

Sea Trial

Enabler for a Transformed Fleet

By Admiral Robert J. Natter, U.S. Navy

Lieutenant Paul Jones has just launched two unmanned underwater vehicles (UUVs) from the littoral combat ship Arrowhead. Working with the USS Virginia (SSN-774) below the surface and an overhead swarm of unmanned aerial vehicles (UAVs) launched by the Arrowhead's sister ships, the lieutenant is part of a sustained, littoral reconnaissance effort. In minutes, he receives confirmation that the UUVs are up and sweet in the net. His commanding officer is using all of his ship's nearly 50-knot speed to reposition outside the range of an enemy coastal defense cruise missile battery spotted by one of the UAVs. Jones thinks to himself that the battery will be a hellish place to be once hypersonic projectiles begin raining down from the destroyer 100 miles to seaward. As he checks the hyperspectral imagery coming from the UAVs, Jones receives a video conference call on his personal communicator from his commanding officer. The captain of the Virginia and a SEAL platoon commander are in the conference as well. They already are recommending to the joint force commander the immediate insertion of special forces ashore. This is going to be a busy day for Lieutenant Jones and the rest of the Arrowhead's crew.



SEAL TEAM TWO CONDUCTS SEAL DELIVERY VEHICLE TRAINING / U.S. NAVY (ANDY MCKASKLE)

The technology at Lieutenant Jones's fingertips is in development now. How effective it will be in combat depends on the processes—known broadly as concepts of operations (ConOps) and doctrine—we develop to harness its potential. Simply grafting new technology to old processes will not work. To fully leverage the advantages technology brings, we must speed our process of innovation and coevolve concepts, technologies, and doctrine.

Sea Trial will drive that coevolution.

In the Navy's strategic concept for the 21st century, "Sea Power 21," Chief of Naval Operations Admiral Vern Clark designated Commander, U.S. Fleet Forces Command (CFFC), as the executive agent for Sea Trial. The reason is simple. Because the Navy starts with the fleet, the fleet must drive innovation and experimentation. Sea Trial cannot be dictated from programming offices in Washington, D.C., nor can systems commands alone foster it. It will require the active involvement of our operators in the testing and evaluation of the technology provided by systems commands and the tactics and doctrine developed by warfare centers of excellence. That depth of integration is possible only at the fleet level—and it is only through that kind of integration that we can generate the intellectual synergy necessary for experimentation and discovery. In the end, this process is about unleashing the creative genius of our people.

As executive agent for Sea Trial, CFFC integrates the efforts of the Second and Third Fleet commanders, along with the commander of Network Warfare Command, as they sponsor concept development and experimentation to develop Sea Strike, Sea Shield, Sea Basing, and ForceNet capabilities. These commanders will

reach throughout the fleet, the military, and beyond to coordinate concept and technology development in support of future warfighting effectiveness. The systems commands and program executive offices are central partners in this effort, bringing concepts to reality through innovation and the application of sound business principles. Meanwhile, our ships and aircraft will serve as sea-based laboratories, with our operators helping to answer the most pressing questions posed by this period of rapid technological change:

- ▶ What new ConOps will make the most effective use of existing and emerging technologies?
- ▶ What organizational changes will be necessary to achieve the most efficient execution of the new ConOps?
- ▶ What new technologies must be developed to fully implement new doctrine?

Sea Trial is up and running, facilitating the transition of promising capabilities from validated concept, to experimentation and demonstration, to implementation in the fleet. This process serves both as the voice of today's war fighters and a means to look beyond current programs of record to provide the right capabilities for future generations. We will prioritize the fleet's required capabilities, share information on potential solutions, conduct sound and analytical war gaming and experimentation, agree on a way ahead, and implement it without delay. Sea Trial also will stimulate the Navy's science and technology efforts by identifying the technologies needed to fully implement new doctrine.

It is not the strongest of the species that survive, nor the most intelligent, but those most adaptive to change.

