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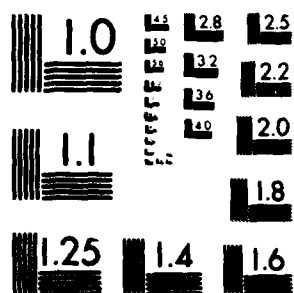
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UPPER LIMITS OF COSAL PERFORMANCE

REPORT 145

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EXECUTIVE SUMMARY

1. Background. The COSAL (Coordinated Shipboard Allowance List) specifies the range and depth of on-board repair parts required for a ship to perform its operational mission. The user normally assumes the COSAL supports all installed equipment aboard the ship. This assumption is not completely accurate because not all equipments are designated as APL (Allowance Parts List) worthy; items applicable to non-APL worthy equipments are not recorded in SPCC (Navy Ships Parts Control Center) files and, therefore, not supported by the COSAL. Although an equipment is considered to be APL worthy, this does not necessarily mean that the related repair parts will be included on the COSAL. Errors in maintenance level coding of items, omission of items from configuration files, or elimination of items from candidate files because of technical decisions can prevent an item from being included on the COSAL. Items which are purposely excluded from the COSAL candidate files, but show reported usage, tend to reduce COSAL performance, since performance is measured in terms of the percent of all demands satisfied by the COSAL.
2. Objective. The objective of this study is to determine the upper limit of COSAL performance, i.e., the maximum gross requisition effectiveness if every COSAL candidate item were stocked in the COSAL.
3. Approach. SPCC equipment configuration files and a three year history of 3M (Navy Maintenance and Material Management System) usage data were obtained for five test ships. A three year history of CASREP (Casualty Reporting System) usage data was also obtained for the ship classes containing the five test ships. The upper limit of COSAL performance was determined by matching the 3M and CASREP data against the COSAL candidate files. Data which did not match the COSAL candidate file were matched against the total configuration file to determine if the item was not a candidate because of: (1) no entry

in the Weapons System File for this ship; (2) maintenance capability to remove and replace the item was beyond that of the test ship; or (3) item was suppressed by a technical override.

4. Findings. The study showed that the upper bound of COSAL effectiveness varied between 69% and 79% for the five test ships when measured in terms of 3M usage data. Approximately 17-27% of the demands were for items which were not included in the test ship's WSF (Weapons System File) configuration files. An additional 2-3% of the demands were for items having an organizational level maintenance code, but a zero override code. Items having Intermediate or Depot level maintenance codes accounted for 1-2% of the 3M usage data.

Analysis of the total CASREP demands, regardless of severity, showed the upper bound of COSAL effectiveness to be between 54% and 67%. Items not included in the test ship's WSF configuration files accounted for 26-39% of the CASREP demands. An additional 2-5% of the CASREP demands were for items capable of being installed by shipboard personnel, but having zero overrides. Between 3-5% of the CASREP demands were for items requiring Intermediate or Depot level maintenance capability.

I. INTRODUCTION

The COSAL (Coordinated Shipboard Allowance List) is the basic document used in determining the range and depth of the items required for a ship to perform its operational mission. The items allowed on this document are selected by a COSAL model from a candidate file extracted from SPCC's (Navy Ships Parts Control Center's) WSF (Weapons System File). The user normally assumes that: (1) the COSAL supports all installed equipments/components aboard ship; (2) every stock numbered repair part with maintenance significance to an equipment is listed on an APL (Allowance Parts List) and properly coded to the maintenance level of the ship, and (3) all maintenance-related consumables are considered within the scope of COSAL coverage. These assumptions are not completely valid. Some equipments/components, such as access closures and office machines, have been designated by NAVSEAINST 4441.4 as non-APL worthy components. Repair parts for non-APL worthy equipments are not included in the WSF. Repair parts which are commonly used at all levels of maintenance, such as common nuts, bolts, screws, and lubricants, are excluded from the COSAL and supported by the GUCL (General Use Consumables List). Errors in maintenance coding may prevent a repair part from being considered by the COSAL model since the model candidates are selected on the basis of authorized maintenance codes. Additionally, technical overrides may exclude repair parts that are within the ship's authorized maintenance capability.

