U.S. Air Force (Raymond T. Conway)

Support to Joint Exercises

By EUGENE D. SANTARELLI

The use of computer simulations to create the environment for joint exercises has increased dramatically over the last decade. Since the Gulf War it has become apparent that a change in the dynamics of warfare is underway. In what some describe as a revolution in military affairs, joint warfighting is characterized by compressed planning cycles, precision weapons, and vastly greater battlefield awareness. This highly active, technology-driven atmosphere creates unique challenges for exercise planners. Unlike the scripted, paper-driven exercises of the past, computer simulation has become a must. In fact, it may be the only way to represent the complexities of future warfare. This article describes the development of simulation-driven exercises and offers some insights on the integral role of air component involvement in joint training.

Ulchi Focus Lens

The largest, most complex computer simulation-driven exercise in the world is known as Ulchi Focus Lens (UFL). With the temporary cessation of the Team Spirit field training exercise, UFL has become the major opportunity for the commander in chief, Combined Forces Command (CINC CFC) and component staffs to exercise critical warfighting procedures and decision-making tasks. In this exercise, the training audience—CINC CFC and his staff; the ground, maritime, air, and unconventional warfare component staffs; and a field Army and corps headquarters—requires a complex infrastructure of computer simulations, temporary gaming centers, and communications equipment and links to create a realistic, reasonably detailed wartime environment. Given training objectives and the scale of the exercise, this infrastructure poses a significant challenge to the state of the art in simulations and joint

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exercise planning. Currently, the joint training confederation (see figure below), a collection of service- and agency-provided simulations, is the only means of creating a suitable exercise environment for UFL.

air component training and contributions to joint exercises reached a low point in UFL '95

Often overlooked in the world of simulations are the contributions of service components to database development, pre-exercise plans, response cell augmentees, controllers, and pre-exercise tests which are critical to creating an effective exercise environment for the joint force commander and other service components in his command.

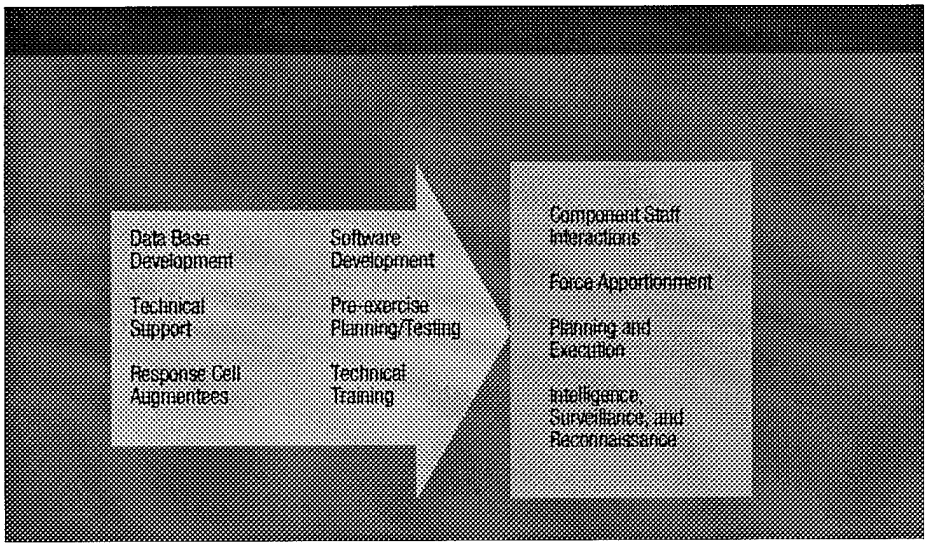
In UFL '95, the air component commander in Korea—the commander of the Combined Air Component Command (CACC) who is dual-hatted as commander, Seventh Air Force—discovered that a greater level of effort would be required to fully realize simulation-driven joint exercises.

