Organizational and Policy Considerations for Implementing Distributed Simulation in Operational Environments

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ABSTRACT

Over the past ten years, the US military, and specifically the US Air Force has been on the road to revolutionize training through the use of high fidelity simulation and Distributed Mission Operations (DMO). Both contractors and military have invested heavily in this technology with the expectation that providing the equipment and capability will naturally improve performance and provide a more highly trained combat force. The U.S. Air Force's DMO initiative offers an advanced opportunity to examine the organizational characteristics and policy considerations that are likely to impact the level of success in the implementation, integration, and utilization of DMO in the operational training environment. Traditionally, military organizations have identified technological change needs without fully considering the specific organizational and policy associated with that technology and its implementation within operational contexts. Moreover, task and training requirements analysis tools do not afford military planners with implementation data to develop organizational concepts of operation related to the new technology. Typically, organizations obtain the technology and implement it as best they can. This leads to successful and unsuccessful implementations being driven by individual initiative as opposed to a systematic examination and consideration of the issues and policies impacted by the new capability. With the tremendous cost associated with advanced training technologies such as those within DMO, this delegation of ultimate success to an individual or a specific unit or base is troublesome. This paper describes and discusses the considerations, actions taken, and lessons learned in pioneering efforts of DMO installation and integration at the first operational site, Eglin AFB, FL. It also examines the adoption and utilization of DMO by a formal training program, the United States Air Force Weapons School in the same light. In addition, the paper will discuss recent work to develop and integrate briefing and debriefing enhancements and performance measurement instruments in DMO operational sites and potential considerations to ensure acceptable adaptation of these capabilities at operational units to structure DMO program implementation for maximum training benefit. The paper will conclude with a discussion of critical organizational and policy considerations for integrating and utilizing DMO in joint and multinational/coalition training environments.

DISCUSSION POINTS

- Institutional considerations in development of DMO capability.
- Complexities in integration of DMO in tactics development and evaluation and operational training environments.
- Requirements to successful integration of brief/debrief enhancements and performance measurement tools.
- Considerations in utilization of DMO in Joint and coalition training.

ABOUT THE AUTHORS

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INTRODUCTION

"*Build it and they will come.*" This is the philosophy taken by industry and decision makers in the DoD towards the new generation of high fidelity simulators. While this may have worked in the movie "Field of Dreams", it is not a given or necessarily true in the case of Mission Training Center (MTC)/Distributed Mission Operations (DMO) development, integration, and utilization. This paper is not technical in nature but is intended for use in planning and awareness and to be thought provoking when planning a DMO system. Limitations of this paper only allow discussion of issues at a macro level and many other smaller issues can come into play on the road to DMO integration. WARNING: Small issues and those discussed within may be more complex than they seem on the surface and if overlooked as inconsequential may come back to haunt you. For the purposes of this paper, MTC, DMO device, and device will be used interchangeably to mean a device located at a single location.

AT THE ONSET

Before beginning the development process of a DMO device, establishing a contractual foundation and understanding several important issues starts the project properly and reduces consternation later.

The headquarters (HQ) point of contact (POC) should demand a post award contract conference that includes a line-by-line review of the proposed contract. The review will allow the government and contractor to detect and correct any errors/flaws, inaccuracies, or omissions before the contract is initiated. Representatives at the review should have the authority to make decisions from the guiding HQ, the System Program Office (SPO), using units, and the device contractor. The process will drag out, and most likely result in additional meetings, if representatives are not able to make decisions during the review process. At the completion of the review, there should be no questions from the government or the contractor on respective responsibilities, what is to be delivered, and what is expected from the contractor in order to receive payment. If for some reason the review does not occur at the beginning, it should be accomplished as soon as possible.

It is critical to forecast future weapons system modifications as completely as possible for incorporation into the contract. This information is normally contained in the weapons system's roadmap. Consolidation and introduction for inclusion will be done by the HQ POC, in conjunction with the weapons system Program Element Manager (PEM) and the SPO, during the contracting process. Incorporation of these elements in the contract ensures the device stays concurrent with the weapon system configuration. A historical problem with maintaining simulator devices concurrent with the actual weapons system has been low prioritization in the funding process. Incorporation in the contract allows known future modifications to be factored into the original contract price therefore negating the need for additional funds down the road when they may not be available. It also allows and ensures the contractor plans accordingly and prevents delayed training capability of the modification in the device. Optimally, the modification should be incorporated in the device one to two months prior to fielding in the actual weapons system, which optimizes training value and enhances training performance in the weapons system.