COSAL performance is frequently determined from 3M (Navy Maintenance and Material Management System) usage reporting. By design, 3M usage should include only repair parts used in maintenance actions. However, there are numerous consumables that are used in daily maintenance operations and frequently included in the usage reporting. Examples of these items include

gasket/expansion joints used in attached piping systems, miscellaneous electrical/electronic fittings used between installed components, hull fasteners, etc. To the extent demands for GUCL items and demands for items designated as non-APL worthy are reported into 3M, COSAL performance statistics are degraded.

This study will determine the maximum COSAL effectiveness that could be attained by any model by matching 3M usage data against the COSAL candidate file, where the candidate file contains all items (1) recorded in the WSF as applicable to an APL/AEL (Allowance Equipage List) installed on the given ship, (2) within the maintenance capability of the ship to remove and replace, and (3) without a zero technical override. The study will also determine what percentage of reported demands are (1) not identified anywhere within the ICP's (Inventory Control Point's) configuration/part level files as applicable to the ship or (2) prevented from COSAL stocking by various technical decisions (i.e., maintenance codes beyond the ship's capability to install and zero overrides). The above analysis will also be made based on CASREP demand data.

II. TECHNICAL APPROACH

The approach to the study was to obtain and match ship configuration data, COSAL candidate files and usage data. The usage data that matched the COSAL candidate files represents the upper limit of COSAL effectiveness if all of the items listed on the candidate files were stocked on the COSAL. The remaining usage data were then matched against the ship's configuration files to determine whether the item was not a candidate because (1) the item was not identified in the WSF or (2) technical decisions (i.e., maintenance capability assigned beyond that of the ship or zero overrides)

prevented the items from being stocked. The items which could not be identified in the WSF were not analyzed to determine the reason for the omission of these items. The matching of demands, COSAL candidate files, and WSF configuration was completed for both 3M and CASREP demand data.

The ships selected for this study were the FF 1060, LST 1196, DD 963, DDG 23, and the CG 30. These ships were selected because records showed no major configuration changes had occurred since the last overhaul and the ships were considered to be good 3M reporters. These criteria tended to ensure that the extracted WSF configuration files reflected the configuration applicable to the period of reported usage and that the usage data reported would be relatively valid with few voids.

The equipment configurations for FF 1060 and the LST 1196 were provided by NAVSSEDETMECH (Naval Ship Systems Engineering Station Detachment Mechanicsburg), and represented a 1977 pre-overhaul configuration. The equipment configurations for the other three ships were extracted in February 1981 from the WSF in SPCC. SPCC then used the equipment configuration files to construct a COSAL candidate file for each of the selected ships. A complete file of all items applicable to the equipment configuration was also extracted.

3M usage data for each of the ships was obtained from NAMSO's (Navy Maintenance Support Office's) 3M data bank. The data covered varying time periods: three years (1974 - 1976) for the FF 1060 and the LST 1196, two and one-half years (January 1978 - June 1980) for the DD 963, DDG 23, and the CG 30. These 3M data were processed through a series of programs that updated the NIIN (National Item Identification Number) and augmented these data with demand records which had been reported through the CASREP System and not through the 3M Reporting System. TABLE I shows the number of CASREP demands reported by each test ship which were added to the 3M data.

TABLE I
CASREP Demands Not Reported Through 3M

Ship	FF 1060	LST 1196	DD 963	DDG 23	CG 30
No. of CASREPs Added to 3M Usage Data	189	0	175	175	287

For the CASREP analysis, there was a low volume of CASREP data for each individual ship. Therefore, the CASREP data for the test ships were augmented by data for other ships in the same class when the test ship equipment was also installed on the other ships. Thus, the CASREP data base for each test ship reflects the total CASREPs reported by the entire ship class for those APLs on the test ship. These demand data were obtained from SPCC's CASREP Master Data Bank for the following five ship classes: the FF 1052 class (46 ships); the LST 1179 class (20 ships); the DD 963 class (30 ships); the DDG 2 class (23 ships); and the CG 26 class (9 ships). These data were for three years, covering the following periods of time; 1974 - 1976 for the FF 1052 class and the LST 1179 class, and 1978 - 1980 for the other three ship classes. These CASREP data were processed through a series of programs which updated the NIIN.

