Repair | 0 | 1 | 0 | 0 | |
| | Gun Repair | 0 | 1 | 0 | 0 | |
| Weapons Control | | | | | | |
| | MT 51 Loader Drum Rm | 0 | 2 | 0 | 1 | |
| | MT 51 Handling Rm | 0 | 8 | 0 | 0 | |
| | MT 52 Loader Drum Rm | 0 | 2 | 0 | 0 | |
| | MT 52 Handling Rm | 0 | 8 | 0 | 0 | |
| | Mk 41 VLS Launcher | 0 | 5 | 0 | 1 | |
| | Tomahawk | 0 | 5 | 0 | 1 | |
| | CIWS MT 1 | 0 | 5 | 0 | 0 | |
| | CIWS MT 2 | 0 | 4 | 0 | 0 | |
| | Harpoon Missile Sys | 0 | 2 | 0 | 0 | |
| Total | | 14 | 147 | 7 | 33 | |

Note:

Augmented by off-watch or standing down other watches

Different from CG SS

| Control Station | | Condition I | | Condition III | |
|-----------------------------|--|-------------|----------|---------------|----------|
| | | Officer | Enlisted | Officer | Enlisted |
| ASW Control | | | | | |
| Sonar Control (SQQ 89(v)6) | | 0 | 6 | 0 | 4 |
| Mk 32 SVTT enclosed | | 0 | 2 | 0 | 0 |
| SQR-19 Control (SQQ 89) | | 0 | 1 | 0 | 0 |
| Helo Control Station | | 1 | 0 | 0 | 0 |
| Flight Deck Control | | 0 | 6 | 0 | 0 |
| Ready Life Boat | | 0 | 9 | 0 | 0 |
| RAST Control (LAMPS III) | | 1 | 0 | 0 | 0 |
| Crash and Salvage | | 0 | 6 | 0 | 0 |
| AFFF Generator Station | | 0 | 1 | 0 | 0 |
| JP5 Pump Room | | 0 | 1 | 0 | 0 |
| MIO | | | | | |
| Boarding Team (co-manned) | | 0 | 15 | 0 | 0 |
| Divert Team | | 0 | 9 | 0 | 0 |
| Engineering Control | | | | | |
| Central Control Station | | 1 | 1 | 0 | 4 |
| ENG Rm Fwd | | 0 | 3 | 0 | 0 |
| ENG Rm Aft | | 0 | 3 | 0 | 0 |
| Aux Machinery Rm 1 | | 0 | 3 | 0 | 1 |
| Aux Machinery Rm 2 | | 0 | 1 | 0 | 0 |
| Generator Rm 3 | | 0 | 2 | 0 | 0 |
| IC and Gyro Rm Fwd | | 0 | 2 | 0 | 0 |
| IC and Gyro Rm Aft | | 0 | 2 | 0 | 0 |
| Converter Rm Aft | | 0 | 1 | 0 | 0 |
| Repair 5 | | 1 | 32 | 0 | 0 |
| Damage Control | | | | | |
| Damage Control Central | | 1 | 4 | 0 | 1 |
| Oil Lab | | 0 | 1 | 0 | 1 |
| Repair 2 | | 0 | 24 | 0 | 0 |
| Repair 3 (sec DCC) | | 0 | 25 | 0 | 0 |
| Battle Dressing Station Fwd | | 0 | 5 | 0 | 0 |
| Battle Dressing Station Aft | | 1 | 5 | 0 | 0 |
| Support Control | | | | | |
| Battle Messing | | 0 | 5 | 0 | 0 |
| Emergency Issue | | 0 | 3 | 0 | 0 |

6/6 augmented
9/9 augmented
1 LAMP OFF
8/8 augmented
1/1 augmented

5/9 augmented

| | | | | |
|---------------|-----|-----|----|----|
| Total | 6 | 178 | 0 | 11 |
| Overall Total | 345 | | 11 | |

Note:

| |
|---|
| Augmented by off-watch or standing down other watches |
| Different from CG SS |

APPENDIX J. DDG BATTLE BILL REQUIREMENTS

| Control Station | | Condition I | | Condition III | |
|---------------------------------|----------------------------|-------------|----------|---------------|----------|
| Ship Control | | Officer | Enlisted | Officer | Enlisted |
| | Pilot House | 3 | 12 | 2 | 5 |
| | Lookouts | 0 | 3 | 0 | 3 |
| | Steering Aft | 0 | 3 | 0 | 0 |
| | Signal Bridge | 0 | 6 | 0 | 2 |
| Operations Control | | | | | |
| | Air Control | 0 | 3 | 0 | 2 |
| | Display and Decision | 6 | 8 | 3 | 7 |
| | Tactical Information | 0 | 7 | 0 | 5 |
| | Surface Warfare | 0 | 9 | 0 | 3 |
| Communications Control | | | | | |
| | Radio Central | 0 | 8 | 0 | 3 |
| | Information Security | 0 | 3 | 0 | 1 |
| Combat Systems Casualty Control | | | | | |
| | Combat Sys Maint Central | 1 | 5 | 0 | 2 |
| | CIC | 0 | 1 | 0 | 0 |
| | Electronics Workshop #1 | 0 | 3 | 0 | 1 |
| | Power Supply/Conversion | 0 | 2 | 0 | 0 |
| | Radar Room #1 & #2 | 0 | 8 | 0 | 1 |
| | Radar Room #3 | 0 | 2 | 0 | 0 |
| | Combat Sys Equipment Rm #1 | 0 | 2 | 0 | 0 |
| | Combat Sys Equipment Rm #2 | 0 | 5 | 0 | 2 |
| | Combat Sys Equipment Rm #3 | 0 | 3 | 0 | 0 |
| | Radio Transmitter Rm | 0 | 3 | 0 | 0 |
| | Communication Center | 0 | 1 | 0 | 0 |
| | Sonar Equipment Rm #1 | 0 | 2 | 0 | 0 |
| | Harpoon Equipment Rm | 0 | 5 | 0 | 0 |
| | Gun Repair | 0 | 1 | 0 | 0 |
| Weapons Control | | | | | |
| | MT 51 Loader Drum Rm | 0 | 3 | 0 | 0 |
| | MT 51 Handling Rm | 0 | 8 | 0 | 0 |
| | CIWS MT 1 | 0 | 6 | 0 | 0 |
| | CIWS MT 2 | 0 | 5 | 0 | 0 |
| | MK 41 Launcher Station | 0 | 8 | 0 | 2 |
| | Tomahawk | 0 | 7 | 0 | 2 |
| Total | | 10 | 142 | 5 | 41 |

Note:

Different from DDG(OME)

| Control Station | Condition I | | Condition III | |
|-----------------------------|-------------|----------|---------------|----------|
| ASW Control | Officer | Enlisted | Officer | Enlisted |
| Sonar Control (SQQ 89(v)6) | 0 | 7 | 0 | 5 |
| NIXIE | 0 | 2 | 0 | 0 |
| SQR-19 Control (SQQ 89) | 0 | 1 | 0 | 0 |
| Engineering Control | | | | |
| Central Control Station | 1 | 3 | 0 | 3 |
| ENG Rm Fwd | 0 | 3 | 0 | 1 |
| ENG Rm Aft | 0 | 4 | 0 | 1 |
| Aux Machinery Rm 1 | 0 | 4 | 0 | 1 |
| Aux Machinery Rm 2 | 0 | 1 | 0 | 0 |
| A/C Machinery and Pump Rm | 0 | 1 | 0 | 0 |
| Generator Rm | 0 | 3 | 0 | 0 |
| IC and Gyro Rm Fwd | 0 | 2 | 0 | 1 |
| IC and Gyro Rm Aft | 0 | 1 | 0 | 0 |
| Repair 5 | 1 | 31 | 0 | 0 |
| Repair 5 Unit A | 0 | 21 | 0 | 0 |
| Damage Control | | | | |
| Damage Control Central | 1 | 9 | 0 | 2 |
| Oil Lab | 0 | 1 | 0 | 1 |
| Repair 3 | 0 | 31 | 0 | 0 |
| Repair 2 (sec DCC) | 1 | 35 | 0 | 0 |
| Battle Dressing Station Fwd | 0 | 2 | 0 | 0 |
| Battle Dressing Station Aft | 1 | 2 | 0 | 0 |
| Support Control | | | | |
| Battle Messing | 0 | 5 | 0 | 0 |
| Emergency Issue | 0 | 3 | 0 | 0 |
| Total | 5 | 172 | 0 | 15 |
| Overall Total | 329 | | 61 | |