UFL '95

Air component training and contributions to joint exercises reached a low point in UFL '95. Primarily because of failures in the exercise simulation system, major air component training goals were not met, and the air component contribution to training was diluted. In UFL '95, intelligence reporting and the flow of information critical to the battle damage assessment process did not take place. In this case CACC had difficulty assessing the effectiveness of support for CFC strategic priorities. After thousands of sorties, CACC simply was not getting feedback on the effectiveness of air forces in supporting the joint campaign.

Other anomalies caused added difficulties. Combat results were implausible and disjointed. In some cases weapons performed brilliantly. In others significant capabilities were unreasonably diminished. Rather than creating a realistic wartime environment, simulations gave CACC, CFC, and maritime and ground component commanders fragmented, uneven views of combat in general and—where the air component was concerned—an inaccurate portrayal of employing air forces. From the air component standpoint, the result was that neither JFC nor any service component had the opportunity to fully integrate air forces into the execution of the exercise scenario.

All participants were short changed by the partial representation of air component combat processes, intelligence assessment processes, and staff-to-staff interactions, all of which depended upon a balanced representation of the warfighting environment.

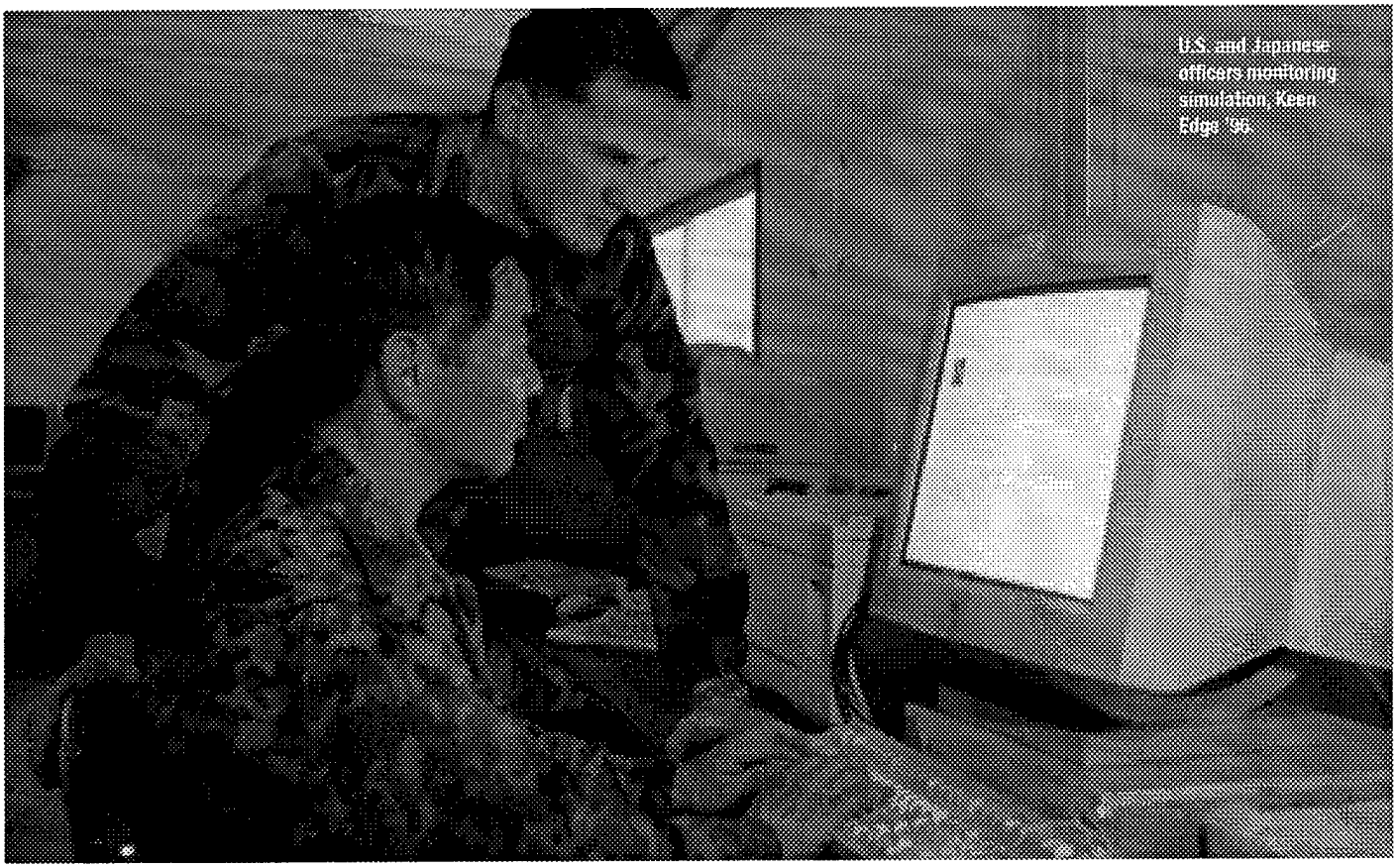


With all the promise of advanced simulation technology, what led to this situation? As usual the devil was in the details.

The air component difficulties in UFL '95 stemmed from a lack of resources for sufficient integration of simulation support into exercise planning and execution. Unlike commands in both Europe and CONUS, little in the way of manpower and funding has been available for simulation-based training for air components in the Asia-Pacific. Consequently, in UFL '95 the temporary air component simulation center established for the exercise at Osan Air Base, Korea, was ill equipped and staffed. The equipment on loan arrived late and was insufficient. Qualified simulation center augmentees were in short supply. The outcome was ineffective control of the simulations, lack of training realism, and lost training opportunity. Pre-exercise planning was one culprit.

Development of simulation databases was not coordinated with corresponding command, control, computer, communication, and intelligence (C^4I) systems databases. This was telling for the air component since target databases are essential to battle damage assessment, and intelligence combat assessment was insufficiently coordinated with simulation databases. Accordingly, targets struck in simulations did not conform to those in the air component training audience warfighting plan. Expected damage did not occur or was not reported, and rational adjustments to warfighting plans and intelligence estimates were made difficult if not impossible. Unstructured development and testing of databases led to similar incongruities in other areas. This resulted in further losses in effectiveness of air component interaction with the other components.

