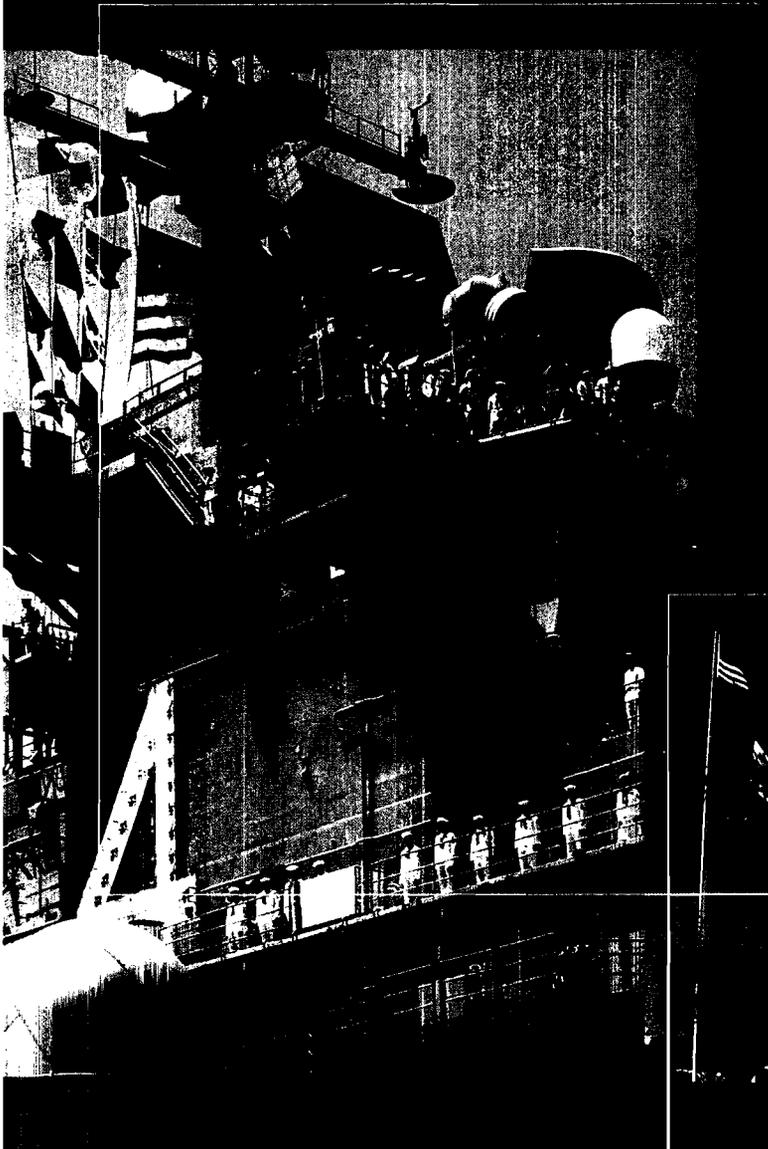


103-06A – RH14 – State Input (California)
Regional Hearing – July 14, 2005 – Los Angeles, CA
BRAC COMMISSION – FY 2005
COFF: _____ DISPOSITION: Permanent

MILITARY VALUE & PROGRAM IMPACT

NAVAL SURFACE WARFARE CENTER
CORONA DIVISION
CORONA, CALIFORNIA

This Report was Commissioned by the
NSWC Corona Community Partnership Committee



EXECUTIVE SUMMARY



Naval Surface Warfare Center (NSWC) Corona is the sole U.S. Navy command charged with providing independent assessment of the warfighting effectiveness of platforms, systems, and combat units and personnel. Its reputation for early, consistent identification of performance deficiencies and its ability to collaboratively develop optimal remedies has (conservatively) saved the Navy and the Defense Department more than \$2.0 billion over 10 years. It has also resulted in a growing demand by the other branch services and defense agencies for their expertise. Currently, 15% of the work performed by NSWC Corona is classified as joint or non-Navy.

NSWC Corona has been able to achieve these results through a workforce that is a national asset. Their expertise and ability to apply their talents across a diverse array of programs sets them apart from all other labs, federal or academic. To illustrate this point, consider the breadth and critical impact NSWC Corona has made on the following:

- Developed and currently maintains the Quality Assurance standards for the \$10 billion annual Missile Defense Agency's National Missile Defense program;
- Designed, built and rapidly deployed a Joint Radio Relay for use in Operation Enduring Freedom (Afghanistan) which relieved the need to continuously deploy AWACs for communication conductivity. Associated cost avoidance: \$8.5 million per month;
- Identified defective chemical-biological sensors through their in-house testing and analysis which prevented the expenditure of approximately \$800 million; and
- Recruited to identify and recommend corrective action for two CEC (Cooperative Engagement Capability) equipped ships that were electronically blind and unable to deploy. Estimated cost savings from NSWC Corona's actions: \$340 million.

By themselves, these 4 programs provide ample evidence to maintain (if not grow) NSWC Corona mission areas. As it is, however, these programs represent simply a prelude of the diverse, operationally significant contribution that NSWC Corona provides.

To capture the military significance of NSWC Corona, this report is divided into three sections and has purposely been constructed to include detailed data and illustrative case studies that quantitatively support the Corona community's major contention that,

Operationally, technically and financially, the U.S. Navy and the Department of Defense can ill afford the risk of closing Naval Surface Warfare Center Corona.

EXECUTIVE SUMMARY *(continued)*

Section I: The Cost of Closure—seeks to analyze the true value of NSWC Corona and the likely costs should Corona be closed or its missions re-located. This section outlines several arguments that are supported and proven by real-life examples/incidents. The case for Corona is predicated on three key points:

1. Corona's assessment mission is a core government function that has saved both money and lives, and should not be transferred outside the Department of Defense
2. With more than 100 subject matter experts that would require approximately 15 years to replace, loss of Corona's intellectual capital will have a devastating and long-term effect on the operational success and safety of the U.S. military
3. With a return-on-investment in excess of six years, there is insufficient financial gain to warrant closing NSWC Corona

Section II: Command Overview—is designed to provide basic facts on the warfare center, its core competencies, its competitive advantages, and the fact that NSWC Corona is the Navy's only Independent Assessment Agent charged with gauging the war-fighting capability and effectiveness of ships and aircraft, from unit to battle group level. In executing this mission, Corona has demonstrated its role and value as an agent of change. By providing objective, unbiased assessments, Corona enables senior defense officials to transform the military for a more dangerous and unpredictable era.

Section III: Capabilities and Results—contains dozens of specific examples of operational and programmatic accomplishments attributed to Corona's highly skilled professional staff. Collectively, these case studies factually demonstrate the cost effectiveness of Corona while also highlighting the impressive return-on-investment that NSWC Corona provides the Navy and the nation. This section also brings to the forefront the diversity of programs in which Corona is involved. Although classified as a naval warfare center, Corona has increasingly been recruited to work on programs that have national and joint applications such as missile defense, tactical communications, and the establishment of government and industry-wide calibration standards.

As a public document, the information contained in this report is limited to unclassified, open-source material. As such, this report makes only passing reference to the special-access programs that NSWC Corona is centrally involved in. Nevertheless, any decision affecting Corona's status should not be considered without first fully assessing its impact on Corona's role in these highly classified (and often, hidden) programs.

At its core, this document is intended to highlight for senior defense officials specific aspects of NSWC Corona that may not have received sufficient attention. It is designed to alert and educate military officials of the true capabilities resident at Corona, causing further examination of the role of Corona in our military. For as impressive as NSWC Corona's past is, its future is even brighter.



