

INSURV ANNUAL REPORT

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President, Board of Inspection and Survey
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Preface

The following is a report of INSURV's findings from fiscal year 2018, as well as comparisons to previous years and is provided in accordance with the John S. McCain National Defense Authorization Act for Fiscal Year 2019.

Minimal notice requirements delineated in Section 322 of the above noted legislation are scheduled for implementation on October 1, 2019.

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

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

The estimated cost of this report for the Department of Defense (DoD) is approximately \$1,950 for the Fiscal Year (FY) 2018. This includes \$0 in expenses, and \$1,950 in DoD labor.

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1.0 Requirements

The FY19 NDAA Conference report (115-874) requires an annual report not later than March 1 each year setting forth an overall narrative summary of material readiness of Navy ships, overall number and types of vessels and for in-service vessels, material readiness trends.

SEC. 322. EXAMINATION OF NAVY VESSELS

(a) NOTICE OF EXAMINATIONS —Subsection (a) of section 7304 of title 10, United States Code, is amended—

(1) by striking “The Secretary” and inserting “(1) The Secretary”; and

(2) by adding at the end the following new paragraph:

“(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) ANNUAL REPORT —Such section is further amended by adding at the end the following new subsection:

“(d) ANNUAL REPORT — (1) Not later than March 1 each year, the board designated under subsection (a) shall submit to the congressional defense committees a report setting forth 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 an unclassified form that is releasable to the public without further redaction.

“(3) No report shall be required under this subsection after October 1, 2021.”

2.0 Executive Summary

In general, the overall Fleet material condition is about the same as it was six years ago, and is generally considered satisfactory when compared to established material condition standards (see Figure 2.1). However, some functional areas and subsystems remain degraded or show declining trends; which is indicative of areas where material readiness is stressed.

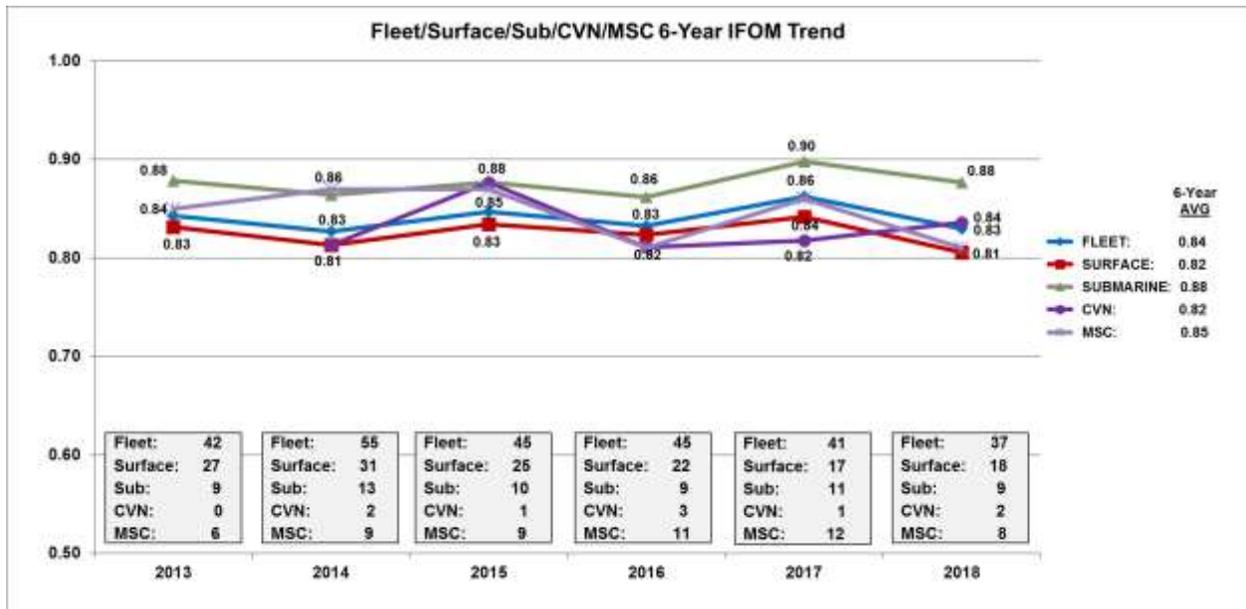


Figure 2.1 Fleet 6-Year IFOM Trends

New construction DDG, SSN, EPF, and ESB programs are mature programs. The LCS programs showed significant improvement in FY18, however both FREEDOM and INDEPENDENCE variants continue to experience challenges in Main Propulsion and Aviation.