The DMO device and contractor Instructor Pilot (IP) contracts are normally and should remain separate and distinct. Combining them into a single contract could likely result in conflict of interest issues during testing and utilization. Contract IPs will accomplish a significant amount of the installation testing. They will be under tremendous pressure from the device contractor to minimize impacts of discrepancies or overlook them all together. A separate IP contract allows/requires them to focus on unit training needs and to look for discrepancies that would impact aircrew training. This minimizes pressure from the device contract. If IPs were to be under a single DMO device contract, their allegiance could shift or be leveraged into overlooking problems so as to call the device operational vice it's ability to meet operational unit training needs.

During operational utilization under a Commercial Training Simulation Services (CTSS or "fee for service") contract, device availability, performance, and aircrew satisfaction dictate device contractor payment and contract award term. Contract IPs will be involved in each mission so his/her input is critical and possibly the only one used for these ratings. If contract IPs are under the device contract, they may be pressured by the company to elevate their ratings or modify missions to mask problem areas through avoidance. With contract IPs under a separate contract, they can assess the device's ability to meet unit training needs, performance, and aircrew satisfaction on each mission without undo corporate pressure.

FACILITY CONSTRUCTION/MODIFICATION

Facility availability or construction funding is often the driving factor for site selection and installation timing. The unit DMO program begins during the facility construction phase, well before delivery of any equipment. Discussed here are some keys to facility construction.

The DMO contractor must define facility design requirements as completely as possible. Design changes or addition of requirements once the design is completed and/or construction started normally leads to contract modifications, which are costly, time consuming, and can easily lead to timeline crunches or slips. Defined requirements should include electrical power, heating/cooling, humidity constraints, office space, and security. Facility construction must be funded in a timely manner with sufficient resources to cover contract modifications, which are almost guaranteed to occur. Periodic on-site HQ presence and continual involvement is critical to assist in timeline maintenance and to clear any open disputes. Without this support, the unit POC is left to fend for him/herself with Civil Engineering (CE), contracting, and the device contractor.

Optimally, the facility should be constructed to allow for concurrent use at multiple classification levels. This will allow for optimum utilization during busy periods of time. One example would be to conduct classified training in half of the facility while conducting maintenance engine run training or entertaining visitors in other areas.

The construction timeline must be reasonable. The construction schedule is pivotal to equipment delivery and the entire Initial Operational Capability (IOC) timeline. A reasonable construction timeline permits planning, incorporation of modifications, and on-time completion without compromise of system installation or facility capability.

The unit POC and CE relationship is critical. If at all possible, a single POC in CE helps maintain control of the construction process. Dealing with numerous CE representatives makes it difficult to find the correct representative to work the issue at hand or having to "re-invent the wheel" with a new person. A bad relationship with CE will certainly lead to delays and a great deal of frustration. The CE POC can assist with construction contracts, which are normally outside the expertise of the unit POC. Attempting to foster a good relationship with CE does not relieve the unit POC from maintaining control of facility design, the construction process, and timeline.

Use care in accepting the contractor "assistance" on construction issues that arise during the construction process. By "assistance" I mean, the DMO contractor use of money, manpower, or resources to get some part of the facility completed. Accepting this "assistance" is usually easier and quicker than going through the normal CE contracting channels and will seem like a good idea at the time. However, acceptance of "assistance" comes with risks. The major risk is that the DoD organization (read unit) could be held responsible for the costs incurred by the contractor. These costs could be deemed as unauthorized obligations of government funds. Additionally, the contractor could use this "assistance" as leverage in future issue disputes. Lastly, since the contractor "assistance" did not go through the normal government contracting process, the government has no recourse if the work is found to be unsatisfactory or needs repair in the future. Bottom line; go through the normal CE contracting process if at all possible.

Facility furnishings must be planned and coordinated during construction. This ensures timely delivery upon construction completion. Remember, this facility will be a unit centerpiece and subject of visitation by high-ranking government, local, and foreign military dignitaries. Funding for furnishings should include administrative requirements, i.e. computers, FAX, copier, debrief computers, etc.

CONSIDERATIONS IN DEVELOPMENT

Resistance To Change

One of the more subtle impediments to development, installation, and integration of new technology and methodology is the resistance to change and implement new methodology at the various levels. This occurs for a variety of reasons but the most significant problem is where individuals perceive, either rightly or wrongly, the new system or methodology as a threat to their job. Those having this perception will attempt to hinder the process any way they can in the name of survival.

