

CARRIER AIRWING TRAINING: AN INNOVATIVE APPROACH

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ABSTRACT

A central theme in modern naval warfare is the ability to conduct joint operations which combine the tactical aviation elements of two or more carrier task forces. Unfortunately, due to operational constraints and the complex nature of such operations, carrier airwings are seldom afforded the opportunity to conduct training activities which emphasize joint operations. This paper will highlight how the use of distributed simulator networking technology can be directly applied to the conduct of carrier airwing training. It will also show how simulation networks for carrier airwing training can provide the capability to conduct joint operations training involving two or more carrier airwings in a simulated real-world tactical environment. The implementation of such a network will serve to multiply the effectiveness of shore-based pre-deployment airwing training and will provide a heretofore unavailable capability to conduct simulated joint airwing tactical operations in a battle group environment.

INTRODUCTION

Historically, in over 90% of the instances in which U.S. leadership has tasked our forces with achieving political goals through power projection, the U.S. Navy has been called upon to provide the necessary combat forces. One of this nation's most flexible means of projecting military power is through the use of deployed Navy carrier task forces. The potent capabilities of carrier-based and supporting firepower have been dramatically demonstrated on several recent occasions including the Gulf of Sidra "Freedom of Navigation" incidents, the Operation Eldorado Canyon strike against Libyan terrorist targets, and the Operation Praying Mantis engagements versus Iranian naval assets in the Persian Gulf. The success of these operations was primarily due to the quality of the training provided to carrier task force combat elements during pre-deployment training cycles. However, if U.S. Navy carrier task forces are called upon to conduct carrier battle group operations which combine the assets of two or more carrier task forces for conduct of high intensity, "general war" combat operations, the pre-deployment training opportunities currently available to carrier task force combat elements may prove to be inadequate.

This paper provides a description of the types of training currently conducted by the carrier task force's primary combat element, the carrier airwing, and proposes an enhancement to this

training in the form of a distributed architecture simulation network for carrier airwing training. This network will support a sufficient number of vehicle simulators to permit carrier battle group operations in a robust, high density tactical environment which contains all related command and control features and intelligent opposing forces. This proposed carrier battle group simulation network, called BATTLENET, is based upon a standardized simulator communications protocol and is an appropriate training and tactics development medium for conducting both large scale shore-based and carrier-based simulation training activities.

CARRIER AIRWING TRAINING

U.S. Navy carrier airwings are normally composed of nine squadrons consisting of seven different aircraft types with a complement of over eighty aircraft including the F-14A Tomcat, F-18A Hornet, A-6E Intruder, S-3B Viking, E-2C Hawkeye, EA-6B Prowler, and SH-3 Sea King. When not deployed on their assigned carrier, airwing squadrons are geographically dispersed at various coastal Naval Air Stations (NAS).

The aircraft carrier's deployment schedule dictates the length of the pre-deployment training cycle during which each squadron in the airwing must train newly assigned personnel, conduct recurrent training for experienced personnel, and prepare the squadron's aircraft

for the next deployment. Deployments are generally six months in length with a maximum of one deployment scheduled every eighteen months.

The unique nature of carrier operations dictates stringent training requirements for all squadron aircrew members. Blue water operations, where divert landing fields are not available ashore are the norm. Therefore, each aircrew's ability to safely and efficiently launch and recover in all weather conditions must be assured. Prior to being assigned to a deployable carrier airwing squadron, each aircrew must have successfully completed carrier landing qualifications while assigned to a Fleet Readiness training Squadron (FRS). In addition to carrier qualification, each pilot and Naval Flight Officer (NFO) receives 6-8 months of intensive training in aircraft and weapon systems familiarization, aircraft and weapon systems employment, and basic and advanced tactics while assigned to the FRS.

Pre-Deployment Carrier Airwing Training

During the pre-deployment training cycle, each carrier airwing squadron strives to achieve the highest possible state of combat readiness. This assures the airwing is at peak combat potential upon commencement of the deployment. Due to the nature of deployed carrier operations, it is difficult to maintain the state of readiness achieved during the pre-deployment training cycle for the duration of the deployment.

Each squadron's primary training emphasis is on integrating aircrew members into a cohesive squadron tactical organization and preparing them for the rigors of deployed carrier operations. Squadron aircrew members who have made one deployment are considered fully combat ready. These individuals are experts in the operation of their aircraft and weapon systems in the deployed carrier environment.

