



THE SECRETARY OF THE NAVY  
WASHINGTON DC 20350-1000

June 02, 2023

The Honorable Mike D. Rogers  
Chairman  
Committee on Armed Services  
U.S. House of Representatives  
Washington, DC 20515

Dear Mr. Chairman:

The enclosed report is submitted pursuant to Title 10 U.S.C. Section 8674, which requires the Secretary of the Navy to submit an annual report not later than 1 March.

The enclosed report is unclassified and is releasable to the public without redaction.

Copies of this letter have been sent to the appropriate Ranking Members and Senior Members in the House and Senate. If I can be of any further assistance, please let me know.

Sincerely,

A handwritten signature in blue ink, reading "Carlos Del Toro".

Carlos Del Toro

Enclosure:  
As stated

cc:  
The Honorable Adam Smith  
Ranking Member



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WASHINGTON DC 20350-1000

June 02, 2023

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Committee on Armed Services  
U.S. House of Representatives  
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Dear Representative Smith:

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THE SECRETARY OF THE NAVY  
WASHINGTON DC 20350-1000

June 02, 2023

The Honorable Kay Granger  
Chairwoman  
Committee on Appropriations  
U.S. House of Representatives  
Washington, DC 20515

Dear Madam Chairwoman:

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The Honorable Rosa L. DeLauro  
Ranking Member



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WASHINGTON DC 20350-1000

June 02, 2023

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Ranking Member  
Committee on Appropriations  
U.S. House of Representatives  
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Dear Representative Granger:

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The Honorable Kay Granger  
Chairwoman



THE SECRETARY OF THE NAVY  
WASHINGTON DC 20350-1000

June 02, 2023

The Honorable Patty Murray  
Chair  
Committee on Appropriations  
United States Senate  
Washington, DC 20510

Dear Madam Chair:

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As stated

cc:  
The Honorable Susan Collins  
Vice Chair



THE SECRETARY OF THE NAVY  
WASHINGTON DC 20350-1000

June 02, 2023

The Honorable Susan Collins  
Vice Chair  
Committee on Appropriations  
United States Senate  
Washington, DC 20510

Dear Senator Collins:

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As stated

cc:  
The Honorable Patty Murray  
Chair



THE SECRETARY OF THE NAVY  
WASHINGTON DC 20350-1000

June 02, 2023

The Honorable Jack Reed  
Chairman  
Committee on Armed Services  
United States Senate  
Washington, DC 20510

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As stated

cc:  
The Honorable Roger F. Wicker  
Ranking Member



THE SECRETARY OF THE NAVY  
WASHINGTON DC 20350-1000

June 02, 2023

The Honorable Roger F. Wicker  
Ranking Member  
Committee on Armed Services  
United States Senate  
Washington, DC 20510

Dear Senator Wicker:

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As stated

cc:  
The Honorable Jack Reed  
Chairman



# INSURV ANNUAL REPORT

1 March 2023



**DISTRIBUTION STATEMENT A. Approved for public release.**

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## **Preface**

The following is a report of the Board of Inspection and Survey (INSURV) findings from fiscal year 2022, as well as comparisons to previous years and is provided in accordance with U.S. Code Title 10 Section 8674.

Address comments, questions, or requests for additional information to:

RDML Randall Peck, President, Board of Inspection and Survey at  
randall.w.peck2.mil@us.navy.mil, (757) 462-7006

Or

Bob Strait, N5, Director for Plans and Analysis at robert.p.strait.civ@us.navy.mil, (757) 462-2278.

For general information about INSURV, please visit our public web portal:

<http://www.public.navy.mil/fltfor/insurv/>

The estimated cost of this report for the Department of Defense (DoD) is approximately \$3,200 for Fiscal Year (FY) 2022. This includes \$0 in expenses, and \$3,200 in DoD labor.

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## **1.0 Requirements**

Title 10 USC Section 8674 requires an annual report not later than March 1 each year setting forth an overall narrative summary of material readiness of Navy ships, the number and types of vessels inspected and for in-service vessels, material readiness trends.

### **SEC. 8674. EXAMINATION OF NAVY VESSELS; STRIKING OF VESSELS FROM THE NAVAL VESSEL REGISTER**

#### **(a) Boards of Officers To Examine Naval Vessels.-**

(1) The Secretary of the Navy shall designate boards of naval officers to examine naval vessels, including unfinished vessels, for the purpose of making a recommendation to the Secretary as to which vessels, if any, should be stricken from the Naval Vessel Register. Each vessel shall be examined at least once every three years if practicable.

(2)(A) Except as provided in subparagraph (B), any naval vessel examined under this section on or after January 1, 2020, shall be examined with minimal notice provided to the crew of the vessel.

(B) Subparagraph (A) shall not apply to a vessel undergoing necessary trials before acceptance into the fleet.

(b) Actions by Board.-A board designated under subsection (a) shall submit to the Secretary in writing its recommendations as to which vessels, if any, among those it examined should be stricken from the Naval Vessel Register.

(c) Action by Secretary.-If the Secretary concurs with a recommendation by a board that a vessel should be stricken from the Naval Vessel Register, the Secretary shall strike the name of that vessel from the Naval Vessel Register.

#### **(d) Annual Report.-**

(1) Not later than March 1 each year, the board designated under subsection (a) shall provide to the congressional defense committees a briefing and submit to such committees a report regarding the following:

(A) An overall narrative summary of the material readiness of Navy ships as compared to established material requirements standards.

