Building A Sustainable DMO Training Program: Please Try This At Home

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ABSTRACT

The Combat Air Forces (CAF) Distributed Mission Operations (DMO) program has grown in capability and will expand significantly in FY09 to include various command and control, intelligence and surveillance (C2ISR), bomber, and fighter assets. Since the program inception in 1999, there has been little standardization between DMO programs regarding structure, organization, implementation, or priority. DMO-equipped units have adopted different approaches with a varying degree of "success" and challenges in an increasingly difficult operational training environment. Some units have adapted well to this changing training environment while others have had less favorable results, inconsistent outcomes or endured a longer duration toward realizing the benefits of high-fidelity distributed training.

This paper defines specific recommendations for establishing and sustaining a viable DMO training program. In over seven years at Headquarters Air Combat Command (ACC) and DMO-equipped units, the authors have observed numerous DMO programs evolve from the ground up; some with commonality and focus, while others have struggled. This approach has application for Air Force (AF) integration into the Joint National Training Capability and evolving coalition virtual training. It will focus on CAF DMO evolution from 2001-2008. The paper focuses on CAF DMO C2 participants and the various levels of program maturity and their way ahead. It offers practical tips and techniques on how to build and maintain an effective transformational training program that includes discussion of continuity, scheduling, utilization, key tasks, and leadership involvement. The paper outlines a current construct that has truly been the model for optimizing DMO opportunities. While program approaches vary depending on the weapon system, there are some observed common characteristics that can help organizations build a leading edge 21st century joint training program that enhances warfighter skills by including DMO as a critical cornerstone capability.

ABOUT THE AUTHORS

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Lt Col Kyle Mullen is the ACC/A3Y Airborne C2 Systems Branch Chief, responsible for operational and training oversight of the E-3 AWACS and E-8 JSTARS programs. As the 552 ACW Wing Tactics Flight Commander, he provided security oversight and directed Weapons Officer involvement in the DMO program for the wing's simulation training. A Master Air Battle Manager and USAF Weapons School graduate, Lt Col Mullen has over 15 years operational experience with AWACS and CRC weapons systems.

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HISTORICAL DMT BACKGROUND

When the Air Combat Command (ACC) Distributed Mission Training (DMT) program was initially established by General Richard Hawley in 1998, there were a number of concepts highlighted that we have still not achieved nine years later. As paraphrased in the DMT Red Team Final Report (Nov 1999), "The ability to operate command, control, communications, computers and intelligence (C4I) systems as well as conduct operational and tactical training within one system at multiple levels of security (MLS) is increasingly critical for US and US-led coalition operations." In 2005, DMT was renamed Distributed Mission Operations (DMO) by former USAF Chief of Staff General John Jumper and revised to include test and evaluation; experimentation; and Tactics, Techniques, and Procedures (TTP) development. In 2008, we are still having difficulty achieving this DMO vision for a number of reasons.

There has been little standardization between elements of the Combat Air Forces (CAF) DMO programs regarding structure, organization, implementation, or priority. [The CAF is made up of fighter, bomber, and Command and Control, Intelligence, Surveillance, Reconnaissance (C2ISR) units from ACC, Pacific Air Forces (PACAF), United States Air Forces Europe (USAFE), the Air National Guard (ANG), and Air Forces Reserve Command (AFRC)] DMO-equipped units have adopted different approaches with varying degrees of "success" in dealing with challenges in an increasingly difficult operational training environment. Some units have adapted well to this changing virtual environment while others have had less favorable outcomes or endured a longer duration toward realizing the benefits of high-fidelity distributed training. This paper is geared primarily toward command and control (C2) DMO programs, but the concepts are applicable to any distributed sim-capable organization.

Augmenting live training, not replacing it

In August 2007, the ACC DMO Operations Planning Team (OPT – a Colonel-level group of various ACC Directorate of Air and Space Operations Division Chiefs led by the Fighter, Bomber Training Division) decided on a vision statement for CAF DMO: "Provide the CAF a persistent virtual training environment to increase operational effectiveness by integrating DMO as a complement to live fly training." The authors do not suggest DMO as a complete replacement for live flying, but in many cases some training events are (and should be, especially in the C2 community) being credited for "live" in the DMO Mission Training Center (MTC) simulator.