Note:

Different from DDG(OME)

APPENDIX K. DDG (OME) BATTLE BILL REQUIREMENTS

| Control Station | | Condition I | | Condition III | |
|--|----------------------------|-------------|----------|---------------|----------|
| | | Officer | Enlisted | Officer | Enlisted |
| Ship Control | | | | | |
| | Pilot House | 4 | 10 | 2 | 2 |
| | Lookouts | 0 | 3 | 0 | 1 |
| | Steering Aft | 0 | 3 | 0 | 0 |
| | Signal Bridge | 0 | 5 | 0 | 0 |
| Operations Control | | | | | |
| | Air Control | 0 | 3 | 0 | 2 |
| | Display and Decision | 6 | 8 | 3 | 7 |
| | Tactical Information | 0 | 6 | 0 | 5 |
| | Surface Warfare | 1 | 7 | 1 | 2 |
| Communications Control | | | | | |
| | Radio Central | 0 | 7 | 0 | 3 |
| | Information Security | 0 | 4 | 0 | 1 |
| Combat Systems Casualty Control | | | | | |
| | Combat Sys Maint Central | 1 | 4 | 0 | 1 |
| | CIC | 0 | 2 | 0 | 0 |
| | Electronics Workshop #1 | 0 | 2 | 0 | 3 |
| | Power Supply/Conversion | 0 | 2 | 0 | 0 |
| | Radar Room #1 & #2 | 0 | 6 | 0 | 0 |
| | Radar Room #3 | 0 | 2 | 0 | 0 |
| | Combat Sys Equipment Rm #1 | 0 | 2 | 0 | 0 |
| | Combat Sys Equipment Rm #2 | 0 | 3 | 0 | 2 |
| | Combat Sys Equipment Rm #3 | 0 | 3 | 0 | 0 |
| | Radio Transmitter Rm | 0 | 2 | 0 | 0 |
| | Communication Center | 0 | 2 | 0 | 0 |
| | Sonar Equipment Rm #1 | 0 | 1 | 0 | 0 |
| | Harpoon Equipment Rm | 0 | 4 | 0 | 0 |
| Weapons Control | | | | | |
| | MT 51 Loader Drum Rm | 0 | 3 | 0 | 1 |
| | MT 51 Handling Rm | 0 | 8 | 0 | 0 |
| | CIWS MT 21 | 0 | 6 | 0 | 0 |
| | CIWS MT 22 | 0 | 5 | 0 | 0 |
| | MK 41 Launcher Station | 0 | 4 | 0 | 1 |
| | M 60 Machine Gun #1 | 0 | 2 | 0 | 0 |
| | M 60 Machine Gun #2 | 0 | 2 | 0 | 0 |
| | 25 MM Mount #1 | 0 | 2 | 0 | 0 |
| | 25 MM Mount #2 | 0 | 2 | 0 | 0 |
| | 50 CAL Mount #1 | 0 | 2 | 0 | 0 |
| | 50 CAL Mount #2 | 0 | 2 | 0 | 0 |
| | 50 CAL Mount #3 | 0 | 2 | 0 | 0 |
| | 50 CAL Mount #4 | 0 | 2 | 0 | 0 |
| | Tomahawk | 1 | 5 | 0 | 1 |
| Total | | 13 | 138 | 6 | 32 |

2/5 aug

All aug
All aug
All aug
All aug
All aug
All aug
All aug
All aug

Note:

Augmented by off-watch or standing down other watches

Different from DDG

| Control Station | | Condition I | | Condition III | |
|------------------------------|--|-------------|----------|---------------|----------|
| ASW Control | | Officer | Enlisted | Officer | Enlisted |
| Sonar Control (SQQ 89(v)6) | | 0 | 5 | 0 | 4 |
| NIXIE | | 0 | 1 | 0 | 0 |
| SQR-19 Control (SQQ 89) | | 0 | 1 | 0 | 0 |
| Helo Control Station | | 1 | 0 | 0 | 0 |
| Flight Deck Control | | 0 | 6 | 0 | 0 |
| JP5 Pump Room | | 0 | 1 | 0 | 0 |
| Crash and Salvage | | 0 | 6 | 0 | 0 |
| Ready Life Boat | | 0 | 9 | 0 | 0 |
| MIO | | | | | |
| Boarding Team | | 1 | 15 | 0 | 0 |
| Divert Team | | 0 | 9 | 0 | 0 |
| Engineering Control | | | | | |
| Central Control Station | | 1 | 2 | 0 | 4 |
| ENG Rm Fwd | | 0 | 4 | 0 | 1 |
| ENG Rm Aft | | 0 | 4 | 0 | 1 |
| Aux Machinery Rm 1 | | 0 | 3 | 0 | 1 |
| Aux Machinery Rm 2 | | 0 | 1 | 0 | 0 |
| A/C Machinery and Pump Rm | | 0 | 1 | 0 | 0 |
| Oil Test Lab | | 0 | 1 | 0 | 1 |
| Generator Rm | | 0 | 2 | 0 | 0 |
| IC and Gyro Rm Fwd | | 0 | 2 | 0 | 0 |
| IC and Gyro Rm Aft | | 0 | 1 | 0 | 0 |
| Repair 5 | | 1 | 32 | 0 | 0 |
| Damage Control | | | | | |
| Damage Control Central | | 1 | 9 | 0 | 2 |
| Repair 3 | | 0 | 25 | 0 | 0 |
| Repair 2 (sec DCC) | | 1 | 30 | 0 | 0 |
| Battle Dressing Station Fwd | | 0 | 6 | 0 | 0 |
| Battle Dressing Station Main | | 0 | 6 | 0 | 0 |
| Battle Dressing Station Aft | | 0 | 6 | 0 | 0 |
| Support Control | | | | | |
| Battle Messing | | 0 | 3 | 0 | 0 |
| Emergency Issue | | 0 | 2 | 0 | 0 |
| Total | | 6 | 193 | 0 | 14 |
| Overall Total | | 350 | | 52 | |

All aug
All aug
All aug
All aug

5/9 aug

Note:

Augmented by off-watch or standing down other watches

Different from DDG(NO)

APPENDIX L. FFG BATTLE BILL REQUIREMENTS

| | | With Reserves | | | | Without Reserves | | | | | |
|---------------------------------|--------------------------------|---------------|----------|---------------|----------|------------------|----------|---------------|----------|-------------|------------|
| Control Station | | Condition I | | Condition III | | Condition I | | Condition III | | CI notes | CIII notes |
| Ship Control | | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted | | |
| | Pilot House | 4 | 10 | 2 | 3 | 3 | 7 | 1 | 3 | 4/14 res | 1/2 res |
| | Lookouts | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 1 | | |
| | Steering Aft | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | | |
| | Signal Bridge | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 1/2 aug res | |
| Operations Control | | | | | | | | | | | |
| | CIC | 3 | 14 | 1 | 7 | 1 | 9 | 1 | 3 | 7/17 res | 4/7 res |
| | Weapons CIC (MK 92 Mod 6) | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 2/2 res | 1 res |
| | Electronic Warfare | 0 | 3 | 0 | 1 | 0 | 2 | 0 | 0 | 1/3 res | 1/1 res |
| Communications Control | | | | | | | | | | | |
| | Radio Central | 0 | 6 | 0 | 2 | 0 | 6 | 0 | 2 | | |
| | Information Security | 0 | 4 | 0 | 0 | 0 | 3 | 0 | 0 | 1/4 res | |
| Combat Systems Casualty Control | | | | | | | | | | | |
| | Radar/IFF/CIC Equip Rm | 0 | 5 | 0 | 0 | 0 | 4 | 0 | 0 | 1/5 res | |
| | Radio Central | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 1/2 res | |
| | Combat Sys Maintenance Central | 0 | 2 | 0 | 3 | 0 | 1 | 0 | 0 | 1/2 res | All res |
| | Air Nav/ECM Rm | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| | NIXIE Equipment Rm | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| | MK 92 Mod 6 Equipment Rm | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| Weapons Control | | | | | | | | | | | |
| | Gun Control | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 2/3 res | |
| | 76 MM Magazine | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 2/3 res | |
| | CIWS MT 1 | 0 | 5 | 0 | 0 | 0 | 2 | 0 | 0 | 3/5 res | |
| | 25 MM Mount #1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 25 MM Mount #2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 50 CAL Mount #1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 50 CAL Mount #2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 50 CAL Mount #3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 50 CAL Mount #4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 50 CAL Mount #5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 50 CAL Mount #6 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | M 60 Machine Gun #1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | M 60 Machine Gun #2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| | 40 MM Grenade Launcher | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All aug | |
| Total | | 9 | 91 | 3 | 18 | 4 | 44 | 2 | 9 | | |