(B) The overall number and types of vessels inspected during the preceding fiscal year.

(C) For in-service vessels, material readiness trends by inspected functional area as compared to the previous five years.

(2) Each report under this subsection shall be submitted in-

(2)(A) a classified form; and

(B) an unclassified form that is releasable to the public without further redaction.

## 2.0 Executive Summary

Overall Fleet material condition showed a slight decline in FY 2022, resuming a slight but steady negative trend evident since FY 2017 (see Figure 2.1). The negative trend is more notable this fiscal year due to changes in INSURV Figure of Merit (IFOM) calculations. INSURV updated material condition assessment scoring to more closely adhere to Joint Fleet Maintenance Manual (JFMM), Volume VI, Chapter 5, Appendix A Equipment Operation Capability (EOC) metrics of 0.0 (totally inoperative) to 1.0 (fully operable). INSURV also removed major system demonstration scores and administrative program scores from the IFOM calculation. The updated IFOM calculation generates a more focused measure of overall material condition. INSURV began JFMM scoring in FY 2021, and previous year's IFOM scores were mathematically adjusted to match the current scoring schema by INSURV and NSWC Corona data scientists.

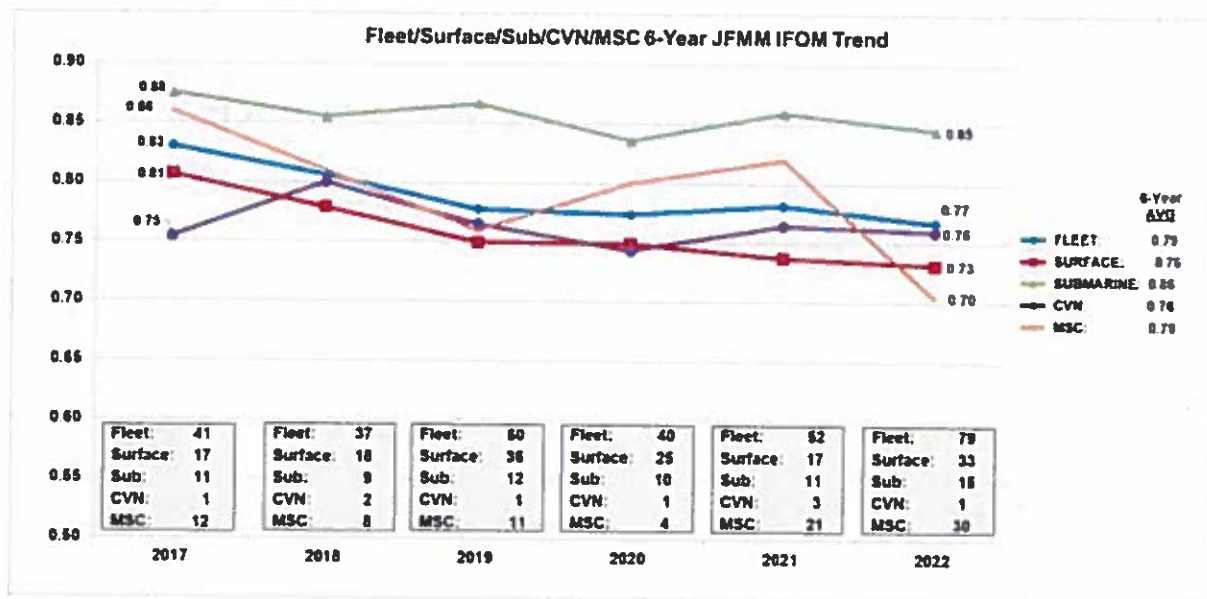


Figure 2.1 Fleet 6-Year IFOM Trends

Surface ships, submarines, and CVNs all declined slightly from FY 2021. The largest year-to-year drop occurred in the MSC fleet, reversing a two-year positive trend. The Military Sealift Command (MSC) average does not contribute to the overall Fleet average. Overall, several functional areas and subsystems remain degraded or show declining trends, indicative of areas where material readiness is stressed.

New construction VIRGINIA-class SSN, INDEPENDENCE-class LCS, SPEARHEAD-class EPF, Ship to Shore Connector (LCAC), Yard Tug (YT), and Barracks Barge (APL) programs performed well on trials. The remaining programs experienced significant deviations from OPNAV trials requirements, missed key program milestones, or had declining trial performance during this fiscal year.

### **3.0 Responsibilities and Authorities**

INSURV conducts a range of inspections to meet its Title 10 responsibilities. These inspections provide assurance to Congress, the Secretary of the Navy (SECNAV), the Chief of Naval Operations (CNO), Fleet Commanders, Systems Commanders (SYSCOM), Type Commanders (TYCOM), and Commanding Officers that ships being introduced to the Fleet will be ready to meet their missions; that Fleet material readiness issues are being identified and addressed and, when required; that the material condition of ships scheduled for inactivation is documented. These inspections include new construction trials that occur at the beginning of ships' lives, Material Inspections (MIs) that occur periodically while ships are in service, and surveys that occur at the end of ships' lives, when required.

#### **3.1 INSURV Process**

INSURV uses only technically approved procedures to conduct these inspections. Currently, Planned Maintenance System (PMS) cards are the principal documentation used to conduct inspections.