Organizations as a whole tend to resist change. This resistance can in itself impede successful development, installation, or integration of new technology and capability. Trying to fit the new round peg into the old square hole of processes can slow down or even derail programs. In today's environment of rapidly developing technology, fiscal limitations, and personnel shortages, organizations must be able to think "outside the container (box)" for innovative ways to acquire, use, and manage new systems. Utilizing CCTS methodology to acquire the F-15C MTCs is an example of innovative thought process though HQ management issues were still problematic.

Technology Push Vs Operational Pull

A major problem in the technology revolution and more specifically many development or procurement programs lies in their driving force. Historically, DoD sent out a call for bids to develop a system with specific requirements to meet a training need. With the recent technology boom and rapidly increasing capability, the process changed in many cases to where systems are developed and pushed towards DoD. The call for DMO systems was not specific in nature and industry was given a reasonably free hand in system specifics. The result is that engineers incorporate "cool" capabilities, with associated costs, simply because it is available, without regard to whether it provides any training enhancement. The problem escalates when senior leadership is blinded by industry presented technology. The solution to ensure technology fulfills training requirements and possibly reduces costs by not incorporating that, which provides no benefit, is two-fold. First, organizations should determine training requirements and then objectively evaluate industry presented technology for its capability to fill those needs. Don't necessarily accept "COTS" technology unless it meets all stated needs and, if it doesn't, require modifications. In other words, "pull" the technology to meet needs. If this results in development of a new system, ensure operational personnel are involved along the entire design and development process including periodic in-plant evaluations by these personnel.

Developmental And Installation Issues

A wide array of issues are involved in the development and installation process. Politics, a common issue throughout this discussion, is probably the most prevelant. Significant money and credibility are on the line, there are timelines to meet, and senior level interest is high both on industry and DoD sides of the project. This puts significant pressure on individuals at the receiving agency (HQ or unit level) for actual installation and integration of devices. This pressure leads to a temptation to cut corners or accept less than "full up" systems. Unfortunately, this can result in the accepted system become the standard, problems will never be corrected, and users at the unit level will be disappointed in the systems performance.

On the subject of timelines, the timeline established for system development, delivery, installation, and testing must be realistic. Unrealistic or highly constrained timelines put undo pressure on all parties who look bad, maybe through no fault of their own, when systems fall well behind schedule and the viability of the concept is questioned. Requirements will change and new technology may become available so allow time for contract modifications and development changes.

Contractor Equipment Delivery

As construction nears the final stages, delivery of contractor equipment becomes a concern. Variances in the delivery schedule may have a positive or negative impact on the overall plan. Late delivery may impact setup, testing, and IOC schedules. Delivery may actually commence before construction completion. It is important to know the delivery schedule. There are normally changes and the unit POC must know when these changes occur and the impact to the program. Early delivery may conflict with facility construction. The area of the facility planned for the equipment may not be available, requiring adjustments to where the equipment is placed or to the planed construction schedule. During this process, the unit POC must be able to answer schedule questions intelligently and reasonably to maintain credibility.

System Testing/Evaluation

Testing and evaluation is a delicate process in the system installation phase. It may also be the most time consuming, frustrating, and critical phase of the DMO installation process. Proper planning, execution, and evaluation ensure the device meets unit training needs.

Testing must be planned early. Planning includes internal unit resources and external units. External units include HQ personnel, the SPO, and test units.

They are the data collectors and planners for testing activities. The unit and HQ POCs must keep abreast of the test plan to ensure it is reasonable and covers appropriate areas relating to the device's ability to support training requirements. Keep tests from wandering onto tangential issues that are irrelevant to unit training. Do not allow testing to commence unless you are confident that a solid plan is in place for the evaluation. Last minute planning or developing the plan during the test is painful. If testing begins without a plan, it will be disjointed, aircrew and the contractors will be frustrated, and the test will not serve its purpose. The unit POC should plan to spend as much time as possible observing the testing process.