CACC; commander, Pacific Air Forces (PACAF); and the Chief of Staff of the Air Force turned that situation around, thereby signalling a commitment to joint training. The Chief of Staff instructed the director of Modeling, Simulation, and Analysis at Headquarters, U.S. Air Force to gather a team and implement a $10 million effort to remedy the shortfall. Their task was to design, man, equip, test, and



U.S. and Japanese officers monitoring simulation, Keen Edge '96

U.S. Air Force (C.M. Ricardo)

operate a new simulation center located at Osan Air Base in less than a year with a virtual program management office which included organizations from around the world.

Integration

The Air Staff program office led the overall effort, hired contractors to permanently operate a simulation center at Osan, and developed a program to select and train Air Reserve Component personnel to augment the center for UFL '96. The Warrior Preparation Center (WPC) contributed expertise from Einsiedlerhof, Germany, and the Electronic Systems Center (ESC) at Hanscom Air Force Base tested reengineered systems. PACAF developed technical options, coordinated real-world and simulation databases, designed and installed the simulation local area network, and with the guidance of the CACC staff acted as focal point for integrating technical plans and pre-exercise milestones. Planners and specialists tied efforts together in Korea by developing physical facilities and doing hands-on work to create technical infrastructure at Osan. Finally, contractors analyzed the UFL '96 exercise information flow and came up with a design to support technical systems in the new facility. Attaining this goal in under a year was difficult. Headquarters, U.S. Air Force, PACAF, and CACC worked together with the Korea Battle Simulation Center (KBSC), the CFC activity responsible for simulation-driven exercises in the theater.

Through video teleconferencing, planning conferences, in-process reviews, and thousands of e-mail messages, an implementable plan took shape. Simulation systems and communications networking equipment were delivered to Korea in record time. A building at Osan Air Base was remodeled and the local infrastructure was expanded to include more than a hundred simulation workstations. Communications links between the simulation center and actual air component C^{4}I system were established. One spin-off was improvement of the joint simulation infrastructure in Korea. For the new Air Force simulation center to interoperate with the joint simulation system, aging communications network components were upgraded. The result was a much more capable, robust exercise communication infrastructure for all participants.

