MISSION REHEARSAL BEHAVIORAL RESEARCH ISSUES

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ABSTRACT

We have entered the era of simulator-based Mission Rehearsal (MR). The capability will soon exist to provide real world mission rehearsal and practice to mission qualified aircrews before they leave the ground. The engineering capability to provide MR will undoubtedly improve as time goes on. However, a variety of behavioral issues need to be addressed before we will be confident about effectively using this new technology for training or practice purposes. In this paper we list and discuss some of those issues with the goal of setting forth a research agenda. Plans for MR research, at the Operations Training Division of the Air Force Human Resources Laboratory are described.

INTRODUCTION

A Mission Rehearsal Scenario

The mission is not a surprise. It is the type of mission they have trained for. Fourteen American and Organization of American States diplomats have been taken hostage less than 24 hours ago. A terrorist group has already released a variety of demands. A warning order for a rescue operation has been issued six hours ago, an execute order is expected in the next 48 hours.

Col Smith is the air component commander. His mission is to infiltrate Special Operation Forces (SOF) into the hostage sites, provide supporting fire, and extract the force on call. All elements of the mission planning staff have been assembled, the rescue force is on alert.

Col Smith and his staff have been using a variety of mission planning tools to plan the rescue on a contingency basis since the hostages were first taken. They already have a substantial data base on the general target area and have been gathering updated intelligence data from overhead reconnaissance, electronic intelligence and human intelligence sources in the area. Sources have indicated that the air defense network is not a direct threat but it could provide early warning to the terrorists. Handheld SAMs and heavy automatic weapons are expected in the target area. Weather in the target area is forecast to be marginal, enroute it will not be a factor. They have developed a number of alternative plans for entering and exiting the hostage sites.

The new SOF Mission Rehearsal (MR) Facility will be available in 12 hours to begin practicing. While mission rehearsals are not new to Col Smith or his forces, it is unlikely that they could put together a realistic rehearsal using mission aircraft in the short time they have. The logistics, operational, and security constraints of rehearsal are often as demanding as an actual mission. Elements of the force have used the mission rehearsal facility before. Col Smith has confidence that from an equipment standpoint (physical and functional fidelity) the mission rehearsal devices will serve their purpose. His questions now are not equipment related but rather are centered around how to use this rehearsal system to best advantage in the short term he has prior to deployment. Here are some of his questions:

1. How should Col Smith address the reliability of the results of the mission rehearsal? For example, suppose the mission rehearsal goes well and the mission, at least in the practice session, is a success. Should Col Smith then have complete confidence that the real mission will succeed? Probably not, but what degree of confidence should he have? If the practice shows a poor result should Col Smith have enough confidence in the result to change or scrub the mission?

2. Suppose the MR shows that the assumptions Col Smith made about his Special Ops Force are not correct. What if the MR reveals that some of the individual and team skills which he assumes exist in the crews are not there. Will it be possible for Col Smith to conduct a very quick training session in the MRD to train those skills which are either missing or are less than sufficient? If the skills can't be taught or remediated one alternative will be to quickly use an alternative plan that doesn't require those skills. However, then Col Smith will have to conduct another mission rehearsal to determine if his crews have the skills to carry out the new mission plan. A final, though highly undesirable, alterative will be for Col Smith to cancel the mission.

3. If the decision is made to remediate, what tools will the Colonel have at his disposal? What will be the best way to use instructional features normally found on training devices such as freeze, playback and performance measurement? Should these features be used or will it be better to make the rehearsal as close to possible as the mission by not introducing artificial instructional aids for the Colonel and his staff. After all, it will not be possible to freeze the mission in the real aircraft once it is underway so why do it in the MR?

4. What is the best way for the Col and his staff to give feedback to the aircrews? For example, should such features as playback and performance measurement be used as they are for

training skills initially or are there better ways to use these capabilities? Should these capabilities be used at all?

5. What guidelines should Col Smith use that will help him conduct and evaluate a mission rehearsal? Should he and his staff be left to their own approaches or can research provide clear-cut help?