Internal resources include specific aircrew. This will include a Stan/Eval flight examiner, a functional check flight pilot, several IPs, and a reasonable complement of mission aircrew. These manning requirements tend to be limiting factors. Failure to plan properly or with sufficient lead-time will make it difficult to support testing aircrew needs. If testing is not supported adequately the organization could be held liable for unsuccessful test results. Know the resources required and start preparing. Use a core cadre of unit aircrew. Limit unit aircrew exposure during testing. This serves several functions. It provides continuity during the test process allowing a more direct comparison of test results from previous missions. There will certainly be problems with the system during testing. Using too many unit aircrew could easily cause a perception to spread throughout the group that the DMO device performs poorly. This perception will be difficult to overcome later no matter how well the device performs when complete. Manage user expectations by briefing test aircrew prior to testing. It is important to prepare them for problems they might experience or what to look for. Ensure they know their function is to detect and report any possible discrepancies so they can be corrected and the device will meet performance requirements and desires. It is inevitable test aircrew will discuss device performance with other aircrew. But, if briefed properly, their discussions will focus on positive elements of the device, the training capability it will ultimately provide, and what is being done to correct problems.

Try to minimize unit leadership presence during testing. The unit POC must keep them abreast of progress and major issues. However, their presence will put undue pressure on contractor representatives and potentially hinder the testing process. "Off the cuff" comments made by unit leadership to the contractor during testing could be construed as government direction. These comments may not have been made with the benefit of all the information required or the history involved. Their presence also tends to pull resources from the testing process to assist with their visit. Additionally, the DMO program could suffer if unit leadership gets a "bad taste" due to problems that inevitably occur during the testing process. The unit POC will need their support later so it is imperative this not occur.

SPO and HQ presence during testing is critical. It provides a bridge between the unit POC (operational inputs) and the contractor ensuring operational inputs remain within scope of the contract and follow proper contracting procedures. It also ensures presence of proper technical representatives. They will provide invaluable assistance to the unit POC in areas beyond his/her technical expertise and solution recommendations to the contractor. (Note – Do not let "technocrats" bog down the process if the performance output of the device is correct.) Their presence ensures HQ awareness of unit inputs, provides "top cover" for the unit POC and ensures issues are worked in proper priority. It also keeps HQ representatives working in concert with one another.

The unit POC must be familiar with all discrepancies found during installation and testing. The number of discrepancies found during testing will seem daunting. Prioritizing the discrepancies in relation to impact on unit training will help keep them manageable and allows the contractor to focus on appropriate issues. Do not start unit aircrew training until the DMO device is ready. The unit POC will most likely be asked to determine levels of impact. One option for defining these impact levels is: Above the Line Critical, Below the Line Critical, and Non-Critical.

Above The Line Critical Discrepancy

Discrepancies that are obvious to aircrew in the cockpit. They include ownship sensors in normal operational modes, ownship displays, reasonable ownship aircraft performance, and threat and ownship missile performance. It also includes frequent system crashes. The basic question is; "Would I have to tell a new crewmember that it looks or performs differently in the aircraft?" or "Will aircrew be frustrated by device performance while attempting to accomplish training?" These deficiencies must be corrected before allowing line unit aircrew into the device on a normal basis or to use it for any training.

Below The Line Critical Discrepancy

Discrepancies that are noticeable to aircrew but can be prevented from being factors through mission profile manipulation. Examples are threats that do not work properly. Missions can be built to avoid or not include the discrepancy. The basic questions here are; "To train to everything we need to on a normal basis, does this need to be corrected?" or "Would the person developing a scenario have to modify their plans to prevent the discrepancy from being an issue?" These discrepancies must be corrected before the device is deemed to provide "full up" training.

Non-Critical Discrepancy

These discrepancies prevent the device from meeting contract specifications but have little to no impact on unit aircrew training. Examples here include Instructor Operating Station (IOS) functionality, or sensor modes that are not used on a normal basis. The basic question here is; "Will the aircrew notice the discrepancy in the course of a normal mission?" If not, then it fits in this category. These discrepancies must be corrected in the contract warranty process.