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THE COST OF CLOSURE: MAKING THE CASE FOR CORONA

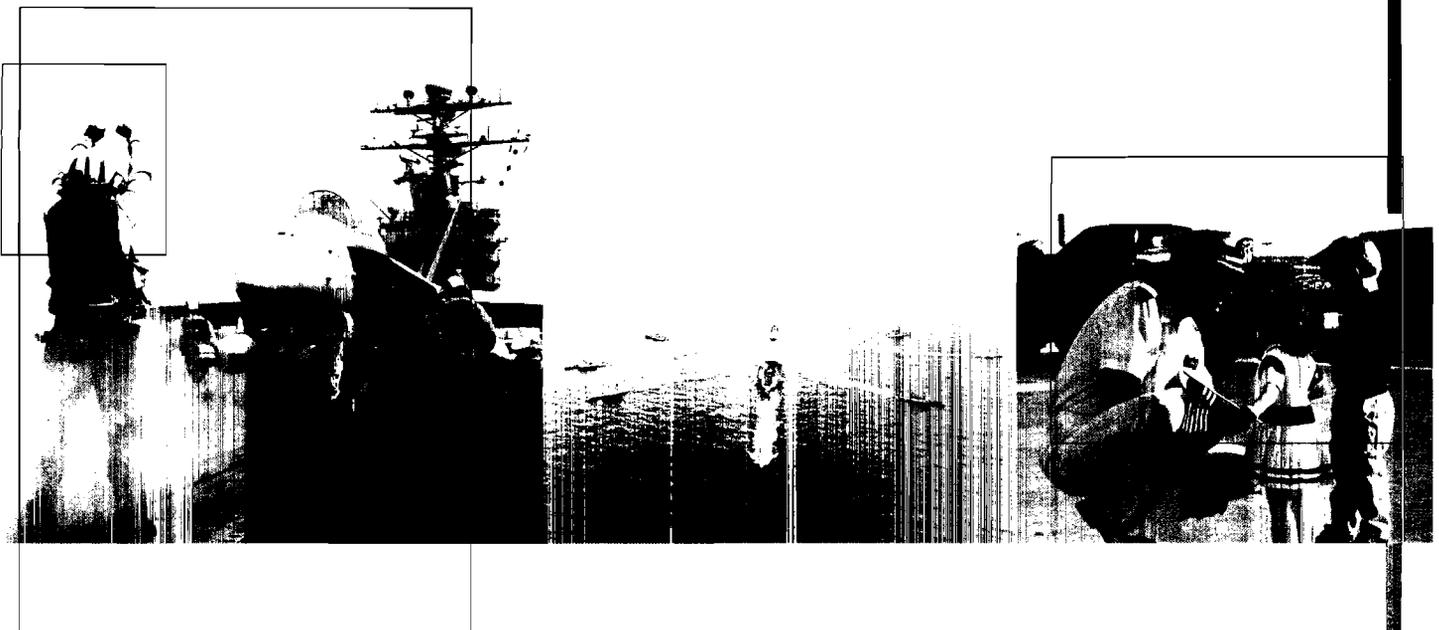
Base closure is a necessary and useful tool to properly align critical resources and transform the U.S. military for modern warfare. As a practical matter, decisions to close or realign military installations should achieve at least one of several basic objectives:

- a. Eliminate or transfer to a non-DOD agent current military functions which are unnecessary or classified “non-core”
- b. Improve the efficiency and effectiveness of military functions which should remain within the Defense Department’s jurisdiction
- c. Act as a catalyst to reshape military organizations, procedures, operations, and culture
- d. Better align infrastructure with the size and missions of current and future military forces
- e. Achieve a financial savings which can then be invested back into modernizing U.S. forces

A thorough examination of Naval Surface Warfare Center Corona’s mission, its business practices and methodologies, its capabilities and applicability across the entire joint military spectrum, argue persuasively for retention, and possible expansion, in order for it to provide the valuable (and critically important) national service. Briefly, the case for Corona rests on the following:

1. Importance of Independent Assessment in Military Operations and Weapon Acquisition.

As detailed throughout this report, NSWC Corona provides relevant and highly specialized independent technical assessment of weapon and combat systems, as well as the operational and material readiness of deploying forces. This is a mission that should, and in fact, must remain within the purview of the federal government. Ensuring that weapon systems perform to established parameters is a fundamental and unwavering requirement that must reside within government. Delegating or outsourcing this essential mission to a non-DoD 3rd party is done only at great financial and operational risk. There are inherent and inescapable pressures placed upon private industry that can (and have) affect the objectivity in performing this critical mission. These pressures include an overarching need to maintain a business unit’s profitability—a need which may adversely impact schedule and cost. In addition, with the continued consolidation of the defense industry, it is quite likely that a contractor responsible for performance assessment and certification may also be financially engaged in product development.



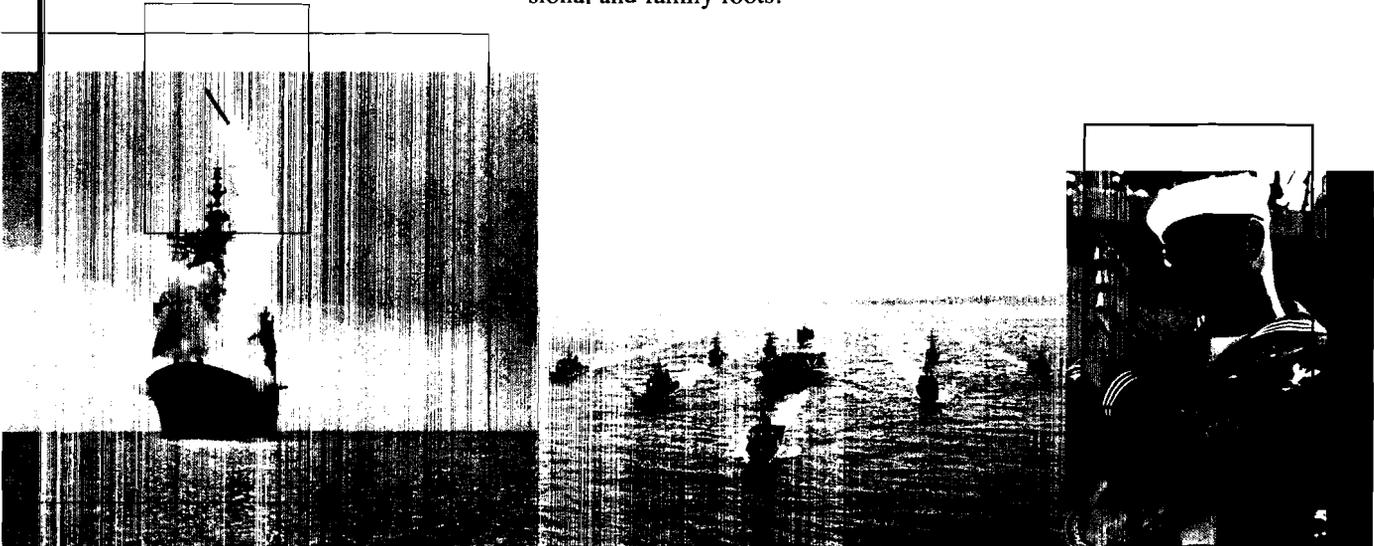
This problem was highlighted in a September 2004 article in "National Defense" Magazine which stated that, "it is not unusual to hear defense officials complain that contractors are too focused on their financial bottom lines, rather than on the quality of their products and the needs of the customer. They also blame the industry's rapid consolidation into a handful of conglomerates for a perceived decline in technical innovation." In response to concerns about industry quality control, the article later quotes LtGen Brian Arnold, Commander of the U.S. Air Force Space and Missile Systems Center, as saying, "We [the military] see a lot of quality problems."