6. How should MR training differ from normal training? Specifically, how does a highly pressure packed situation, because of limited time, impact the training that can be given?

7. Can a MR give feedback to the training system? (i.e., Can the training system be improved as a result of the MR experience?) While this question may not be of much relevance to Col Smith's present situation, it will be of great importance to him when he once again has to train new aircrew members for future missions.

These are just a few of the behavioral/practical issues which face a mission commander as he prepares his force. While the technical means for simulating the physical and functional elements of a MR either presently exist, or will exist in the near future, we still have a large number of issues which need to be resolved before we can feel confident about effectively using this new technology for training or practice purposes. In this paper we will examine some of these behavioral/practical issues. Our goal is certainly not to categorically answer the questions and issues we will raise. What we will do is propose a research program that we at the Air Force Human Resources Laboratory aim to pursue to provide answers to these questions. However, first we give our definition of Mission Rehearsal and contrast it with Mission Training.

Definition: Mission Training vs Mission Rehearsal

Combat Mission Training for an individual or for an operational unit is a continuing process. Although the path through this process has certain certification milestones, checkrides and increasing levels of mission qualification for the individual and crew, and operational readiness inspections for the unit, the process never ends and should be one of continuous preparation for a range of combat missions. This range of missions is called the unit's Designated Operational Capability (DOC).

Mission Training, and then continuation training, refers to the long term process moving individuals to new qualification levels and maintaining or improving generalized mission skills. Unit DOC is maintained, improved, and evaluated through a series of exercises and inspections from the Service and the Joint Operational Commands.

The quality of this generalized Mission Training is key to what must be accomplished in a specific Mission Rehearsal prior to mission execution. As stated earlier, Mission Training is an ongoing, long-term process. Traditional methods of Mission Training use classroom and computer-based instruction, weapon systems or specialized task trainers, Mission Rehearsal devices, and exercises with mission aircraft up to a level of interaction with all elements of a Unified Command or Joint Task Force.

The following skills must be developed through Mission Training prior to Mission Rehearsal and mission execution:

Weapon System Proficiency: Individuals and crews must become capable of operating the aircraft and all subsystems to maximum capability. Minimum altitude/minimum weather maneuvering, maximum performance tactics and all offensive and defensive systems must be exercised in a complete tactical environment. Effective simulation may be the only media for some of this proficiency development due to safety, cost, or security constraints.

Situational Awareness (SA): In this context, SA refers to each crewmember understanding how he should be operating within a larger force. He must be able to understand the specifics of a plan that apply to him, specifics on how each element in the plan might interact with him and what is expected of him as new information becomes available.

Tactical Decision-Making: Most decisions are made with incomplete information. Individuals preparing for combat must develop the skills to make the best tactical decision while dealing with uncertainty in a time constrained situation. Uncertainty in weather, intelligence estimates, reliability of personnel and equipment, and unpredictability in friendly, neutral, and hostile forces are some of the major challenges the aircrew member and leaders throughout the chain of command will deal with.

Specific Mission Rehearsal will be characterized by time constraints, will be focused on a very specific mission, and will require individuals and forces that have the range of skills discussed above. The SOF Aircrew Training System (ATS) has a baseline of 48-hours to develop, assess and review the plan of execution. The Mission Rehearsal devices will be prepared in parallel and available within the same 48 hours. Actual Mission Rehearsal with aircrews and the C^3I system takes a minimum of twelve hours. The key components of effective Mission Rehearsal are:

All elements of the mission forces are represented. All elements must be interacting, and communicating, in accordance with the plan of execution.

The enemy threat must be represented. This is a system that should be able to interact, communicate, and react within the bounds of estimated capability. The estimate of this capability and probable enemy actions introduce uncertainty, discussed next.

The type and range of uncertainty introduced, in a time constrained situation, may be the key element in the Mission Rehearsal, and necessarily, a key research and development issue for the Mission Rehearsal system. Unexpected events can test individuals, elements, the C^3 situation, the plan, its

options and most likely create interactions among all these.