INSTITUTIONAL VS INDIVIDUAL RESPONSIBILITIES FOR SUCCESS

Several DMO systems have been integrated into the operational field. The level of success each of these systems have had, or not had, has depended more on a unit level POC than HQ guidance or the capability of the device itself. This is the result of several dynamics. At the HQ level, personnel cutbacks and shortages, especially rated staff, means that most positions are filled by contractors that were formerly rated and in some instances have dated experience. The emphasis, and therefore manpower at the HQ level is on DMO operations instead of installation and integration of individual devices at the unit level. This results in over tasked POCs at HQ and SPO levels and a dependence on unit POCs. There are several requirements for the unit POC to succeed. He/she must have an understanding of the developmental history of the device, system capabilities, and politics involved in the development and use. HQ support for decisions made at the unit level, unit leadership support in the decision process, and a strong unit staff, such as the Project Officer (PO) and Quality Assurance Representative (QAR), are also essential for unit integration success. Most of all, unit POC continuity through the preparation, installation, and integration process is critical. This is often the primary cause for less than successful integration. Unit personnel often change several times during the process of receiving a DMO device. Changing unit POCs often results in relearning lessons and redundant effort. It also displays a lack of emphasis on the importance of the device to unti personnel. Optimally, HQs would have more people dedicated to site installation and integration. Since large portions of the staff are contractors, this will provide continuity. More responsibility should rest at HQ levels and guidance provided from lessons learned in previous site experiences. Units should assign a dedicated simulator POC with sufficient credibility and rank to ensure actions required at the unit level are accomplished and the retention to see the process through. This unit POC along with the unit PO and QAR should receive background training from HQ and POCs at previously integrated units on techniques and actions necessary for successful integration.

COMPLEXITIES OF INTEGRATION IN OPERATIONAL TRAINING ENVIRONMENTS AND TACTICS DEVELOPMENT AND EVALUATION

Integration into the operational training environment starts well before installation and testing are completed or even begun. As with all phases and elements of these devices, there are several issues critical to success.

Preparation

Aircrew satisfaction, efficient unit utilization, and capturing DMO training advantages depend on planning and proper publicity. The unit POC is key in the attitude that unit leadership and aircrew approach DMO training. Preparing personnel responsible for unit training for device utilization is critical. Lack of preparation will result in haphazard use and not providing the full benefit of DMO device capabilities.

Get weapons officers, training officers, and possibly operations officers together to determine incorporation of the device into existing training syllabi. Unit POC guidance and direction will be required during meetings to keep the agenda on track, to provide ideas, and to ensure awareness of DMO training capability. These devices provide a significant increase in capabilities to enhance current syllabi, actual aircraft training and provide a more capable/proficient end product. This incorporation will most likely add missions and lengthen syllabi. Use care not to trade off aircraft training with the objective of keeping syllabi length unchanged. The end result is normally worth the increased time or number of missions. Modifications to HQ managed training publications may be necessary.

Work with unit weapons officers to develop Continuation Training (CT) mission profiles. These first profiles will form the foundation of DMO device

CT. Build, maintain, and update a cataloged database of mission profiles. This catalogue will increase as more profiles are developed or current profiles modified by subsequent use. This will save significant preparation time and effort for daily missions. It is much easier to modify existing missions than to build new ones. Four or five profiles for each mission type are a good starting point. Profiles should be as complete as possible to include weather, friendly assets, threat assets and tactics, electronic countermeasures, etc. Additionally, work with other DMO sites to build a small database of missions for use in distributed missions. The complexities of DMO require that certain conditions in the files for missions at each location be exactly the same to work correctly. This gets into interoperability issues but is not fully resolved by industry standard protocol. Stan/Eval must also develop scenarios for all required checkride profiles.

Marketing

An important element of the planning process is "marketing" the device. The operational environment has historically been hostile towards simulators. This has its genesis in the fact that aircrew have been forced to use devices that fall well short of meeting their training needs, have fallen into disrepair or become seriously non-concurrent with the aircraft due to the fact that simulator funding is normally cut first in a fiscally tight environment. Apart from this predisposed attitude, new, high fidelity simulators are viewed as a threat to aircraft training and flying hours. These perceptions must be overcome for successful integration and use. "Marketing" should emphasize capabilities of the device and potential uses that are above and beyond existing training capability. The idea of risk to flying hours should be minimized however; it is essential to future credibility that the actual risks be known. The fact is, flying hours will most likely be reduced by some amount to fund the devices and allow integration within daily training time limitations. However, if done properly, those reductions will be minimal and transparent to flight operations with an end result of more highly trained crews.