The initial steps of the fledgling CAF DMO program were to link F-15C fighter MTCs with an AWACS MTC over the DMO Network (DMON). These "long haul" missions between geographically separated sites have been the cornerstone of daily distributed training. Missions conducted internal to the MTC (not on the DMON) are considered "short haul", local training. Because they do not have the same visual system fidelity issues as the fighter and bomber MTCs, C2ISR weapons systems such as AWACS, Joint STARS, Control and Reporting Center (CRC), Rivet Joint and eventually JTAC/ASOC, Predator and Global Hawk stand to gain the most benefit and "bang for the buck" from DMO. Their requirement to train and operate in a theater-wide setting (normally with joint assets including Patriots, Aegis, E-2C, EP-3, etc.), large force employment (LFE) missions or theater-level exercises are key to DMO C2 unit mission preparation and readiness. Conducting these missions in a live environment is cost prohibitive.

These netted, large scale events are in addition to the daily long haul missions between AWACS and F15C units that have become more normative over the last 3 years and will continue to grow. With this growth, CAF DMO is experiencing even greater security

growing pains as we evaluate how to bring our joint and coalition partners into DMO.

The seven deadly sins of DMO

The biggest problem noticed over the past five years is a lack of consistency in DMO – specifically how different organizations, especially at the Wing level, deal with what we refer to as the seven deadly DMO sins. These seven areas are normally discussed and debated at every DMO meeting or conference: standards, security, scenarios, scheduling, databases, contracts, and funding. At some point, they inevitably become intractable issues or problems for a variety of reasons that will be addressed in detail. Granted, CAF DMO is a fairly young program but there are four things that should be accomplished sooner than later to quickly create a viable and sustainable DMO training environment. As a major part of the Air Force's training transformation initiative, DMO has future implications for the joint warfighter that could be shared across other Major Commands (MAJCOMs) or services. For MTC-equipped units, at the execution level, we suggest four things to expedite and enhance the overall DMO experience.

Figure 1. Hieronymus Bosch's *The Seven Deadly Sins and the Four Last Things*

THE FOUR FIRST THINGS FOR SUCCESS

We suggest four "TTPs" that will help DMO-equipped organizations (including those that will soon to be capable) increase their unit combat capability, training productivity, and MTC scheduling effectiveness. These common traits are:

1. Leadership advocacy
2. Organizational structure
3. Weapons Officer involvement
4. Participation in DMO forums

Leadership advocacy

In 2006, the ACC Commander (COMACC) established five ACC Focus Areas – People, Expeditionary Operations, Recapitalization, Organization and Transformation. According to COMACC, "The Focus Areas help shape our efforts and communicate to every Airman in the command what is important, why it is important, and where ACC is headed in the future." Under the heading of Transformation it stated: "A simple example of this type of transforming is the development of our Distributed Mission Operations approach to training: the ability to integrate cockpits, systems, and command and control in real-time around the globe in a virtual simulated world." COMACC further stated: "Distributed Mission Operations (DMO) is critical to Air Force readiness and is the cornerstone of Air Force training transformation in accordance with OSD-directed Joint National Training Capability initiatives."

This highlights the CAF DMO leadership vision and provides command emphasis for a variety of the right reasons. Former ACC Vice Commander, Lieutenant General William Fraser stated:

> Given the current budget challenges, we're developing new and better ways to practice and train as a joint force. Distributed Mission Operations is the perfect tool for training. DMT/DMO (distributed mission training/ operations) lets us build a virtual battlespace by linking simulators and live assets into a shared interactive network. DMO allows us to integrate as a joint force without the risk and expense of flying actual sorties. We can train jointly and in combined operations. DMO extends aircraft life and seasons our pilots more rapidly. DMO also integrates ISR assets and shooters in real-time rehearsals; it enables us to create a realistic threat environment in exercises such as Joint Red Flag.

The ACC Directorate of Air and Space Operations Top Ten Priorities (Jul 07) included item #5: "Refine DMO Strategy and Vision to Encompass All Weapons Systems and Platforms", but not all levels of CAF leadership have embraced this progressive vision.