Charles Darwin

Synchronizing Concept Development

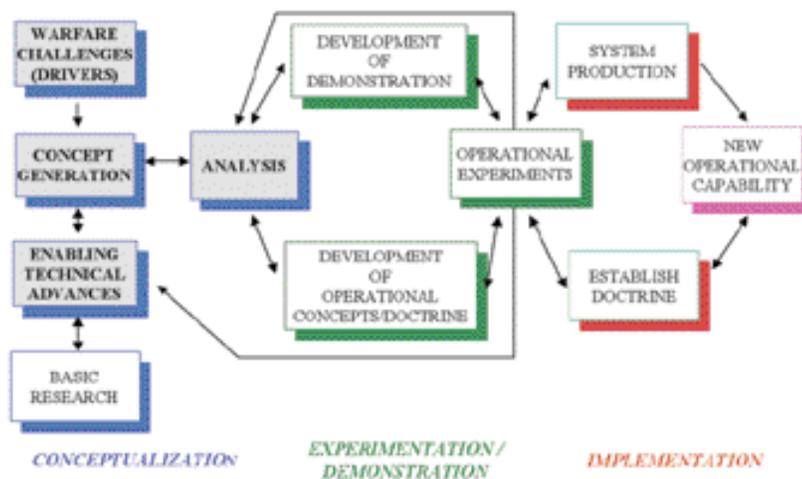
Managing the development of each contributing element, from concept to capability to operational deployment, presents a unique challenge. Innovators are driven by discovery or opportunity independent of fixed timelines, a freedom that is inherent to a creative process and must be fostered inside the Navy environment. Experimenters and operators are driven by more disciplined rhythms, influenced by factors such as deployment schedules, joint war gaming, real-world contingencies, and demanding readiness requirements. Finally, Navy and DoD programs of record are driven by an even less flexible rhythm where planning is long-term and budgeting deadlines are nonnegotiable.

The challenge is to synchronize Sea Trial efforts efficiently across innovation, experimentation, and warfare programs, accounting for both fiscal realities and operational imperatives. The objective is to deliver relevant combat capability—including significant, transformational enhancements to our naval forces whenever possible—and to do so without slowing or artificially constraining the creative process. The Sea Trial organizational structure is designed to accomplish this.

The key players in the Sea Trial dynamic are:

CFFC's Sea Trial Executive Steering Group (STESG). Established as an oversight body, this flag-level group is comprised of key stakeholders within the naval corporate structure. It primarily is responsible for the creation and maintenance of an environment supportive of discovery and learning, cognizant of the balance between competing rhythms and tolerant of failure in the experiential-

Notional Innovation Process



tion process. The STESG also is charged with asking the tough questions:

- ▶ Does the proposed experiment have the potential to enhance warfighting capability significantly?
- ▶ Does it represent a transformational capability?
- ▶ Is the technology/concept aligned with “Sea Power 21”?
- ▶ Is it naval? Is it joint?
- ▶ Does it have or can it readily get resource sponsorship?
- ▶ Is there a transition plan for implementation?

The STESG approves the overall Sea Trial concept development and experimentation campaign plan, resolves issues of resources and priorities, evaluates Sea Trial operational assessments, and makes recommendations to CFFC on the viability of emergent concepts, technologies, and doctrine.

Navy Warfare Development Command (NWDC). NWDC plans, coordinates, and implements the fleet’s concept development and experimentation processes. As the overall coordinator, NWDC works to eliminate the seams between current processes and to speed advanced concepts and technology through workshops, war gaming, lab and fleet experimentation, integration with joint initiatives, and fleet validation. NWDC missions under Sea Trial include:

- ▶ Coordinate Sea Trial pillar groups (working groups for Sea Strike, Sea Shield, Sea Basing, and ForceNet) to develop an integrated and synchronized campaign plan, linking Sea Trial events to warfighting challenges identified by fleet and Marine Corps operational forces.
- ▶ Coordinate integration of Marine Corps concept development and experimentation into Sea Trial and leverage other services’ and joint experimentation.
- ▶ Plan and coordinate execution, analysis, and assessment of fleet battle experiments, selected limited objective experiments, and Navy participation in joint experiments.
- ▶ Synchronize experimentation to coevolve technologies, tactics, techniques, procedures, doctrine, and organizational changes needed to field capabilities.
- ▶ Develop and host the Sea Trial Information Management System, an interactive database that serves as a central library of Sea Trial initiatives and technologies.

Sea Trial Operational Agents. As lead advocates for the “Sea Power 21” pillar concepts Sea Strike, Sea Shield, and Sea Basing and the enabling concept of ForceNet, the Second and Third Fleet commanders, with Commander, Naval Network Warfare Command, are the true implementers of Sea Trial. They are responsible for developing these concepts, conducting operational assessments, and validating evolving fleet capabilities in their respective areas.

Sea Trial Pillar Groups. Working groups have been established for each of the Sea Power pillar concepts and ForceNet. These groups provide the numbered fleets and Commander, Naval Network Warfare Command, with the expertise to develop and evolve “Sea Power 21” operational concepts. They also direct development and implementation of an iterative experimentation process design to bring transformational capability to the fleet.

Collaborative Teams. Key to attaining the “Sea Power 21” vision will be the formation of collaborative teams that leverage the intellectual capital of warfare centers of excellence (e.g., Naval Strike Air Warfare Center and Surface Warfare Development Group), along with NWDC, the Office of Naval Research, type commands, system commands, fleets, and other commands. As experts in their respective mission areas, centers of excellence provide innovative ideas for conceptual development, participate in Sea Trial experiments, and contribute to doctrine and tactics development for the new capabilities being delivered to the fleet.

U.S. Marine Corps. Although Sea Trial is a Navy process, cooperation with and integration of the Marine Corps’ concept development and experimentation is vital to the success of our future naval forces.

The Sea Trial Process

Guided by “Sea Power 21,” the Sea Trial campaign plan, and related documents, the numbered Fleets have developed an initial list of required fleet capabilities. This list guides Sea Trial efforts and provides input to the Chief of Naval Operations’ “Naval Strategic Guidance.” The Sea Trial campaign plan is the vehicle for the fleet to articulate current and future warfighting challenges, the means to propose and evaluate solutions to these challenges, and ultimately a way to deliver transformational capabilities.

The campaign plan begins with strategic guidance from senior leaders, an assessment of current effectiveness, and insight into advancing technology. The fleet identifies specific warfighting challenges and the urgency that should be assigned to their solutions. Next, concepts of operation are developed to capitalize on an existing or emerging technology. Experimentation permits the evaluation of these potential solutions with sufficient analytical rigor to separate the wheat from the chaff. The cycle is complete when the doctrine development, training, and acquisition process reflect those results.

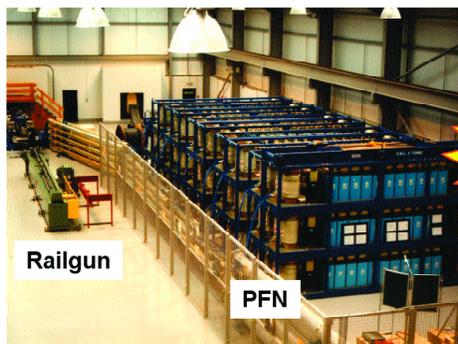
Anyone within the Navy, other services or agencies, or industry may submit ideas to NWDC for inclusion in the Sea Trial process. The governing Sea Trial pillar group and operational agent will validate these proposals before sending them forward to the STESG for approval and integration into the campaign plan.