Politics Of Simulator Use

DMO devices offer so many capabilities and options for use that they have the potential to be their own worst integration enemy. Unfortunately, the significance and publicity involved with DMO results in politics at various levels. Loss of flying hours, as mentioned above, is a political as well as perception issue. Actual use of DMO devices is a major political issue. DMO is a high emphasis and "Gucci" use for new simulators. Senior leadership envisions a large virtual battle space conducting mission rehearsal on a regular basis. While this concept garners funding and fills a portion of operational training needs, it is not the primary utility nor even optimal use for these devices. Again, there is no argument on the need for a mission rehearsal capability. But, when considering actual need and use for these devices, senior leadership and designers have to be aware of the training continuum. To prepare for the mission rehearsal environment, aircrew must be trained to a point where they can effectively operate in that environment. To do so, significant training, ranging from basic to advanced, is required. Additionally, attrition and replacement of unit personnel due to reassignment of aircrew, pilot training pipeline flow, or attrition of forces in operational units puts them in a perpetual state of upgrade training. Within the training continuum, only some portions of the DMO capability will need to be incorporated. DMO capable devices are able to provide a training capability in all areas of the continuum that are far beyond what was available in the past.

A primary issue is who drives the use of the device. If the operating unit uses the device to meet it's training needs then successful integration is possible. If forces outside the unit (Pentagon or HQ) drive use of the device, then it will be viewed as a burden and use will be limited to that required by HQ. Outside driving forces could come in several forms. As mentioned above, driving the unit to use the device in a mission rehearsal scenario when the unit has other training priorities is one. This breeds resentment towards the outside force and the device and success of the mission could suffer depending on the training level of unit participants. Another major concern for HQ driven use is that, given the capabilities of the DMO devices, they will be used in Command and Control exercises which are typically limited in aircrew training value and would lead to the same results. This impact cannot be underestimated.

The popularity and publicity of DMO devices results in another problem that falls in the political arena. This problem has to do with visits to the facility by senior leadership, politicians, and dignitaries, local, foreign, and national. While this type of publicity is essential for the future of DMO and resource funding, visits must be done properly. Develop a controlled and consistent program to plan and approve device visitors. Expect unit leadership and the unit POC to be called directly for visits. If not controlled, these visits will have a serious impact on wing device training

utilization. Visits will normally require modification of security levels
.

The capabilities of DMO devices enable numerous additional potential users. Testing of weapons, weapons system upgrades, engine run training, and tactics development are but a few. Again, these are valid uses of the device but must be used with discretion and planned well ahead of time. Like visits, use by other organizations will normally require reconfiguration of the device. Reconfiguration will normally result in loss of training capability. Significant loss of this capability and more significantly, perception or actual loss of control over use of the device will impede successful integration.

There are ways to overcome the predisposed thoughts of aircrew from previous simulators. One key is to develop a formal and centralized scheduling process. In the past, scheduling of aircrew for simulators was done after flights were scheduled, other duties filled, and as an afterthought. Given the resources involved, the attitude and process used for DMO device scheduling should be the same as that taken towards aircraft scheduling. This ensures effective utilization, stable schedules, and proper aircrew preparation, prevents contractor frustration, and limits unit liability in the DMO facility availability rating. The process should be controlled by unit scheduling with significant input by the DMO PO/QAR and involvement of the DMO contractor scheduler.

Training research studies are inevitable in the DMO process. Unit POCs should be well versed in the schedule and focus of studies planned to take place in the unit's device. Unit aircrews are normally skeptical of outside researchers and the unit POC will set the pace for the study. The research organization should be advised of and sensitive to aircrew concerns (i.e. flying hour tradeoffs) as well as expected conduct. Aircrew participating in the study should be aware of the focus and purpose of the study to prevent skewed data that could result from protective attitudes. Proper planning and preparation will allow aircrew to get valid training during execution of the study and hopefully, the outcome of these studies are improved training practices.

REQUIREMENTS TO SUCCESSFULLY INTEGRATE BRIEF/DEBRIEF ENHANCEMENTS AND PERFORMANCE MEASUREMENT TOOLS

Performance Measurement Development

The plethora of data available in high fidelity simulator systems is fertile grounds for performance measurement systems. Significant effort is being expended on development of performance measurement schemes for aircrew training systems. While the concept is valid, there are factors to consider in the development and integration process.

Even the simplest combat exercise has a fairly complex decision tree when determining possible actions/reactions. Interviews with subject matter experts will be filled with "it depends" as an answer to situational questions. In that light, performance measurement systems must be able to either accommodate various actions based on the scenario or limit it's scope to negate the impact of decision variables.

Objective Vs Subjective Measurement

In a given situation where standard performance criteria are known, performance measurement is fairly simple. Deviation from standard criteria is measured and the larger the deviation, the poorer the performance. These measurements are objective in nature. Airspeed at given times, shot ranges, desired altitudes, etc. are examples of such data. In static environments, this data is easily measured. However, the base criteria may change as a result of flight briefings, commander's intent, etc. and objective measurement programs must be flexible enough to incorporate mission specific changes to standards.