#### **3.2 Scoring**

INSURV introduced the INSURV IFOM in 2012 in order to more consistently score MI and Trials. The Navy's renewed focus on lethality and survivability caused INSURV to review its material condition metrics. Starting in FY 2022, INSURV adjusted IFOM calculations to match the Equipment Operational Capability (EOC) definitions found in the JFMM, Volume 6, Chapter 5, Appendix A. FY 2021 Material Inspections were dual scored to capture both methodologies.

To ensure objective and consistent material readiness metrics, INSURV scores ships based on a weighted average of the material condition of equipment in functional areas. During an MI, INSURV inspects up to 100,000 shipboard material configuration items. Depending upon the ship class, these items are functionally aligned into ~156 systems and ~551 sub-systems. Results from this alignment are then used to develop EOC Scores ranging from 0.0 (complete failure) to 1.0 (no deficiencies found). Sub-system scores are averaged into system scores and system EOC scores are further averaged into functional areas such as Aviation, Weapons, and Main Propulsion. The functional areas are then weighted based on their importance to the platform's primary missions with respect to lethality and/or survivability and averaged to form an overall IFOM score. This final IFOM score will be between 0.0 and 1.0 and can be used to assess both mission capability as well as the relative material readiness of a particular ship when compared to IFOM scores from other ships in its class. Additionally, INSURV conducts demonstrations to determine the effectiveness of integrated systems in an operational environment. While these demonstrations are graded, the scores are not factored into the ship's IFOM. However, deficiencies that arise from the demonstrations do affect the calculus of the associated functional areas. Finally, programmatic scores for safety, environmental protection, and medical are also not factored into IFOM, but are scored and tracked separately.

### **3.3 The Schedule Process**

Title 10 requires INSURV to inspect in-service ships once every three years, if practicable. On 01 October 2019, INSURV, per CNO direction, established inspection periodicity at three years for all vessels.

In July 2019, Fleet Commanders removed options for waivers and codified requirements for schedule changes. Ships will either be within 3-year periodicity or considered overdue. As of 30 September 2022, there were 154 of 353 (43.6%) vessels, subject to inspection, that exceeded a 3-year inspection periodicity. Schedule changes requested within 90 days of the scheduled inspection date only occur with Fleet Commander authorization, and are predicated on operational requirements, maintenance delays, or INSURV capacity limitations.

### **4.0 Fiscal Year 2022 Inspections**

INSURV conducted 80 in-service material inspections in fiscal year 2022, which is a 72% increase in total inspections compared to the six-year average. Additionally, INSURV conducted 23 new construction trials and eight surveys. The break down follows:

- (1) Material Inspections (50): One NIMITZ-class multipurpose aircraft carrier (CVN), one TICONDEROGA-class guided missile cruiser (CG), 16 ARLEIGH BURKE-class guided missile destroyers (DDG), one FREEDOM-class littoral combat ship (LCS), one AMERICA-class amphibious assault ship (LHA), two WASP-class amphibious assault ships (LHD), five SAN ANTONIO-class amphibious transport dock ships (LPD), two WHIDBEY ISLAND-class dock landing ships (LSD), one HARPERS FERRY-class dock landing ship (LSD 49), three AVENGER-class mine countermeasures ships (MCM), five OHIO-class ballistic missile submarines (SSBN), three OHIO-class guided missile submarines (SSGN), two SEAWOLF-class submarines (SSN 21), four LOS ANGELES-class submarines (SSN 688), two VIRGINIA-class submarines (SSN 774), and one THOMAS G. THOMPSON-class oceanographic research ship (AGOR).
- (2) Ship's Material Assessment and Readiness Test (SMART) (30): Three oceanographic survey ships (T-AGS), two MERCY-class hospital ships (T-AH), four LEWIS AND CLARK-class cargo ships (T-AKE), three BOB HOPE-class vehicle cargo ships (T-AKR 300), six WATSON-class vehicle cargo ships (T-AKR 310), four HENRY J. KAISER-class fleet replenishment oilers (T-AO), one SUPPLY-class fast combat support ship (T-AOE), one ZEUS-class cable repairing ship (T-ARC), two EMORY S. LAND-class submarine tenders (AS), one NAVAJO-class fleet ocean tug (ATF), one SPEARHEAD-class expeditionary fast transport (T-EPF), one LEWIS B. PULLER-class expeditionary sea base (T-ESB), and one GUAM-class high speed transport (HST).
- (3) Trials (23): One GERALD R. FORD-class aircraft carrier (CVN 78), two ARLEIGH BURKE-class guided missile destroyers (DDG), one SPEARHEAD-class expeditionary fast transports (EPF), two landing craft, air cushioned (LCAC) combatant craft, six INDEPENDENCE-class littoral combat ships (LCS 2), one AMERICA-class amphibious assault ship (LHA 6), one SAN ANTONIO-class



amphibious transport dock (LPD), three VIRGINIA-class submarines (SSN 774), one JOHN LEWIS-class fleet replenishment oiler, two VALIANT-class yard tugs (YT), and three barracks craft.

- (4) Surveys (8): Four TICONDEROGA-class guided missile cruisers (CG), one WHIDBEY ISLAND-class dock landing ship (LSD), two FREEDOM-class littoral combat ships (LCS 1), and one INDEPENDENCE-class littoral combat ship (LCS 2).

Additionally, INSURV conducted inspections on 274 service craft, combatant craft, and boats greater than 85 feet.