3.0 Responsibilities and Authorities

The Board of Inspection and Survey (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 (MI) that occur periodically while ships are in service, and surveys that occur at the end of ships' lives, when required.

3.1 INSURV Process

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

3.2 Scoring

In 2013, the Board developed the INSURV Figure of Merit (IFOM) to score MIs and trials. IFOM is derived through an algorithm that takes the weighted average of Functional Area Equipment

Operational Capability (EOC) and demonstration scores and produces a single score from 0 – 1.00. Data was retrofitted back to 2004 for trending purposes.

3.3 The Schedule Process

Title 10 requires the Board to inspect in-service ships once every three years, if practicable. By policy, Surface ships and CVNs are inspected by the Board every six years. In-service submarine inspections occur at least once every seven years, but are tied to the maintenance process. In reality, submarine inspections occur at an average of about five to six year intervals.

Ships and CVNs that exceed six years and submarines that exceed seven years require a waiver. As of 30 Sep 2018, there were 37 of 355 (10.4%) vessels, subject to inspection, on approved waivers.

4.0 Fiscal Year 2018 Inspections

INSURV conducted 59 material inspections in fiscal year 2018, broken down as follows:

- (1) Material Inspections (29): two TICONDEROGA-class guided missile cruisers (CG), two NIMITZ-class multipurpose aircraft carriers (CVN), six ARLEIGH BURKE-class guided missile destroyers (DDG), one WASP-class amphibious assault ship, two SAN ANTONIO-class amphibious transport docks (LPD), three WHIDBEY ISLAND-class dock landing ships (LSD), two AVENGER-class mine countermeasures ships (MCM), two CYCLONE-class patrol coastal ships (PC), four OHIO-class ballistic missile submarines (SSBN), one OHIO-class guided missile submarine (SSGN), two LOS ANGELES-class submarines (SSN 688), and two VIRGINIA-class submarines (SSN 774).
- (2) Ship's Material Assessment and Readiness Test (SMART) (8): two SGT JATEJ KOCAK-class cargo ships (T-AK), five LEWIS AND CLARK-class dry cargo and ammunition ships (T-AKE), and one SPEARHEAD-class expeditionary fast transport ship (T-EPF).
- (3) Trials (22): one ZUMWALT-class guided missile destroyer (DDG 1000), three ARLEIGH BURKE-class guided missile destroyers (DDG), three SPEARHEAD-class expeditionary fast transports (EPF), one MONTFORD POINT-class expeditionary sea base, three FREEDOM-class littoral combat ships (LCS 1), five INDEPENDENCE-class littoral combat ships (LCS 2), and three VIRGINIA-class submarines (SSN 774).

Additionally, 109 service craft, three combatant craft, and six boats (> 85') were inspected.

4.1 Material Inspections (MIs)

To ensure that Fleet material readiness issues are being identified and addressed, the Board 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,
- (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 the Military Sealift Command (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

To verify that ships being introduced to the Fleet will be ready to meet their missions, the Board conducts trials of ships and service craft. There are three types of trials: Acceptance Trials (AT), Final Contract Trials (FCT), and Special Trials (ST). These trials:

- (1) Verify the quality of construction,
- (2) Ensure compliance with specifications and Navy requirements,
- (3) Serve as a means to provide the CNO a final acceptance recommendation,
- (4) Verify that builder responsible equipment is operating satisfactorily during the guarantee period following acceptance.

5.0 Material Readiness Trends

5.1 Surface Ships

The surface force makes up the bulk of Fleet ships inspected each year. As mentioned above, the surface force, much like the overall Fleet in general, is generally comparable to what it was six years ago, but does show areas where material readiness is stressed. At the class level, CG, LSD, PC, and MCM class ships declined slightly in FY18 and are trending below the 6-year average. DDGs have remained statistically steady, while LHD and LPD ships show an improving trend over the same 6-year period.

Overall for surface ships, eight functional areas were evaluated as DEGRADED: Main Propulsion (MP), Electrical (EL), Damage Control (DC), Deck (DK), Weapons Systems (WP), Aviation (AV), Supply (SP), and Ventilation (VT). MP, EL, AV, SP, and VT were degraded in FY17. DC, DK, and WP were SATISFACTORY in FY17, though DC is historically DEGRADED.