Note:

Augmented by off-watch or standing down other watches

| With Reserves | | | | | Without Reserves | | | | CI notes | CIII notes |
|-----------------------------|-------------|----------|---------------|----------|------------------|----------|---------------|----------|------------------|------------|
| Control Station | Condition I | | Condition III | | Condition I | | Condition III | | | |
| ASW Control | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted | | |
| Sonar Control (SQQ 89(v)9) | 0 | 6 | 0 | 3 | 0 | 3 | 0 | 0 | 3/6 res | All res |
| SQR-19 Control (SQQ 89) | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| Sonar Repair (SQQ 89(v)9) | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| NIXIE | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| Torpedo Launch Station | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | All res | |
| Helo Control Station | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | All aug | |
| Flight Deck Detail | 0 | 8 | 0 | 0 | 0 | 8 | 0 | 0 | All aug | |
| Ready Life Boat | 0 | 5 | 0 | 0 | 0 | 5 | 0 | 0 | All aug | |
| Boat davit crew | 1 | 6 | 0 | 0 | 1 | 6 | 0 | 0 | All aug | |
| RAST Control (LAMPS III) | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | All aug | |
| Crash and Salvage | 0 | 12 | 0 | 0 | 0 | 12 | 0 | 0 | All aug | |
| AFFF Generator Station | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | All aug | |
| JP5 Pump Room | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | All aug | |
| MIO | | | | | | | | | | |
| Boarding Team (co-manned) | 1 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | all res, all aug | |
| Divert Team | 1 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | all res, 5/9 aug | |
| Engineering Control | | | | | | | | | | |
| Central Control Station | 1 | 6 | 0 | 7 | 1 | 5 | 0 | 7 | 1/6 res | |
| ENG Rm | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | | |
| Aux Machinery Rm 1 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | | |
| Aux Machinery Rm 2 | 0 | 4 | 0 | 0 | 0 | 3 | 0 | 0 | 1/4 res | |
| Aux Machinery Rm 3 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | | |
| Switch Gear Rm | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | | |
| Repair 5 | 1 | 26 | 0 | 0 | 1 | 24 | 0 | 0 | 2/26 res | |
| Damage Control | | | | | | | | | | |
| Central Control Station | 1 | 5 | 0 | 1 | 1 | 5 | 0 | 3 | | |
| Repair 2 (Sec DCC) | 0 | 24 | 0 | 0 | 0 | 23 | 0 | 0 | 1/24 res | |
| Repair 3 | 0 | 24 | 0 | 0 | 0 | 23 | 0 | 0 | 1/24 res | |
| Battle Dressing Station Fwd | 0 | 6 | 0 | 0 | 0 | 6 | 0 | 0 | | |
| Battle Dressing Station Aft | 0 | 6 | 0 | 0 | 0 | 6 | 0 | 0 | | |
| Support Control | | | | | | | | | | |
| Battle Messing | 0 | 4 | 0 | 0 | 0 | 2 | 0 | 0 | 2/4 res | |
| Emergency Issue | 0 | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 1/3 res | |
| Total | 7 | 188 | 0 | 11 | 5 | 146 | 0 | 10 | | |
| Overall Total | 295 | | 32 | | 199 | | 21 | | | |

Note:

Augmented by off-watch or standing down other watches

APPENDIX M. MCM BATTLE BILL REQUIREMENTS

| Control Station | | Condition I | | Condition III | | Condition IM | | Condition IIM | |
|-------------------------------------|------------------------------------|-------------|----------|---------------|----------|--------------|----------|---------------|----------|
| | | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted |
| Ship Control | | | | | | | | | |
| | Pilot House | 3 | 8 | 1 | 2 | 2 | 5 | 2 | 7 |
| | Lookouts | 0 | 2 | 0 | 1 | 0 | 5 | 0 | 5 |
| | Signal Bridge | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operations Control | | | | | | | | | |
| | CIC | 1 | 3 | 0 | 3 | 1 | 4 | 1 | 4 |
| Mine Warfare | | | | | | | | | |
| | Sonar Control | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 5 |
| | MNV Launch and Recovery | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 1 |
| | Minesweep Launch and Recovery Area | 0 | 0 | 0 | 0 | 1 | 17 | 0 | 0 |
| | Boat Vectoring Crew | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | Boat Handling Detail | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 |
| Communications Control | | | | | | | | | |
| | Radio Central | 0 | 4 | 0 | 1 | 0 | 2 | 0 | 2 |
| Electronics Casualty Control | | | | | | | | | |
| | Electronic Repair | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Weapons Control | | | | | | | | | |
| | Gun Control | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| | MT 501 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 |
| | MT 502 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Engineering Control | | | | | | | | | |
| | Central Control Station | 1 | 2 | 0 | 4 | 0 | 3 | 0 | 3 |
| | Main Engine Room | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 1 |
| | Aux Machinery Rm | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | IC Room | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oil Lab | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Damage Control | | | | | | | | | |
| | Damage Control Station | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair 2 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair 3 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Battle Dressing Station | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Support Control | | | | | | | | | |
| | Battle Messing | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| | Emergency Issue | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 7 | 77 | 1 | 12 | 5 | 59 | 4 | 37 |
| Overall Total | | 84 | | 13 | | 64 | | 41 | |

3/5 aug

Note:

Augmented by off-watch or standing down other watches

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APPENDIX N. MHC BATTLE BILL REQUIREMENTS

| Control Station | | Condition I | | Condition III | | Condition IM | | Condition IIM | |
|-------------------------------|-------------------------|-------------|----------|---------------|----------|--------------|----------|---------------|----------|
| | | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted | Officer | Enlisted |
| Ship Control | | | | | | | | | |
| | Pilot House | 2 | 6 | 1 | 4 | 2 | 3 | 2 | 4 |
| | Lookouts | 0 | 1 | 0 | 1 | 0 | 5 | 0 | 5 |
| | Signal Bridge | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operations Control | | | | | | | | | |
| | CIC | 1 | 2 | 0 | 2 | 1 | 5 | 1 | 6 |
| Mine Warfare | | | | | | | | | |
| | Sonar Control | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 3 |
| | MNV Launch and Recovery | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 |
| | Boat Vectoring Crew | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | Boat Handling Detail | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 |
| Communications Control | | | | | | | | | |
| | Radio Central | 0 | 3 | 0 | 1 | 0 | 2 | 0 | 2 |
| Weapons Control | | | | | | | | | |
| | Gun Control | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | MT 501 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 |
| | MT 502 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Engineering Control | | | | | | | | | |
| | Central Control Station | 1 | 1 | 0 | 2 | 1 | 2 | 1 | 2 |
| | Main Engine Room | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Aux Machinery Rm | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Damage Control | | | | | | | | | |
| | Damage Control Station | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair 2 | 0 | 23 | 0 | 0 | 0 | 0 | 0 | 0 |
| Support Control | | | | | | | | | |
| | Battle Messing | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| | Main Battle Dressing | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 5 | 46 | 1 | 10 | 4 | 40 | 4 | 30 |
| Overall Total | | 51 | | 11 | | 44 | | 34 | |

Note:

Augmented by off-watch or standing down other watches

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APPENDIX O. NAVY ENLISTED RATE DESCRIPTION

Boatswain's Mate (BMs) train and supervise personnel in all activities relating to marlinspike, deck and boat seamanship, and the maintenance of the ship's external structure and deck equipment. They act as petty officers in charge of small craft and may perform duties as master-at-arms, serve in or take charge of gun crews and damage control parties.

Cryptologic Technicians Technical (CTTs) control the flow of messages and information. Their work depends on technical communications by means other than Morse code and electronic countermeasures.

Electronics Warfare Technician (EWs) operate and maintain electronic equipment used in navigation, target detection and location and for preventing electronic spying by enemies. They interpret incoming electronic signals to determine their source. EWs are advanced electronic technicians who do wiring, circuit testing and repair. They determine performance levels of electronic equipment, install new components, modify existing equipment and test, adjust and repair equipment cooling systems.

The CTT and EW rates have been combined into the CTT rate.

Damage Controlmen (DCs) perform the work necessary for damage control, ship stability, fire-fighting and chemical, biological and radiological (CBR) warfare defense. They instruct personnel in damage control and CBR defense and repair damage-control equipment and systems.