#### **4.1 Material Inspections**

To ensure that Fleet material readiness issues are being identified and addressed, INSURV assesses the end-to-end material readiness of all ships on the Naval Vessel Register. These MIs:

- (1) Determine and report upon an individual ship's fitness for further service, with a six-year comparative view,
- (2) Identify areas of degraded material readiness that impact a ship's ability to carry out assigned missions,
- (3) Provide feedback to the Fleet Commanders, Systems Commanders, Type Commanders, ISICs, and ship COs on recommendations for improving material readiness.

#### **4.2 Ships Material Assessment and Readiness Test (SMART)**

Under a Memorandum of Understanding between INSURV and MSC, MSC conducts Material Inspections, called SMARTs, of ships under their purview. INSURV audits these inspections to ensure that they are carried out consistently, following standardized procedures.

#### **4.3 Trials**

INSURV conducts Acceptance Trials (AT), Combined Trials (CT) and Integrated Trials (IT) per OPNAVINST 4700.8L to independently verify the readiness of ships, craft, and submarines for preliminary acceptance by the Navy. INSURV acts as the Navy's designated representative to recommend acceptance of a ship under Navy contract. Negative recommendations specify which deficiencies are required to be corrected or have correction waived by the CNO prior to acceptance.

INSURV also conducts Final Contract Trials (FCT) on surface ships and Guarantee Material Inspections (GMI) on submarines during the post-delivery period to determine if additional deficiencies have developed since AT, to validate correction of significant AT "starred" deficiencies, and to provide an assessment of readiness for "Fleet Introduction".

Finally, at the request of the CNO, INSURV may conduct Special Trials (ST) when significant ship systems or capabilities remain incomplete until after Post-Shakedown Availability (PSA), or Retrials (RT) to address specific deficiencies for unsuccessful trial events.

## 5.0 Material Readiness Trends

### 5.1 Surface Ships

The surface force makes up the bulk of Fleet ships inspected each year. The surface force showed a slightly decreasing trend in average IFOM; FY 2022 was below the 6-year average.

Overall, for surface ships, 14 functional areas were evaluated as DEGRADED: Main Propulsion (MP), Auxiliaries (AX), Damage Control (DC), Deck (DK), Mine Warfare (MN), Operations (OP), Weapons Systems (WP), Aegis Weapon Systems (AW), Communications (CC), Information Systems (IS), Navy Occupational Safety and Health (OH), Ventilation (VT), Environmental Protection (EP), and Preservation (PR). One functional area was evaluated as UNSAT, Aviation (AV).

Figure 5.1 shows the six-year trend for surface functional area scores and the total number of ships inspected each year. These scores are based on the JFMM scoring methodology noted previously.

Functional Areas (Ships Inspected)	SURFACE						6-Year Average	2022 Comparison to 6-Year Avg
	2017 (17)	2018 (18)	2019 (36)	2020 (25)	2021 (17)	2022 (33)		
Main Propulsion	0.81	0.79	0.67	0.73	0.78	0.76	0.74	ABOVE
Anti-Sub Warfare	0.95	0.85	0.88	0.81	0.87	0.86	0.87	BELOW
Communications	0.82	0.79	0.75	0.77	0.75	0.74	0.76	BELOW
Information Systems	0.60	0.63	0.55	0.56	0.56	0.59	0.58	ABOVE
Aegis Weapon Systems	0.77	0.70	0.66	0.62	0.69	0.69	0.68	ABOVE
Mine Warfare	0.81	0.78	0.76	0.73	NA	0.78	0.78	NEUTRAL
Operations	0.86	0.82	0.78	0.77	0.71	0.74	0.77	BELOW
Weapons Systems	0.80	0.73	0.69	0.67	0.71	0.63	0.69	BELOW
Auxiliaries	0.84	0.84	0.82	0.83	0.83	0.78	0.82	BELOW
Electrical	0.73	0.69	0.70	0.76	0.74	0.80	0.74	ABOVE
Damage Control	0.80	0.79	0.79	0.77	0.77	0.79	0.79	NEUTRAL
Deck	0.83	0.78	0.76	0.69	0.75	0.78	0.76	ABOVE
Navigation	0.87	0.87	0.86	0.85	0.82	0.84	0.85	BELOW
Aviation	0.63	0.75	0.81	0.82	0.61	0.85	0.54	BELOW
Preservation	0.84	0.82	0.84	0.84	0.81	0.78	0.82	BELOW
Ventilation	0.76	0.75	0.77	0.78	0.61	0.69	0.73	BELOW
Environmental Protection	0.85	0.81	0.76	0.76	0.73	0.65	0.75	BELOW
Medical	0.94	0.93	0.91	0.92	0.93	0.95	0.93	ABOVE
Supply	0.76	0.78	0.80	0.88	0.83	0.80	0.80	NEUTRAL
Habitability	0.80	0.78	0.78	0.78	0.74	0.80	0.79	ABOVE
NAVOSH	0.78	0.70	0.72	0.72	0.75	0.72	0.73	BELOW

Figure 5.1 6-Year Surface Functional Area Scores

### 5.2 Submarines

Submarine average IFOM showed a slight decline from FY 2021 and was just below the 6-year average. Overall two functional areas were evaluated as DEGRADED: Deck (DK), and Navy Occupational Safety and Health (OH).