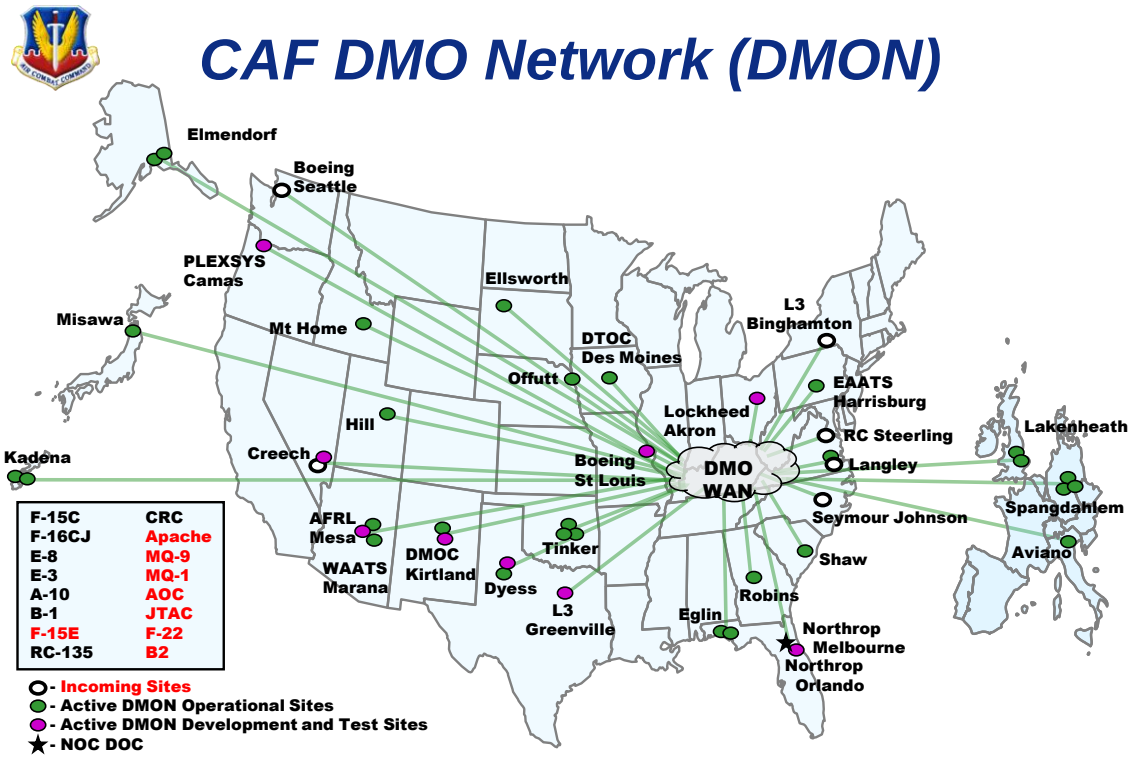

Figure 2CAF DMO Network 2008 (HQ ACC A3)

Looking forward, as with any other "program" at the Wing or unit level, DMO will only be successful if there is support from senior leadership. Spending time "in the box" helps show the operators that DMO is not just about filling a square by "going to the sim." Networked training opportunities will continue to grow if the leadership visibly embraces the DMO concept. Stating DMO as a Wing or Operations Group priority, and having guidance or an operating instruction to support it will help schedulers, training officers, and others better understand the role and benefits of advanced distributed simulation. Gaining viable, realistic training via advanced distributed simulation requires a mental shift because the simulators have significantly improved over the years but many times the approach to training hasn't changed. An effective training program now includes a mixture, and it varies depending on the weapons system, of live and virtual training. A limited few units actually list DMO missions along with their live fly (or control) missions on their daily, weekly and long term schedules. The 552d Air Control Wing (ACW), Tinker Air Force Base, Oklahoma, includes DMO mission effectiveness (successful, non-successful, reason) in its Operations Group scheduling reviews.