Electrician's Mates (EMs) operate and repair the ship's or station's electrical power plant and electrical equipment. They also maintain and repair power and lighting circuits, distribution switchboards, generators, motors and other electrical equipment.

Enginemen (ENs) keep internal combustion engines, diesel or gasoline in good order. They also maintain refrigeration, air-conditioning, distilling-plant engines and compressors.

Electronics Technicians (ETs) are responsible for electronic equipment used to send and receive messages, detect enemy planes and ships, and determine target distances. They must maintain, repair, calibrate, tune and adjust all electronic equipment used for communications, detection and tracking, recognition and identification, navigation and electronic countermeasures.

Fire Controlmen (FCs) maintain the control mechanism used in weapons systems on combat ships. Complex electronic, electrical and hydraulic equipment is required to ensure the accuracy of Navy guided missile and surface gunfire-control systems. FCs are responsible for the operation, routine care and repair of this equipment, which includes radars, computers, weapons direction equipment, target designation systems, gyroscopes and range finders. It is in the advanced electronics field and requires a six-year enlistment.

Navy Gunner's Mates (GMs) operate, maintain and repair all gunnery equipment, guided-missile launching systems, rocket launchers, guns, gun mounts, turrets, projectors and associated equipment. They make detailed casualty analyses

and repairs of electrical, electronic, hydraulic and mechanical systems. They also test and inspect ammunition, missiles and their ordnance components. GMs train and supervise personnel in the handling and stowage of ammunition, missiles and assigned ordnance equipment.

Gas Turbine System Technicians (GSs) operate, repair and maintain gas turbine engines; main propulsion machinery, including gears; shafting and controllable pitch propellers; assigned auxiliary equipment propulsion control systems; electrical and electronic circuitry up to the printed circuit module; and alarm and warning circuitry. They also perform administrative tasks related to gas turbine propulsion system operation and maintenance, (GSE: Electrical) (GSM: Mechanical)

Hull Maintenance Technicians (HTs) are responsible for maintaining ships' hulls, fittings, piping systems and machinery. They install and maintain shipboard and shore based plumbing and piping systems. They also look after a vessel's safety and survival equipment and perform many tasks related to damage control.

Interior Communications Electricians (ICs) operate and repair electronic devices used in the ship's interior communications systems, SITE TV systems, public address systems, electronic megaphones and other announcing equipment. They are also responsible for the gyrocompass systems.

Machinist's Mates (MMs) are responsible for the continuous operation of the many engines, compressors and gears, refrigeration, air-conditioning, gas-operated equipment and other types of machinery afloat and ashore.

They are also responsible for the ship's steam propulsion and auxiliary equipment and the outside (deck) machinery. MMs also may perform duties involving some industrial gases.

Minemen (MNs) test, maintain, repair and overhaul mines and their components. They are responsible for assembling, testing, handling, issuing and delivering mines to the planting agent and for maintaining mine-handling and mine-laying equipment.

Machinery Repairmen (MRs) are skilled machine tool operators. They make replacement parts and repair or overhaul a ship's engine auxiliary equipment, such as evaporators, air compressors and pumps. They repair deck equipment, including winches and hoists, condensers and heat exchange devices. Shipboard MRs frequently operate main propulsion machinery, besides performing machine shop and repair duties.

Operations Specialists (OS) operate radar, navigation and communications equipment in shipboard combat information centers (CICs) or bridges. They detect and track ships, planes and missiles. They also operate and maintain identification friend or foe (IFF) systems, electronic countermeasures (ECM) equipment and radio-telephones.

Quartermasters (QMs) assist the navigator and officer of the deck (OOD), steer the ship, take radar bearings and ranges, make depth soundings and celestial observations, plot courses and command small craft. Additionally, they maintain charts, navigational aids and oceanographic publications and records for the ship's log.

Signalmen (SMs) send and receive various visual messages, handle and route message traffic, operate voice radio and repair visual signaling devices. They also render honors to ships and boats and serve as navigators.

The QM and SM rates have been combined to be called bridge specialists. No acronyms exist to represent this consolidation. The QM rate is still in effect and will be used to fill bridge specialist requirements.

Torpedoman's Mates (TMs) maintain underwater explosive missiles, such as torpedoes and rockets, which are launched from surface ships, submarines and aircraft. They also maintain launching systems for underwater explosives, and are responsible for shipping and storage of torpedoes and rockets.

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APPENDIX P. SEAFRAME BASELINE BATTLE BILL

| Type of Control | Station ID | BUSINESS AS USUAL Watch station title | CONDITION I Rate |
|------------------------------|----------------------------|--|---------------------|
| Ship | | | |
| Pilot House | OOD | OOD | OFF |
| | | JOOD | OFF |
| | | NAV | OFF |
| | | BMOW | BM |
| | | SCC OPER | SHIP |
| | Lookouts | Plotter | QM |
| | | Lookout | SHIP |
| | Signal Bridge | Signalman/recorder | QM |
| | | recorder | QM |
| Operations | | | |
| Air Control | AIC Supv | OS | |
| | AIC | OS | |
| Display & Decision | ASTAC | OS | |
| | TAO | OFF | |
| | Cbt Sys Coord | FC | |
| | Missile Sys Supv | FC | |
| | CIC Supv | OS | |
| | GCCS-M Administrator | OS | |
| | Own Ship display Ctrlr | OS | |
| | Talker | OS | |
| | Talker | OS | |
| | Talker | OS | |
| Engagement | Talker | OS | |
| | Radar Oper | OS | |
| | DRT Oper | OS | |
| | Weps Contrl Officer | OFF | |
| Tactical Info | Weps Console Operator | FC | |
| | Tactical Information Coord | OS | |
| | Radar sys controller | SHIP | |
| | EW Supervisor | CTT | |
| | DCC Operator | CTT | |
| | Communications | | |
| Radio Central | Radio Supervisor | IT | |
| | Comm Sys Oper #1 | SHIP | |
| | Comm Sys Oper #2 | SHIP | |
| | Radio Oper | SHIP | |
| | Talker | SHIP | |
| Information Security | Network Security Tech | IT | |
| | System Administrator | IT | |
| | LAN Manager | SHIP | |
| | Tactical Sys Administrator | IT | |
| Electronics Casualty Control | | | |
| CS Maint Cntrl | CSOOW | OFF | |
| | CS Maint Supv | FC | |
| | Test & Maint Console Oper | FC | |
| | Talker | SHIP | |
| | Computer Oper | SHIP | |
| | EW Repairman | CTT | |
| Search RADAR | Electronics Repairman | ET | |
| | Electronics Repairman | ET | |
| CIC | Console Repairman | FC | |
| SONAR Repair | Sonar Repairman | STG | |
| NIXIE Repair | Torp Decoy Oper/Repairman | STG | |
| Gun Repair | Gun Repairman | GM | |

| Type of Control | Station ID | BUSINESS AS USUAL Watch station title | CONDITION I Rate |
|----------------------|------------|--|---------------------|
| Weapons | | | |
| MT 51 Loader Drum Rm | | TDT Supv | GM |
| | | EP2 Panel Oper | GM |
| MT 51 Handling Rm | | TDT #1 Oper | SHIP |
| | | POIC/MT Captain | GM |
| | | Ammo Passer | SHIP |
| | | Ammo Passer | SHIP |
| RAM | | RAM Supv | SHIP |
| CIWS MT 1 | | RCP Oper | FC |
| | | LCP Oper | FC |
| | | POIC/Reloader | SHIP |
| | | Ammo Passer | SHIP |
| | | Ammo Passer | SHIP |
| 50CAL #1 | | Gun Oper | SHIP |
| | | Gun Loader | SHIP |
| 50CAL #2 | | Gun Oper | SHIP |
| | | Gun Loader | SHIP |
| 50CAL #3 | | Gun Oper | SHIP |
| | | Gun Loader | SHIP |
| 50CAL #4 | | Gun Oper | SHIP |
| | | Gun Loader | SHIP |
| SONAR | | Sonar Supv/UWS | STG |
| | | SQS-53 Console Oper | STG |
| | | SQS-53 Console Oper | STG |
| | | SQQ-28 Console Oper | STG |
| | | SIMAS Oper/Log Keeper | STG |
| Torpedo CM | | Torp Tube Oper Port | STG |
| | | Torp Tube Oper Stbd | STG |
| Helo Control Station | | HCO | OFF |
| Flight Deck Control | | FD Safety Officer | BM |
| | | LSE | BM |
| Ready Life Boat | | FD Crewman | SHIP |
| | | FD Crewman | SHIP |
| | | Fuel station Oper | SHIP |
| | | JP5 Nozzleman | SHIP |
| | | Coxswain | BM |
| | | Rescue Swimmer | SHIP |
| | | Bow Hook | SHIP |
| | | Boat Engineer | EN |
| | | Boat Deck POIC | BM |
| | | Talker | SHIP |
| Aircraft Handling | | Davit Oper | SHIP |
| | | Line Handler | SHIP |
| | | Line Handler | SHIP |
| | | RAST Oper | OFF |
| Crash and Salvage | | Scene Leader | DC |
| | | Hot Suitman | ENG |
| | | Hot Suitman | ENG |
| | | Hose Team Leader #2 | ENG |
| | | AFFF Nozzleman | ENG |
| | | AFFF Hoseman/plugman | ENG |
| AFFF Station | | AFFF Station Oper | ENG |
| JP5 Pump Room | | Fuel Pump Oper | ENG |