Experienced aircrew are normally paired with the newly assigned aircrew and are responsible for training the new aircrew member in the art of carrier operations. This "experience mix" in each aircraft contributes to operational safety and is the most efficient way to maximize the combat potential of the airwing's manpower assets.

The majority of each airwing squadron's pre-deployment training is conducted as a separate unit. The airwing will normally operate as a combined arms team for only six weeks during the pre-deployment training cycle. Three weeks of this joint operations training is conducted during an airwing weapons detachment to the

Navy's Strike Warfare Center (NSWC) located at NAS Fallon, NV. During this detachment, the airwing conducts Overland Air Superiority Training (OAST), Battlefield Air Interdiction (BAI) training, and Close Air Support (CAS) training. A series of airwing attacks against heavily defended targets are also planned and executed during this detachment. The joint operations training opportunities provided at NSWC prepare the airwing for conduct of carrier-based training.

During the final phase of the pre-deployment training cycle, the airwing is based aboard the carrier for operations which prepare both the carrier crew and the airwing personnel for the actual deployment. Pre-deployment carrier operations consist of several at-sea periods including Refresher training, Advanced Phase training, and Battle Group Phase training. The carrier and airwing conduct carrier qualifications and learn to operate safely as a combined unit during Refresher training. Advanced Phase training stresses the carrier and airwing in a high tempo operational environment that emphasizes the conduct of joint operations in which the airwing applies the lessons learned from the NSWC weapons detachment. Battle Group Phase training exercises the airwing's ability to perform joint operations in concert with another carrier airwing. In actuality, there are rarely two carriers available for the conduct of Battle Group Phase training. The airwing is able to perform approximately three weeks of joint operations training during these pre-deployment at-sea periods.

Deployed Carrier Airwing Training

Overall airwing combat readiness is highest at the commencement of the deployment. Due to limitations imposed upon the conduct of flight training activities in the deployed carrier operating environment, this readiness level declines as the deployment progresses. Quality tactical flight training opportunities are limited due to the nature of cyclic flight operations in which there is a specific length of time, usually about two hours from launch, before it is possible to recover on-board the carrier. The quality of these tactical operations is also affected by a lack of available airborne tanking assets, the lack of suitable training ranges due to civilian air and surface traffic congestion, and the lack of friendly nation facilities in close proximity to forward operating areas.

Several large scale training exercises are normally conducted with friendly armed services during the course of the deployment and live ordnance is carried whenever possible.

Although each aircrew will usually fly over 225 hours and make about 100 carrier landings during the six month deployment, approximately 40% of total flight hours for tactical aircraft such as the F-14, F-18 and A-6 are devoted to launching from and recovering on the carrier. When transit and coordination times are included, only about 50% of the available flight time is actually devoted to tactical training.

Carrier Airwing Training Summary

The superior quality of training provided to U.S. Navy carrier airwings is evidenced by the outstanding performance of carrier-based airpower during the Libyan and Iranian hostilities. The quality and type of training currently provided is clearly adequate to meet the requirements for projecting power against third world countries in low-intensity combat operations where the carrier itself is at little risk.

The primary reasons for maintaining aircraft carriers in the U.S. force structure are to provide a potent, mobile power projection capability, to provide the means for protecting our sea lines of communication during general war hostilities, and to provide the capability to deny a hostile nation the sanctuary of its home waters. During any of these war-at-sea scenarios, the forces of two or more carrier task forces will be combined to form a carrier battle group. The question which must be asked is does the current carrier airwing training system adequately address the conduct of high intensity, war-at-sea combat operations, in particular, the conduct of carrier battle group operations? The answer to this is questionable at best. Due to training time limitations and asset availability, carrier airwings have little opportunity to conduct training in a joint operations environment, and seldom have the opportunity to train in a carrier battle group environment.

CARRIER BATTLE GROUP SIMULATION NETWORK (BATTLINET)

Distributed simulation, involving networked, interactive simulators, is rapidly emerging as the answer to large scale, collective team training problems. Distributed simulation systems for combined arms training can provide the bridge from individual skills training in the schoolhouse environment to joint tactical training in the operational environment. The full measure of this advanced simulation technology is only now being recognized as its initial implementation by the U.S. Army allows large units to conduct realistic training in a simulated operational environment without the huge expense

normally associated with the conduct of such operations.

Distributed simulation overcomes the following three limitations to daily peacetime training: First, the limits of scale imposed on the conduct of large, massed force-on-force engagements are overcome by lower cost, tactical team training (T³) simulators and crewstations which provide man-in-the-loop training opportunities. These tactical skills trainers are optimized fidelity configurations of ground, sea, and air vehicles and their weapon systems; command and control elements; and key support systems.