Flying squadron and Operations Support Squadron commanders set the bar when it comes to rank ordering priorities, meeting Ready Aircrew Program (RAP) requirements, Air Expeditionary Force (AEF) spin up, or participating in a major exercise. The same should be true for DMO long haul missions and participation in exercise Virtual Flags – if there is squadron leadership emphasis for gaining valuable training from the networked sim, the rest of the squadron will normally get onboard quickly. Because of their natural aptitude and learned computer gaming skills, many of the young 'digital native' operators (pilots, navigators, electronic warfare officers, and air battle managers) feel comfortable utilizing advanced, networked sims that provide high (although not perfect) fidelity and realism. These forward looking wingmen, instructors, and controllers are the four-ship flight leads and package/mission commanders of tomorrow that "get it" today and will take DMO to its intended capability in the next 3-5 years.

Numerous operations group commanders have recently brought forth DMO-related concerns to the ACC Realistic Training Review Board. In 2006-2007, USAF MAJCOM functional area managers started examining the role of DMO sorties as a method to credit live training requirements. F-15C pilots can now count 25% of selected simulator mission profiles to fulfill Ready Aircrew Program (RAP) training requirements. AWACS and JSTARS recently increased their reliance on DMO, allowing 50% or more of their MTC missions to credit toward live training requirements. Future predictions for F-22A Raptor and F-35 Joint Strike Fighter training include 45-50% in a DMO environment. With the completion of each weapons system's Mission Essential Competencies Study geared toward identifying experiences, skills and knowledge required to make a "full up" mission qualified operator in a non-permissive environment, the role of DMO changes.

DMO provides repetitive opportunities to practice core competencies that may not be utilized during current steady state Air Expeditionary Force (AEF) deployments. Due to their high deployment rates, JSTARS has been one of the biggest benefactors of DMO for daily training. The 116 Air Control Wing Operations Group Commander, Colonel Greg Clark, is a big advocate. At the June 2008, JSTARS Training Planning Team conference at Robins Air Force Base, Georgia, he commented "DMO is the future. The training is that good." JSTARS crews participate in weekly Iron Triad missions with AWACS and Rivet Joint and are habitual players in Virtual Flag and Northern Edge large scale virtual exercises. DMO has become an integrated, routine part of the JSTARS training scheme and a way to overcome training limitations in a high operations tempo unit.

General John D. W. Corley, the current COMACC, stated at the Air Force Association-sponsored Air Warfare Symposium in February 2008 (Training and Simulation Journal, April/May 2008) "I am an advocate of more flying hours, but I'm also an advocate of the hybrid live-virtual-constructive training solution because there are things you can do in the virtual and constructive environment that you can't assume the risk of doing in the real world." With the senior leadership vision for DMO provided, there are still organizational deficiencies that preclude optimizing DMO training opportunities.

Organizational Structure

It may seem like common sense, but the most critical item for success in a DMO program is continuity. Unfortunately this is not always feasible in today's CAF squadrons. Most "blue suiters" (USAF military members, i.e. not civil service or contract personnel) are only involved with unit- or wing-level DMO program operation and management for a short time, normally just once in their career. Because of all the technical integration issues, the DMO learning curve is usually vertical for these individuals. A mix of active duty, civil service (GS) and support contractors have proven to be the most effective formula to provide stability, corporate knowledge, and DMO program growth.

The most progressive CAF DMO programs have a formal structure that defines roles, responsibilities and procedures for "all things DMO" to provide clear cut guidance. The dedicated 'DMO Flight' construct utilized by the 3rd Wing, Elmendorf Air Force Base, Alaska, has shown the most promise for current DMO operations and could be considered the model for future programs. Embedded within the 3d Operations Support Squadron (3 OSS), the DMO Flight has active duty personnel in the flight chief and assistant DMO flight commander positions along with a C2 battle management senior director (AWACS), a dedicated DMO flight scheduler, and an intelligence liaison officer; two GS project officers serve as Quality Assurance Evaluators/Representatives. The DMO flight is also supported by contractor site managers and instructors from the sim service providers. Back in 2006, Lieutenant Colonel Jeff Anderson, 3 OSS Commander, stated that the DMO Flight helps consolidate numerous functions previously done in different offices and DMO is "fully integrated into daily ops at the 3d Wing. It's part of our AEF spin up and prep programs and our Wing leadership are strong advocates." In May 2008, the 3 OSS Commander, Lieutenant Colonel Mark McGeorge, further stated "DMO is working very well here, it's integrated and coordinated. Our senior leaders are fully behind our DMO program."