SUBMARINE								
Functional Areas (Boats Inspected)	2017 (11)	2018 (9)	2019 (12)	2020 (10)	2021 (11)	2022 (15)	6-Year Average	2022 Comparison to 6-Year Avg
Main Propulsion	0.85	0.81	0.83	0.83	0.85	0.86	0.83	ABOVE
Auxiliaries	0.81	0.74	0.78	0.70	0.81	0.80	0.77	ABOVE
Electrical	0.86	0.84	0.88	0.86	0.86	0.81	0.83	BELOW
Damage Control	0.85	0.86	0.85	0.88	0.85	0.86	0.86	NEUTRAL
Combat Systems	0.87	0.84	0.83	0.76	0.86	0.81	0.83	BELOW
Navigation	0.88	0.88	0.88	0.90	0.89	0.89	0.89	NEUTRAL
Operations	0.90	0.92	0.91	0.94	0.89	0.89	0.89	NEUTRAL
Information Systems	0.88	0.93	0.90	0.86	0.81	0.87	0.88	BELOW
Deck	0.88	0.86	0.88	0.83	0.81	0.73	0.83	BELOW
Supply	0.90	0.80	0.87	0.86	0.92	0.86	0.88	BELOW
Habitability	0.92	0.89	0.89	0.88	0.90	0.91	0.90	ABOVE
NAVOSH	0.88	0.88	0.80	0.81	0.80	0.78	0.82	BELOW
Survivability/Escapes	0.86	0.85	0.90	0.89	0.82	0.82	0.86	BELOW
Medical	0.95	0.94	0.92	0.92	0.90	0.85	0.91	BELOW
Preservation	0.91	0.87	0.92	0.92	0.85	0.88	0.90	BELOW
Strategic Systems	0.94	0.94	0.95	0.96	0.95	0.94	0.94	NEUTRAL

Figure 5.2 6-Year Submarine Functional Area Scores

### 5.3 CVNs

Aircraft carrier data has been difficult to trend due the small sample sizes that result when a population of ten to eleven CVNs was historically inspected an average of once every five to six years. In order to increase that sample size to make the trends more relevant, INSURV expanded the overall time period of the trend (12 years) and grouped the CVNs into multi-year periods. This data set expansion yields a sample of 40-60% of the total force in each period.

CVN IFOM remained consistent with FY 2021 results and equaled the 6-year average. Results of six CVN inspections over four fiscal years showed 11 functional areas evaluated as DEGRADED: Damage Control (DC), Deck (DK), Electrical (EL), Information Systems (IS), Operations (OP), Weapons Systems (WP), Navy Occupational Safety and Health (OH), Ventilation (VT), Environmental Protection (EP), Supply (SP), and Habitability (HB).

Functional Area (Ships Inspected)	CVN				2019 – 2022 Comparison to 12-Year Average
	2011-2014 (6)	2015-2018 (7)	2019-2022 (6)	12-Year Average	
Damage Control	0.69	0.71	0.72	0.71	ABOVE
Deck	0.75	0.88	0.71	0.76	BELOW
Auxiliaries	0.80	0.79	0.81	0.80	ABOVE
Electrical	0.83	0.70	0.73	0.75	BELOW
Propulsion	0.82	0.80	0.80	0.84	ABOVE
Communications	0.76	0.78	0.80	0.78	ABOVE
Information Systems	0.50	0.56	0.62	0.56	ABOVE
Navigation	0.84	0.86	0.83	0.84	BELOW
Operations	0.80	0.82	0.73	0.79	BELOW
Weapons	0.71	0.78	0.73	0.74	BELOW
Aviation	0.86	0.81	0.81	0.82	BELOW
NAVOSH	0.79	0.54	0.65	0.65	NEUTRAL
Ventilation	0.74	0.88	0.74	0.79	BELOW
Environmental Protection	0.87	0.86	0.76	0.83	BELOW
Supply	0.76	0.71	0.69	0.72	BELOW
Habitability	0.82	0.72	0.75	0.76	BELOW
Medical	0.88	0.93	0.93	0.94	ABOVE
Preservation	0.79	0.79	0.81	0.80	ABOVE

Figure 5.3 12-Year CVN Functional Area Scores

#### 5.4 Military Sealift Command (MSC) ships

A significant increase in the number of SMART inspections on MSC ships provides insight into the material condition of the MSC fleet. Each SMART inspection is broken into two areas, Mission Areas and Underway Demonstrations. Mission Areas include Main Propulsion, Auxiliaries, Electrical, Damage Control, Deck, Communications, Aviation, Supply/Habitability, Environmental Protection, Medical, and Safety/NAVOSH.

The FY 2022 MSC IFOM average was lower than the 6-year average. Figure 5.4 shows MSC's Functional Area scores over the past five Fiscal Years. It shows six functional areas were DEGRADED in FY 2022: Main Propulsion, Auxiliaries, Electrical, Damage Control, Deck, and Aviation. Damage Control consistently averaged DEGRADED, beginning in FY 2018.

FY 2022 scores and trends indicate nearly all functional areas experiencing a decline over previous years, as highlighted by the precipitous drop in IFOM. Safety/NAVOSH remained steady and Communications improved.