One must only look to the Columbia Shuttle disaster to witness the consequences of relying on non-government agents to oversee and ensure that adequate testing is performed. Following the crash, the Columbia Accident Investigation Board was commissioned to determine the causes of the disaster and recommend corrective actions. Chaired by retired Navy Admiral Harold Gehman, the CAIB published an exhaustive report that explored both the immediate technical causes of the crash as well as organizational elements that contributed to the death of the seven-member crew. Among the CAIB's key findings were: (a) the NASA Shuttle program was under intense pressure to remain on schedule resulting in a series of exemptions and waivers of safety and performance requirements; (b) NASA lacked a robust independent program technical authority that had complete control over specifications and requirements; and (c) there appeared to be an over reliance on aerospace contractors who constituted nearly 70% of the workforce. Among its recommended changes, the CAIB argued that all level-one specifications, requirements, and waivers should be vested within a technical and engineering organization that is divorced from the cost and schedule process. It was the opinion of the Board that this one management change could directly and positively affect a fundamental cause of the disaster. During subsequent congressional testimony, Admiral Gehman specifically cited NSWC Corona, an organization that provides independent assessment, as a very attractive model to emulate for fixing a number of NASA's shuttle problems.

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2. NSWC Corona's Intellectual Capital.

Corona possesses a professional staff that is recognized as a national, not simply a naval, asset. Among Corona's specialized workforce are approximately 100 individuals that are identified as one-of-a-kind and which do not exist in private industry, government, or academia. These high value subject matter experts are specifically detailed on page 11 of this report. A review of previous BRAC actions reveals that approximately 70-75% of civilian workers employed at a base identified for closure or realignment refuse to transfer. A recent survey of Corona employees indicated that fewer than 20% of current staff would consider relocating should Corona close, and its functions move beyond 50 miles of Corona/Riverside, California. This survey supports earlier ones which found a similar resistance to leave a community for which they have long-time professional and family roots.



While it is true that given sufficient time and money the Defense Department could replicate NSWC Corona's capability at another DoD facility, the question must be asked: at what cost? NSWC Corona provides a necessary service to numerous complex, high-value military programs such as the Aegis combat system, Cooperative Engagement Capability (CEC), strategic Missile Defense, and many highly classified programs. These programs represent the cornerstone of this country's national defense capability. To disrupt, degrade, or disband Corona's ability to ensure consistent and effective system performance should not be undertaken without complete confidence that comparable capabilities exist and are readily available now, not theoretically in the future.

Neither the federal government nor private industry are immune to the upheavals and programmatic disruptions associated with the loss of intellectual capital that generally accompanies a physical transfer of core competencies, vice general technical support or "touch labor". In the case of Corona, relocation would result in the following:

- Loss of independent assessments affecting combat systems, missile performance and Fleet readiness, resulting in unknown performance areas, conformance to specifications, and identification of factors that enhance or limit system capability and effectiveness with significant cost impact for redesign.
- Loss of Material Readiness Data Bases (MRDB), which measure Fleet Readiness contributors in areas of systems availability, reliability, and identification of troubled equipment, modal problems that affect fleet readiness to deploy, and overall systems effectiveness when engaged in combat.
- Loss of Government technical authority and oversight required to ensure product and technical integrity at prime contractor facilities and across multiple contractor sources At risk is the ability to conduct: interface analysis; test systems assessment; metrology engineering; product-oriented surveys and program risk assessment; and, other Technical Program Management disciplines necessary for effective local plant government acceptance and contract administration services. Loss of these technical disciplines would result in degraded product integrity and increased risk of acceptance of non-compliant weapons.
- Loss of the missile and combat systems performance data collection and distribution process through the utilization of telemetry, test and training range networks, telecommunication and instrumentation systems, which support the assessment, analysis, evaluation function, in determining and improving military proficiency and readiness. Loss of control of these instrumentation functions would result in loss of data necessary for assessment.
- Loss of global connectivity of every major range facility utilized in the US Navy with the Joint Warfare Assessment Laboratory (JWAL) for real-time community collaborative assessment of test and training exercises across the technical communities. Loss of associated synergies of technologies and personnel.
- Loss of centralized technical authority for all Navy Metrology and Calibration (METCAL) programs. Loss of Measurement Science Laboratory with subsequent break in traceability of calibration and standards to National Institute Standards and Technology (NIST), and the inability to provide independent verification and validation of dimensional integrity of weapons.
- Loss of a single point of responsibility and contracting for Tactical Training Range (TTR) Instrumentation Operation and Maintenance (O&M) for Navy, Marine Corps and Air Force systems, resulting in range commands assuming responsibility for individual range O&M contracting at a greater cost.
- Loss of products and services across NAVSEA, NAVAIR, Marine Corps, Air Force customer base resulting in divergent processes, systems and loss of interoperability, particularly in the test and training range instrumentation applications.

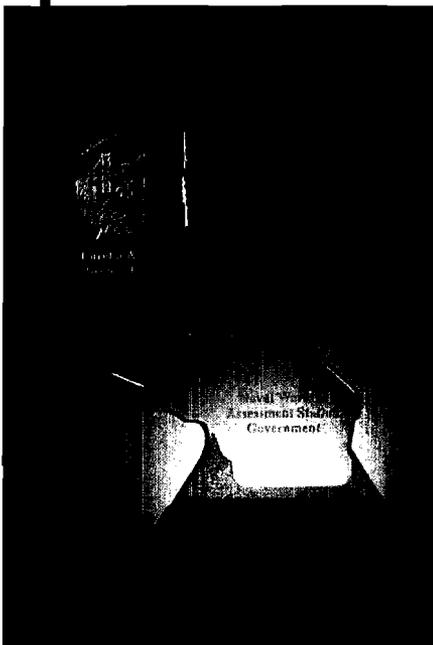
Loss of any one of these capabilities would be detrimental to military operations, while the loss of most, if not all, would be catastrophic.



3. Return on Investment.

Fiscal pressures associated with retaining excess military infrastructures, as well as inefficiently aligned resources, have always been a motivating factor for the conduct of a department-wide BRAC exercise. In response to both sound business practices and congressional directives, recommended closures and realignments must demonstrate financial savings within six years of implementation in order to receive consideration and approval. Given NSWC Corona's physical and operational characteristics, it is difficult to conceive of a scenario in which closing or significantly realigning this facility would garner the Defense Department with a net savings, either within or beyond the six year ROI window. This contention is based on the following:

- **Workforce Demographics**—Corona is staffed by a highly educated, well trained professional workforce. Of the nearly 1000 civil servant employees, 82% are classified as technical or professional, and thus directly support Corona's core function areas. Of the 18% that are not categorized as technical staff, approximately 25% are considered essential and would be required regardless of whether Corona's functions were moved. As such, only 10% of Corona's total workforce would be eligible for possible elimination in the event that the warfare center's missions were transferred onto an existing base. This demographic breakout is not a product of happenstance. Rather, it is the end result of a deliberate effort by senior Corona and Navy management to shape its workforce as efficiently as possible, retaining and training only those individuals that directly contribute to its mission. Recognizing that workforce reduction is one of the principal methods to capture (short-term) savings, and acknowledging that Corona's missions are essential to the military and thus must continue to be performed, it is clear that Corona is simply not a viable "bill-payer" candidate.
- **Business Rates**—NSWC Corona functions as a Defense Working Capital Fund entity and, as such, must aggressively market its services and capabilities. It must also take steps to establish and maintain competitive service rates vis-à-vis other Test & Evaluation facilities. Corona has accomplished this task and offers one of the lowest rates among federal and private industry providers, as is cited below:



NAVAL WARFARE CENTERS	
NSWC, Carderock	\$87.24
NSWC, Indian Head	\$85.46
NSWC, Dahlgren	\$81.20
NSWC, Corona	\$73.57
NSWC, Port Hueneme	\$72.25
NSWC, Crane	\$69.57
NON-FEDERAL T&E FACILITIES	
Center for Naval Analysis	\$200.00
Applied Physics Laboratory	\$200.00
Aerospace Corporation	\$250.00

Again, any attempt to replicate NSWC Corona's capabilities would adversely impact both its methodologies and business practices, and thus result in higher rates.