It is simple to measure objective elements in a mission such as if a missile shot is within parameters and at the proper range. More difficult questions are, should the missile have been shot, should two missiles have been shot, should he have been in that position at all? These other elements in a mission, like communications, are subjective in nature and fall mostly in the "it depends" category of the decision process and should be captured to accurately assess performance. Performance measurement systems must be able to incorporate human-in-the-loop inputs to accommodate subjective elements in both real time and after the fact review. Unfortunately, each human-in-the-loop has predisposed thoughts, therefore, guidelines are required to ensure some level of standardization. One other problem identified in analysis of subjective measurement at AFRL, Mesa is that subject matter experts accomplishing subjective measurement tend to rate subjects along the mean and seldom utilize the outer regions of the measurement scale. This, of course, leads to little useful collected data.

Installation

The world's best performance measurement system does no good unless installed into an actual system. Here lays another hurdle, attempting to incorporate third party designed improvements into existing simulator and brief/debrief systems. Simulator systems are designed and built by a variety of contractors and sub-contractors. Each has their proprietary interests. Full integration of a measurement scheme normally requires access to source code used by the system. Unless the performance measurement system developer is a partner in the simulator system, this level of access is difficult. The alternative is to ensure the performance measurement programs and brief/debrief enhancements are compatible with industry standards and common languages so they can be connected to existing and future devices. Government support or even sponsorship goes a long way towards overcoming this hurdle since they can "pressure"/require contractors incorporate improvements. Government involvement for incorporation may even require modification to existing contracts and, if this is the case, most likely funding.

Integration

Designers of performance measurement systems live in a myopic world when considering how these systems will be used in the operational environment. The truth is, use of performance measurements is an extremely sensitive area. Expecting to install a system, telling an instructor or flight lead how they did, and collecting and reporting individual and unit performance to HQ won't hack it.

First, the ego and pride of a fighter pilot is too large to allow a bunch of "techno geeks" to tell him how *his* flight did. Attempting to use performance measurements in this way will result in failure. Performance measurement should provide the appropriate information in a manner to assist the IP/flight lead in determining how they did.

Performance collection and reporting has a similar problem. Individual aircrew and unit commanders are concerned that performance reporting to HQ will result in micro-management by HQ; a resultant loss of control over unit training and questioning readiness at too detailed a level. These concerns will result in performance measurement systems not being used, minimal use of the training device, or design of scenarios around the measurement system instead of training requirements. Successful integration of performance measurement systems will depend on presentation in an appropriate manner and maintaining data at the unit level to prevent the fear of "big brother".

CONSIDERATIONS IN UTLIZATION OF DMO IN JOINT AND COALITION ENVIRONMENTS

Many of the considerations mentioned previously as impediments to successful integration at the unit or command level exist in the joint and coalition levels as well though possibly with different slants.

Joint DMO Considerations

Joint operations are synonymous with politics. With the publicity involved, this may be especially true in the DMO environment. At the joint level, politics will most likely come in the form of funding and control. Funding in the joint arena revolves primarily around who will pay for interoperability. Since each service will most likely have developed their heterogeneous capability in a vacuum, it is likely that interoperability issues will come to light when joint DMO is pursued. Overcoming interoperability issues will require funding and who provides the funding will have to be negotiated and overcome. As with performance measurement integration, proprietary ownership of data and capability will pose as much or more of a problem as funding. Since each service, and even elements within each service will most likely have developed their DMO capability in stovepipe fashion, the likelihood that different contractors were used is high. To obtain interoperability will require contractors to work with one another. In some cases, proprietary issues will be involved and overcoming them will be challenging. During development, organizations must ensure that the capability to work in a DMO environment is incorporated in system design. To be proactive on the issue of proprietary rights, organizations developing systems must require contractors not only use current industry standard protocol but also have the potential to incorporate future technology to the maximum extent possible.

Coalition DMO Considerations

Politics of course is an issue in multi-national/coalition DMO as well. The interesting thing is that these issues may be more straightforward than those in joint or intra-service operations. In this forum, most of the political issues are procedural in nature and simply require time to wade through established bureaucratic protocol.