MSC (All Classes)								
Functional Areas (Ships Inspected)	2017 (12)	2018 (8)	2019 (11)	2020 (4)	2021 (21)	2022 (30)	6-Year Average	2022 Comparison to 6-Year Avg
Main Propulsion	0.85	0.81	0.72	0.83	0.82	0.76	0.80	BELOW
Auxiliaries	0.88	0.80	0.81	0.85	0.80	0.76	0.81	BELOW
Electrical	0.86	0.84	0.84	0.80	0.87	0.77	0.83	BELOW
Damage Control	0.83	0.69	0.74	0.74	0.73	0.65	0.73	BELOW
Deck	0.83	0.76	0.77	0.76	0.84	0.77	0.79	BELOW
Communications	0.92	0.92	0.94	0.86	0.95	0.86	0.92	ABOVE
Aviation	0.80	0.69	0.84	0.89	0.84	0.74	0.80	BELOW
Supply/Habitability	0.86	0.84	0.89	0.86	0.95	0.89	0.88	NEUTRAL
Environmental Protection	0.92	0.85	0.90	0.84	0.92	0.86	0.90	BELOW
Medical	0.94	0.91	0.90	0.93	0.95	0.92	0.93	NEUTRAL
Safety/NAVOSH	0.87	0.80	0.80	0.85	0.89	0.89	0.85	ABOVE

Figure 5.4. 5-Year MSC Functional Area Scores

## 5.5 Trials

INSURV conducted 23 trials in FY 2022: 12 ATs, 2 CTs, 3 FCTs, 1 GMI, 3 RTs, and 2 STs on 9 surface ships, 2 submarines, 2 combatant craft, and 5 service craft. Based on these results, INSURV assessed that the following programs performed well on trials:

- VIRGINIA Attack Submarine (SSN)
- INDEPENDENCE Littoral Combat Ship (LCS 2)
- SPEARHEAD Expeditionary Fast Transport (EPF)
- Ship to Shore Connector (LCAC)
- VALIANT Yard Tug (YT)
- Barracks Barge (APL)

The remaining programs experienced significant deviations from OPNAV trials requirements or declining trial performance during this fiscal year. The CVN program completed a ST on CVN 78 after its new construction period ended. The DDG 1000 program is in a similar situation and will present DDG 1000 for a ST after its new construction period. In January 2021, the LCS 1 program suspended new ships deliveries after LCS 23 pending resolution of a combining gear defect. Four ships (LHA 7, DDG 118, LCS 26, and LCS 28) required ST/RT because they had significant incomplete capabilities, uncorrected deficiencies, or unperformed demonstrations during FCT. Details are contained in the individual program sections below.

### 5.5.1 CVN 78 Aircraft Carrier Program

CVN 78 class ships are built by Huntington Ingalls Industries–Newport News Shipbuilding in Newport News, Virginia. USS GERALD R FORD (CVN 78) completed AT in May 2017. The ship was unfinished and had significant deficiencies affecting many mission-critical systems. In August 2020, Program Executive Office (PEO) Aircraft Carriers informed the CNO the ship would be unable to complete a ST prior to the ship's Obligation Work Limiting Date (OWLD) and Fleet Introduction. The PEO requested a waiver to have the Type Commander present the ship for ST

after the ship's OWLD in CY 2022. The Type Commander presented the ship for a comprehensive ST in June 2022. The ship's material readiness was poor with one unsatisfactory and 13 degraded scores among 18 functional areas. There were one unsatisfactory and three degraded scores among the eight major demonstrations. Seven starred deficiencies that were CNO-waived for delivery were either uncorrected or not assessed during the ST.

#### **5.5.2 ARLEIGH BURKE Guided Missile Destroyer (DDG) Program**

DDG 51 class ships are built by Ingalls Shipbuilding in Pascagoula, Mississippi and Bath Iron Works (BIW) in Bath, Maine. The program completed two trials in FY 2022: an FCT on USS DANIEL INOUYE (DDG 118), and a RT on USS DANIEL INOUYE (DDG 118).

The DDG 51 program's FCT performance was consistent with recent DDG trials, however; several Fleet Introduction deficiencies were not corrected for the ship's RT.

#### **5.5.3 ZUMWALT Guided Missile Destroyer (DDG) Program**

DDG 1000 class ships are built by BIW. The program has delivered two ships since 2016: USS ZUMWALT and USS MICHAEL MONSOOR. PEO Ships planned to present DDG 1000 for a mission systems trial in FY 2021. In July 2021, PEO Ships informed the CNO that the ship would be unable to complete any trials in CY 2021. The CNO approved a waiver in October 2021 to defer any trial until after the ship's OWLD and directed the Type Commander to present the ship for a comprehensive inspection by December 2022. The Type Commander has scheduled a ST for DDG 1000 in October 2022. PEO Ships plans to conduct a ST for DDG 1001 in September 2023 prior to her OWLD.

#### **5.5.4 Littoral Combat Ship (LCS) Program – FREEDOM (LCS 1) Variant**

FREEDOM variant ships are built by Fincantieri Marinette Marine in Marinette, Wisconsin. The program did not complete any trials in FY 2022; the most recent trials were LCS 23 AT in December 2020 and LCS 17 FCT in August 2021. In early 2021, the CNO suspended accepting LCS 1 ships pending resolution of a combining gear defect that restricted the ships' propulsion plant operation. PEO USC intends to present LCS 25 for AT in November 2022 with a redesigned combining gear that addresses the known defect.

