Can Under Way Training Be Reduced?
The Use of Simulation for Training in the U.S. Navy Surface Force

Must sailors go to sea to learn their jobs? An affirmative answer may, at first, seem obvious, but, in fact, naval training has long involved a mix of shore-based and at-sea training. The question, then, is not whether naval training must take place at sea but which components of naval training must be conducted at sea.

Answering this question has become increasingly important as budgetary, political, and environmental concerns, as well as concerns about quality of life for naval personnel, have led training officials in the U.S. Navy's surface force to consider reducing under way training. The issue gained further currency from the trend toward rotating crews, rather than ships, to forward-deployed locations, which makes it impractical for crews to complete their training on the ships on which they will be deployed. Finally, technological advances have increased the feasibility of using simulation in training.

Prompted by these considerations, the U.S. Navy asked RAND to assess current policies governing the use of simulation in surface force training and to analyze training practices with a view toward determining whether it would be feasible to increase the use of live simulation or virtual, shore-based simulation.[1]

Greater Clarity and Coherence in Simulation Policies are Needed

Multiple agencies are responsible for defining and implementing modeling and simulation policy—including development, governance, and financing—resulting in a complex web of goals and requirements. Furthermore, beyond the basic phase of training, training requirements for ships

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[1] In live simulation, a real person operates real equipment, but some aspect of the environment is simulated. Such exercises are carried out on own ship's equipment–either in port or under way. In virtual simulation, real people operate simulated systems.

Key findings

- More surface-force training exercises could be completed in port
- Clear, coherent policies regarding the use of simulation are needed
- Training requirements must be aligned with simulation policies
- Changes in Navy culture may be needed to support expanded use of simulation in training

have been only minimally articulated. Vagueness and inconsistency in training requirements and standards for assessing readiness further complicate the problem of determining the best use of simulation. The successful use of simulators requires, at a minimum, clear and coherent policies governing their development and use and coordination of these policies with more-general training requirements. Knowledge of current training requirements and practices in the U.S. Navy and other organizations can help to provide an empirical foundation for such policies. Developing that knowledge was the goal of the remainder of RAND's work on this topic.

Training Requirements Must Be Aligned with Simulation Goals and Policies

Using the DDG-51 class ship as an exemplar, RAND analysts determined that the specified training requirements are inconsistent with increasing the use of simulation. These requirements, however, do not seem to be justified on either military or economic grounds.

Equivalencies have been specified for only about one-fifth of required exercises. For the DDG-51, the Surface Force Training Manual speci-

fies 271 training exercises across 15 mission areas. Of these, only 58 (21 percent) have approved equivalencies, meaning that credit toward readiness ratings can be earned by completing these exercises either under way or in port. Interviews with Surface Force, U.S. Atlantic Fleet (SURFLANT) training officials, however, revealed that many exercises for which there are no equivalencies could be completed in port, which means that creating new equivalencies would increase opportunities for simulation without reducing the quality of training.

Few high-frequency exercises have equivalencies. One of the benefits of simulation is being able to repeat training at low cost. Thus, one might expect high-frequency exercises would be more likely to have equivalencies, permitting them to be completed through simulation, than low-frequency exercises. The RAND analysis indicated, however, that one-third of the low-frequency exercises (requiring completion only every two years) had equivalencies, but only about one-tenth of the high-frequency exercises (requiring completion at least every three months) had equivalencies. Thus, opportunities for simulation do not exist in areas that offer the greatest cost reductions.

More Training Exercises Could Be Completed In Port

According to information provided by SURFLANT training officials, exercises with no equivalencies were categorized as "can only be completed under way" or "could be completed under way or in port." RAND analysts examined the relationship between where these exercises, as well as those that did have equivalencies, *could* be completed and where they *were* completed.

As is shown in Table 1, of the exercises completed by nondeployed ships, 77 percent were completed under way; only 23 percent were completed in port. Of exercises with equivalencies, all of which could be completed in port, 80 percent were completed under way. Only 20 percent were reported as having been completed in port. Thus, having an approved equivalency did not increase the likelihood that an exercise would be completed in port. Neither did mission area appear to determine where these exercises were completed. Most exercises with equivalencies were completed under way, regardless of mission area. Further, a large majority (71 percent) of the exercises that could, according to SURFLANT training officials,

Table 1. Across All Types of Exercises, Most Were Completed Under Way

Type of Exercise	Where Exercise Was Completed	
	In Port (%)	Under Way (%)
All exercises	77	23
Exercises with equivalencies	80	20
Exercises that could be completed under way or in port	71	29
Exercises that could only be completed under way	92	8

NOTE: All figures are for nondeployed ships only. For deployed ships, 99 percent of all exercises were completed under way.

be completed under way or in port were also completed under way. Only 29 percent were completed in port.[2]

Table 2 shows where exercises that could be completed in port were actually completed. The data in the first column reflect all potential in-port exercises completed during the period we examined. Of these, 21 percent had equivalencies, and 79 percent did not have equivalencies but could have been completed either under way or in port. As shown in the second column, exercises with equivalencies actually completed in port constituted 4 percent of exercises that could have been completed in port; exercises with no equivalencies that could be completed either in port or under way and were actually completed in port constitute 22 percent of potential in port exercises. In sum, only 26 percent of all potential in-port exercises were actually completed in port—clear evidence that there is substantial opportunity for increasing the proportion of training exercises conducted in port and, by extension, for increasing the use of simulation in training.