Funding and interoperability difficulty increases in multi-national DMO operational environments. Funding to resolve interoperability is probably simpler in the coalition environment than in joint DMO. Each country will likely bear the expense to ensure their system interoperable with other nations. A more difficult issue will be what is required and what will be used as the base for interoperability without delving into proprietary interests. Again, the starting point for overcoming these issues is to ensure systems intended for coalition DMO incorporation comply with international industry standards and have the potential to evolve to future standards.

Funding for multi-national DMO operational exercises is a more difficult issue. Costs for such exercises include not only operation of one's own system but also the costs of connecting systems across borders and even oceans. This cost is not insignificant and must be coordinated in planning sessions well prior to the exercise.

The Kicker; Security

Now that the most obvious issues have been discussed, it is important to cover less obvious and potentially a more serious impediment to joint and coalition DMO operations; multi-level security (MLS).

In the joint arena, each service will have it's own security classification of the systems included in an exercise and of their operation within the exercise itself. Short of resolving the MLS issue, the exercise will need to be designed to each of the services classification level and limited to the lowest common denominator.

Security in multi-national/coalition environments escalates to a much more significant issue. Unless MLS is resolved, security will have the greatest impact on multi-national and coalition DMO operations of any issue short of the inability to connect. The risk is that systems participating in these exercises and the entire exercise will have to operate at such a low classification level that little to no valid training will be accomplished.

CONCLUSION OR KEY STATEMENTS TO SUCCESS

CONTINUITY IS CRITICAL! The issues involved in establishing a DMO facility and program are so diverse, complicated, and at times political that issues can "drop through the crack" or don't get handed off properly with personnel changes. At least one person versed in the process, programs, and issues should remain involved through the entire process. Failure to maintain continuity will impact the program performance.

Unit PO and QAR involvement in device development and day-today operations is essential to success. The unit POC will not have the time or expertise to handle the multitude of issues that surface throughout the development process. The PO and QAR are trained to handle issues foreign to most unit POCs. In most cases, the PO and QAR are the only government personnel that will remain with the program on a long-term basis. Their corporate knowledge is the glue that binds the program through unit POC changeovers and is essential for a successful on-going program.

Be prepared and plan for the next step in the process. Planning and preparation is the thread that ties the processes together, keeps them under control and focused, and ensures the system meets performance expectations.

Lack of unit leadership support for the device spells potential disaster for a successful program. Unit leadership support allows the unit POC to establish internal unit processes necessary for device utilization. Unit leadership confidence and delegation allows the unit POC to make necessary decisions during program development. Micromanagement or having to consult unit leadership on every decision will drag the process down and ultimately lead to delays and frustration of all parties involved. Lack of commitment by unit leadership will hinder getting the support required to establish scheduling processes, conduct testing, develop scenarios, and integrate the device into unit training programs.

KNOW THE CONTRACT. The unit POC, PO, and QAR must be intimately familiar with the contract and consult one another continually. They must know what is within the unit's purview to manage and what limitations to execution exist in the contract. Members of the unit will often have excellent ideas for device training or modifications. Unfortunately, these ideas often fall outside contract scope. Any attempt to follow through could be perceived as governmental direction. Perceived governmental direction without proper approval may be deemed an unauthorized obligation of government funds or the contractor could ask for consideration from the government. Unit leadership relies on the POC to keep them and yourselves out of jail. Contract law is stringent and the government does not look kindly on unauthorized obligations or claims for consideration.

A positive working relationship with the DMO contractor aids in establishing a successful and effective DMO program. The unit POC may have to make decisions that are not popular with the contractor. But, approached properly, they can be handled with minimal friction. The unit POC and contractor site lead should understand each other's positions. This understanding allows each to make necessary compromises as long as they do not negatively impact unit training.

Keep the HQ POC involved. The HQ POC can be a powerful ally when leverage with the contractor or the SPO is necessary. He/she can also provide "top cover" when senior leadership starts questioning unit related issues. If the HQ POC knows the issues, they can head off the questions, keep unit leadership from being put on the spot, and save the unit POC a lot of staff work answering questions. This allows the unit POC to concentrate on unit DMO training.

Unit POCs must understand the impact of their decisions. These decisions may have widespread impact outside the unit. This is especially true for POCs at sites for the first device of a weapons system. Decisions made by those POCs impact not only their own unit training but also training programs for the rest of that weapons system's community.

BOTTOM LINE: The unit POC MUST keep the focus of the DMO device on unit aircrew training. There are countless ways to divert this focus or pressure the unit POC to make decisions that would detract from training. The unit POC has to dig in their heels when unit aircrew training is at stake. They depend on it.