The 3d Wing DMO Operating Instruction is a documented example of very specific guidelines on office roles and responsibilities, DMO simulator policy and scheduling, forms, timelines, and Points of Contact. This helps establish continuation training/virtual exercise program continuity and provides a detailed single reference document for wing DMO. Granted, there are some inherent advantages of having current state-of-the-art (F-15C, AWACS) and future (C-17, F/A-22) MTCs collocated at Elmendorf, but the stand-alone DMO Flight concept has merits for any wing. One of the key DMO players in Alaska has been AWACS. The 962d Airborne Air Control Squadron

Commander, Lieutenant Colonel Russell "Rusty" Armstrong, commented during exercise Northern Edge 08, "The 3d Wing has undergone a massive transition in the last one and a half years, losing some fighter assets, changing missions, etc. If it had not been for DMO, we couldn't have maintained a credible warfighting capability."

While some DMO-capable wings have organized around their sim programs, others remain fractured to varying degrees. Because it is a cross-cutting capability, DMO includes elements of training, exercises, modeling and simulation, long and short range scheduling, weapons and tactics, standardization/evaluation and contracting. Having a single, one stop DMO shop (like the 3d Wing stand-alone OSS/DMO flight) that coordinates and deconflicts these various aspects has numerous advantages as the complexities of incorporating DMO into the overall training plan grow. Finally, a more effective DMO organizational structure could help preclude future problems identified by the GAO in its September 2006 report regarding scheduling, utilization, tracking and reporting of DMO sim sites.

Weapons Officer Involvement

From seven years of experience working DMO C2 programs (and seeing some fighter MTC evolution), the second biggest variable affecting unit training growth and improvement is the degree of unit Weapons Officer involvement. In units that actively integrate their "patch wearers" in the MTC operations schema, the better the program. This is especially true for exercise Virtual Flag, conducted four times per year at the USAF's Distributed Mission Operations Center (DMOC), where an experienced USAF Weapons School graduate can use the DMOC environment as a virtual teaching laboratory. Whether it's functioning as the "Instructor Pilot of record" from home station or the C2 Package Commander at the DMOC at Kirtland Air Force Base, New Mexico, an engaged Weapons Officer can assist in creating a training environment not seen anywhere outside of the "live" Flag environment inherent to Nellis Air Force Base, Nevada. In some cases, this virtual large scale exercise can be even better because participants are not restricted by airspace, distance, size and scope of the adversaries, the threats or time in the virtual environment as they are in the Nevada training ranges.

As cited in the May 2006 *Barnyard Broadcast*, most recent USAF Weapons School graduates "get" DMO and understand the potential of using the DMO toolbox. The USAF Weapons School's 8th Weapons Squadron (battle management, command and control, and electronic warfare squadron) has come to learn the value of DMO .

> The first lesson we re-learned this class was the value of DMO. Without question giving our students the ability to brief with daily control of 10-12 passes, and debrief daily with a 4-ship is invaluable to solidifying the core competency of Tactical Fluid Control (TFC). DMO is not only valuable for those with little "traditional" air-to-air experience, it is also valuable for the E-3 and CRC Instructor Senior Directors (SD) and Instructor Air Weapons Officers who may have spent the last year as an SD, instructing, and / or evaluating instead of controlling the available TFC events. We have seen dramatic improvement in their control and application of the Weapons School Standards as they shake the rust off during their two weeks at each DMO / DMT facility. DMO will continue to be a "must have" as our student's backgrounds vary significantly. (Barnyard Broadcast, May 2006)

Twice per year depending on funding, the 8th Weapons Squadron sends its instructors and students to a combination of DMO-capable sites in conjunction with their F-15C and F-16 counterparts in the 433d and 16th Weapons Squadrons. In Mesa, Arizona, the Air Force Research Lab provides a distributed four ship F-16 and battle management simulation capability plus the advantage of an advanced debriefing capability. The USAF Distributed Mission Operations Center (DMOC at Kirtland AFB, NM) can connect AWACS, Joint STARS, or CRC C2 simulators with local or distributed fighter sims; or they can utilize MTCs at Elmendorf, Tinker, and/or Eglin Air Force Bases in a local or distributed configuration to prepare for enhanced live flying and mission control requirements during the 6-month long Weapons School course. Since 1998, at least five Weapons School papers have been written advocating DMO's enabling capabilities. For an excellent assessment on how to plan, schedule and execute DMO continuation training missions (written from an F-15C and F-16CJ perspective but applicable to all MTC-equipped units) see Captain James McFarland's recent (June 2006) USAF Weapons School student paper entitled "Improving CAF Integration through Effective DMO Operations."