III. FINDINGS

The findings are divided into two parts. The first part used 3M usage data to determine the upper limit of COSAL performance, while the second part used CASREP usage data. Both data bases were matched against each test ship's COSAL candidate file. Data which did not match the candidate files were analyzed to determine the reason for the omission of these items from the file.

TABLE II shows that between 69% and 79% of the 3M usage data matched the test ships' COSAL candidate files. These percentages represent the upper limit of COSAL performance. This means that if all of the items which matched the COSAL candidate files were listed on the ships' COSALs, then COSAL effectiveness for the five test ships would range between 69% and 79%. It is noted that 3-7% of the demand was for items that were COSAL candidates but had a zero demand forecast and, therefore, would not be stocked unless an override applied.

TABLE II also shows 21-31% of the 3M usage records from the five test ships were for non-COSAL candidates, i.e., items which were not considered by the COSAL model. The usage records for items not identified in the WSF as applicable to the ship varied between 17% and 27% of the reported usage data. An additional 3-4% of the reported usage was for items that would not be considered by the COSAL model because of various technical decisions. Approximately 2-3% of the items had organizational level maintenance codes but also had zero overrides which excluded these items from the ship's COSAL. Between 1-2% of the demanded items had Intermediate or Depot Level Maintenance codes. Less than 1% of the usage data was for items in the WSF but not included in the ship's COSAL candidate files due to invalid data (i.e., data fields left blank, invalid codes, or negative ship populations).

TABLE II
Analysis of 3M Usage Records

Ship	FF 1060	LST 1196	DD 963	DDG 23	CG 30
Total Usage Records	4,998	3,727	9,250	9,096	12,202
Usage for COSAL Candidate Items	73.0%	69.3%	78.6%	74.7%	74.6%
Usage for Candidates with Zero Annual Demand Forecasts	6.8%	2.6%	3.5%	7.1%	4.2%
Usage for Non-COSAL Candidate Items	27.0%	30.7%	21.4%	25.3%	25.4%
Usage for Items Not in WSF for this Ship	23.5%	26.9%	17.5%	20.7%	21.9%
Usage for Items in WSF but with Organization Level Maintenance Codes and Zero Overrides	2.6%	2.8%	1.8%	2.9%	1.9%
Usage for Items in WSF but with Intermediate Level Maintenance Codes	.3%	.6%	.5%	.2%	.3%
Usage for Items in WSF but with Depot Level Maintenance Codes	.5%	.3%	1.1%	.4%	.5%
Usage for Items Rejected by COSAL Candidate Development Program	.1%	.1%	.5%	1.1%	.8%

Appendix A shows the TABLE II usage data segmented into DLR (Depot Level Repairable) and non-DLR categories. For DLRs, the upper limit of COSAL performance was between 58-87%, while for non-DLRs the upper limit was between 70-78%. There was no consistent pattern as to which category, DLR or non-DLR, had the highest number of demands that were not in the WSF, or had maintenance level codes beyond that of the ship. In general, the DLRs tended to have more zero overrides than the non-DLR items.

TABLE III shows the total CASREP demands across all severity codes. As shown in TABLE III, between 54% and 67% of the data matched the test ship's COSAL candidate files. These percentages represent the highest level COSAL performance could attain. Approximately 1-4% of the demands were for items that were COSAL candidates but had zero demand forecasts which would prevent these items from being stocked unless an override applied. TABLE III also shows 33-46% of the total number of CASREP demands were for non-COSAL candidates. CASREP demands for items not identified in the WSF as being applicable to the ship's configuration ranged between 26-39% of the reported usage data. Additionally, 6-8% of the total number of CASREP demands were for items that were not considered by the COSAL model for various technical decisions. As seen in TABLE III, approximately 2-5% of the data had organizational level maintenance codes and zero overrides which prevented these items from being stocked. Another 3-5% of the CASREP demand data were for items with Intermediate or Depot Level Maintenance codes. Demand data which were identified in the WSF but were excluded from the ship's COSAL due to invalid data represent less than .5% of the total number of CASREP demands.