SURFACE						
Functional Areas (Ships Inspected)	2013 (27)	2014 (31)	2015 (25)	2016 (22)	2017 (17)	2018 (18)
Main Propulsion	0.85	0.80	0.81	0.76	0.78	0.76
Auxiliaries	0.87	0.88	0.82	0.82	0.83	0.83
Electrical	0.85	0.87	0.86	0.79	0.73	0.69
Damage Control	0.78	0.74	0.75	0.78	0.80	0.79
Deck	0.87	0.82	0.76	0.80	0.83	0.78
Mine Warfare	0.79	0.88	0.93	NA	0.98	0.85
Anti-Sub Warfare	0.78	0.80	0.91	0.88	0.92	0.81
Operations	0.82	0.82	0.87	0.86	0.88	0.83
Navigation	0.90	0.88	0.91	0.92	0.92	0.92
Weapons Systems	0.76	0.81	0.89	0.85	0.85	0.78
Aegis Weapon Systems	NA	0.79	0.83	0.86	0.88	0.81
Communications	0.83	0.82	0.87	0.85	0.87	0.84
Information Systems	0.67	0.61	0.69	0.90	0.89	0.91
Aviation	0.85	0.77	0.74	0.72	0.75	0.78
Supply	0.84	0.82	0.83	0.78	0.77	0.78
Habitability	0.83	0.79	0.85	0.81	0.80	0.80
NAVOSH	0.90	0.93	0.92	0.88	0.88	0.81
Ventilation	0.76	0.81	0.78	0.79	0.78	0.78
Environmental Protection	0.83	0.82	0.85	0.84	0.84	0.81
Medical	0.93	0.95	0.98	0.97	0.97	0.96
Preservation	0.86	0.85	0.83	0.83	0.82	0.80

Figure 5.1 6-Year Surface Ship Functional Area Scores

Figure 5.1 shows the six-year trend for surface functional area scores and the total number of ships inspected each year. Statistically, scores did not deviate significantly this past fiscal year.

5.2 Submarines

The submarine program is consistently strong. All submarine functional areas averaged SAT for the fourth consecutive year.

SUBMARINE						
Functional Areas (Boats Inspected)	2013 (9)	2014 (13)	2015 (10)	2016 (9)	2017 (11)	2018 (9)
Main Propulsion	0.89	0.91	0.91	0.90	0.94	0.90
Auxiliaries	0.85	0.85	0.84	0.84	0.88	0.82
Electrical	0.86	0.87	0.87	0.83	0.88	0.87
Damage Control	0.88	0.86	0.87	0.87	0.88	0.89
Combat Systems	0.81	0.79	0.83	0.80	0.88	0.85
Navigation	0.93	0.88	0.90	0.90	0.90	0.89
Operations	0.90	0.86	0.86	0.84	0.89	0.92
Information Systems	0.88	0.71	0.83	0.89	0.92	0.95
Deck	0.92	0.93	0.87	0.88	0.90	0.87
Supply	0.86	0.86	0.93	0.92	0.91	0.87
Habitability	0.92	0.92	0.93	0.93	0.93	0.89
NAVOSH	0.85	0.91	0.90	0.91	0.88	0.88
Environmental Protection	0.88	0.93	0.91	0.94	0.91	0.91
Survivability/Escape	0.86	0.86	0.80	0.85	0.85	0.84
Medical	0.95	0.94	0.96	0.94	0.95	0.94
Preservation	0.88	0.90	0.91	0.87	0.91	0.88
Strategic Systems	NA	NA	0.97	0.97	0.96	0.96

Figure 5.2 Submarine Functional Area Scores

As shown in Figure 5.2, submarine Functional Area scores did not deviate significantly this past fiscal year.

5.3 CVNs

Aircraft carrier data has been historically difficult to trend due the small sample sizes that result when a population of ten to eleven CVNs is inspected an average of once every five to six years. In order to expand that sample to make the trends more relevant, we have expanded the overall time period of the trend and grouped the CVNs into multi-year periods. This yields a sample of 40-60% of the total force in each period. Using this dynamic, it is clear that CVN material condition has improved over the previous six-year period.