COMMAND OVERVIEW

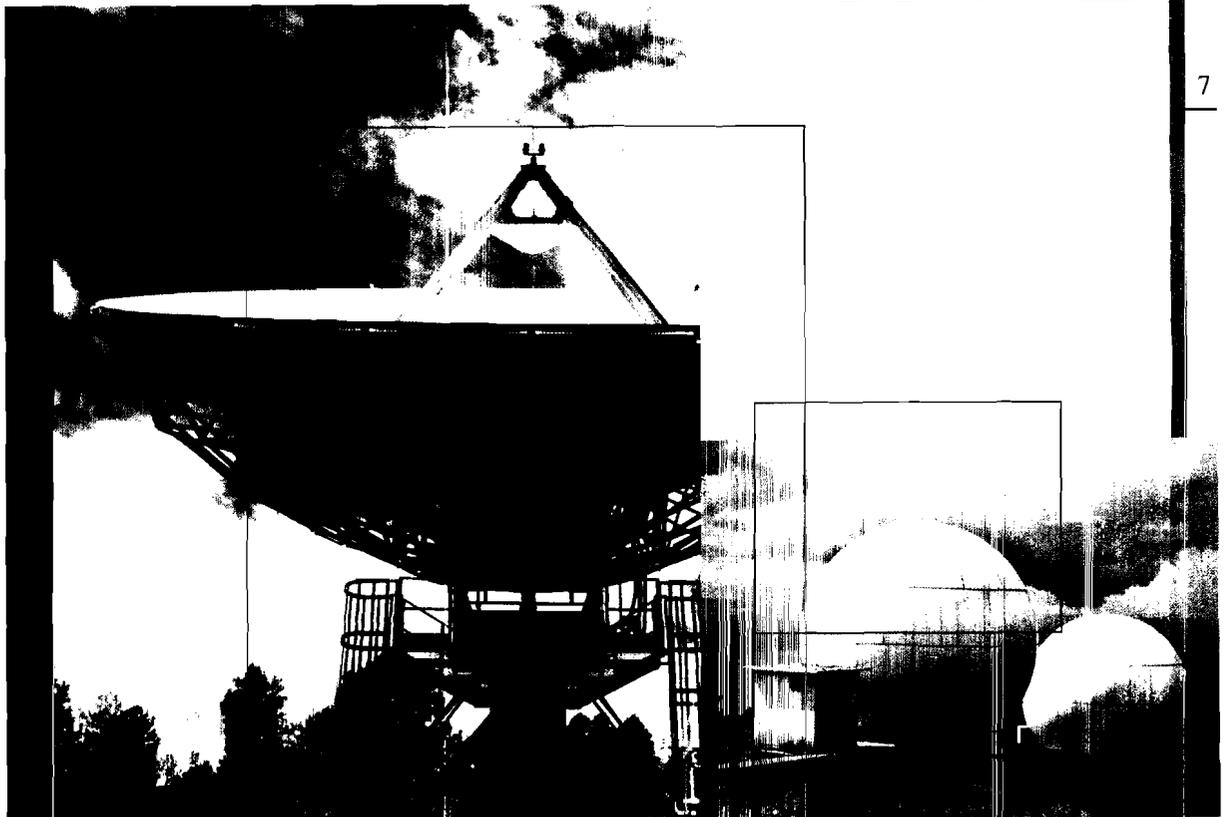
MISSION:

NSWC Corona is the Navy's only Independent Assessment Agent chartered to gauge the war-fighting capability of ships and aircraft from individual unit to battle group level. Accomplishment of this function is achieved by assessing the suitability of combat system design, evaluating the performance of equipment and weapons, and assessing the adequacy of fleet training.

Corona is a highly leveraged, widely sought-after partner that excels at assessing the design, performance, and material readiness of equipment and weapons, as well as the adequacy of operational testing at every stage of program development:

- Concept Development
- Prototype Test & Evaluation
- Initial Deployment
- Fleet Training and Use
- Life-cycle Upgrades
- Product/System Replacement

NSWC Corona is also home to the Navy's only metrology and calibration laboratory where it is responsible for developing methodologies and equipment necessary to precisely measure system performance, test results, and weapon certification and acceptance.



PHYSICAL FACILITIES & CAPABILITIES:

NSWC Corona is an efficient, low-cost technical complex. It is located approximately 50 miles east of Los Angeles in Riverside (CA) County. The warfare center consists of:

- 56 Buildings and Labs
- 467,000 ft² Technical Space
- 1766 Professional Workforce
 - 6 Military
 - 1000 Civil Servants
 - 760 Contracted Employees
 - \$72.8M Annual Payroll
- Fleet support at all Navy Tactical Training Ranges and at more than 20 sites worldwide, including routine embarkation for fleet exercises and testing.
- Joint Warfare Assessment Laboratory (JWAL) a secure facility equipped with satellite and landline communications which facilitates world-wide, collaborative assessment of weapon and platform performance.

COMPETITIVE ADVANTAGES:

NSWC Corona is a national asset that directly serves vital Navy and joint military community missions. These include:

- Identification and correction of performance flaws through a collaborative process with program management/system contractors while maintaining technical independence that promotes critical, objective assessments;
- Enhancement of fleet effectiveness, mission success, and safety of personnel through continuous life-cycle product development and improvement; and
- Quantification of performance gaps between enemy weapon systems and U.S. countermeasures for current as well as evolving threat systems.

NSWC Corona's achievement of these essential missions is accomplished through the advancement of technical expertise in the following core areas:

PERFORMANCE ASSESSMENT:

Assesses weapons and combat systems performance using consistent, government-controlled evaluation criteria, procedures, techniques, and analysis methodology to gauge success. Provides an objective determination of war-fighting capability of unit, joint, and combined forces using threat-representative scenarios and operational environments to evaluate mission effectiveness, and analyzes current system capability against emerging and evolving threats. This technical area is essential in validating weapons and combat systems performance in a realistic battle environment to preclude undetected anomalies which may fail to meet or limit system capability, resulting in required redesign with a significant cost impact.

QUALITY & READINESS ASSESSMENT:

Provides the government's technical assessment of material readiness, requirements, products, and processes for weapons and combat systems during all life-cycle phases to improve quality, reliability, performance, and Fleet readiness. Measures ship, weapons, and combat systems elements' availability and reliability which contribute to the readiness of the Fleet to deploy, and achieve overall systems effectiveness when engaged in combat.



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MEASUREMENT & TEST ASSESSMENT:

Serves as the Department of the Navy's technical authority for metrology programs. Evaluates system interface requirements, test requirements, and processes to assure interchangeability of complex components, measurement effectiveness, test system certification, and government acceptance; and, validates and certifies the conformance of critical interfaces of key weapon components (e.g., missile to launcher, missile to canister, rocket motor to missile, etc.) produced by one or more prime contractors, and requiring 3rd party technical integration. Non-compliance in these areas could result in catastrophic failure during operational use.