TABLE III
Analysis of CASREP Demands

Ship	FF 1060	LST 1196	DD 963	DDG 23	CG 30
Total Number of Demands	6,266	879	8,899	4,457	2,033
Demands for COSAL Candidate Items	60.7%	54.4%	64.6%	63.7%	66.7%
Demands for Candidates with Zero Annual Demand Forecast	1.7%	2.5%	1.4%	3.6%	2.2%
Demands for Non-COSAL Candidate Items	39.3%	45.6%	35.4%	36.3%	33.3%
Demands for Items not in WSF	31.7%	39.3%	27.3%	27.3%	25.6%
Demands for Items in WSF but with Organizational Level Maintenance Codes and Zero Overrides	4.6%	3.2%	2.5%	5.1%	4.0%
Demands for Items in WSF but with Intermediate Level Maintenance Codes	.9%	1.6%	.5%	1.4%	.7%
Demands for Items in WSF but with Depot Level Maintenance Codes	2.1%	1.5%	4.9%	2.1%	2.8%
Demands for Items Rejected by COSAL Candidate Development Program	0.0%	0.0%	.2%	.4%	.2%

Appendix B shows the TABLE III demand data divided into DLR and non-DLR categories and segmented by severity code. Generally, DLR items showed a higher percentage of items which were considered COSAL candidates than non-DLR items. DLR items tended to have more demand items with zero overrides and with maintenance codes above the organization level. There were no significant differences across severity codes.

IV. CONCLUSIONS

A determination of the upper bound of COSAL effectiveness was made by comparing demands which were reported through the 3M and CASREP systems against the items which were included on the ship's COSAL candidate files. The upper bound of COSAL effectiveness was between 69% and 79% when measured against 3M data. Analysis of 3M usage data from the five test ships indicated that 21-31% of the demands were for items which were not considered by the COSAL model. Items not included in the test ship's WSF configuration records accounted for 17-27% of the reported usage data. The reasons for the omission of these items which showed demand but were not included in configuration files was not addressed in this study and will require research by technical personnel. Possible reasons include configuration changes during the evaluation period, substitutions for an item in the WSF, General Use Consumable items which are excluded by policy, incomplete configuration data, etc. Items which were included in the configuration files and can be installed by ship personnel but also have zero override codes accounted for 2-3% of the usage data. Approximately 1-2% of the demands were for items requiring Intermediate or Depot level maintenance.

The analysis of the CASREP demand data showed the upper bound of COSAL effectiveness was between 54% and 67% when effectiveness was measured in terms

of the total number of CASREP demands, regardless of severity code. Between 33-46% of the total number of CASREP demands were for items which were not considered by the COSAL model. Between 26-39% of the demands could not be identified in the WSF. Research by technical personnel will be required to determine the reasons for the omission of these items from the ship's WSF configuration file. Approximately 2-5% of the CASREP demands were for items which had organizational level maintenance codes but zero override codes precluded consideration by the COSAL model. About 3-5% of the CASREP demands were for items requiring Intermediate or Depot level maintenance.

In summary, this study showed 69-79% to be the upper limit of COSAL performance when measured in terms of 3M data, while the upper limit is between 54-67% when measured in terms of CASREP data. COSAL performance is primarily reduced by items which show demand but cannot be identified in the WSF as being applicable to the ship's configuration. Items which have the capability of being installed by ship personnel but also have zero overrides, and items which have maintenance level codes beyond that of the ship's, account for 3-4% of the 3M usage data and between 6-8% of the total number of CASREP demands.