Functional Area (Ships Inspected)	CVN		
	2007-2010 (5)	2011-2014 (6)	2015-2018 (7)
Damage Control	0.63	0.69	0.71
Deck	0.66	0.79	0.83
Auxiliaries	0.69	0.82	0.81
Electrical	0.76	0.83	0.70
Propulsion	0.79	0.82	0.82
Communications	0.73	0.80	0.82
Information Systems	0.85	0.76	0.83
Navigation	0.84	0.88	0.91
Operations	0.79	0.82	0.84
Weapons	0.84	0.80	0.86
Aviation	0.87	0.86	0.84
NAVOSH	0.80	0.84	0.69
Ventilation	0.76	0.74	0.81
Environmental Protection	0.65	0.87	0.86
Supply	0.78	0.76	0.70
Habitability	0.79	0.82	0.81
Medical	0.90	0.88	0.97
Preservation	0.78	0.80	0.80

Figure 5.3 12-Year CVN Functional Area Scores

As Figure 5.3 illustrates, the number of CVN DEGRADED areas has declined steadily since 2009 from twelve in 2007-2010, to the current four from 2015-2018. The four areas that scored as DEGRADED: Damage Control (DC), Electrical (EL), NAVOSH (OH), and Supply (SP).

5.4 Military Sealift Command (MSC) ships

Eight Military Sealift Command (MSC) ships received Ships Material Assessment Readiness Test (SMART) inspections this year.

MSC (All Classes)					
Functional Areas (Ships inspected)	2014 (10)	2015 (9)	2016 (11)	2017 (13)	2018 (8)
Main Propulsion	0.85	0.89	0.84	0.89	0.81
Auxiliaries	0.84	0.83	0.86	0.88	0.80
Electrical	0.83	0.82	0.83	0.86	0.84
Damage Control	0.84	0.76	0.78	0.83	0.69
Communications	0.91	0.90	0.92	0.92	0.92
Deck/UNREP/Structural	0.87	0.83	0.86	0.83	0.76
Medical	0.92	0.90	0.89	0.94	0.91
Aviation	0.89	0.86	0.79	0.81	0.69
Habitability/Supply	0.86	0.87	0.87	0.86	0.84
Environmental Protection	0.86	0.92	0.91	0.92	0.85
Safety/NAVOSH				0.87	0.80

Figure 5.4. MSC Functional Area Scores

Figure 5.4 shows three MSC ship Functional Areas were DEGRADED in FY18, Damage Control, Deck/UNREP/Structural, and Aviation. All areas were SATISFACTORY in FY17. The Board assesses that these results are due to the introduction of Government-owned, Contractor-operated (GOCO) vessels into the SMART inspection program in FY18.

5.5 Trials

In support of the requirements noted in paragraph 4.3, the Board assesses the maturity of shipbuilding programs. The Board defines a mature program as one that produces ships that have no systemic, repetitive, and unresolved mission-limiting deficiencies at AT and FCT.

The Board conducted 22 trials in FY18: twelve ATs and ten FCTs on 17 surface ships and three submarines. Based on these trials, the Board assessed the Submarine (SSN), Guided Missile Destroyer (DDG 51), Expeditionary Fast Transport (EPF), and Expeditionary Support Base (ESB) programs as mature. The Littoral Combat Ship (LCS) program presented five ships for AT in FY18: three ships completed AT with no mission-degrading deficiencies; two ships completed AT with mission-degrading material deficiencies. This continued a trend of improvement over previous years. Additional focus is required for both variants at AT or FCT with respect to Main Propulsion, Aviation, and platform lift deficiencies. The DDG 1000 program delivered one ship in FY18 following a Hull, Mechanical, and Electrical systems AT. The Board has not assessed a complete ship in this class. The LPD 17, LHA 6, and CVN 78 programs were not inspected at trial in FY18.

5.5.1 ARLEIGH BURKE Guided Missile Destroyer (DDG) Program

DDG 51 class ships are built by Huntington Ingalls Industries in Pascagoula, Mississippi and Bath Iron Works in Bath, Maine. The program completed four trials in FY18: an AT on PCU THOMAS HUDNER (DDG 116), and FCTs on USS JOHN FINN (DDG 113), USS RAPHAEL PERALTA (DDG 115), and USS RALPH JOHNSON (DDG 114). The program has delivered ships in good material condition. DDG 116 was delivered with an above average IFOM score and four starred deficiencies; none of these were repeated from previous ships.