#### **5.5.5 Littoral Combat Ship (LCS) Program – INDEPENDENCE (LCS 2) Variant**

INDEPENDENCE variant ships are built by Austal USA in Mobile, Alabama. The program completed five trials in FY 2022: ATs on USS CANBERRA (LCS 30) and USS SANTA BARBARA (LCS 32), FCTs on USS MOBILE (LCS 26) and USS SAVANNAH (LCS 28), and RTs on USS MOBILE (LCS 26) and USS SAVANNAH (LCS 28).

The program's AT performance was consistent with recent trials, but both ships had starred deficiencies and below-average IFOM scores. The program's FCT performance was also consistent with its recent trials. LCS 26 was unable to demonstrate its twin boom extensible crane during FCT because no 11-meter boat was available; the ship successfully demonstrated the system

during a subsequent Retrial. LCS 28 had five uncorrected Fleet Introduction deficiencies and three incomplete events during FCT; the ship completed all events during the RT, but three Fleet Introduction deficiencies remained uncorrected.

#### **5.5.6 AMERICA Amphibious Assault Ship (LHA(R)) Program**

LHA(R) class ships are built by Ingalls Shipbuilding in Pascagoula, Mississippi. The program completed one trial in FY 2022: a ST on USS TRIPOLI (LHA 7). INSURV inspected all new system installations and determined all starred and Fleet Introduction deficiencies were corrected.

#### **5.5.7 SAN ANTONIO Amphibious Transport Dock (LPD) Flight II Program**

The SAN ANTONIO (LPD 17) program delivered its final ship (LPD 27) in 2017. In 2014, the Secretary of the Navy determined an Amphibious Transport Dock derivative design (LPD Flight II) would meet its Amphibious Ship Replacement (LX(R)) operational requirements to replace the LSD 41/49 Dock Landing Ships. The LPD Flight II design selectively de-scoped ship equipment and spaces to meet the reduced LX(R) capacity and capabilities requirements. Two "transition ships" (LPD 28 and 29) will be built before LPD 30 delivers in the final Flight II configuration. USS FORT LAUDERDALE (LPD 28) completed AT in January 2022. The ship generally performed well during its trial.

#### **5.5.8 VIRGINIA Class SSN Program**

VIRGINIA class SSNs are built jointly by General Dynamics-Electric Boat (GD-EB) and Huntington Ingalls Industries-Newport News Shipbuilding (HII-NNS). The program completed three trials in FY 2022: CTs on USS OREGON (SSN 793) and USS MONTANA (SSN 794), and a GMI of USS MONTANA (SSN 794).

The program continued to perform well. Both submarines delivered with all functional areas and demonstrations scoring SAT. SSN 793 did have two starred cards, however, both involving the anchor system. No starred cards were identified on SSN 794.

#### **5.5.9 JOHN LEWIS Fleet Replenishment Oiler (T-AO) Program**

T-AO class ships are built by General Dynamics/NASSCO in San Diego California. These ships are intended to replace the HENRY J KAISER class oilers. The program completed one trial in FY 2022: an AT on JOHN LEWIS (T-AO 205), the class lead ship.

The program's AT performance required improvement. The lead ship has four starred deficiencies, a number of other significant deficiencies, and a relatively low IFOM score.

#### **5.5.10 Expeditionary Fast Transport (T-EPF) Program**

EPF class ships are built by Austal USA in Mobile Alabama. The program completed one trial in FY 2022: an AT on APPALACHICOLA (T-EPF 13). EPF 13 contained notable configuration changes as a "transition ship" between Flight I (Expeditionary Fast Transport mission) and Flight II (Fast Transport, medical mission capable) configurations. T-EPF 13 retained most of the Flight I transport capabilities while incorporating some of the Flight II medical mission capabilities:

reduced troop seats, enlarged embarked forces berthing, additional medical support spaces, 11M mission boat, and flight deck modifications to allow MV-22 launch and recovery. Medical equipment installation was not part of the acquisition contract and will be determined later. T-EPFs 14 - 16 will include full Flight II medical mission capability.

#### **5.5.11 LEWIS B PULLER Expeditionary Support Base (ESB) Program**

ESB class ships are built by General Dynamics–NASSCO in San Diego California. The program did not complete any trials in FY 2022. The program office plans to present CANLEY (ESB 6) for an AT in FY 23.

#### **5.5.12 SHIP TO SHORE CONNECTOR (SSC) Program**

The LCAC 100 program builds the LCAC Replacement craft at Textron Marine and Land Systems in New Orleans Louisiana. The program completed two trials in FY 2022, ATs of LCAC 103 and 104. The program resolved significant design deficiencies with the craft propeller blades and cushion vane leakage. LCAC 103 completed AT with no starred deficiencies. LCAC 104 had starred deficiencies on its propeller hub oil system, bow ramp cables, and ice protection systems.

#### **5.5.13 VALIANT Class Yard Tug (YT) Program**

YT craft are built by Dakota Creek Industries in Anacortes, Washington. The program completed two trials in FY 2022: ATs on YT 812 and 813. Both craft were generally well-constructed. YT 812 completed trial without starred deficiencies and YT 813 had one starred deficiency.

#### **5.5.14 Barracks Craft (APL) (Non-Self Propelled)**

APL craft are built at VT Halter Marine in Pascagoula, Mississippi. This program completed three trials in FY 22: ATs of APL 68, 69 and 70. All three craft were well-constructed and completed trial without starred deficiencies.