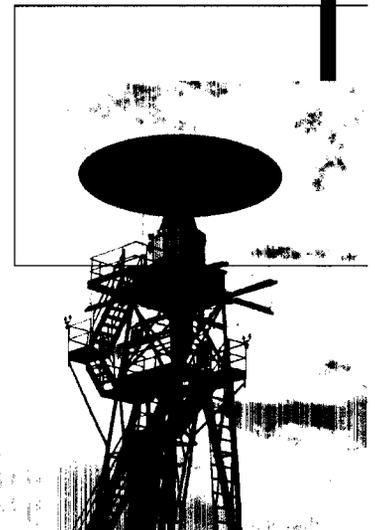
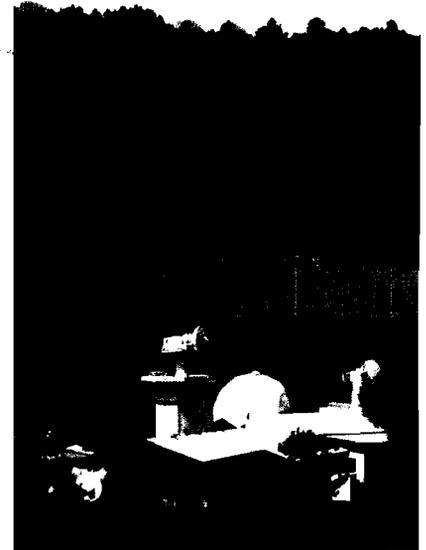
RANGE INSTRUMENTATION ENGINEERING MANAGEMENT:

Provides government oversight and contract management for acquisition, systems engineering, and life-cycle support for range instrumentation and telecommunication systems for the test and training range communities; allows for and supports the collection, assessment, analysis, evaluation, and distribution of data to determine and improve the military proficiency and readiness of surface, subsurface, and air-combat weapons systems, while in support of joint training exercises.

CAPACITY TO GROW:

NSWC Corona has the physical and intellectual assets that would allow for the rapid and relatively inexpensive incorporation of new or expanded missions. Among the possibilities that represent the most logical and beneficial to the nation's national security posture are the following:

- Co-location/consolidation of DoD's measurement science capability. As the branch services become increasingly interdependent, the development of joint or multi-service weapon systems and platforms has increased in volume and importance. Maintaining service-specific calibration and measurement laboratories in support of these systems is no longer viable... or sustainable. NSWC Corona already performs this service on many joint programs and has the capacity to consolidate under a single command all of DoD's measurement science equipment and expertise.
- Distributive multi-service training. Leveraging the existing worldwide communication infrastructure that currently resides within Corona's Joint Warfare Assessment Laboratory (JWAL), as well as its expertise in range instrumentation and evaluation of fleet readiness, NSWC Corona could (with no physical expansion) readily assume the critical role of integrating, organizing, and evaluating joint training exercises that entail multiple units performing simultaneously at geographically dispersed training sites. The opportunity exists to finally achieve the electronic integration of service-specific training ranges while maintaining the operation of the individual ranges with their host service.
- Emergency Operational Command Center. NSWC Corona possesses a secure, global communication infrastructure that permits decision makers to send and receive information and exert direct control during national or regional contingencies. Corona is equipped with its own water supplies and a reliable critical infrastructure posture that would help ensure continuous operations in the most severe national disaster. As such, it is an ideal candidate for selection as a Homeland Security/ Homeland Defense EOC.
- Technical Agent for Joint Forces Command. As JFCOM assumes greater responsibility for the interoperability of forces and equipment, NSWC Corona is ideally suited to lend its expertise and experience in assessing the performance of specific programs and training readiness. While this is not necessarily a new function—NSWC Corona currently performs this mission on selective programs—it is an area that Corona could readily assume a larger, more active role and thus provide DoD with a consistent standard across all the military services.



CAPABILITIES & RESULTS

With decades of experience, NSWC Corona's nationally recognized staff is rightfully viewed as a critical and valuable partner in DOD's evaluation process of weapons and organizational systems. In very real and demonstrative ways, Corona's expertise has resulted in:

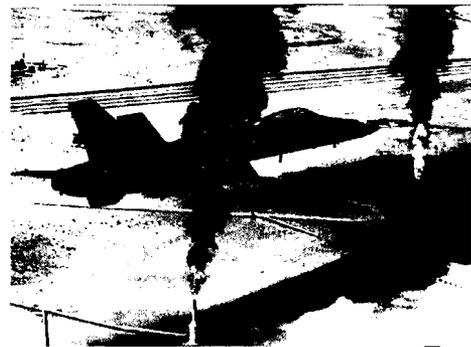
- Preservation of lives
- Achievement of greater mission success
- Better expenditure of critically-needed program funding

“WITH DECADES OF EXPERIENCE, NSWC CORONA’S NATIONALLY RECOGNIZED STAFF IS RIGHTFULLY VIEWED AS A CRITICAL AND VALUABLE PARTNER IN DOD’S EVALUATION PROCESS OF WEAPONS AND ORGANIZATIONAL SYSTEMS ”

Achievement of these accomplishments is due in large part to the many technical skill sets that exist only at NSWC Corona and which represent knowledge that has taken years of professional experience to acquire. Efforts to replicate this expertise would require an average of 15 years of training and practical application with some positions requiring upwards of 20 years and would result in the serious degradation of weapon system performance and reliability during any attempt to reconstitute elsewhere. Some Systems Analysts for complex weapons systems are irreplaceable due to experience and knowledge being developed during the design phase of the system or weapon. Only when the system or weapon is removed from the U.S. arsenal will their knowledge no longer be required. The high degree of interdependency and synergy within the technical capabilities across the Corona command further increases the risk of impacting mission success should these individuals be lost due to Corona being closed or realigned.

Among the skills at Corona are approximately 100 key positions which require subject matter expertise (SME) and for which incumbents are regarded as national experts. The following are examples of skills and the number of positions present at Corona:





• Missile Flight Analysts	12
• Ship Self Defense Senior Analyst	10
• Quantitative Fleet Feedback (QFF) Program Manager	1
• GIDEP Program Manager	1
• Telemetry Systems SME	6
• Test Systems Assessment Analyst	8
• Metrology Execution Agent	1
• NMD Senior Liaison	1
• Product Integrity SME	12

All positions are sensitive and require a security clearance. Duties falling under special access programs include positions with additional security protection and handling measures, special investigative, adjudicative and clearance procedures, or special briefings, reporting procedures or formal access lists. Some positions may require access to special access programs that have been designated by the Navy such as North Atlantic Treaty Organization, Single Integrated Operational Plan-Extremely Sensitive Information, Nuclear Weapon Personnel Reliability Program, Navy Nuclear Weapon Security Manual, Critical Nuclear Weapon Design Information, Presidential Support Duties and programs for foreign intelligence information under the control of the Director of Central Intelligence or the NCSC.

Evidence of the specialized talent that resides at Corona is illustrated below, along with each of the core functions and enabling capabilities that has earned NSWC Corona the respect of fleet operators, system developers, and program managers.



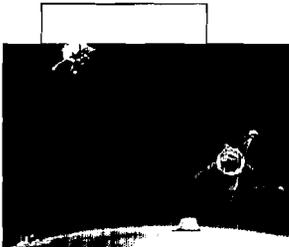
CORE TECHNICAL FUNCTION: PERFORMANCE ASSESSMENT

Enabling Capability: Independent Assessment of weapons and combat systems performance using consistent evaluation criteria, procedures, techniques, and analysis methodology to objectively gauge the success of war-fighting capability of unit, joint, and combined forces using threat-based scenarios and operational environments.

Applicable Subject Matter Expertise:

- Multi-Target, Multi-Sensor data fusion techniques for detection, identification, and tracking
- Statistical Analysis
- Software Assessment
- Coding Theory— error detection and correction
- Discrete and combinatorial mathematics, especially in its applications to Computer Science and computer programming
- Simulation Modeling and Analysis
- Uncommon software languages such as LISP and PASCAL

CASE STUDY: MISSILE DEFENSE

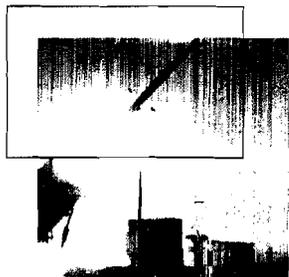


The skills and experience found at NSWC Corona are directly supporting the development and deployment of the national missile defense program, working with program managers in the Pentagon and at other key support organizations including the Naval Sea Systems Command, Space and Missile Defense Technical Center, Joint National Test Facility, and Kwajalein Missile Range (KMR). Corona serves as the Execution Agent (EA), with primary responsibility for the planning, execution, analysis, and reporting of the campaign. This was for Systems Integration Test 01 which was the first attempt to integrate the family of systems designated for use in Ballistic Missile Defense. This responsibility includes the ability to plan, coordinate, monitor, and evaluate the technical aspects of achieving program goals while providing responsible and proper fiscal management and control. The staff at Corona possesses knowledge of Battle Group operations, Naval Tactics, Naval Protocol, and Naval Weapons Systems capabilities and employment in a Battle Group, Battle Force environment.