Following a rigorous independent analysis, the numbered fleets provide CFFC with a comprehensive operational assessment of the experiment—the war fighter’s perspective of the value of the concept or system. Possible outcomes of a Sea Trial event include:

- ▶ Stop development—the capability is ineffective or inefficient
- ▶ Not ready—continued experimentation required
- ▶ Validated fleet requirement—will be recommended for acquisition
- ▶ Accelerated implementation—the highest priority for acquisition and deployment

Rail Gun Sea Trial Experiment

Final Demo 24-25 April 2003



UK Kirkcudbright Facility

Toward 1st Generation Capabilities

- Range : 250 nm
- Payload: 44 lbs
- Length: 10 m
- Fire Rate: 6 rds/min
- Muzzle Vel: 2.5 km/sec
- Impact Vel: 1.5 km/sec
- Guidance: GPS/INS
- CEP: 3 m
- Power (MW) 15 MW (2.5 MW for 1rd/min)



FY-03 Sea Trial Objectives

- 1/8 Scale Hypersonic Projectile
- 6.6 lbs Integrated Launch Package
- 2.1 km/s Muzzle Velocity
- 7.25 MJ Muzzle Energy
- 29 km (range limited)
- Validate the following:**
- Base-Push ILP Design
- Sabot Separation
- In-Bore Dynamics

NWDC has placed online the Sea Trial Information Management System. This tool for managing Sea Trial events and related activities is the portal for organizations to make input into the Sea Trial process. Organizations with access to the secure military web can access this database at www.nwdc.navy.smil.mil/stims.

Early Experimentation Results

Sea Trial is fully operational, with ongoing projects spanning the range of experimentation, and is yielding results that will make a difference in the Navy's ability to fight today and in the future. Examples of productive Sea Trial experiments include:

► *Giant Shadow*. Four Trident ballistic missile submarines will be converted into guided-missile submarines (SSGNs), conventional strike platforms capable of launching 154 Tomahawk missiles, conducting special operations missions, and supporting other strike operations by both sea- and land-based forces. We already are experimenting with the ConOps and capabilities that will be needed to make these platforms truly transformational. In January, we completed Exercise Giant Shadow, in which the USS *Florida* (SSBN-728) conducted complex operations designed to test SSGN technology and operational concepts in conjunction with a variety of air, land, and sea-based assets.

One significant result of Giant Shadow was the ability to use high-frequency ground wave to deliver sensor-

to-shooter data from land-based forces to an SSGN at sea. Using man-portable high-frequency systems, gigabyte-sized video images were transferred from a special warfare unit ashore to the submarine in support of a strike mission. This link also supported real-time chat between submerged, surface, and land-based units. In addition, surrogate aircraft were used to model the UAV technologies that will be a critical enabler for these conventional strike assets. In all, a variety of lessons were learned that will be critical to formulation of our SSGN operating concepts.

► *Command and Control*. One of the most significant areas for concept development, experimentation, and doctrine development is command and control of naval forces operating in the joint environment. During Fleet Battle Experiment Kilo conducted in April and May 2003, spiral events with Second Fleet tackled the thorny problem of collaboration between geographically separated elements of an integrated staff. The equally challenging tasks of commanding theater antisubmarine warfare, area air defense, joint fires, and the new expeditionary strike group were examined in an operational environment with Seventh Fleet during Tandem Thrust '03.

► *High-Speed Vessel*. The high-speed vessel (HSV) is an example of leap-ahead technology critical to Sea Basing. Through Sea Trial, we will continue to examine not only the technologies associated with these platforms, but also the associated concept of operations, manning

profiles, and potential mission uses. The *Joint Venture* (HSV-X1) recently completed her experimental service with the Navy. This included a highly successful deployment in support of Operation Iraqi Freedom, during which the *Joint Venture* conducted maritime interdiction and mine countermeasures operations and performed duties as an afloat forward staging base for special forces. The *Joint Venture* was replaced by the *Swift* (HSV-2), which builds on the concept by providing a larger ship with more defensive and offensive capability, including the ability to support helicopters. (For more details about the *Swift*, see “High Speed Is Here,” pages 72–73, in this issue.)

