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Training Gaps for the One System Remote Video Terminal: Observations from the Joint Readiness Training Center

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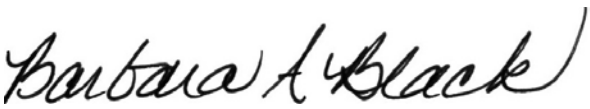

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The One System Remote Video Terminal (OSRVT) is a combined system (including antennas, receiver, modem, and ruggedized personal computer) that receives and displays video and downlink data from a variety of unmanned and manned aircraft systems. The system is typically deployed either in a tactical operations center (TOC) or on a vehicle (e.g., Stryker) and operated by NCOs or junior officers. This information provides observers with critical near real-time battlefield information. Recently, however, informal observations by both training personnel and Soldiers suggest that while some OSRVT operators are capable of successfully using the system to support unit operations, others struggle to incorporate its capabilities. To address this issue, the present research documents current OSRVT use at the Joint Readiness Training Center and identifies the training gaps impeding its effective integration into tactical operations. The present results identify a range of issues impeding effective OSRVT utilization including a mismatch between those receiving formal training and those ultimately responsible for system operation, an absence of command emphasis on system integration, and the failure of leadership to clearly specify how OSRVT information should be utilized. Specific recommendations on improving the contribution of OSRVT information to mission planning and execution are also provided.

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TRAINING GAPS FOR THE ONE SYSTEM REMOTE VIDEO TERMINAL: OBSERVATIONS FROM THE JOINT READINESS TRAINING CENTER

EXECUTIVE SUMMARY

Research Requirement:

The One System Remote Video Terminal (OSRVT) is a combined system (including antennas, a receiver, a modem, and a ruggedized personal computer) that receives and displays video and downlink data from a variety of unmanned and manned aircraft systems. This information provides observers with critical near real-time information on the battlefield. Recently, however, informal observations by both training personnel and Soldiers suggest that while some OSRVT operators are capable of successfully using the system to support unit operations, others struggle to incorporate its capabilities. To address this issue, the present research formally documents current OSRVT use at the Joint Readiness Training Center (JRTC) at Fort Polk, LA and identifies the training gaps impeding its effective integration into tactical operations.

Procedure:

Observations tied to OSRVT operational use during mission-readiness exercises (MRE) were conducted at JRTC and during OSRVT training immediately prior to the MRE (i.e., pre-rotational training). The first goal was to understand the OSRVT training and training context provided by the Field Service Representative (FSR) at JRTC. The second goal of these observations was to identify areas of potential training gaps related to the operational employment of the OSRVT. This research was executed in two separate phases. The first phase (see Phase 1 Methods) was primarily exploratory and intended to identify the core OSRVT training-utilization issues. Based on Phase 1 observations, we then developed interview protocols that allowed us to further explore these issues systematically in Phase 2 (see Phase 2 Methods).

Findings:

The present results indentified a range of issues impeding effective OSRVT utilization including a mismatch between those receiving formal training and those ultimately responsible for operating the system, an absence of command emphasis on system integration, and the failure of leadership to clearly specify how OSRVT information should be utilized. Specific recommendations on improving the contribution of OSRVT information to mission planning and execution are also provided.

Utilization and Dissemination of Findings:

The present findings suggested that undertaking any of the provided recommendations can substantially improve the contribution of the OSRVT system to mission planning and/or execution. At a broader level, they also highlight the bigger challenge of contending with new technologies and additional data in the present-day Tactical Operations Center. Whereas many technologies can in principle provide information that enhances survivability or lethality, the present results indicate that consideration of these systems in isolation and not in the context of existing force integration is problematic. Effective use of information technologies such as the OSRVT depends on each system's effective integration into the training regimen and the operational dynamics of the organization in which those technologies are placed.

Given the strong conceptual and operational links with other, newer intelligence and reconnaissance systems including Small Unmanned Aircraft Systems (e.g., Raven, Puma) and small unmanned ground vehicles (SUGVs), consideration of the training and utilization issues identified here can promote more effective, efficient operational integration of these and future systems across a range of mission planning and execution contexts.

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TRAINING GAPS FOR THE ONE SYSTEM REMOTE VIDEO TERMINAL: OBSERVATIONS FROM THE JOINT READINESS TRAINING CENTER

Background

The One System Remote Video Terminal (OSRVT) is a combined system (including antennas, a receiver, a modem, and a ruggedized personal computer) that receives and displays video and downlink data from a variety of unmanned and manned aircraft systems. The system is typically deployed either in a tactical operations center (TOC) or on a vehicle (e.g., Stryker) and operated by NCOs or junior officers. By accessing information available from a range of air assets, the OSRVT can provide critical near real-time data aiding the assessment of enemy locations, battle damage, enemy terrain, potential threats and potential assets. The OSRVT is thus capable of serving as an effective force multiplier.

At the most basic level, effective OSRVT use entails (a) knowledge of basic set-up procedures and operating tasks (e.g., assembly, inputting correct frequencies) and (b) the ability to plan for, acquire, and communicate mission-appropriate information to Leadership. Recently, however, informal observations by both training personnel and Soldiers suggest that these knowledge, skills, and abilities are often lacking or entirely absent in those assigned to use the OSRVT. In particular, while some OSRVT operators are capable of successfully using the system to support unit operations, others struggle to incorporate its capabilities. Consequently, the OSRVT system is often underutilized or neglected altogether.