More recently, MDA specifically sought out Corona to support the development of the MDA Quality Assurance Program citing Corona's Quality Assurance experience (which has been a core competency since the 1950's) and more recently because of their involvement with the Trident Missile nuclear program.

NSWC Corona is responsible for developing MDA provisions for safety, quality and mission assurance and provides the primary technical expertise to execute these requirements for all involved parties, both government and private sector.

CASE STUDY: COOPERATIVE ENGAGEMENT CAPABILITY

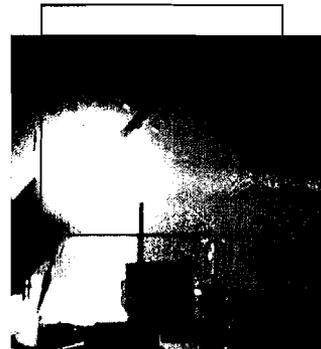


NSWC Corona's expertise sought out by the Chief Engineer for the Assistant Secretary of the Navy (Research, Development and Acquisition) to identify and recommend corrective action for two CEC ships that were electronically blind and unable to deploy. NSWC developed and implemented a successful test plan and applied a rigorous and disciplined engineer assessment with recommendations to the engineering community resulting in an estimated saving to the Navy of \$340M.

CASE STUDY: SEASPARROW MISSILE

NSWC Corona functions as the lead for the SEASPARROW Performance Assessment Process as directed by NATO SEASPARROW Project Office (NSPO). This includes analysis, documentation, and assessment of the performance of the NATO SEASPARROW AAW Self Defense weapons and combat systems utilizing the SEASPARROW Missile. Corona has the unique ability to provide technical direction, oversight, and leadership to the program office, field activities, OPTEVFOR, Surface Warfare Development Group (SWDG), contractors, and Ministries of Defense/naval organizations in the non-US Consortium countries with regard to the assessment of the weapons systems (including missiles) they employ. This includes the ability to oversee the performance assessment process chartered by the US program office.

The criticality of Corona's role is heightened even more by the fact that NATO members are often hesitant to share information among other members. NSWC Corona provides the ability to assess and provide information to each member and has the ability to assess the overall performance and readiness as it pertains to NATO as a whole. The result is that Corona provides U.S. and NATO militaries with the ability to gage the combined and individual war-fighting capability based on parameters developed by NSWC Corona.



CASE STUDY: STANDARD MISSILE (SM-2)

In 2002, NSWC, Corona conducted an analysis of Standard Missile SM-2 moisture damage and its effect on preflight and flight reliability. Analysis showed preflight reliability was affected but flight reliability was not. This discovery avoided possible costly corrective actions to prevent a supposed degradation in flight reliability. Non-routine maintenance was avoided saving at a minimum about \$14,000 per missile.

In 2003, NSWC, Corona identified a negative trend in preflight data for a subpopulation of Standard Missile SM-2 Block IIIA/IIIB missile guidance section rate integrating gyros. The problem gyros would have caused hard flight failures and possible safety issues if fired missiles were configured with them. Gyros were replaced avoiding the potential loss of the weapon if it were fired. Cost per weapon is \$800,000.

NSWC Corona's involvement in the total life cycle of the Standard missile has lead to identification of flight performance limitations and corrective action to allow for interception of low flying foreign missile threats. It has also yielded break through in development of systems capable of detecting and intercepting tactical ballistic missiles.



CASE STUDY: STANDARD MISSILE DEPOT

In 2002-2003 there was a concern that cross-country shipping of Standard Missiles degraded reliability. It was believed this reliability degradation would justify standing-up an depot facility on the East coast. Analysis by Corona showed that there was no significant reliability degradation from cross-country shipping, thus the cost of building and maintaining an East Coast depot facility to process Fleet returned Standard Missiles was avoided.

CASE STUDY: JOINT RADIO RELAY

In 2001, as U.S. military forces successfully engaged in Operation Enduring Freedom (Afghanistan), NSWC Corona was requested to design, build, and deploy a battlefield communication system that would provide for greater tactical conductivity with combat and support units in the area of operation. Corona's solution, the JR2, was fielded in six months and eliminated the requirement to deploy AWACS aircraft on a continuous basis to provide the necessary ground support communications. Cost savings: \$8.5 million per month.

CASE STUDY: CHEMICAL-BIOLOGICAL DETECTORS

As part of their normal cooperative testing services, NSWC Corona identified sensor deficiencies in a planned \$1 billion procurement of chemical and biological detectors. Corona's analysis prevented the purchase of defected detectors at a cost of approximately \$800 million

CASE STUDY: JOINT WARFARE ASSESSMENT LABORATORY (JWAL)

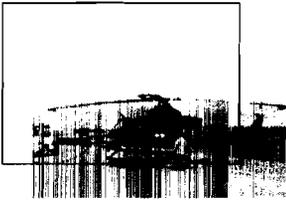


The JWAL is a 48,460 sq. ft. secure facility that provides global connectivity with every major range facility utilized in the U.S. Navy to allow for real-time collaborative assessment of test and training exercises across the multiple technical communities. The JWAL is equipped with internal vaults and special access spaces configurable for work centers and supported by secure LAN with satellite/land-line telecommunications. Its one-of-kind capabilities allow for rapid evaluation of critical events, live and simulated, during developmental testing (DT), operational testing (OT), Fleet, and joint operations, via integrated data collection, distribution, and analysis tools/processes.

CASE STUDY: INFORMATION FRIEND OR FOE (IFF) TEST SET

In 2003, the Navy planned to procure approximately 100 IFF Test Sets from an Air Force Contract. NSWC Corona reviewed the Air Force procurement specification and determined that the units would not meet Navy specifications. As a result, the Navy avoided expending \$6-8 million for equipment that would not adequately test Navy IFF systems.

CASE STUDY: AEGIS EMBEDDED DATA COLLECTION



Embedded data collection for the Aegis weapons system is a direct result of NSWC Corona's involvement with the program from its inception. This concept works much like a computer-aided fault detection in today's cars. It has led to the isolation of relevant operation factors and continuous improvement in system capabilities and performance. NSWC Corona's extensive involvement in the Sea Based aspects of MDA has yielded instrumentation capable of extracting and displaying near real time information during tests.

CORE TECHNICAL FUNCTION: QUALITY & READINESS ASSESSMENT

Enabling Capability: Evaluation of material readiness, requirements, products and processes for weapons and combat systems during all life-cycle phases to improve quality, availability, reliability, and performance. Assessments contribute directly to gauging and maintaining fleet readiness and ensuring combat effectiveness for deployed units.

Applicable Subject Matter Expertise:

- Missile Readiness Assessment and Analysis
- Independent Logistics Assessment
- Technical Data Exchange
- Software Assessment
- Statistical Analysis
- Coding Theory—error detection and correction
- Discrete and combinatorial mathematics, especially in its applications to Computer Science and computer programming
- Quality Management and Engineering (Design & Production Processes)
- Reliability Assessment

CASE STUDY: CROSS PLATFORM ANALYSIS/PERFORMANCE EVALUATION TOOL

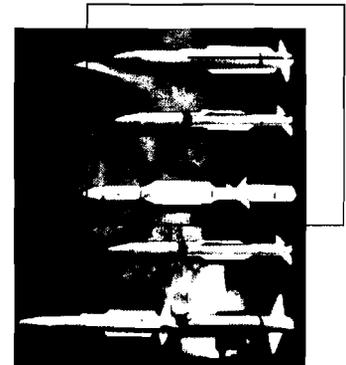
NSWC Corona developed the Performance Evaluation Tool to accurately analyze data transfer/ data linkage from AEGIS, PATRIOT and other joint systems. In addition, Corona has developed PHOENIX, a tool that analyzes AEGIS and CEC data. PHOENIX is in the process of becoming the only tool that will perform cross platform analysis of all Open Architecture platforms.