| Type of Control | Station ID | BUSINESS AS USUAL Watch station title | CONDITION I Rate |
|--------------------|-------------------------|--|---------------------|
| Engineering | | | |
| | CCS | EOOW/Prop/DCO | OFF |
| | | Prop Ctrl Sys Oper | GS |
| | | Elec Plant Ctrl Cons Oper | GS |
| | ENG Rm | Equip Monitor/Oper | GS |
| | Aux Machinery Rm | Aux Oper/Rover | EN |
| | | Equip Monitor/Oper | EN |
| Damage | | | |
| | DC Central | DCA | OFF |
| | | Plotter | DC |
| | | Talker | SHIP |
| | Oil Lab | Oil/Water Tester | EN |
| | Repair | Repair Party Leader | DC |
| | | Scene Leader | SHIP |
| | | Team Leader | SHIP |
| | | Plotter | DC |
| | | Investigator/SCBA Man #1 | SHIP |
| | | Investigator/SCBA Man #2 | SHIP |
| | | Nozzleman/SCBA Man #2 | SHIP |
| | | Hoseman/SCBA Man #1 | SHIP |
| | | Hoseman/SCBA Man #2 | SHIP |
| | | Electrical Repair | EM |
| | | IC Repair | IC |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | Utilityman | SHIP |
| | | AFFF Station Oper | ENG |
| | Battle Dressing Station | Med Tech | HM |
| | | Talker | SHIP |
| Support | | | |
| | Battle Messing | Ships Cook | CS |
| | | Ships Cook | CS |
| | | Ships Cook | CS |
| | Emergency Issue | Stock Ctrl Supv | SK |
| | | Locate/issue clerk | SK |
| | | Locate/issue clerk | SK |

APPENDIX Q. SEAFRAME BASELINE RQMTS

LCS SEAFRAME

| <u>Billet Title</u> | <u>Rate</u> |
|-----------------------------------|-------------|
| <u>Executive Dept</u> | |
| COMMANDING OFFICER | OFF |
| EXECUTIVE OFFICER | OFF |
| YEOMAN | YN |
| HOSPITAL CORPSMAN | HM |
| <u>Operations Dept</u> | |
| OPS AFLOAT GEN/SURF SFTY | OFF |
| IT PROFESSIONAL/COMMO | OFF |
| QUARTERMASTER | QM |
| QUARTERMASTER | QM |
| SIGNALMAN | QM |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| BOATSWAIN'S MATE | BM |
| BOATSWAIN'S MATE | BM |
| BOATSWAIN'S MATE | BM |
| BOATSWAIN'S MATE | BM |
| BOATSWAIN'S MATE | BM |
| ELECTRONICS TECHNICIAN | CTT |
| ELECTRONICS TECHNICIAN | CTT |
| ELECTRONICS TECHNICIAN | CTT |
| INFORMATION SYSTEMS TECHNICIAN | IT |
| INFORMATION SYS TECH | IT |
| INFORMATION SYS TECH | IT |
| INFORMATION SYSTEMS TECHNICIAN | IT |
| <u>Combat Systems Dept</u> | |
| CMBT SYS | OFF |
| GUN/ORD | OFF |
| SHP ELX MTL | OFF |
| ELECTRONICS TECHNICIAN | ET |
| ELECTRONICS TECHNICIAN | ET |
| ELECTRONICS TECHNICIAN (SONAR) | STG |
| ELECTRONICS TECHNICIAN (SONAR) | STG |
| IC ELECTRICIAN | IC |
| IC ELECTRICIAN | IC |
| IC ELECTRICIAN | IC |
| SONAR TECH (SURFACE) | STG |
| SONAR TECH (SURFACE) | STG |
| SONAR TECH (SURFACE) | STG |
| SONAR TECH (SURFACE) | STG |
| SONAR TECH (SURFACE) | STG |
| TORPEDOMAN'S MATE | STG |
| TORPEDOMAN'S MATE | STG |
| GUNNER'S MATE | GM |
| GUNNER'S MATE | GM |
| GUNNER'S MATE | GM |
| GUNNER'S MATE | GM |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |
| FIRE CONTROLMAN | FC |

LCS SEAFRAME

| <u>Billet Title</u> | <u>Rate</u> |
|--------------------------------|-------------|
| <u>Engineering Dept</u> | |
| SHP ENG GASTBN | OFF |
| DC ASST | OFF |
| MPA GASTURBINE | OFF |
| AUX MACH | OFF |
| ELECTRICIAN'S MATE | EM |
| ELECTRICIAN'S MATE | EM |
| ELECTRICIAN'S MATE | EM |
| ELECTRICIAN'S MATE | EM |
| ELECTRICIAN'S MATE | EM |
| ELECTRICIAN'S MATE | EM |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| HULL TECHNICIAN | HT |
| HULL TECHNICIAN | HT |
| HULL TECHNICIAN | HT |
| MACHINERY REPAIRMAN | MR |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH ELEC | GS |
| GAS TURB SYS TECH ELEC | GS |
| GAS TURB SYS TECH ELEC | GS |
| GAS TURB SYS TECH ELEC | GS |
| GAS TURB SYS TECH ELEC | GS |
| <u>Supply Dept</u> | |
| STOREKEEPER | SK |
| STOREKEEPER | SK |
| STOREKEEPER | SK |
| STOREKEEPER | SK |
| STOREKEEPER | SK |
| MESS MANAGEMENT SPECIALIST | CS |
| MESS MANAGEMENT SPECIALIST | CS |
| MESS MANAGEMENT SPECIALIST | CS |
| MESS MANAGEMENT SPECIALIST | CS |
| MESS MANAGEMENT SPECIALIST | CS |
| MESS MANAGEMENT SPECIALIST | CS |

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APPENDIX R. SEAFRAME RQMTS ANALYSIS

| LCS SEAFRAME | | SmartShip | OME | Composite Sailor | Technology Leverage | Workload Alignment |
|--------------------------------|-------------|-------------|-------------|------------------|---------------------|--------------------|
| <u>Billet Title</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> |
| <u>Executive Dept</u> | | | | | | |
| COMMANDING OFFICER | OFF | OFF | OFF | OFF | OFF | OFF |
| EXECUTIVE OFFICER | OFF | OFF | OFF | OFF | OFF | OFF |
| YEOMAN | YN | YN | YN | YN | YN | YN |
| HOSPITAL CORPSMAN | HM | HM | HM | HM | HM | HM |
| <u>Operations Dept</u> | | | | | | |
| OPS AFLOAT GEN/SURF SFTY | OFF | OFF | OFF | OFF | OFF | OFF |
| IT PROFESSIONAL/COMMO | OFF | OFF | OFF | OFF | OFF | OFF |
| QUARTERMASTER | QM | QM | QM | | | |
| QUARTERMASTER | QM | QM | QM | QM | | |
| SIGNALMAN | QM | QM | QM | | | |
| OPERATIONS SPECIALIST | OS | OS | | | | |
| OPERATIONS SPECIALIST | OS | OS | | | | |
| OPERATIONS SPECIALIST | OS | OS | | | | |
| OPERATIONS SPECIALIST | OS | OS | | | | |
| OPERATIONS SPECIALIST | OS | OS | | | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | | |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | OS | OS |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | OS | OS |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | OS | OS |
| OPERATIONS SPECIALIST | OS | OS | OS | OS | OS | OS |
| BOATSWAIN'S MATE | BM | BM | BM | BM | | |
| BOATSWAIN'S MATE | BM | BM | BM | BM | | |
| BOATSWAIN'S MATE | BM | BM | BM | BM | BM | BM |
| BOATSWAIN'S MATE | BM | BM | BM | BM | BM | BM |
| BOATSWAIN'S MATE | BM | BM | BM | BM | BM | BM |
| ELECTRONICS TECHNICIAN | CTT | CTT | CTT | CTT | CTT | CTT |
| ELECTRONICS TECHNICIAN | CTT | CTT | CTT | CTT | | |
| ELECTRONICS TECHNICIAN | CTT | CTT | | | | |
| INFORMATION SYSTEMS TECHNICIAN | IT | IT | | | | |
| INFORMATION SYS TECH | IT | IT | IT | IT | | |
| INFORMATION SYS TECH | IT | IT | IT | IT | IT | IT |
| INFORMATION SYSTEMS TECHNICIAN | IT | IT | IT | IT | IT | IT |