Table 2. Most Exercises That Could Be Completed in Port Were Actually Completed Under Way

Type of Exercise	Of Exercises That Could be Completed in Port—	
	Potential (%)	Actual (%)
Exercises with equivalencies	21	4
Exercises with no equivalencies that could be completed in port or under way	79	22
Total	100	26

Simulation Is Used Extensively for Training In Other Organizations

Interviews with training officials in commercial shipping and aviation and with British and Canadian naval training officials, as well as past RAND research regarding the use of simulation in U.S. military aviation, strongly support the idea that simulation can be used effectively for training on particular tasks. For instance, in the aviation community, a relatively small proportion of training exercises for fighter strike missions is conducted through simulators. For maritime patrol aircraft, however, about 50 percent of both basic flight and mission training exercises are completed on simulators. In commercial aviation, nearly all training is completed on simulators.

In the Canadian Navy, under way training is required for only the most-advanced exercises—those that involve multiple ships. For all other exercises, the use of simulation is both permitted and encouraged. Similarly, in the Royal Navy, simulation is used to reduce the costs and risks of training; under way time is reserved for training in primary warfare mission areas.

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[2] Table 1 also indicates that 8 percent of "under way only" exercises were completed in port. This finding may be a result of reporting error or may suggest that exercises that were categorized as "must be completed under way" are, in fact, sometimes completed in port.

In commercial shipping, training for tasks required for certification is performed on appropriate simulators. Training officials indicated that the simulators allow everyone to be trained through a core set of drills in a timely manner. In addition, simulators allow personnel to experience the casualty-control exercises and procedures not normally done at sea, thereby preventing damage to equipment and injury to personnel.

Taken together, these observations indicate that simulation can be and is used effectively to provide many different kinds of training in military and civilian organizations whose needs are comparable to those of the U.S. surface force.

Changes in Navy Policies and Culture Are Needed to Support Expanded Use of Simulation

Navy training representatives interviewed in this study acknowledged the potential value of using simulation to reduce time under way in surface force training, but they disagreed about how it might best be used. Some indicated that under way training time could be reduced by completing more intermediate and advanced training in port, but others suggested that efforts to reduce under way time should focus on basic training.

In terms of naval policy, the most important obstacle to reducing under way training time may be the requirement that any exercise for which completion credit is claimed must be performed on own ship's systems, i.e., completed through live simulation. This requirement precludes earning "readiness and training" credit for exercises completed in shore-based simulators.

Another limiting factor is a bias, acknowledged by Navy officers, toward completing training exercises under way. A change in Navy culture may be required to achieve a higher level of in-port training involving simulated exercises.

Recommendations

Using the analyses described above, RAND researchers developed several recommendations that, if adopted, would help to build a coherent set of policies and practices for the use of simulation in surface force training.

Define the Goals of Training

To determine the roles of live and simulated training in relation to performance goals, it is essential to establish the relative importance of particular training goals in diverse situations. If the primary goal is to achieve the greatest proficiency, more resources may have to be expended, or significant process changes may need to be made. If the primary goal is to reduce cost while maintaining the same proficiency, the trade-offs may be different. Defining clear training goals could help increase openness to the use of simulation for training.

Specify Measures of Effectiveness for Training

The Navy needs clear proficiency and readiness standards covering all phases of training across mission areas to assess not only the general effectiveness of training but also the effectiveness of training through simulation. Given the experience of other organizations, it seems likely that in-port simulation—either live or virtual—would be at least as effective as under way training for many skills. Evidence derived from well-defined measures substantiating such an outcome could be instrumental in producing change.

Increase the Efficiency of Under Way Training

Under way training should be reserved for exercises that can only be completed under way. The number of exercises with approved equivalencies should be expanded, and a much higher proportion of exercises with equivalencies should be completed in port. In addition, "under way only" exercises should be prioritized, with high-priority exercises being completed first. Finally, exercises should be sorted into groups that can be completed simultaneously to maximize the benefits of training at sea.

Identify Exercises for Which Simulation Is Appropriate

The Navy should select the areas for which simulation will provide the greatest benefit. Such areas include (1) exercises for which the required activities do not depend on the location of the ship, (2) high-frequency exercises, (3) exercises in nontactical mission areas, and (4) exercises simulated by other military organizations and the private sector.

Develop an Investment Strategy

The Navy should invest in the simulators that afford the best fidelity and should maximize their availability. Currently, there are multiple simulators for the same exercises, suggesting that the direction of simulation has been to improve the fidelity of what is already simulated. Although fidelity is, of course, important, it may already be satisfactory in some areas, so greater attention should be given to developing simulators in new mission areas. ∎

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