With the installation of the simulation infrastructure in Korea, the Air Force team planned and implemented a pre-exercise test of simulations and databases. One month before UFL '96, as the technical infrastructure was being established, exercise simulations and actual databases were installed on WPC computer systems. In addition, PACAF collaborated with the CACC staff and WPC to install a contingency automated planning system—the air component C^{4}I system—on the WPC simulation network. Subsequent testing of simulation systems was effective and represented the first pre-test of


Walker Battle Simulation Center.

DOD (Helene Stikkel)

UFL simulation systems, databases, and C4I systems prior to the exercise.

The result of this effort was the establishment of the Korea Air Simulation Center (KASC), a small, permanent site at Osan. Its staff was selected to cover the spectrum of expertise needed to plan complex, simulation-driven events. Experts in operations, logistics, intelligence, databases, communications technology, and computer systems were identified in time for UFL '96. Although Murphy's Law haunted the exercise, CACC declared it the best air component simulation to date. More importantly, KASC contributed significantly to achieving CINC CFC exercise objectives and laid the basis for greater success in UFL '97.

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Proof of Concept

KASC contributed greatly to "flawless simulation support" of UFL. With the Directorate of Command and Control at Headquarters, U.S. Air Force; PACAF; the Air Force Agency for Modeling and Simulation (AFAMS); ESC; and WPC, KASC fielded a greatly improved version of the air warfare simulation (AWSIM), used a newly developed interface between C4I and simulation systems, and implemented an ESC software solution that allowed simulations to feed the exercise air picture to the global command and control system.

The performance of KASC during UFL '97 set a new standard for training in the exercise and was the proof of concept for the effort to establish a simulation site in Korea. The KASC role in a pre-exercise load test eliminated many technical problems plaguing previous exercises. More importantly, the KASC effort improved the quality of training for all participants. The quality and realism of theater missile defense play was vastly enhanced. The responsiveness of air forces to JFC requirements was demonstrated more clearly than in previous exercises in which simulation anomalies interfered. The training audience executed air operations in support of CINC goals in an environment unmatched in exercises in terms of realism and employment of actual C4I systems. While challenges remain in providing simulation support to exercise intelligence processes, UFL was a solid success. Beyond establishing a simulation site to support joint and air component training in Korea, this effort led the Air Force to reassess its support of simulation in the Pacific theater and to review the way it organizes for major joint exercises worldwide. The outcome of this reassessment was the PACAF modeling and simulation program and key lessons about Air Force exercise support.

Lessons

As the Air Force implemented better support of UFL and established the air component simulation facility in Korea, a number of valuable lessons emerged about Air Force support of its air components in joint exercises.

Simulation planners and technicians must be stationed in theater to be thoroughly involved in the JFC exercise planning process on a daily basis as needed. Unless the subject area experts (on simulation planning, database development, simulation control, communications planning, pre-exercise training, and technical testing) are present and accountable to the air component for routine involvement in exercise planning, simulation-driven exercises are unlikely to accurately represent air component capabilities for the JFC training audience. KASC success supports this assertion.

KASC has simulation experts in various areas who have vastly improved the quality of air component play in exercises by being directly engaged with KBSC, the CFC exercise simulation organization charged with overall planning responsibility for simulation-driven exercises in Korea. This engagement has run the gamut from simulation control and communications architectures to database coordination. This level of cooperation cannot be achieved by long distance and requires a minimum presence of air simulation experts in-theater to work with exercise simulation planners who, unlike single service training events, are members of the JFC staff. KASC is a good model for describing the minimum presence needed in-theater to support this interaction.