This section separated the concepts of general Mission Training and specific Mission Rehearsal. Both of these are major components in combat preparation. The concept of realistic specific Mission Rehearsal, in a time constrained situation, is a capability being developed for the future and the focus for the rest of this paper is a proposed research agenda for determining how to use that capability.

PROBLEM

As discussed earlier, the engineering technology for developing and conducting simulator based MR is either with us now, or it will be developed within the next few years. Unfortunately, we can expect a problem which has plagued us in the use of training devices to also be of concern with MR devices. That is, our technological prowess has outstripped our understanding of how to use that technology to its most effective level.

A good example of the problem is the capability to capture performance measurement information from a training device. Because modern training devices make great use of digital computers it is easy to have the computer record every event and trainee interaction that takes place during a training scenario. Frequently, because it is difficult to make hard decisions about which training performance measurement data an instructor really needs we merely have the training device computer record every piece of data that is available. The result is a very unsatisfactory avalanche of performance measurement numbers. The instructors become quite frustrated with the system and frequently simply turn it off.

It is imperative that we plan now to produce the research results that will allow us to effectively use any MR technology that is produced.

Lack of Previous Behavioral Research on Mission Rehearsal

We can look to the behavioral research literature to give us some help, but due to the rather unique nature of MR we shouldn't expect to find a large amount of aid just yet. Our search of the literature found few articles that directly addressed Mission Rehearsal. Wiggers, Hiteshew and Matsuf (1) and Monette, Knight and George (2) presented two good discussions of the definitions and requirements for designing an MR device (MRD). However, they did not present guidelines for how best to use the device once it has been built. In fairness, we should not expect to see many empirically or expertentially based guidelines given the fact that no MRDs have been in use for any length of time or that any research has been specifically targeted at Mission Rehearsal.

What of the general body of research about training individuals and teams? Gagne (3) has proposed, and presented evidence for, five different domains of learning (psychomotor, verbal information, intellectual skills, cognitive strategies, attitude). MR requires the exercise of all of these domains. Psychomotor skills are used to operate the aircraft and various systems on the aircraft. (e.g., Manipulating the controls of a weapon system.) Verbal information is facts and labels (e.g., being able to state the destination of the rescue mission). Intellectual skills represent the higher order mental skills such as the use of concepts and rules, and problem solving (e.g., being able to develop an alternate tactical plan if an aircraft is lost to the mission). Cognitive strategies enable us to learn how to learn. That is, they are the strategies each learner develops to cope with new learning tasks (e.g., a new aircrew is formed and each member must determine how best to communicate with his partners). Finally, attitude learning is important because aircrews must learn the proper attitudes about the necessity of mutual support, discipline and safety.

Gagne and Briggs (4) describe internal and external conditions of learning. Internal conditions are those which the learner brings to the learning situation. For example; enabling skills and knowledge, cognitive strategies, and attitudes. We as designers of instructional environments cannot change these internal conditions by ourselves. That's something the learner has to do. What we can do is arrange the external conditions of learning. These include such things as the curriculum, the instructor, and the training media (including simulators and training devices). Our job is to make the external learning environment match the learner's internal conditions as much as possible. For example, if the learner has an internal locus of control (5), we should arrange the external conditions so that the learner can have as much control as possible in the way he/she interacts with the learning materials. There is good evidence that the internal and external conditions of learning will differ depending upon the domain of learning.

How can this knowledge of domains of learning and internal/external conditions of learning help us with MR? After all, by the time an aircrew gets to the MR stage they should have learned all they need to know in all five learning domains for their mission. Their training stage should be over and MR should be a time to transfer general mission skills to a specific set of requirements.

Well, yes the aircrews are certainly "mission qualified" but what does that really mean? It means they have learned and been "checked off" in a set of generic mission skills. Now those generic skills must be applied to the specific mission requirements. We contend that in this sense MR is a form of training that imparts specific knowledge about a specific application.