Second, the limitation of a dynamic threat or opposing force of the proper size is easily met with Semi-Automated FORces (SAFOR). The use of SAFOR provides realistic enemy, and friendly, engagement forces networked into the tactical battle environment to provide the proper degree of "stress" on the human combatants. Using artificial intelligence techniques, and man-in-the-loop command and control, SAFOR can provide a doctrinally sound, robust capability for conduct of combat development and mission rehearsal as well as tactical team training.

Third, the limitations of replicating and orchestrating the force multipliers of C³I and supporting logistics elements in the training scenario are eliminated by networking these participants in the same interactive environment as the fighting elements.

BATTLINET Description

BATTLINET has only recently become a viable concept as a direct result of accomplishments by the Defense Advanced Research Projects Agency (DARPA) in the area of large scale simulation networking, particularly in development of a standardized simulator networking communications protocol. The use of an open architecture, standardized networking protocol permits a modular, assured way of adding simulated entities to a battle environment just as combatants would be added in a scalar fashion in wartime. A mix of existing simulator assets and newer T³ simulators would allow a distributed, networked simulation training system to be located at carrier airwing squadron shore bases and at sea, aboard the carrier itself.

BATTLINET Simulator Device Fidelity. As described in the first section of this paper, carrier airwing aircrew have received extensive training in their warfare specialty and are experts in the operation of their aircraft and weapon systems in the operational

carrier environment. Therefore, it is not necessary to provide high fidelity simulations of aircraft systems and malfunctions, or attempt to accurately replicate the carrier landing environment for BATTLENET T³ simulators. Only those systems required for tactical team training need be simulated, and only with "just enough" fidelity to effectively operate, execute tactics, and employ their weapons in the tactical environment.

The main design goal for development of BATTLENET should be to create an environment in which aircrew and support structure personnel are forced to make decisions and behave as if they are in actual combat. The ability to provide this type of behavioral environment is primarily a function of the fidelity of the tactical environment rather than the fidelity of the individual training devices. BATTLENET provides this high fidelity tactical environment by virtue of the large number of manned simulators which are linked in a common environment.

Simulators with a broad range of fidelities, from part-task air intercept trainers to full fidelity weapon system trainers, can be successfully networked in the same tactical environment. Linking simulators not designed to support network communications is not a technological problem. Network Interface Units (NIU) for simulators of varying fidelities are currently being developed through the Air Force Human Resources Laboratory (AFHRL) Aircrew Combat Mission Enhancement (ACME) Multiship Network Development and Installation program. The Naval Ocean Systems Center is also developing NIUs in conjunction with the Battle Force In-port Trainer (BFIT) program. This project will link ship-board simulation systems over a long haul network to Army SIMNET (SIMulation NETWORKing) combat element simulators and will allow conduct of naval gunfire support and tactical air traffic control services in support of large scale Army simulation exercises.

BATTLENET Network Description.

Both newly developed T³ simulators and existing simulator assets will be used on the BATTLENET network. Procurement of the lower cost, optimum fidelity T³ simulators is necessary to provide a sufficient number of manned simulators on the network to conduct realistic tactical team training. These T³ simulators can also be cost-effectively augmented by modifying the existing inventory of high fidelity simulators through incorporation of NIUs.

Local area networks (LAN) would initially be

installed at each shore base where carrier airwing training is conducted. These LANs could then be linked over a long haul network (LHN) to provide the capability for carrier airwing squadrons to conduct real-time joint operations training evolutions while dispersed at their respective shore bases. A representative BATTLENET LAN, in this case for the Navy's east coast F-14 and A-6 Master Jet Base, NAS Oceana, is depicted in Figure 1.

Each BATTLENET LAN contains all the necessary components to conduct carrier airwing training evolutions in a stand-alone manner for those training evolutions where it is not practical to access those components from other BATTLENET LANs through a LHN. The optimum number of T³ simulators for each BATTLENET LAN is the number of each specific aircraft type which is necessary to conduct dual carrier airwing battle group training evolutions. In the case of the NAS Oceana BATTLENET LAN, four F-14 squadrons of six aircraft and two A-6 squadrons of six aircraft are depicted. This number of F-14 and A-6 T³ simulators is sufficient to conduct two separate carrier airwing size training evolutions, or one carrier battle group training evolution over the same network. The number of T³ simulators on a LAN is based on the assumption that each squadron can maintain one half of its aircraft airborne at any given time.