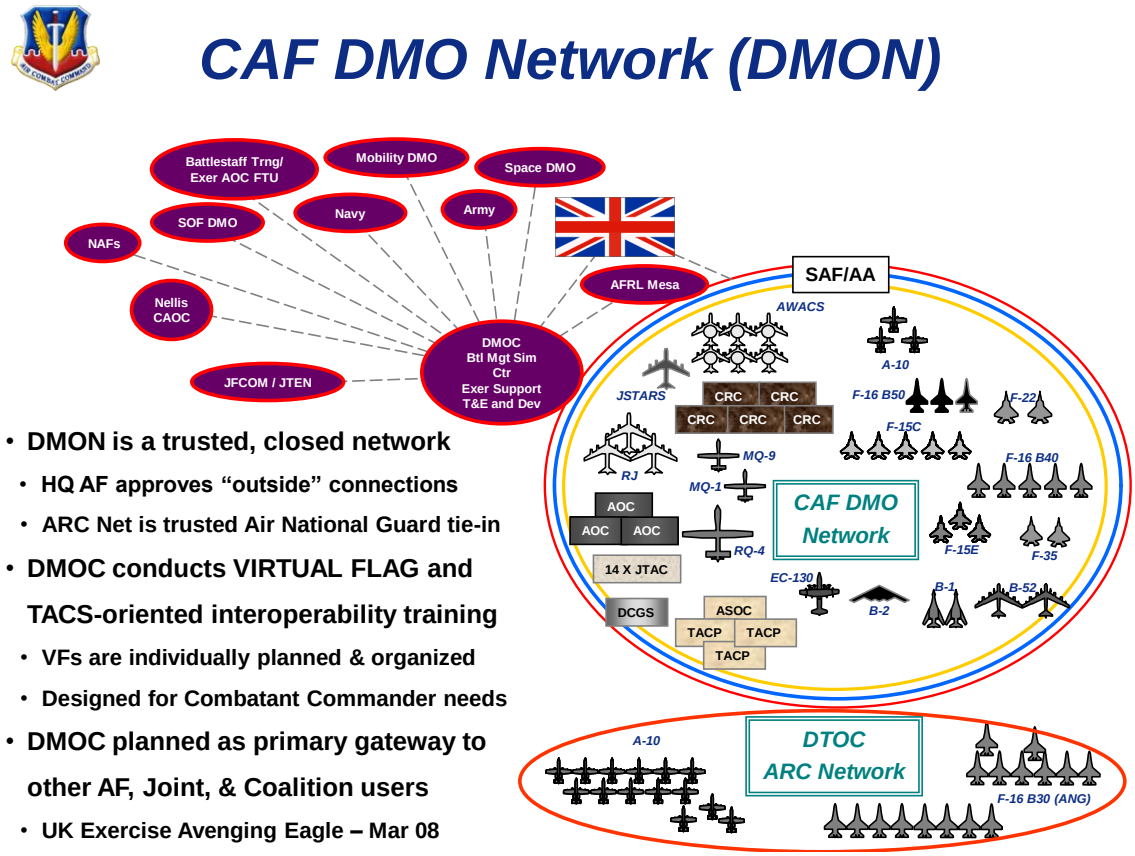

Figure 3. CAF DMO Network connections (HQ ACC A3)

The USAF Weapons School is such a believer in DMO that there are plans to conduct the first Weapons School Integration Phase (Mission Employment) in October 2008 at the DMOC using AWACS, JSTARS, CRC and other C2ISR DMO assets. In addition to completing a major part of the syllabus – multi-platform integration exercises – the Weapons School also imparts the utility of DMO to students and exercise participants. These lessons must be carried back to the home units to fully engage in squadron and wing training scenario development, simulator-based competitions, training partnerships, Weapons School preparation, and TTP development for integrated training.