What all this means is that the crewmember will have a set of internal conditions of learning that are different than someone who is not mission qualified. The crewmember will have a better set of relevant skills and knowledge

better set of relevant skills and knowledge related to the mission; his attitude about mutual support, discipline, safety and so forth will probably be more positive; his cognitive strategy mechanism will be better developed and so he will learn in new situations, like MR, more quickly.

Perhaps the most important difference between qualified crewmembers and those who are not qualified is that the mission qualified crewmembers' should receive intrinsic feedback from the MR. Intrinsic feedback is feedback which we gain from the experience itself without any added feedback from outside the experience. For example, when we hit a baseball the flight of the ball gives us intrinsic feedback about how well we hit the ball and experienced hitters can then decide how to change their swing in the future, if necessary. Contrast that with external feedback where, for example, a coach tells the hitter what happened and what to do about it. A qualified crewmember undergoing MR should need less extrinsic feedback than a trainee who is being Mission Trained.

RESEARCH ISSUES AND AGENDA

Issues

At the beginning of the paper we described some practical issues which Col Smith might wonder about as he prepares for an MR. In this section we discuss some of these issues in more detail and describe some additional issues.

Feedback to Crews

Despite the old saying that "practice makes perfect," researchers have found that without knowledge of the consequences of performance, practice per se is not particularly beneficial. In a recent study, Killion (11) demonstrated the importance of appropriate feedback when he provided real-time feedback, post-mission feedback, or no feedback as A-10 pilots attempted to kill tanks and avoid threats in a simulated combat environment. He found that a combination of real-time feedback and post-mission feedback of actual consequences facilitated the learning process most, followed closely by real-time feedback alone. Post-mission feedback resulted in reduced levels of improvement in survivability over trials. Training with no feedback resulted in no improvement in performance during training and no benefit in test trials.

Obviously, the quality of feedback information provided through MR will be a major factor in its overall effectiveness. The SOF ATS mission rehearsal devices will have the capability of providing both intrinsic feedback, and post-mission feedback (extrinsic feedback). Both feedback types represent fertile research areas. For example, when crews execute the mission, is it best to overfly the area first to get a better understanding of specific information about the route and target area, (which should enhance crew performance as they fly the mission in the MRD with this knowledge), or is it more valuable for crews to first practice at intended altitudes and speeds in order to obtain maximum feedback about problems encountered by crews without the advantage of specific knowledge that the MR environment can provide? With respect to post-mission feedback, crew self assessments and assessments by experts observing the MRD mission are obvious sources of feedback to crews.

In addition, multiple currently available mission planning devices contain capabilities to provide enhanced information about selected mission performance parameters. As one example, the Comarco Marc III and IV provide a graphic approach to vulnerability assessment. Color-coded bar charts depict the relative danger along the route, specific weapons responsible for the danger, and how much the relative danger can be reduced by different types of Electronic Counter-Measures. To what extent can such enhanced feedback data sources contribute to effective mission rehearsal?

Instructional Features

At present, most planned MRDs will double as training devices. Therefore, the instructional features of the Training Devices (TDs) will be available to the mission commander who conducts an MR. Some areas of fruitful research are the determination of; which instructional features will be useful for MR, how and when they should be used, and whether there are any additional features which should be added. Following is a discussion of a sample of instructional features and how they might be used for MR. In the discussion we present a number of assumptions and hypotheses about what an MRD would need. All of these assumptions and hypotheses can and should be tested via a research program.

Record/Playback - This function in a TD is used to provide opportunities for the trainee to receive additional intrinsic feedback opportunities beyond what he can get from the scenario as he goes through it for the first time. In addition, it allows the instructor to provide extrinsic feedback and remediation.

This feature would appear to be very important for a mission commander as he gives feedback to his aircrews. The feature will allow him to show particularly problematic sections of the MR over and over until the aircrews can perform maneuvers to his satisfaction. It will also allow the aircrews to try different approaches to countering threats so that the commander may decide which approach will prove most effective.