| LCS SEAFRAME | | SmartShip | OME | Composite Sailor | Technology Leverage | Workload Alignment |
|--------------------------------|------|-----------|------|------------------|---------------------|--------------------|
| Billet Title | Rate | Rate | Rate | Rate | Rate | Rate |
| Combat Systems Dept | | | | | | |
| CMBT SYS | OFF | OFF | OFF | OFF | OFF | OFF |
| GUN/ORD | OFF | OFF | OFF | | | |
| SHP ELX MTL | OFF | OFF | | | | |
| ELECTRONICS TECHNICIAN | ET | ET | ET | ET | ET | ET |
| ELECTRONICS TECHNICIAN | ET | ET | ET | ET | ET | ET |
| ELECTRONICS TECHNICIAN (SONAR) | STG | STG | | | | |
| ELECTRONICS TECHNICIAN (SONAR) | STG | STG | STG | | | |
| IC ELECTRICIAN | IC | IC | | | | |
| IC ELECTRICIAN | IC | IC | IC | IC | IC | IC |
| IC ELECTRICIAN | IC | IC | IC | IC | IC | IC |
| SONAR TECH (SURFACE) | STG | STG | STG | STG | | |
| SONAR TECH (SURFACE) | STG | STG | STG | STG | | |
| SONAR TECH (SURFACE) | STG | STG | STG | STG | | |
| SONAR TECH (SURFACE) | STG | STG | STG | STG | STG | STG |
| SONAR TECH (SURFACE) | STG | STG | STG | STG | STG | STG |
| TORPEDOMAN'S MATE | STG | STG | STG | | | |
| TORPEDOMAN'S MATE | STG | STG | STG | | | |
| GUNNER'S MATE | GM | GM | | | | |
| GUNNER'S MATE | GM | GM | GM | GM | GM | |
| GUNNER'S MATE | GM | GM | GM | GM | GM | GM |
| GUNNER'S MATE | GM | GM | GM | GM | GM | GM |
| FIRE CONTROLMAN | FC | FC | | | | |
| FIRE CONTROLMAN | FC | FC | FC | FC | | |
| FIRE CONTROLMAN | FC | FC | FC | FC | | |
| FIRE CONTROLMAN | FC | FC | FC | FC | | |
| FIRE CONTROLMAN | FC | FC | FC | FC | | |
| FIRE CONTROLMAN | FC | FC | FC | FC | FC | FC |
| FIRE CONTROLMAN | FC | FC | FC | FC | FC | FC |
| FIRE CONTROLMAN | FC | FC | FC | FC | FC | FC |

| LCS SEAFRAME | | SmartShip | OME | Composite Sailor | Technology Leverage | Workload Alignment |
|-------------------------|------|-----------|------|------------------|---------------------|--------------------|
| Billet Title | Rate | Rate | Rate | Rate | Rate | Rate |
| Engineering Dept | | | | | | |
| SHP ENG GASTBN | OFF | OFF | OFF | OFF | OFF | OFF |
| DC ASST | OFF | OFF | OFF | OFF | | |
| MPA GASTURBINE | OFF | OFF | OFF | | | |
| AUX MACH | OFF | OFF | OFF | | | |
| ELECTRICIAN'S MATE | EM | | | | | |
| ELECTRICIAN'S MATE | EM | EM | | | | |
| ELECTRICIAN'S MATE | EM | EM | | | | |
| ELECTRICIAN'S MATE | EM | EM | EM | EM | EM | |
| ELECTRICIAN'S MATE | EM | EM | EM | EM | EM | EM |
| ELECTRICIAN'S MATE | EM | EM | EM | EM | EM | EM |
| ENGINEMAN | EN | EN | EN | | | |
| ENGINEMAN | EN | EN | EN | | | |
| ENGINEMAN | EN | EN | EN | | | |
| ENGINEMAN | EN | EN | EN | | | |
| ENGINEMAN | EN | EN | EN | EN | | |
| ENGINEMAN | EN | EN | EN | EN | | |
| ENGINEMAN | EN | EN | EN | EN | EN | |
| ENGINEMAN | EN | EN | EN | EN | EN | EN |
| ENGINEMAN | EN | EN | EN | EN | EN | EN |
| HULL TECHNICIAN | HT | HT | | | | |
| HULL TECHNICIAN | HT | HT | HT | | | |
| HULL TECHNICIAN | HT | HT | HT | | | |
| MACHINERY REPAIRMAN | MR | MR | MR | | | |
| DAMAGE CONTROLMAN | DC | | | | | |
| DAMAGE CONTROLMAN | DC | DC | DC | DC | | |
| DAMAGE CONTROLMAN | DC | DC | DC | DC | | |
| DAMAGE CONTROLMAN | DC | DC | DC | DC | DC | DC |
| DAMAGE CONTROLMAN | DC | DC | DC | DC | DC | DC |
| GAS TURB SYS TECH MECH | GS | | | | | |
| GAS TURB SYS TECH MECH | GS | | | | | |
| GAS TURB SYS TECH MECH | GS | | | | | |
| GAS TURB SYS TECH MECH | GS | GS | | | | |
| GAS TURB SYS TECH MECH | GS | GS | | | | |
| GAS TURB SYS TECH MECH | GS | GS | GS | | | |
| GAS TURB SYS TECH MECH | GS | GS | GS | | | |
| GAS TURB SYS TECH MECH | GS | GS | GS | | | |
| GAS TURB SYS TECH MECH | GS | GS | GS | GS | GS | GS |
| GAS TURB SYS TECH MECH | GS | GS | GS | GS | GS | GS |
| GAS TURB SYS TECH MECH | GS | GS | GS | GS | GS | GS |
| GAS TURB SYS TECH ELEC | GS | GS | | | | |
| GAS TURB SYS TECH ELEC | GS | GS | GS | GS | | |
| GAS TURB SYS TECH ELEC | GS | GS | GS | GS | | |
| GAS TURB SYS TECH ELEC | GS | GS | GS | GS | GS | GS |
| GAS TURB SYS TECH ELEC | GS | GS | GS | GS | GS | GS |

| LCS SEAFRAME | | SmartShip | OME | Composite Sailor | Technology Leverage | Workload Alignment |
|----------------------------|-------------|-------------|-------------|------------------|---------------------|--------------------|
| <u>Billet Title</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> | <u>Rate</u> |
| <u>Supply Dept</u> | | | | | | |
| STOREKEEPER | SK | SK | SK | SK | | |
| STOREKEEPER | SK | SK | SK | SK | | |
| STOREKEEPER | SK | SK | SK | SK | SK | |
| STOREKEEPER | SK | SK | SK | SK | SK | SK |
| STOREKEEPER | SK | SK | SK | SK | SK | SK |
| MESS MANAGEMENT SPECIALIST | CS | CS | | | | |
| MESS MANAGEMENT SPECIALIST | CS | CS | | | | |
| MESS MANAGEMENT SPECIALIST | CS | CS | CS | CS | | |
| MESS MANAGEMENT SPECIALIST | CS | CS | CS | CS | | |
| MESS MANAGEMENT SPECIALIST | CS | CS | CS | CS | CS | CS |
| MESS MANAGEMENT SPECIALIST | CS | CS | CS | CS | CS | CS |

APPENDIX S. SEAFRAME REDUCED RQMTS

Minimal Manning for LCS Seaframe

| <u>Billet Title</u> | <u>Rate</u> |
|-----------------------|-------------|
| Executive Dept | |
| COMMANDING OFFICER | OFF |
| EXECUTIVE OFFICER | OFF |
| YEOMAN | YN |
| HOSPITAL CORPSMAN | HM |

Operations Dept

| | |
|--------------------------|-----|
| Operations Officer | OFF |
| IT PROFESSIONAL/COMMO | OFF |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| OPERATIONS SPECIALIST | OS |
| BOATSWAIN'S MATE | BM |
| BOATSWAIN'S MATE | BM |
| BOATSWAIN'S MATE | BM |
| ELECTRONICS TECHNICIAN | CTT |
| INFORMATION SYSTEMS TECH | IT |
| INFORMATION SYSTEMS TECH | IT |