V. RECOMMENDATIONS

This study shows that most demands for items not in the model candidate file were for items not identified in the WSF as applicable to the ship configuration as opposed to items with incorrect maintenance codes or zero overrides. The causes for omission from the WSF could include configuration changes during the evaluation period, substitutions for an item in the WSF, GUCL items which are excluded by policy, incomplete configuration data, etc.

It is strongly recommended that 3M/CASREP usage data, which could not be identified in SPCC's configuration files, be analyzed by technical personnel to determine the reason for omission in order to identify necessary corrective actions.

APPENDIX A: 3M USAGE DATA BY DLR/NON-DLR CATEGORIES

This appendix shows 3M usage data divided into non-DLR and DLR categories. TABLE I shows the analysis of non-DLR usage data. These data include items whose cogs begin with a 0, 1, 3, 5, or 9 as reported through 3M. Also included in this category are items which did not have a cog listed. TABLE II shows the analysis of DLR usage data for material whose cogs begin with 2, 4, 6, 7, or 8.

The upper limit of COSAL performance was between 70-78% for non-DLRs and between 58-87% for DLRs. No consistent pattern emerged as to which category showed the highest number of demands not identified in the WSF as applicable to the ship's configuration or with maintenance level codes beyond that of the ship. Generally, DLR items tended to have more zero overrides than non-DLR items.

TABLE I
Analysis of Non-DLR 3M Usage Records

Ship	FF 1060	LST 1196	DD 963	DDG 23	CG 30
Total Usage Records	4,663	3,592	8,277	8,435	11,186
Usage for COSAL Candidate Items	72.5%	69.7%	77.7%	75.2%	74.2%
Usage for Candidates with Zero Annual Demand Forecast	6.7%	2.6%	3.7%	6.4%	4.3%
Usage for Non-COSAL Candidate Items	27.5%	30.3%	22.3%	24.8%	25.8%
Usage for Items not in WSF for this Ship	23.9%	26.5%	18.3%	20.7%	22.4%
Usage for Items in WSF but with Organizational Level Maintenance Codes and Zero Overrides	2.7%	2.8%	1.8%	2.6%	1.8%
Usage for Items in WSF but with Intermediate Level Maintenance Codes	.4%	.6%	.5%	.2%	.3%
Usage for Items in WSF but with Depot Level Maintenance Codes	.4%	.3%	1.1%	.3%	.4%
Usage for Items Rejected by COSAL Candidate Development Program	.1%	.1%	.6%	1.0%	.9%

TABLE II
Analysis of DLR 3M Usage Records

Ship	FF 1060	LST 1196	DD 963	DDG 23	CG 30
Total Usage Records	335	135	973	661	1,016
Usage for COSAL Candidate Items	79.7%	57.8%	86.7%	68.8%	78.4%
Usage for Candidates with Zero Annual Demand Forecast	8.7%	4.4%	1.7%	15.1%	3.3%
Usage for Non-COSAL Candidate Items	20.3%	42.2%	13.3%	31.2%	21.6%
Usage for Items not in WSF for this Ship	17.9%	37.1%	10.1%	20.9%	16.4%
Usage for Items in WSF but with Organizational Level Maintenance Codes and Zero Overrides	1.8%	3.7%	2.1%	6.7%	2.9%
Usage for Items in WSF but with Intermediate Level Maintenance Codes	0.0%	.7%	.1%	1.2%	.4%
Usage for Items in WSF but with Depot Level Maintenance Codes	.6%	.7%	1.0%	.9%	1.4%
Usage for Items Rejected by COSAL Candidate Development Program	0.0%	0.0%	0.0%	1.5%	.5%

APPENDIX B: CASREP DEMAND DATA BY DLR/NON-DLR CATEGORIES

This appendix shows CASREP demand data divided into non-DLR and DLR categories. The data is also divided by severity code of each CASREP for each ship class. The severity of a CASREP ranges from C2 to C4, with C4 being the most severe. The severity of a CASREP is measured by the effect the failure of a mission essential equipment has on the primary mission. For example, a CASREP with a severity classification of C4 means that a failure exists in mission essential equipment which causes loss of at least one primary mission area, while a C2 means that an equipment failure causes a minor degradation to any primary mission area.