CASE STUDY: JOINT THEATER AREA MISSILE DEFENSE ORGANIZATION (JTAMDO)

NSWC Corona has been designated as the Independent Assessment Agent for JTAMDO and is directly involved in assisting JTAMDO in the selection of solutions. They have provided analysis of sensor networks for JTAMDO and identified numerous deficiencies in the joint force picture. These deficiencies have resulted in problems with identifying friend or foe and have resulted in friendly fire fratricide in the Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). NSWC Corona's recommendations provided the program manager with a decision management tool to invest in the solutions to these problems. Corona's analysis tools have provided a baseline for comparative analysis of proposed solutions to the Single Integrated Air Picture for DoD and the National Capital Region commercial air picture.

CASE STUDY: JOINT TRAINING FLEET EXERCISE ASSESSMENT

During a Joint Training Fleet Exercise in 2001, NSWC Corona assessment discovered a Blue-on-Blue incident, where a friendly aircraft was misidentified as a possible threat and was constructively engaged by Blue surface-to-air missiles. One of the debrief points provided to the firing ship was that the aircraft in question was flying a steady altitude, not descending, and therefore was not presenting a threatening profile. A few months later, on deployment after 9/11, a firing ship reported an incident where an unidentified aircraft was inbound to the Battle Group. Although tensions were high, one of the reasons cited for not engaging the possible threat with live surface-to-air missiles was that its altitude was steady and not descending. The unidentified aircraft was ultimately identified as a friendly. These events and the results are directly attributable to Corona's consistent application of procedures for data collection, analysis and comparison of historical information that have had a major impact on evaluation threats and non-threats and changes in the rules of engagement.



CASE STUDY: STRATEGIC WEAPONS DEVELOPMENT & ACQUISITION

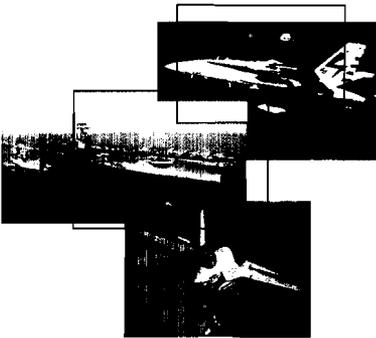
As key technical agent, NSWC Corona provides acquisition and deployment support for Strategic Weapons, TRIDENT, SSGN, as well as the development of programs evaluation criteria, support-threat based scenario development, and development of data collection and analysis plans for Commander, Operational Test & Evaluation Force. NSWC Corona will act as COMOPTEVFOR'S trusted agent in assessing TOMAHAWK weapons system SSGN capabilities.

CASE STUDY: MK41 VERTICAL LAUNCHING SYSTEM (VLS)

Corona's Material Readiness Database (MRDB) was used to assist in determining the cause and necessary corrective actions for a serious of problems plaguing the MK41 VLS, the Navy's principle surface ship missile launch system. Analyzing an extensive database for which Corona developed and maintains Corona engineers participated in a study of the VLS cell hatch problems that resulted in an update of the deck resurface of all VLS ships. In addition, Corona provided data on the root cause failure of the VLS knife-edge uptake hatch. The data were used to update the VLS gas management monitoring after missile launches. Finally, Corona provided data on the VLS reliability of failures and malfunctions which is being used to correct the VLS spare parts requirements.

CASE STUDY: GOVERNMENT INDUSTRY DATA EXCHANGE PROGRAM (GIDEP)

NSWC Corona manages the operations center of GIDEP. GIDEP is a cooperative activity chartered by the Joint Logistic Commanders to provide for the full exchange of information between government and industry participants. Participants share the desire to reduce or eliminate unnecessary duplicative resource expenditures by making maximum, efficient use of existing technical information. GIDEP has realized a cost avoidance of \$1.8B since 1964. Corona has been the managing activity for this program since its inception and has actively contributed to cost savings realized through efficiencies improvements in calibration intervals and procedures.



CORE TECHNICAL FUNCTION: RANGE INSTRUMENTATION ENGINEERING MANAGEMENT

Enabling Capability: Government oversight and contract management for acquisition, systems engineering, and life-cycle support for range instrumentation and telecommunication systems for the test and training range communities. Use in the application of automated and instrumentation weapons scoring technology used during training and evaluation exercises by the Air Force, Navy, and Marine Corps.

Applicable Subject Matter Expertise:

- Pulse and Doppler radar systems
- Coding Theory - error detection and correction
- Discrete and combinatorial mathematics, especially in its applications to Computer Science and computer programming
- Telecommunications Engineering
- Telemetry Systems Engineering
- Scoring Systems Engineering
- Statistical Analysis
- Network Engineering

CASE STUDY: WEAPONS IMPACT SCORING SET (WISS)

An excellent example of Corona's ability to improve the effectiveness of a weapon systems is with the Weapons Impact Scoring Set (WISS), a video-based, triangulation system that automatically scores practice bombs or mines dropped from aircraft. Corona has built 23 WISS systems and installed them on 11 Navy ranges.

The Air Force had an aging, unsupportable scoring system of its own called Tactical Ordnance Scoring System (TOSS). It opted to fund Corona to build and field 21 WISS at 12 of their ranges. In addition, the Army at Fort Drum NY has recently funded Corona to install a WISS to be used by National Guard units on their range.

Not only is the WISS more accurate (1-5 feet accuracy vs. 8-10 feet for TOSS), but it is greatly more accurate than the manual scoring used at approximately half of the USAF ranges that were scheduled but have not received a WISS system. In addition, the manually scored ranges require at least two people in the field to obtain and record the placement of each bomb drop while none are required with the auto-scoring WISS. Maintenance is both cheaper and possible with WISS vs. TOSS. More pilots can be trained in a shorter length of time using the WISS than either TOSS or manual scoring.

CASE STUDY: TACTICAL AREA SAFETY SURVEILLANCE SYSTEMS (TASSS)

NSWC Corona designed TASSS as a surveillance system used at practice bombing and strafing ranges. The TASSS (with optional Loud Hailer Systems) allows the operator to remain at a central control point (often miles away from the tactical range) and use television cameras to remotely pan the target areas to ensure no human or other intruders have strayed into the target areas. If an intruder is spotted, the remote Loud Hailer System can be used to issue verbal warnings to depart the area. Human presence is not necessary at these locations as was required earlier, with the electronic detection and warning systems installed.

Also, the TASSS and Loud Hailer System have been used as part of NSWC Corona's contribution to the Homeland Defense. It is set up at the majority of the range sites as intrusion detection system for monitoring the integrity of the base and ranges facilities with upgrades in the system to support infrared night vision capability. The organization has also been tasked to install surveillance systems at military bases, security gates, and on such prime locations as base water towers, etc.

CASE STUDY: LASER DESIGNATION

It became apparent during recent conflicts that although the systems passed test bench parameters, targets were not being hit. NSWC Corona developed, designed and built laser standards 100,000 times more sensitive than were available in the world to increase the accuracy of test equipment used to align systems on the planes. NSWC Corona has the only certified laser ranges certification instructors and surveyors in the Navy. These skills are critical to the laser designators that are widely used by the joint services to identify and spot targets for engagement. Training ranges must have their laser ranges safety-regularly certified. That capability would be lost with these staff members since there is no commercial requirement for laser target designators in the private sector and, as such, has no technical capability.