5.5.2 ZUMWALT Guided Missile Destroyer (DDG 1000) Program

DDG 1000 class ships are built by Bath Iron Work in Bath, Maine. The program completed one trial in FY18: an AT on PCU MICHAEL MONSOOR (DDG 1001). The program delivered an incomplete ship based on the ZUMWALT-class delivery strategy. This strategy directed accepting the first two ships in two phases: a hull, mechanical, and electrical (HM&E) AT followed by a post-delivery mission systems activation availability followed by a combat systems AT (CSAT). For the HM&E AT, the Board inspected the ship's integrated power system, damage control systems, auxiliary systems, deck systems, and messing, berthing and medical facilities. Additionally, the Board inspected selected navigation and information system components required for safe navigation at sea. Sensors, weapons, command and control systems, external communications, total ship computing environment (TSCE), and the bulk of aviation facilities were not activated. Temporary surface search radars, navigation, and communications systems were installed to permit safe at-sea operation.

DDG 1001 AT performance was incrementally improved over DDG 1000. Her IFOM was somewhat improved (0.68 vice 0.65). She delivered with 23 starred deficiencies and 29 significant construction deficiencies that required CNO waivers to proceed to AT and delivery; DDG 1000 delivered with 33 starred deficiencies and 27 CNO waived deficiencies.

5.5.3 Expeditionary Fast Transport (EPF) Program

EPF class ships are built by Austal USA in Mobile, Alabama. The program completed four trials in FY18: ATs on USNS CITY OF BISMARCK (T-EPF 9) and USNS BURLINGTON (EPF 10), and FCTs on USNS YUMA (T-EPF 8), USNS CITY OF BISMARCK (T-EPF 9).

The program has delivered satisfactory ships in good material condition. EPF 9 delivered with two starred deficiencies; EPF 10 delivered with none. The in-service ships have generally performed well on FCT.

5.5.4 Expeditionary Sea Base (ESB) Program

ESB class ships are built by General Dynamics NASSCO in San Diego, California. The program completed two trials in FY18: USNS HERSHEL "WOODY" WILLIAMS (T-ESB 4) completed both an Integrated Trial (IT) and FCT.

The program has delivered satisfactory ships in good material condition. ESB 4 achieved a significant milestone by executing an Integrated Trial (IT), combining builder's trial and acceptance trial into a single event. The IT's successful outcome demonstrated the maturity and stability of this shipbuilding program. The ship delivered with a single starred deficiency.

5.5.5 Littoral Combat Ship (LCS) Program – FREEDOM (LCS 1) Variant

LCS 1 variant ships are built by Fincantieri Marinette Marine Corporation in Marinette, Wisconsin. The program completed three trials in FY18: an AT on PCU SIOUX CITY (LCS 11), an AT on PCU WICHITA (LCS 13), and an FCT on USS MILWAUKEE (LCS 5).

LCS 11 completed AT with average results with four starred deficiencies. LCS 13 performed better and had no starred deficiencies.

5.5.6 Littoral Combat Ship (LCS) Program – INDEPENDENCE (LCS 2) Variant

LCS 2 variant ships are built by Austal USA in Mobile, Alabama. The program completed five trials in FY18: ATs on PCU MANCHESTER (LCS 14), PCU TULSA (LCS 16), and PCU CHARLESTON (LCS 18), and FCTs on USS GABRIELLE GIFFORDS (LCS 10) and USS OMAHA (LCS 12).

The program has delivered ships in good material condition. LCS 14 and 16 completed AT with no starred deficiencies; LCS 18 completed AT with one. These ships continue to be challenged at FCT in Aviation and Main Propulsion.

5.5.7 VIRGINIA Class SSN Program

SSN 774 Class submarines are built by General Dynamics (GD) and Huntington Ingalls Industries (HII). USS COLORADO (SSN 788) and USS SOUTH DAKOTA (SSN 790) were built by GD, USS INDIANA (SSN 789) was built by HII. The VIRGINIA class SSN program continues to perform well and is delivering well-built submarines to the Fleet.

6.0 INSURV Way-Ahead

6.1 NDAA-19 Additional Requirements

As noted in Section 1.0, NDAA-19 also states: “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”.

To comply with this requirement, INSURV will execute a Pilot Program which will exercise multiple courses of action to determine the best methodology to define and perform “minimal notice” inspections, while maintaining an accurate assessment of material readiness.

6.2 Lethality and Survivability Assessment

INSURV will collaborate with Center for Naval Analysis and Naval Surface Warfare Center Corona to develop and implement processes and procedures that use INSURV-discovered and/or INSURV-validated material condition discrepancies to highlight combat readiness impacts to US Navy ships’ lethality and survivability.