Another issue is interaction among members of the air simulation cadre and air component commander's staff. Daily interaction between KASC and CACC staff at Osan Air Base has been extremely effective in supporting training goals, developing simulation interfaces to C4I systems, and integrating simulations into real-world warfighting processes. The presence of KASC at Osan allowed more effective coordination than in earlier events. The PACAF modeling and simulation program is patterned on the KASC formula of presence in the theater and routine engagement of air simulation cadres in joint exercise simulation planning.

PACAF established a modeling and simulation program to support exercise requirements throughout the theater

Key joint exercises should be supported by an integrated Air Force cross-functional team. Because major exercise goals include testing joint doctrine and emerging technology in addition to battlestaff training, air components need more expertise than is commonly found on air component staffs. For example, Air Force specialists on employing unmanned aerial vehicles or other systems not yet fielded may provide key insights into capabilities, limitations, and employment procedures during the exercise. Having the best technical expertise on scene is essential to correct assessment of employment procedures and combat performance of new weapon systems.

Essential elements of the Air Force simulation infrastructure are likely to function properly if established permanently at the exercise site. For example, simulation communications links are far more likely to function well during an exercise if used and tested often. The same logic applies to automated interface between simulations and air component C4I systems. In-place systems will be far more reliable if technical components and interfaces are used only as an exercise approaches.

Air component play can be improved with trained exercise simulation support and response cell augmentees. In UFL '96, 80 Reserve component augmentees were trained for the Korea Air Simulation Center; during UFL '97, 100 augmentees were involved. Trained in AWSIM and C4I, the Reservists enhanced the quality of air play. If continued, air component representation will be improved as augmentees gain experience.

Finally, exercises such as UFL merit dedicated support by Headquarters, U.S. Air Force, major commands, and agencies responsible for developing Air Force training simulations. During UFL '97, ESC (the AWSIM developer) played a critical role in simulations. Having the software developer present was invaluable in resolving technical problems. Similarly, assistance from both AFAMS and the Directorate of Command and Control at Headquarters, U.S. Air Force, brought expertise from across the service to bear on an exercise critical to the readiness of JFC in Korea.

Based on the UFL experience, PACAF established a modeling and simulation program to support joint and air component exercise requirements throughout the Pacific theater.

Modeling and Simulation

PACAF modeling and simulation is designed to address the void in training experienced by Pacific air components. PACAF air components face simulation shortfalls identical to those encountered in Korea. Key exercises in Japan such as Keen Edge and bilateral training by the Japan Air Self Defense Force and U.S. Air Force lack support for robust air component play. Eleventh Air Force, the Alaskan air component, faces a similar need for better simulation supported training and supplemental assistance with the simulation component of joint exercises. Thirteenth Air Force, the PACOM deployable air component staff for JTFs, lacks the simulation capability to train on the operational level. In wartime air component staffs contribute augmentees to JFC staffs or form the core of air component staffs. Lack of adequate simulation capabilities makes it difficult for PACAF air components to produce realistic command and control training for wartime roles.

PACAF modeling and simulation will include support facilities at both Osan and Hickam Air Force Base. This program is designed to provide theater air component staffs with the means of conducting in-place computer-assisted exercises and training on real-world C4I systems. It will supply training events as small stand-alone air component exercises to reinforce core competencies or a strengthened part of existing joint exercises in Korea and throughout PACOM.

While separate organizations, these sites will be mutually supportive in terms of personnel, equipment, and expertise. For example, PACAF modeling and simulation resources will be placed against requirements generated by peak events such as UFL. Key to the success of relatively small simulation sites will be assistance from the new AFAMS and the Air Force ESC, the developer of exercise simulation system software.

Air Force support for joint exercises in the Asia-Pacific region has come a long way since UFL '95. Following that exercise, a corporate Air Force approach to simulation support of joint training events emerged to the benefit of all participants. Considerable progress has been made in areas such as presentation of a common operational picture driven by simulations. Theater missile defense procedures are exercised more realistically based upon improved simulations. Promising long-term benefit, lessons from establishment of the air component simulation capability in Korea are being applied to principal exercises across the joint exercise program. The outcome is certain to increase readiness for JFC and air component staffs. JFQ

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