#### **5.5.15 LEGEND Class National Security Cutter (WMSL) Program**

The National Security Cutters (also known as the Maritime Security Cutter (Large) (WMSL)) are built by Ingalls Shipbuilding in Pascagoula, Mississippi. The program did not complete any trials in FY 2022. The program office plans to present CALHOUN (WMSL 759) for an AT in FY 23.

## **6.0 INSURV Changes**

### **6.1 Title 10 Implementation**

As cited in Section 1, on 01 October 2019 INSURV implemented minimal notice inspections per Title 10 USC Section 8674 and established inspection periodicity at three years for all vessels on the Naval Vessel Register. Minimal notice was defined and established as 30 days prior to MI start date.



Achieving three-year periodicity requires INSURV to perform approximately 84 material inspections per year. This constitutes an 80% increase in material inspections over the 6-year average number of inspections prior to FY 2020. Implementation of COVID 19 restrictions created a backlog of required material inspections. INSURV expects this backlog to continue for the foreseeable future based on current staffing levels combined with busy Fleet operational schedules. INSURV implemented scheduling procedures with Numbered Fleet and TYCOM schedulers that prioritize scheduling of vessels considered overdue per updated guidance.

## **6.2 INSURV Manning**

INSURV manning derives from inspection periodicity requirements. Prior to FY 2019, inspection periodicity generated a requirement for approximately 60 inspection events (MIs/Trials/Surveys) per year. INSURV does not possess sufficient funded billets to perform all inspection elements, especially the most specialized, specific technical requirements. INSURV bridged the capacity/capability gap by using Regional Maintenance Center technicians as inspectors, along with inherent scheduling authorities. In FY 2015, the U.S. Fleet Forces Command Manpower Analysis Team (USFF CMAT) validated 56 billets to address the gap using the Shore Manpower Requirements Determination (SMRD) process. 40 of these billets were funded and filled in FY 2019 – FY 2020, the remaining billets are either funded in future years or remain unfunded.

Congressional emphasis on, and the CNO's commitment to, meeting Title 10 periodicity requirements beginning in FY 2020 generated a requirement for approximately 102 ship inspection events per year. This requirement generated a situation similar to what INSURV experienced leading to the FY 2015 SMRD. USFF CMAT returned to INSURV in early FY 2020 to conduct a Management Analysis Study (MAS, a focused SMRD), to specifically define manning requirements to meet increased periodicity. This study validated an additional 99 billets consisting of 20 Officer requirements, 52 Senior Enlisted requirements, 24 civil service requirements, and 3 specialized engineering requirements aligned to Norfolk Naval Shipyard. In July 2022, INSURV was authorized to hire all 40 unfunded civilian billets. INSURV is working with Navy resource sponsors and USFF to fund and detail Sailors for the remaining active duty validated billet numbers. This effort is expected to take several years. In the interim, INSURV is pursuing a contract vehicle to hire inspectors under the cognizance of INSURV to bridge the capacity gap.

This capacity gap negatively impacts INSURV's ability to meet a 3-year inspection periodicity. Under current manning, average inspection periodicity is approximately 4.5 years. This average is expected to remain steady until INSURV is fully manned.

## **6.3 INSURV Scoring Changes**

As noted in paragraph 3.2 alignment of inspection scoring to the JFMM-based model improves data granularity. Previously, INSURV used four levels of indenture (IFOM/FA/Subsystem/Component), effectively scoring only the top three. The JFMM-based model includes an additional level of indenture (IFOM/FA/System/Subsystem/Component), with

scoring at all levels. The additional granularity provides INSURV and stakeholders improved visibility of challenged systems and the ability to rapidly isolate root causes. Starting in FY22, all Material Inspections conducted by INSURV were scored using JFMM scoring. Trials were scored using the legacy methodology in FY 2022 (incorporating dual scoring) and will transition to JFMM scoring in FY 2023.

In order to maintain a basis for trends and trend analysis, INSURV collaborated with NSWC Corona to create several mathematical models to convert INSURV legacy EOC scores to JFMM EOC scores from FY 2016 - 2020. Data collected from dual-scored MIs in FY 2021 were used to formulate mathematical models for each functional area in the ship classes. Mathematical models were created using an Anderson Darling Goodness-of-Fit test and the Akaike Information Criterion to determine the best distribution of the data per functional area in each ship class. Once the distribution was determined, a mathematical formula was derived to convert legacy scores to JFMM scores. These models were tested with an  $R^2$  correlation coefficient to determine how well the mathematical formula described the dataset. All Material Inspection trend data from 2020 and previous, in this report, is derived from this conversion.

A notable impact of JFMM scoring are general changes to annual functional area averages, with some averages increasing, e.g. Surface Communications, and some averages decreasing, e.g. Surface Aviation, from previous year's reports. This is due to adherence to operational impact definitions in assigning numerical scores.

This is especially highlighted in the Surface Aviation functional area. Due to the strict requirements of Aviation Facilities Bulletins (AVFACBUL) and Naval Air Training and Operating Procedures Standardization (NATOPS), singular but critical deficiencies are cause to recommend the partial or full suspension of flight operations. Under INSURV's legacy scoring schema, deficiencies that required partial suspension of flight operations generated maximum scores of 0.79, while deficiencies that required full suspension of flight operations generated maximum scores of 0.59. JFMM scoring definitions align partial suspension of flight operations with a maximum score of 0.40 and full suspension of flight operations with a score of 0.20. This significant change in maximum scores resulted in lower averages for FY 2020 and prior following conversion.