Combat Systems Dept

| | |
|------------------------|-----|
| Combat Systems Officer | OFF |
| ELECTRONICS TECHNICIAN | ET |
| ELECTRONICS TECHNICIAN | ET |
| IC ELECTRICIAN | IC |
| IC ELECTRICIAN | IC |
| SONAR OPER/REP | STG |
| SONAR OPER/REP | STG |
| GUN OPER/REPAIRMAN | GM |
| GUN OPER/REPAIRMAN | GM |
| FIRE CONTROLMAN/REP | FC |
| FIRE CONTROLMAN/REP | FC |

Engineering Dept

| | |
|------------------------|-----|
| Chief Engineer | OFF |
| ELECTRICIAN'S MATE | EM |
| ELECTRICIAN'S MATE | EM |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| ENGINEMAN | EN |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| DAMAGE CONTROLMAN | DC |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH MECH | GS |
| GAS TURB SYS TECH ELEC | GS |
| GAS TURB SYS TECH ELEC | GS |

Supply Dept

| | |
|----------------------------|----|
| STOREKEEPER | SK |
| STOREKEEPER | SK |
| MESS MANAGEMENT SPECIALIST | CS |
| MESS MANAGEMENT SPECIALIST | CS |

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APPENDIX T. SEAFRAME REDUCED BATTLE BILL

| Type of Control | REDUX Watch station title | CONDITION I Rate | CONDITION III Rate |
|-------------------------------------|--|---------------------|-----------------------|
| Ship | OOD | OFF | OFF/BM/GM |
| | JOOD | BM | BM/GM |
| | Secondary DC/Lookout/ | DC | |
| | | | |
| Operations | | | |
| | AIC/ASTAC/ATAO | OS | OS/STG/CTT |
| | TAO | OFF | OFF/OS |
| | Radar Oper | OS | |
| | Weps Console oper | FC | |
| | Tact Info Coord | OS | |
| | EW Supv/Repairman | CTT | |
| Communications | | | |
| | Comm Sys Oper | IT | |
| | Sys Admin/LAN Manager | OS | |
| | Tactical Sys Admin | IT | |
| Electronics Casualty Control | | | |
| | CS Maint Supv | ET | |
| | Electronics Repairman | ET | |
| Weapons | | | |
| | MT CAPT/EP2 Panel Oper | GM | GM |
| | Ammo Passer/Gun Rep | FC | FC |
| | MT CAPT/LCP Oper/Gun Rep | GM | GM |
| | Ammo Passer/Gun Rep | BM | BM |
| | Gun Oper | SHIP | SHIP |
| | Gun Loader | SHIP | SHIP |
| | Gun Oper | SHIP | SHIP |
| | Gun Loader | SHIP | SHIP |
| | Gun Oper | SHIP | SHIP |
| | Gun Oper | SHIP | SHIP |
| | Console Oper/SONAR Rep | STG | STG |
| | Console Oper/SONAR Rep | STG | STG |
| | Torp Tube Oper/NIXIE/SQR-19 Winch Oper | BM | BM |
| | HCO/RAST Oper | OFF | OFF |
| | Landing Safety Officer | SHIP | SHIP |
| | FD Crewman | SHIP | SHIP |
| | FD Crewman | SHIP | SHIP |
| | JP5 Nozzleman | SHIP | SHIP |
| | Coxswain/Engineer | SHIP | SHIP |
| | Rescue Swimmer/ Bow Hook | SHIP | SHIP |
| | Boat Deck POIC/Davit Oper | SHIP | SHIP |
| | Line Handler | SHIP | SHIP |
| | Line Handler | SHIP | SHIP |
| | Scene Leader | SHIP | SHIP |
| | Hot Suitman | SHIP | SHIP |
| | Hot Suitman | SHIP | SHIP |
| | Hose Team Leader | SHIP | SHIP |
| | AFFF Nozzleman | SHIP | SHIP |
| | AFFF Hoseman/plugman | SHIP | SHIP |
| Engineering | | | |
| | EOOW/Prop/DCO | OFF | EN/GS |
| | Elec Plant Ctrl Cons Oper | GS | GS |
| | Equip Monitor/Oper | EN/GS | EN/GS |
| Damage | | | |
| | DCA | DC | DC |
| | Oil/Water Tester | EN/GS | EN/GS |
| | Repair Party Leader | DC | DC |
| | Investigator/SCBA Man #1 | SHIP | SHIP |
| | Investigator/SCBA Man #2 | SHIP | SHIP |
| | Nozzleman/SCBA Man | SHIP | SHIP |
| | Hoseman/SCBA Man | SHIP | SHIP |
| | Hoseman/SCBA Man | SHIP | SHIP |
| | Med Tech | HM | HM |
| Support | | | |
| | Ships Cook | CS | |
| | Ships Cook | CS | |
| | Stock Ctrl Supv | SK | |
| | Locate/issue clerk | SK | |
| Total | | | |
| | 59 | 59 | 45 |
| Augment | | | |
| | 21 | 21 | 41 |
| Actual billet | | | |
| | 38 | 38 | 4 |

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APPENDIX U. MODULE PRE-PACKAGED RQMTS

| Billet Title | Rate | MIW | | ASW | | SUW | |
|--------------------------------------|-------|--------|---------|--------|-----------|--------|-----------|
| | | Normal | Reduced | Normal | Optimized | Normal | Optimized |
| FMP Executive | | | | | | | |
| OIC/Analyst | LCDR | 1 | 1 | 1 | 1 | 1 | 1 |
| AOIC/Analyst | LT | 1 | 1 | 1 | 1 | 1 | 1 |
| Yeoman | YN | 1 | | 1 | | 1 | |
| Supply support | SK | 1 | 1 | 1 | 1 | 1 | 1 |
| Comms Support | IT | 1 | 1 | 1 | 1 | 1 | 1 |
| Operations Specialist | MN/OS | 1 | 1 | 1 | 1 | 1 | 1 |
| USV Detachment | | | | | | | |
| USV Oper | BM | 3 | 2 | 5 | 3 | 3 | 3 |
| USV Maint | EN | 2 | | 2 | | 2 | |
| USV Maint | EM | 1 | | 1 | | 1 | |
| USV Maint | ET | 2 | 1 | 2 | 2 | 2 | 2 |
| Weapons/Ordnance | GM | | | | | 2 | 1 |
| RMV Detachment | | | | | | | |
| RMV Oper | MN | 4 | 3 | 2 | 3 | | |
| RMV Maint | EN | 3 | | 3 | | | |
| RMV Maint | STG | 2 | 2 | 2 | 2 | | |
| RMV Maint | EM | 1 | | 1 | | | |
| BPAUV Detachment | | | | | | | |
| BPAUV Oper/Maint | MN | 2 | 1 | | | | |
| SCULPIN Detachment | | | | | | | |
| SCULPIN Oper/Main | MN | 2 | 1 | | | | |
| EOD Detachment | | | | | | | |
| OIC/Dive Supv | EOD | 1 | 1 | | | | |
| Diver | EOD | 1 | 1 | | | | |
| Diver | EOD | 1 | 1 | | | | |
| Stby Diver | EOD | 1 | 1 | | | | |
| Diver Tender | EOD | 1 | | | | | |
| Diver Tender | EOD | 1 | | | | | |
| Stby Diver Tender | EOD | 1 | | | | | |
| Timekeeper/Recorder | EOD | 1 | | | | | |
| ACES/EER/IEER/AEER family Det | | | | | | | |
| Oper/Maint | STG | | | 5 | 3 | | |
| Torpedo CounterMeasures Det | | | | | | | |
| Oper/Maint | STG | | | 3 | 1 | | |
| ADS Det | | | | | | | |
| Oper/Maint | STG | | | 5 | 2 | | |
| Towed Array Det | | | | | | | |
| Oper/Maint | STG | | | | | | |
| Intermediate Cal Gun Det | | | | | | | |
| POIC/Det Supv | GM | | | | | 1 | 1 |
| Oper/Maint | GM | | | | | 3 | 3 |
| Non-lethal Weapon Det | | | | | | | |
| TBD | TBD | | | | | | |
| TOTAL | | | | | | | |
| 32 | | 36 | 19 | 37 | 21 | 20 | 15 |
| Air Det | | | | | | | |
| | | 57 | 34 | 52 | 30 | 52 | 30 |
| TOTAL w/Air Det | | | | | | | |
| | | 93 | 53 | 89 | 51 | 72 | 45 |