We would expect the aircrews undergoing MR to desire a variety of viewing of angles when examining the playback of the visual scene at crucial junctures of the mission. This would allow them to more fully understand the nature of the threat. The aircrews would probably want more viewing angles than a TD instructor would normally want to show his trainees. Too much visual feedback could confuse a trainee who is not mission qualified.

One additional record-playback feature that might prove useful for an MRD, but not a TD, would be a mechanism which would allow an individual crewmember to determine his own

record-playback. That is, since a qualified aircrew member should have developed a good set of cognitive strategies we would want him to have the capability of determine what kinds of feedback he wants to receive. In a TD we seldom give a trainee such feedback latitude because we assume his cognitive strategies are still developing.

Freeze - The freeze function in TDs allows the instructor to stop the action, administer extrinsic feedback and corrective advice, and then proceed with the training scenario. Or, on occasion, the instructor may freeze the TD and allow the trainees to reorient themselves and gain intrinsic feedback without the instructor's help.

Normally we would not expect an MRD to require a freeze function because we want the scenario to proceed in as realistic manner as possible. Obviously, real life missions do not freeze in mid-air. However, it does seem quite possible that a mission commander may want to stop action in a particularly important point of the mission to discuss threats and potential alternative solutions. The Commander may need extra aids, not normally available to a TD instructor, because he wants to highlight, enhance and embellish certain cues that the crewmember may not readily see (e.g., a surface-to-air missile hidden in camouflage). In addition, the mission commander may want to quickly add certain threats that he thinks might be in place by the time the Force flies their mission.

Remote Display - This capability could be used to allow other forces at remote locations who will participate in the mission to understand how the force undergoing MR will act and react under certain mission conditions. They could put themselves into any particular aircraft and crewmember position, or they could get a bird's-eye or enemy's eye view of the mission as it progresses. Research could help determine how much of the MR the additional forces need to see and the best vantage points for their observation.

Demonstration Capability - We feel this instructional feature could prove to be most valuable to a mission commander conducting MR. The commander must be able to show his aircrews how he wants certain critical parts of the mission flown. Presently, a commander can only use films, still photos or sketches of what a target and its approaches look like. He then must give lengthy explanations as to how he wants particular situations handled. With a demonstration capability he can literally show, instead of explain, what he wants done and how he desires it to be performed.

One can imagine at least two methods for performing demonstrations. The first method would allow the demonstration to be performed in a large auditorium setting with all aircrews assembled while the commander uses a large screen display to show visual and sensor scenes of the situation he is addressing. The second approach would have each of the aircrew members sit at their respective stations while the commander performs the demonstration. Each approach has advantages and research could help determine which method is most effective.

Computer Based Instruction - In a TD an instructor might use a computer-based training (CBT) capability to allow the trainee to receive initial academic instruction that could be tailored to the trainee's learning style. It would also save the instructor from having to give separate instruction to a number of different aircrew members at different positions who require instruction unique to their positions. CBT can also be used by the instructor for remedial instruction should it be deemed necessary.

This capability could be especially helpful in MR. If the commander or the crewmember feels that an important set of information or procedures needs to be refreshed, such as an old generation threat system unique to the specific target area, the CBT function could be used. If the appropriate CBT lessons had been developed for the TD using it for MR should be relatively straight forward. Research could focus on when the CBT should be used and how best to streamline it for a mission qualified aircrew member.

Performance Measurement Capability - This capability could be especially helpful for MR. If the appropriate performance measures could be developed, a mission commander could look at not only outcome measures (i.e., targets reached; bombs, missiles and bullets on target) but also process measures. These process measures would allow the commander to determine exactly what went wrong and when. If the commander only knows that the MR succeeded or failed he may not know exactly where the force's strengths and weaknesses lie. That may mean he won't know how to make corrections should the MR prove to be a failure. Such corrections might include; scrub the mission, alter the mission, change the force package, replace certain crewmembers.