TABLE I shows the total number of CASREP demands segmented by severity code. TABLE II shows non-DLR CASREP demands segmented by severity. These data include items whose cogs begin with 0, 1, 3, 5, or 9. Also included in this category are items which did not have a cog listed. TABLE III shows DLR CASREP usage data. This category includes material whose cogs begin with 2, 4, 6, 7, or 8.

Generally, the DLRs showed a higher percentage of items which are considered to be COSAL candidates. DLR items tended to show a lower percentage of items which could not be identified in the WSF as applicable to the ship's configuration, but more items with zero overrides and more items with maintenance codes above the organization level than the non-DLR items. There were no significant trends across severity codes.

TABLE I
Analysis of CASREP Demands

Ship	FF 1060			LST 1196			DD 963			DDG 23			CG 30		
	C2	C3	C4	C2	C3	C4	C2	C3	C4	C2	C3	C4	C2	C3	C4
Severity Code															
Total Number of Demands	4,817	1,303	146	732	147	0	7,446	1,269	184	3,263	1,110	84	1,548	478	7
Demands for COSAL Candidate Items	61.9%	55.8%	63.0%	54.8%	52.4%	0.0%	63.9%	67.5%	69.6%	62.2%	68.4%	60.7%	66.1%	68.4%	71.4%
Demands for Candidates with Zero Annual Demand Forecast	1.6%	2.3%	1.4%	3.0%	0.0%	0.0%	1.4%	1.6%	.5%	3.4%	4.4%	2.4%	2.3%	2.1%	0.0%
Demands for Non-COSAL Candidate Items	38.1%	44.2%	37.0%	45.2%	47.6%	0.0%	36.1%	32.5%	30.4%	37.8%	31.6%	39.3%	33.9%	31.6%	28.6%
Demands for Items not in WSF	30.9%	34.5%	32.9%	39.7%	37.4%	0.0%	28.1%	23.1%	20.6%	28.4%	24.1%	23.8%	25.8%	24.7%	28.6%
Demands for Items in WSF but with Organizational Level Maintenance Codes and Zero Overrides	4.5%	5.4%	2.1%	3.0%	4.1%	0.0%	2.3%	3.1%	4.9%	5.3%	4.0%	9.5%	4.2%	3.8%	0.0%
Demands for Items in WSF but with Intermediate Level Maintenance Codes	.8%	1.3%	2.0%	1.0%	4.7%	0.0%	.6%	.5%	0.0%	1.6%	.9%	0.0%	.8%	.4%	0.0%
Demands for Items in WSF but with Depot Level Maintenance Codes	1.9%	3.0%	0.0%	1.5%	1.4%	0.0%	4.8%	5.7%	4.9%	2.0%	2.3%	6.0%	2.9%	2.7%	0.0%
Demands for Items Rejected by COSAL Candidate Development Program	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	.3%	.1%	0.0%	.5%	.3%	0.0%	.2%	0.0%	0.0%