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APPENDIX V. MODULE FLEXED RQMTS COMPUTATION

| Seaframe | | MIW | ASW | SUW | Total FMP |
|----------|--|-----|-----|-----|-----------|
| 15 | | 13 | 10 | 9 | 32 |

| Billet Title | | Rate | MIW Reduced | ASW Reduced | SUW Reduced | Flexed Total |
|-------------------------------|-----------------------|-------|----------------|----------------|----------------|-----------------|
| FMP Executive | | | | | | |
| | OIC/Analyst | LCDR | 1 | 1 | 1 | 32 |
| | AOIC/Analyst | LT | 1 | 1 | 1 | 32 |
| | Yeoman | YN | 0 | | | 0 |
| | Supply support | SK | 1 | | | 15 |
| | Comms Support | IT | 1 | | | 15 |
| | Operations Specialist | MN/OS | 1 | | 1 | 15 |
| USV Detachment | | | | | | |
| | USV Oper | BM | 1 | 1 | 1 | 32 |
| | USV Maint | EN | 1 | | | 15 |
| | USV Maint | EM | 1 | | | 15 |
| | USV Maint | ET | 1 | | | 15 |
| | Weapons/Ordnance | GM | 0 | | 1 | 9 |
| RMV Detachment | | | | | | |
| | RMV Oper | MN | 3 | 3 | 0 | 69 |
| | RMV Oper | MN | 0 | | | 0 |
| | RMV Maint | EN | 1 | | 0 | 15 |
| | RMV Maint | STG | 2 | | 0 | 30 |
| BPAUV Detachment | | | | | | |
| | BPAUV Oper/Maint | MN | 1 | 0 | | 13 |
| SCULPIN Detachment | | | | | | |
| | SCULPIN Oper/Main | MN | 1 | 0 | | 13 |
| EOD Detachment | | | | | | |
| | EOD Detachment | EOD | 4 | 0 | | 52 |
| ACES/EER/IEER/AEER family Det | | | | | | |
| | Oper/Maint | STG | 0 | 3 | 0 | 30 |
| Torpedo CounterMeasures Det | | | | | | |
| | Oper/Maint | STG | 0 | 1 | 0 | 10 |
| ADS Det | | | | | | |
| | Oper/Maint | STG | 0 | 3 | 0 | 30 |
| Towed Array Det | | | | | | |
| | Oper/Maint | STG | 0 | 0 | 0 | 0 |
| Intermediate Cal Gun Det | | | | | | |
| | Oper/Maint | GM | 0 | | 4 | 36 |
| Non-lethal Weapon Det | | | | | | |
| | TBD | | 0 | | | 0 |
| Air Det Oper (specialists) | | | 16 | 12 | | 388 |
| Air Det Support (generalists) | | | 18 | | | 270 |

| | | | |
|------------------------------|----|----|----|
| Module TOTAL without air det | 19 | 21 | 15 |
| Module TOTAL with air det | 53 | 51 | 45 |

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APPENDIX W. ABBREVIATIONS AND ACRONYMS

| | |
|---------|---|
| AFFF | Aqueous Film Forming Foam |
| AIC | Aircraft Intercept Control |
| ASW | Anti-Submarine Warfare |
| BM | Boatswain's Mate |
| BMOW | Boatswain's Mate of the Watch |
| CBM | Condition Based Maintenance |
| CBT | Combat |
| CCS | Central Control Station |
| CG | Cruiser, Guided Missile |
| CG (NS) | Cruiser, Guided Missile (Pre-Smart Ship) |
| CG (SS) | Cruiser, Guided Missile (Post-Smart Ship) |
| CIC | Combat Information Center |
| CIWS | Close-In Weapon System |
| CMP | Consolidated Maintenance Package |
| CO | Commanding Officer |
| CO2 | Carbon Dioxide |
| COMM | Communication |
| CONOPS | Concept of Operations |
| COTS | Commercial off The Shelf |
| CS | Culinary Specialist |
| CS | Combat Systems |
| CSO | Combat Systems Officer |
| CSOOW | Combat Systems Officer of the Watch |
| CTT | Cryptologic Technicians, Technical |
| DC | Damage Controlman |
| DCA | Damage Control Assistant |
| DCC | Damage Control Central |
| DCC | Damage Control Console |
| DCO | Damage Control Officer |
| DCS | Damage Control System |
| DDG | Destroyer, Guided Missile (Pre-FME) |

| | |
|-----------|--|
| DDG (OME) | Destroyer, Guided Missile (Post-FME) |
| DRT | Dead Reckoning Tracer |
| ECDIS | Electronic Chart Display Information System |
| EM | Electrician's Mate |
| EN | Engineman |
| ENG | Engineering |
| EOOW | Engineering Officer of the Watch |
| ET | Electronics Technician |
| EW | Electronic Warfare Technician (now CTT) |
| EXCEL® | Microsoft Office XP EXCEL® program |
| EXEC | Executive |
| FC | Fire Controlman |
| FFG | Frigate, Guided Missile |
| FME | Fleet Manning Experiment (Refer to OME) |
| FMP | Focused Mission Package |
| GCCS-M | Global Command and Control System - Maritime |
| GM | Gunner's Mate |
| GSE | Gas Turbine System Technician, Electrical |
| GSM | Gas Turbine System Technician, Mechanical |
| HALON | Halogenated Hydrocarbon |
| HCO | Helicopter Control Officer |
| HT | Hull Maintenance Technician |
| IBS | Integrated Bridge System |
| IC | Interior Communications Electrician |
| ICAS | Integrated Condition Assessment System |
| IT | Information Systems Technician |
| JOOD | Junior Officer of the Deck |
| JP5 | Jet Petroleum (Aviation Fuel) |
| LAN | Local Area Network |
| LCP | Local Control Panel |
| LCS | Littoral Combat Ship |
| LSE | Landing Signalman, Enlisted |
| MAINT | Maintenance |

| | |
|--------|--|
| MCM | Mine Counter-Measure |
| MCS | Machinery Control System |
| MHC | Mine Hunting, Coastal |
| MIW | Mine Warfare |
| MM | Machinist's Mate |
| MMC | Multi-Modal Consoles |
| MN | Mineman |
| MR | Machinery Repairman |
| MT | Mount |
| NAV | Navigator |
| NAVAIR | Naval Air Systems Command |
| NAVMAC | Navy Manpower Analysis Center |
| NAVSEA | Naval Sea Systems Command |
| NMRS | Navy Manpower Requirement System |
| NO | Non-Optimal Manning Experiment |
| NS | Non-Smart Ship |
| OME | Optimal Manning Experiment (Type of FME) |
| OOD | Officer of the Deck |
| OPER | Operator |
| OPS | Operations |
| OPSO | Operations Officer |
| OS | Operations Specialist |
| PAPA | Personnel and Pay Ashore |
| PMS | Planned Maintenance System |
| POE | Projected Operational Environment |
| POIC | Petty Officer in Charge |
| PUK | Pack-Up Kit |
| QM | Quartermaster or Bridge Specialist |
| RADAR | Radio Direction and Ranging |
| RAM | Rolling Airframe Missile |
| RAST | Recovery Assist, Securing and Traversing |
| RCM | Reliability Centered Maintenance |
| RCP | Remote Control Panel |

| | |
|-------|--|
| REP | Repairman |
| RQMTS | Manpower Requirements |
| RMS | Remote Mine-hunting System |
| RMV | Remote Mine-hunting Vehicle |
| ROC | Required Operational Capability |
| SCC | Ship's Control Console |
| SH | Ship's Serviceman |
| SK | Storekeeper |
| SM | Signalman (now QM or Bridge Specialist) |
| SMD | Ship Manpower Document |
| SONAR | Sound Navigation and Ranging |
| SQMD | Squadron Manpower Document |
| SS | Smart Ship |
| SUPV | Supervisor |
| SUW | Surface Warfare |
| TAO | Tactical Action Officer |
| TDT | Target Designation System |
| TM | Torpedoman's Mate |
| TORP | Torpedo |
| UAV | Unmanned Aerial Vehicle |
| USV | Unmanned Surface Vehicle |
| UUV | Unmanned Underwater Vehicle |
| UV | Unmanned Vehicle |
| VMS | Voyage Management System |
| VTUAV | Vertical Take-off and Landing Unmanned Aerial Vehicle |
| WCC | Weapons Control Console |
| WEPS | Weapons |
| XO | Executive Officer |

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