CASE STUDY: TACTICAL AIR COMBAT TRAINING SYSTEMS (TACTS)

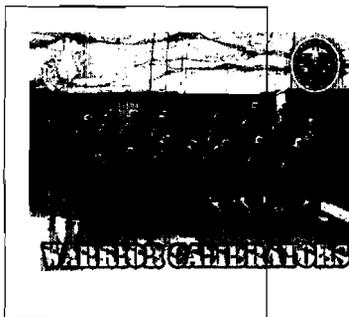
Because NSWC Corona possesses extensive knowledge of training range instrumentation systems including Tactical Air Combat Training (TACTS) systems, Electronic Warfare (EW) systems, telemetry receiving stations, bombing/strafe scoring systems it was specifically asked to assume program responsibility. Corona's involvement was instrumental in the development of the TACTS range capabilities beyond its original concept and resulted in a program cost far below the original contractor. Corona's involvement has saved the Navy, Air Force and Marines \$1M per year since they have assumed responsibility. Corona engineers have the ability to direct, plan, and develop the overall policy for managing the O&M of the systems and equipment that comprise and integrate the range operations functions. Ability to conduct liaison with other high-level personnel at Navy, Marine, Army, and Air Force commands that utilize the FRTC or require information regarding the utilization of the FRTC assets. This liaison involves utilization of an extensive knowledge of range systems to provide information and recommendations to assist those commands concerning the development and employment of the FRTC training systems and equipment. The incumbent also analyzes the changing requirements of the Navy, Marine Corps, Army and Air Force and investigates alternative systems and techniques for meeting those requirements.

CORE TECHNICAL FUNCTION: MEASUREMENT & TEST ASSESSMENT

Enabling Capability: Establishment of department-wide metrology standards and processes to assure effective integration and performance of critical weapon components such as missiles, launchers, and rocket motors. Overall management and technical direction for METCAL programs across the Navy Systems Commands (SYSCOM's) to ensure the Navy's vision of METCAL is translated into program objectives. Establishment and definition of the scope of Navy METCAL technical efforts and projects to be performed, identify new efforts, and appraise state-of-the-art advances in related technology at government, private sector, and foreign activities.

Applicable Subject Matter Expertise:

- Test System Certification
- Test System Assessment
- Scientific Calibration Requirements Analysis
- Calibration Standards Development
- Calibration Procedure Development
- Interval and reliability analysis for Measurement Science
- Calibration laboratory auditors
- Physical Interface Assessment
- Physical Interface and Gage Certification
- Coding Theory - error detection and correction
- Discrete and combinatorial mathematics, especially in its applications to Computer Science and computer programming



CASE STUDY: INFANTRY WEAPON GAGES PROGRAM

Improved measurement techniques developed by NSWC, Corona caused a 60% reduction in the calibrations and verifications time for Infantry Weapons Gages when compared to labor required at previous calibration location. Illustrating the value of NSWC Corona, staff engineers provided timely support to the Marine Corps Infantry Weapon Gages Program in October 2002 when they were tasked to fabricate and

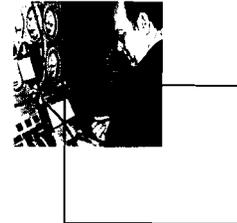
calibrate 2,450 Infantry Weapon Gages for the Marine Corp in support of rapid deployment and operational safety. Although these gages usually take more than 10 weeks for fabrication and calibration, NSWC Corona worked with vendors around the clock to have the gages fabricated and delivered to the Measurement Science and Technology Laboratory in half the normal time. Upon receipt, the gages were then calibrated and shipped by the Marine Corps' due date.

CASE STUDY: MISSILE TEST CERTIFICATION

NSWC Corona Test Equipment Certification personnel found manufacturer faults in TOMAHAWK missile firmware through normal day-to-day analysis of data received at NSWC Corona. The fault could have caused errant operation of the missile. NSWC Corona personnel were able to determine which missiles were affected and were able to advise which missiles required a reload of the firmware thus saving the Navy the cost of reloading all of the missiles. This effort minimized the cost associated in accomplishing the corrective action. Potential savings was \$800,000 for each missile that could have been launched with the incorrect firmware.

CASE STUDY: CALIBRATION STANDARDS MODERNIZATION

Corona was responsible for a calibration equipment program that replaced multiple models of separate, but similar, equipment with fewer, more reliable models that required less maintenance. For example, there were over 23 model numbers of Universal Counters in Navy inventory representing 365 pieces of test equipment. These models were used to perform over 91,000 calibrations each year. Modernization caused a reduction in the model numbers to 3 and a reduction in quantities to 114. After an initial procurement cost of \$1.9M, annual support costs were cut from \$1.6M to \$20,000. Return on investment was secured within 18 months.



CASE STUDY: METBENCH

NSWC Corona is developing METBENCH, the Navy's next-generation calibration platform. METBENCH will replace existing outmoded and obsolete bench top calibration technology, and improve the retrieval of correct metrology requirements data (calibration intervals, approved procedures, authorized standards, etc.) at the technician's bench top where they are required. METBENCH is a unique calibration system that increases the efficiency and effectiveness of the U.S. Navy Metrology and Calibration (METCAL) Program including:

- 33% reduction in calibration run-time through automation
- 50% reduction in tech data work package assembly time
- 50% reduction in technician manual data entry tasks

METBENCH is a forward looking platform-independent architectural design to capitalize on emerging technologies. It is a fast and inexpensive method for converting our library of over 5,000 calibration procedures and is driven by a relational engine that links instrument commands, calibration methods, and "plain language" procedure instructions that allows for preserving investments made on each procedure. It offers a new paradigm for lowering the skill sets required for writing new procedures as well as for performing calibration.

CASE STUDY: GUIDED BOMB UNIT (GBU-24)

While operationally deployed, the USS J.F. Kennedy reported a problem in assembling the airfoil to the GBU-24 bomb bodies. Fifteen days after notification of assembly problem, NSWC Corona was tasked to analyze the data components for design interface deficiencies. Corona engineers identified the root cause and recommended a solution. A portable milling fixture was designed and built and a tiger team was trained to allow repair of the problems at deployed locations. Repairs were conducted at minimal cost and without impacting fleet operations.

CASE STUDY: TEST SET CERTIFICATION

Test equipment must be certified before it is released for use in acceptance testing of weapon systems and their constituent parts. Software that drives automated test equipment used in acceptance testing must be evaluated to verify that all required tests are correctly implemented. Manual verification of this software is a tedious, protracted, error-prone, and often unreliable process.

NSWC Corona personnel developed what is called Computer-Aided Test Software Evaluation (CATSE). It is a sophisticated software tool that automates the software review process. Under CATSE, test system software can be executed without the physical presence of instrumentation and weapon system hardware. Instruments and their associated readings and measurements are simulated, thus providing test software performance identical to that of a fully configured and instrumented test system. It significantly enhances the accuracy and reliability of test software evaluations while substantially reducing the cost and time required for in-depth test software analysis. The biggest cost saving has come through the reduction in time to verify changes in extremely complex software. What use to take four people a year now can be done by one person in a few hours.

CASE STUDY: LASER TRACKER SYSTEM

Laser measuring device was design and built to check for the integrity of the launch tubes onboard the Trident Class submarines. Due to the extreme depths these submarines dive the physical dimensions of the boat change due to pressure of the water. Previously, large mechanical devices were required to ensure the roundness of the tubes to prevent a missile from being jammed in the silo during launch. This device is much smaller and reduces measurement time for large geometric shapes such as the Trident D-5 Launch tube. It has reduced the time from 20 hours to 2 hours with much more robust measurements and dramatically improved accuracy. Cost savings is approximately \$35K per boat.

POINTS OF CONTACT

Preparation of this report was conducted under the leadership and authority of the Naval Surface Warfare Center Corona Community Partnership Committee. Questions regarding the information contained in the report and its preparation should be addressed to:

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