TABLE II

Analysis of Non-DLR Demands

Ship	FF 1060			LST 1196			DD 963			DDG 23			CG 30		
	C2	C3	C4	C2	C3	C4	C2	C3	C4	C2	C3	C4	C2	C3	C4
Total Number of Demands	3,748	974	126	645	134	0	4,842	699	122	2,432	821	63	1,050	328	4
Demands for COSAL Candidate Items	62.0%	53.8%	61.9%	53.0%	54.5%	0.0%	54.6%	56.5%	70.5%	60.8%	65.7%	61.9%	64.0%	66.2%	50.0%
Demands for Candidates with Zero Annual Demand Forecast	.8%	1.5%	1.6%	3.1%	0.0%	0.0%	1.6%	1.3%	0.0%	2.6%	1.8%	3.2%	2.8%	1.2%	0.0%
Demands for Non-COSAL Candidate Items	38.0%	46.2%	38.1%	47.0%	45.5%	0.0%	45.4%	43.5%	29.5%	39.2%	34.3%	38.1%	36.0%	33.8%	50.0%
Demands for Items not in WSF	32.9%	39.5%	35.7%	43.6%	40.3%	0.0%	36.7%	35.3%	27.0%	32.9%	27.9%	25.4%	29.7%	29.0%	50.0%
Demands for Items in WSF but with Organizational Level Maintenance Codes and Zero Overrides	2.9%	3.3%	1.6%	1.7%	2.2%	0.0%	2.2%	1.3%	2.5%	4.4%	3.8%	11.1%	3.3%	2.7%	0.0%
Demands for Items in WSF but with Intermediate Level Maintenance Codes	.4%	.2%	.8%	1.1%	1.5%	0.0%	.3%	.4%	0.0%	.1%	.8%	0.0%	.3%	.3%	0.0%
Demands for Items in WSF but with Depot Level Maintenance Codes	1.8%	3.2%	0.0%	.6%	1.5%	0.0%	5.8%	6.5%	0.0%	1.2%	1.7%	1.6%	2.4%	1.8%	0.0%
Demands for Items Rejected by COSAL Candidate Development Program	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	.4%	0.0%	0.0%	.6%	.1%	0.0%	.3%	0.0%	0.0%

TABLE III
Analysis of DLR CASREP Demands

Ship	FF 1060				LST 1196				DD 963				DDG 23				CG 30			
	C2	C3	C4		C2	C3	C4		C2	C3	C4		C2	C3	C4		C2	C3	C4	
Severity Code																				
Total Number of Demands	1,069	329	20		87	13	0		2,604	570	62		831	289	21		498	150	3	
Demands for COSAL Candidate Items	61.8%	61.7%	70.0%		67.8%	30.8%	0.0%		81.2%	81.1%	67.7%		66.6%	76.1%	57.2%		70.5%	73.3%	100.0%	
Demands for Candidates with Zero Annual Demand Forecast	4.5%	4.6%	0.0%		2.3%	0.0%	0.0%		1.1%	1.9%	1.6%		5.7%	11.8%	0.0%		1.2%	4.0%	0.0%	
Demands for Non-COSAL Candidate Items	38.2%	38.3%	30.0%		32.2%	69.2%	0.0%		18.8%	18.9%	32.3%		33.4%	23.9%	42.8%		29.5%	26.7%	0.0%	
Demands for Items not in WSF	23.9%	19.4%	15.0%		11.5%	7.7%	0.0%		12.1%	8.1%	8.1%		15.5%	13.5%	19.0%		17.7%	15.3%	0.0%	
Demands for Items in WSF but with Organizational Level Maintenance Codes and Zero Overrides	9.7%	11.9%	5.0%		12.6%	23.1%	0.0%		2.5%	5.3%	9.7%		7.9%	4.5%	4.8%		6.0%	6.0%	0.0%	
Demands for Items in WSF but with Intermediate Level Maintenance Codes	2.3%	4.6%	10.0%		0.0%	38.4%	0.0%		.9%	.5%	0.0%		5.9%	1.0%	0.0%		2.0%	.7%	0.0%	
Demands for Items in WSF but with Depot Level Maintenance Codes	2.3%	2.4%	0.0%		8.1%	0.0%	0.0%		3.2%	4.9%	14.5%		4.0%	4.2%	19.0%		3.8%	4.7%	0.0%	
Demands for Items Rejected by COSAL Candidate Development Program	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		.1%	.1%	0.0%		.1%	.7%	0.0%		0.0%	0.0%	0.0%	

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13. ABSTRACT This study determines the upper limit of COSAL (Coordinated Shipboard Allowance List) performance, which is measured in terms of the maximum percent of demands which could be satisfied if every COSAL candidate item were stocked in the COSAL. Performance was measured in terms of satisfying total 3M (Navy Maintenance and Material Management) reported usage data and in terms of satisfying CASREP (Casualty Reporting System) demands. The study shows the highest level that COSAL performance can attain and identifies reasons why items were not included in the COSAL candidate file.			

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