A BATTLENET LAN can also be installed on-board an aircraft carrier for conduct of deployed airwing training. If the Navy procures simulation devices for installation on aircraft carriers in the future, the design of these devices should incorporate a standardized networking communications protocol to facilitate their inclusion on a BATTLENET network. Figure 2 shows a functional block diagram of a BATTLENET network installed on an aircraft carrier.

Each LAN, whether shore- or carrier-based, has common attributes. C³I and logistic support functions are fully replicated. Each BATTLENET LAN has enough simulation assets to conduct stand-alone training with SAFOR replacing any manned components not available on that LAN or over a LHN. A LHN gateway allows BATTLENET LANs to link with other compatible defense simulation network systems for joint operations training across service lines. Finally, each BATTLENET LAN has an excellent capability for post-mission debrief and analysis through the Mission Control and Management system. A Data Logger stores all network traffic which allows post-mission replay from any vehicle perspective and gives a

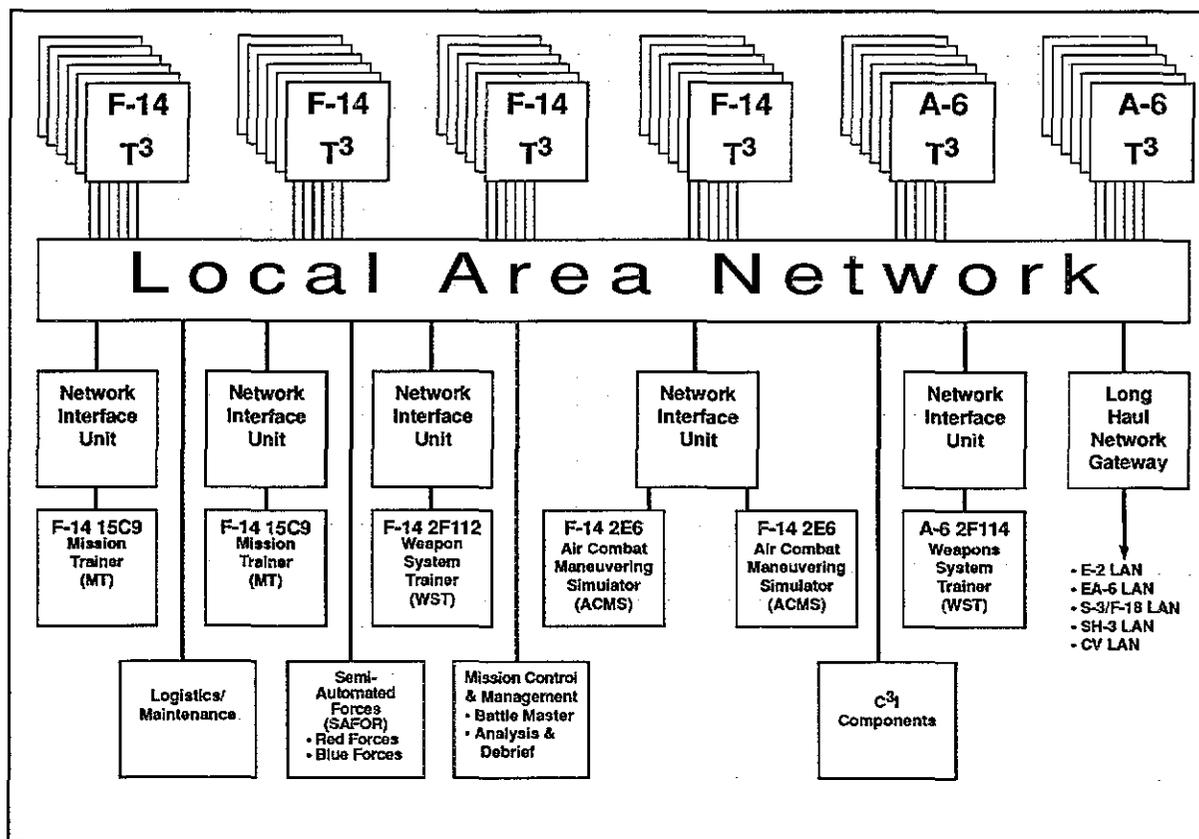


Figure 1. Shore-based BATTLENET Network

unique capability to perform extensive statistical analyses for force combat performance measurement.