The difficulty is first knowing which performance measures are important. As we mentioned earlier in the paper, the digital computers on TDs and MRDs can record just about any inputs and outputs made in the devices. But which ones are most important? Since time is likely to be a critical factor in an MR we can't afford to wait until the first MR is run to determine which of the myriad possible performance measures are important. Research can help here. Unfortunately, the training research community's track record for determining the important performance measurement categories for training has been less than satisfactory.

Feedback to the Training System

The ultimate measure of effectiveness for aircrew training is the ability of crews to perform their operational missions. Currently, standardization/evaluation data, Operational Readiness Inspection (ORI) results, performance on higher headquarters missions, and a variety of training data can be factored into assessments of training effectiveness and adequacy. Each of these provides valuable information, but even collectively, these data

provide only partial knowledge and they often focus on crewmember performance under peacetime conditions. The information of most direct relevance is, of course, the performance of crews during actual combat operations. Feedback to the training system from this source comes primarily from post-mission recollections of participants and from gross mission outcomes. These evaluation data sources will continue to be very important, but they do not provide detailed information about performance problems encountered by crews.

There are at least two ways in which MRDs should have the ability to greatly enhance the quality of information about how the training system prepares crewmembers for their combat missions. The first was during MR itself. While the major function during MR is to rehearse the upcoming mission and assess the feasibility of a given plan, crew performance data from this rehearsal should also provide valuable information about the skills and knowledge of the crews relative to the demands of the mission. The second potential use of the MRD is to enhance post-mission debriefs, providing both an environment to aid recall of critical events, and a diagnostic capability through the performance measurement system to analyze specific crew performance problem areas. Training research issues include identification of skills and knowledge that are most likely to need refresher training immediately prior to the mission, and identification of crew behaviors that are mission critical but that are not included in the normal training environment.

How Should Reliability of Results Be Addressed?

There will undoubtedly be more than enough visibility and pressure on a mission commander to assess the results of any mission rehearsal. While the GO/NO GO recommendation is his, he will have several sources of inputs, different categories of results, and the reliability of each to consider.

The most obvious sources of information are the aircrews, command and control elements, enemy force players, rehearsal controllers, and other participants. Each has his own perspective of the operation, organizational bias, and level of experience. Accommodation must be made to rapidly gather and present each input. An extensive amount of digital audio, and video data will also be available through the simulation. Selecting, collating and presenting these data may be even more of a challenge.

Results can fall into several categories, also. Some of these might be errors in execution plans such as airspace conflicts, unexpected observation by enemy sensors, incomplete plan segments or options, and insufficient communication. In addition, requests for new information or "better ideas" are typically generated.

Commanders have had to deal with these types of problems since military operations began. The challenge will be how to prioritize and assess more information in a shorter time than ever before.

Team Training Research

One area of research that will be especially important to MR is the studies that have examined team training. Work has been going on in this area since World War II (6), (7). A key research issue for MR is, "how should the findings from the team training literature be applied to MR"? A variety of team training concepts appear to be applicable but it will take careful consideration and research to determine just how they should be used.

For example, The Naval Training Systems Center has been conducting a programmatic research effort to examine a variety of team training issues that have remained unresolved (8), (9), (10). One of the findings of the program is that there are two distinct "tracks" of team activity that co-develop over the maturation period of the team. "There is a taskwork track that involves the training-related activities associated with the specific tasks being performed by the team members. There is also a parallel teamwork track that includes those activities that are devoted to enhancing the quality of interactions, relationships, cooperation, communication, and coordination of team members. ... There is evidence that teams evolve through a number of developmental stages. Naval Gunfire Support teams began training with a focus on the basic skills in the area of teamwork. Following this, teams showed independent concern for team work and taskwork. In a final stage of development, teams showed evidence of maturing to a state where their task- and team- related activities became indistinguishable." p. 21 (10).

This concept has important implications for MR. Our Colonel Smith hopes and assumes that his force has matured to the stage mentioned in the quote above. The Colonel obviously does not want to wait until the MR to find out that his assumption about his force's teamwork maturity are not correct. He should be apprised of the team research community's findings long before he gets to MR. He and his staff need to be made aware of methods and techniques that are beginning to emerge that will help the operational community in defining and achieving the proper state of team maturity before MR is attempted. The research community needs to determine how those methods and techniques can be adapted for MR.