Participation in DMO forums

There are currently a number of different venues geared toward providing DMO practitioners an opportunity to get together and recage their craniums. Probably the most useful, and least painful from a technical standpoint, is the DMO User's Group conference. Normally held once per year, the target audience is wing training experts and Weapons Officers from units with an MTC capability (or getting DMO capability within the next 6-12 months to lead turn planning). The focus is geared toward discussing desired training partnerships, objectives and opportunities for daily training missions and LFE exercises. The DMO User's Group conferences are sponsored by ACC Directorate of Air and Space Operations and include participants from across the CAF and joint services. The June 2008 DMO Users Conference emphasized use of the Integrated Training Initiative's Virtual Event Scheduling Tool (VEST) as the primary method to schedule DMO. It was discovered that most attendees had never registered on the website nor were their DMO organizations familiar with the website's capabilities or registered to receive DMO information including the quarterly scheduling newsletter. Most active duty unit reps had been in their DMO-related positions less than one year and had not attended the previous Users Conference. The majority of DMO continuity was provided by government project officers or support contractors – further highlighting the need for better organizational structures to handle DMO issues.

There is no better opportunity to view large scale functional DMO than to observe a Virtual Flag exercise at the DMOC. If the unit has a DMO capability, getting involved in a Virtual Flag is essential for gaining a perspective on the intricacies of integrating various disparate Mission Design Series (MDS) simulators into a coherent synthetic joint battlespace. Held three or four times per year, Virtual Flag became a COMACC-sponsored and funded exercise in 2007.

The Standards Development/Interoperability Working Group (SDWG/SIWG) is a mixture of industry sim company representatives and MAJCOM MDS program managers that meet every other month either by conference or teleconference. While this is normally a detailed technical discussion and proposed standards changes, it is critical that the mission critical items required for current combat mission replication are provided to the SDWG industry partners to find technical solutions for all simulators on the respective networks.

The Interservice/Industry Training, Simulation, Education Conference (I/ITSEC) is the largest and best venue to see the future of emerging simulation and gaming technologies. I/ITSEC attendance should be a "must do" at least once for any simulation program manager. It also provides an opportunity to view paper presentations by leaders from industry, academia, foreign companies, entrepreneurial enterprises, and other government agencies, providing "tutorials" on various aspects of modeling and simulation, networking, computer generated forces, and visual system requirements.

WHEN IT ALL COMES TOGETHER

Over the last two years, DMO has grown into its originally envisioned program geared toward maintaining operator proficiency and increasing mission readiness. DMO will continue to grow—in 2007, the addition of A-10, CRC, Rivet Joint, and B-1 DMO assets doubled the number of sites on the DMON. Consequently the number of long haul training missions conducted with the DMOC and the ANG Distributed Training Operations Center (DTOC) more than doubled. Upcoming players to gain accreditation in 2008/2009 include F-15E, MQ-1 Predator, B-2, Joint Terminal Controller Training and Rehearsal System, and F-22A. DMO program visibility will also increase with Air Staff and ACC Air Force Smart Operations 21 initiatives in fuel saving and pilot experiencing. Potential force structure reductions, increasingly record fuel costs, and aging aircraft are all causes for DMO to be viewed as a potential USAF cost avoidance measure and readiness improvement tool.

With this growth and visibility will come the need for DMO-capable units to codify and standardize their organizations in order to keep DMO moving forward. Leadership advocacy at all levels, an optimized organizational structure, increased Weapons Officer involvement to maximize DMO learning opportunities, and involvement in key DMO forums are all required.

In October 2004, Major General Teresa Peterson, former director of Operations and Training at the Air Staff, commented, "Distributed Mission Operations are the wave of the future and the Air Force is just scratching the surface of distributed training." Four years later as the Air Force continues to evolve its vision for the future Live Virtual Constructive (LVC) environment, CAF DMO is still just scratching the surface. With increased senior officer advocacy and clearer guidance, better organizational structures, greater Weapons Officer involvement, and more uniform participation in DMO forums, CAF DMO can become the habitual readiness tool that truly digs below the surface. The overall initial DMT program goal still remains – to actually train like we fight with different weapons systems from different locations but from within a realistic, repeatable, and less expensive virtual battlespace environment.

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