The *Swift* already has operated in the Arabian Gulf and is scheduled to participate in this year’s West Africa training cruise, where her payload and speed advantages and ability to quickly move Marine Corps forces will provide valuable lessons learned. Experimentation with the *Swift* also will help develop mine warfare command ship operating concepts and will fuel the Littoral Combat Ship’s attendant concept of operations.

► *Precision Fires.* Advances in electric-drive warships and power generation open tremendous possibilities in long-range precision fires. Electromagnetic rail gun technology provides for hypersonic delivery of kinetic-energy projectiles, potentially generating tremendous lethality over current naval fire support systems. A proper-sized round could provide missile-like capability with the destructive power of two Tomahawk land-attack cruise missiles, or tremendous volume fires could be delivered at a fraction of the cost per round. A rail gun also could provide more rounds per similarly sized magazine than current weapons and offer enhanced safety because chemical-based munitions on board the host ship could be eliminated. In addition to taking advantage of the Army’s Direct Fire Electromagnetic Rail Gun program, CFFC and the Office of Naval Research teamed with British research organizations to successfully test a 1/8th-scale model rail gun in April 2003. The next steps will include a gradual buildup of scale model testing before moving on to full-scale development and possible installation on board our all-electric warships. Our experimentation with the rail gun is a great example of leveraging off other organizations’ progress in difficult technical areas.

Upcoming Experimentation

The maturing Sea Trial process will continue to focus on identification of Sea Trial events and exercise opportunities within the fleet. The fiscal year 2004 experimentation plan includes specific activities, including close cooperation with the Marine Corps, in support of the following objectives:

For Sea Strike

► Improve integration of command and control with maritime operations enabled by the ForceNet collaborative information environment.

► Improve combat identification of combat ground forces by maritime forces enabled by ForceNet common tactical picture processing. Provide a common tactical picture tailored to an individual user enabled by ForceNet software agent capability.

For Sea Basing

► Develop a maritime operations planning process for the joint forces maritime component commander (JFMCC) and develop a tactical memorandum that identifies the relationships and processes for vertical and horizontal integration of the JFMCC into the joint command-and-control structure.

► Assess the scalability, ability to support joint forces, and ForceNet enabling technology requirements of a sea base.

► Assess the effectiveness of new capabilities such as high-speed vessels, MV-22 Osprey, T-AKE, selective offload, and integrated naval logistics in support of a sea base.

► Develop the organization, procedures, and ForceNet enabling technology required to support an expeditionary strike group.

For Sea Shield

► Develop an undersea network and nonacoustic detection methods to enable a sensor-rich antisubmarine warfare environment and advanced weapon technology to counter littoral threats.

► Evaluate the contribution of multiple autonomous UUVs to improving mine warfare rate of detection.

► Assess the implications of installing next-generation weapons on board Navy platforms for combating the high-density small boat threat.

For ForceNet

► Develop the architecture and standards necessary to support “Sea Power 21” pillars, providing cross-pillar support for the collaborative information environment multilevel security; computer network defense tactics, techniques, and procedures; and agent-based computing to support data fusion and common tactical and operational pictures tailored to an individual user.

The Bottom Line

As never before, speed is the major characteristic of military forces that win in combat—including speed of strategic mobility and operational and tactical maneuver, speed of attack, and speed of defense. How rapidly we can incorporate new processes and the technologies that go with them into our organization will determine if we are swift indeed, or left behind. Sea Trial will inject new speed into getting the right new capabilities to the fleet. Rapid progress is on the record, and the future of Sea Trial is bright as it becomes the streamlined, integrated process that will drive transformational capabilities from concept to implementation.

Admiral Natter served as Commander, U.S. Fleet Forces Command, and Commander, U.S. Atlantic Fleet, from June 2000 until October 2003.