BATTLENET Mission Rehearsal

A great deal has been written about the process of preparing combatants for specific tactical operations which are planned and executed in the span of a few days and possibly a few hours. As combat ready aircrew approach their highest individual skill levels, the value of traditional continuation training diminishes. And, as low-intensity conflict or special operations scenarios approach their execution points, the need for a dry-run or "rehearsal" becomes more acute. What has been lacking in the operational environment is the capability to practice collective, team skills and coordination procedures. This is particularly meaningful when the terrain/area for the operation will be approached on a first-and possibly only-time basis. Since real world databases can be created for simulation systems, practicing a combat mission over these databases would provide a mission effectiveness

boost which is not easily replicated by any other kind of training exercise. The use of standardized terrain/ocean databases assures all participants can operate in task force or battle group size elements, while the network maintains the needed contact for accurate, real-time interactions.

BATTLENET provides a total mission rehearsal environment. With accurate replication of the full command and control structure combined with the capability to portray realistic numbers of entities in the tactical environment, carrier airwing aircrews will be able to execute tactics and individual combat skills in the highly interactive, dynamic BATTLENET domain. There are no umpires in BATTLENET or outcomes based on the roll of dice. Kill removal is permanent and success goes to the force best able to survive and inflict damage on the opponent.

BATTLENET's unique mission rehearsal capability extends from the lowest simulated level up through the chain of command to the Combined Warfare Commanders. BATTLENET

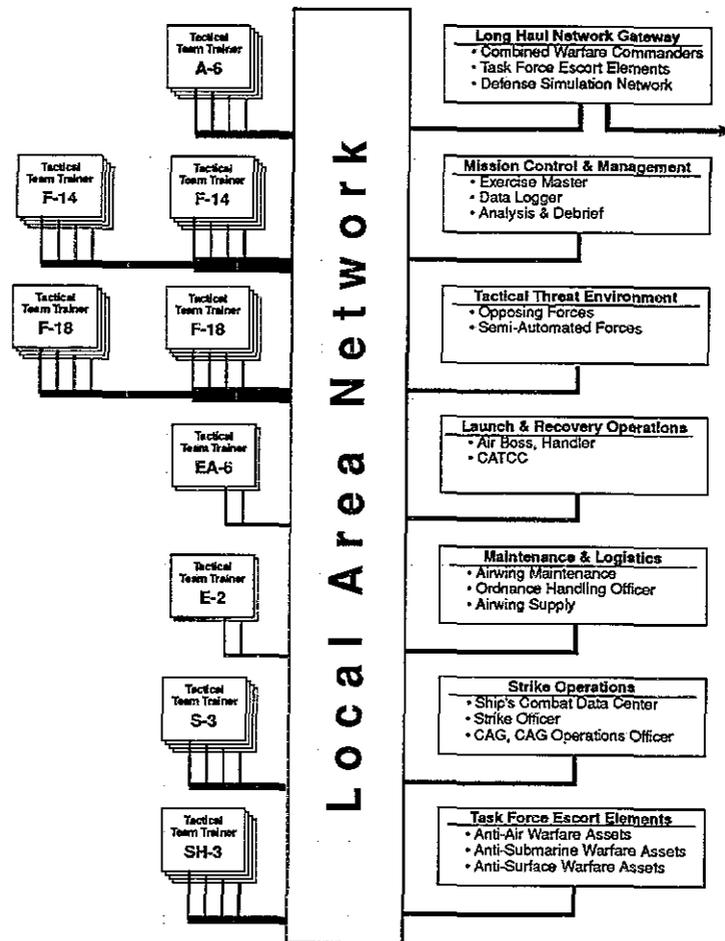


Figure 2. Carrier-based BATTLENET Network

mission rehearsal and training activities may be conducted by a single manned simulator or by a carrier battle group or larger size force. BATTLENET is the first man-in-the-loop simulation training system which allows the Carrier Battle Group Commander to employ and control his forces as he would in a real combat situation.

Training Capability Increase

BATTLENET provides a quantum increase in the ability of a carrier airwing to prepare for high intensity combat operations. The scope of BATTLENET training exercises is only limited by the number of available manned simulators that can access the network. Dispersment of forces is no longer a barrier to conduct of joint operations training. BATTLENET allows the capability to perform true simulated mission rehearsal which includes all aspects of mission planning and execution, and is conducted by all participants, including C³I and logistics support elements. Finally, BATTLENET provides a pre-

viously unavailable capability to routinely perform simulated carrier battle group operations and tactics development.

CONCLUSION

All future tactical simulation systems which involve team training should be compatible with the standardized network communications protocol already in use by the U.S. Army, U.S. Air Force, U.S. Navy, and West German Army.

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