Cockpit Resource Management

Another research area which is important to examine is how the training and aviation community's use of Cockpit Resource Management (CRM) Training (often referred to as Aircrew Coordination Training) can aid in MR (13). Especially where precise communication is required both within and between crews, one would think that CRM principles would be helpful. Unfortunately, there has not been a great deal of empirical research in CRM and so

it is difficult to tell exactly which CRM principles would transfer to MR.

Research Agenda

The MRDs associated with the SOF ATS represent a substantial capital investment. Two initial research issues will be to determine how this new technology is best used to maximize the benefits of MR, and to determine the impact of MR activity on subsequent aircrew performance inflight. The SOF program is comprised of individual options, one for each SOF weapon system. Two options are expected to be exercised upon contract award - MC-130E and MC-130H (Combat Talon I and Combat Talon II). MRD test and evaluation would start with relatively traditional government acceptance tests, but because of the lack of prior Air Force experience with MRDs, testing will go on to ascertain the impact of MRD activity on the ability of crews to execute missions in the MRD, and culminate in an exercise that will include rehearsing and performing demonstration missions. Since evaluation of the MRDs cannot be separated from how the MRDs are being used, part of the preparation for this research will be to develop MR strategies. In addition, observable problem areas in mission performance need to be identified, and measures developed. Because the MRDs have the capability to operate with each other, team preparation across crews can be addressed.

Potential areas of interest include:

- Mission plan validation
  - Ability of the MRD to predict mission success
  - Detection of problems with the plan prior to mission execution
  - Improvements in the plan based on MRD feedback
- Degree to which the plan is ultimately followed
- Effects of mission rehearsal on subsequent crew performance inflight
  - Pre-mission problem solving
  - Immediately prior practice
  - Higher fidelity picture of the mission for crew study/memory

Potential data sources include:

- On board observers
- Subject Matter Expert assessments
- Crew self assessments
- Subjective assessment of MRD value
- MRD performance measurement system
- Range data (timing, accuracy, threats - detected, tracked, fired upon, hit)
- Crew debriefing
- Existing TMS data
- Comparison of missions as planned v missions executed

Multiple research strategies are being considered, with the overall goal being to seek concurrence of results across sets of data. Strategies being considered include:

- Classic experimental group and control group comparisons
- Within subject manipulation
- Comparisons with stated objectives (merit)
- Comparisons with operational needs (worth)
- Logically constructed controls
- Case studies
- Historical controls.

Milestones:

SOF ATS Contract Award - 1990
Develop team performance measures - 1991-1992
Delivery of first MRDs (MC-130E and MC-130H) - 1993
MRD demonstrations - 1993-1994

CONCLUSION

Important world changes in the last year have drastically altered the potential threats which the US faces. The official cold war has been proclaimed over (perhaps prematurely). Both the Department of Defense and the popular press have begun to stress the importance of a quick reaction capability for the types of threats and operations that we are likely to see in the future. The fundamental issue is, "How can we best help the Col Smiths of the military accomplish the mission and get their men back home?"

In this paper we have outlined what we think are key behavioral issues that should be addressed by the operational and research committees if we are to feel confident that we will be able to take best advantage of our current and future MR capability. We have also presented a general plan for the research on MR that we intend to conduct at the Human Resources Laboratory. Undoubtedly, there are more issues than we have mentioned here.

The important point is that the Special Operations Forces community, the training and training device community, and the research community need to work closely together in identifying the key issues that should be addressed. It is clear that the issues we face will require more than work than one community alone can do. That means that the training research labs from all three services should work together in marshalling their resources for this important research challenge. In addition, the research capabilities of industry, academia and foreign allies can, and should, look closely at the behavioral MR challenges. We at the Human Resources Laboratory intend to be on the forefront of this research effort. We encourage other government and industry training research laboratories to also examine issues crucial to good Mission Rehearsal.

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