To understand the sources of this problem, the present research seeks to formally document current OSRVT use and identify the training gaps impeding its effective integration into tactical operations. To this end, we chose to conduct our observations at the Joint Readiness Training Center (JRTC) at Fort Polk, LA. Observations conducted during operational training exercises were particularly useful because that context closely replicates the in-theater environment for intended system use. In addition, because JRTC provides pre-rotational OSRVT training, we can further draw a direct link between that training and its impact on OSRVT use and unit operations.

Method

In order to directly assess the relation between current OSRVT training and system utilization, we conducted observations tied to OSRVT operational use during mission-readiness exercises (MRE) at JRTC, Fort Polk, LA and during OSRVT training immediately prior to the MRE (i.e., pre-rotational training). The first goal was to understand the OSRVT training and training context provided by the instructor and Field Service Representative (FSR) at JRTC. The second goal of these observations was to identify areas of potential training gaps related to the operational employment of the OSRVT. This research was carried out in two separate phases. The first phase (see Phase 1 Materials and Procedures) was primarily exploratory and intended to initially identify the core OSRVT training-utilization issues. Based on these Phase 1 observations, we then developed interview protocols that allowed us to further explore these issues systematically in Phase 2 (see Phase 2 Methods). The Phase 2 observations also provided an opportunity to confirm that the issues raised in Phase 1 are recurrent for the OSRVT and not simply unit-specific challenges.

Phase 1 Materials and Procedures

The Day 1 efforts in Phase 1 focused first on discussion with the instructor/FSR about the content and emphasis of the formal pre-rotational OSRVT instruction period (emphasizing system set-up and basic operations) as well as general student population characteristics. Following this initial discussion and overview, observations of OSRVT use were made in conjunction with the FSR's service rounds to various TOCs and joint command outposts (JCOP). These visits included both informal assessments of OSRVT activity (e.g., active OSRVT operator present, correct system setup) as well as discussions with OSRVT operators on training and system utilization issues.

Day 2 observations focused solely on the operational use of the OSRVT in a Brigade (BDE) and a Battalion (BN) TOC. Discussions with command and staff as well as with the JRTC Trainer/Mentors also occurred on Day 2. Across Day 1 and Day 2, observations were made in one BDE TOC, four BN TOCs, and two JCOPs. Information from informal discussions came from one BDE Intelligence Trainer/Mentor (Chief Warrant Officer - 4), one BN Command Sergeant Major (CSM), one BN Battle Non-Commissioned Officer (NCO; Sergeant First Class), one BN Fires NCO/Comms NCO (Staff Sergeant), one BN Radio Telephone Operator (RTO), and one Company RTO.

Phase 2 Materials and Procedures

Based on the issues identified in the Phase 1 observations, we developed two interview protocols, one for OSRVT Leaders (Appendix A) and one for OSRVT Operators (Appendix B). These protocols were intended to provide a more systematic, structured, and thorough coverage of the potential OSRVT training issues across the varying duties. In addition to these interview protocols, we also developed a general unit data collection sheet (Appendix C) outlining the core indicators of OSRVT use or non-use (e.g., equipment plugged in, video feed displayed).

Phase 2 Observations and interviews were carried out on two consecutive days approximately six months after Phase 1. Across the two days, information was gathered at two BN TOCs and one BDE TOC. We conducted two leader interviews, one with a BN Battle NCO (Staff Sergeant) and the second with a Unmanned Aircraft System (UAS) Platoon Leader (Chief Warrant Officer-3). The four operator interviews consisted of three S-2 collection managers (Second Lieutenants), and one BN Fire Support NCO (Staff Sergeant). Although the limited number of participating Soldiers (whether operators or leaders) and command units precludes a statistical analysis of our results, in the aggregate these differing data collection aids provide a convergent foundation for our later conclusions (Cook & Campbell, 1979). As with Phase 1, all interviews were conducted within the TOCs themselves and only during appropriate lulls in the training activities. While this did somewhat constrain the timeframe and extent of our interactions, it also reduced the dependence of interview responses on the recall of distant events and experiences; Soldier interaction with or consideration of the OSRVT system immediately preceded most of our interviews.

Results and Discussion

The combined Phase 1 and Phase 2 results detailed below can be effectively separated into two broad categories of training issues. The first category focuses on the formal pre-rotational training and the related student characteristics limiting the effectiveness of formal training and system operation. The second category focuses on the effective use of information the OSRVT provides to battlestaff. For the OSRVT to be an effective force multiplier, Leaders and battlestaff must understand its capabilities and appropriately utilize the information provided by the system. Conversely, commanders cannot use the

OSRVT information to aid mission execution if the system cannot be operated effectively.

Formal Pre-rotational OSRVT Instruction

Discussions with the FSR, who was also an experienced instructor responsible for the formal instruction of OSRVT use and core employment capabilities at JRTC, first highlighted the challenges of the limited, three-hour training session. Given the complexity of the physical set-up of the system itself, the bulk of this instructional time was focused on component identification and assembly (although broad treatment of system employment was also provided). This training included both slide presentations and hands-on training exercises to provide direct, practical experience with the system prior to use in the JRTC exercises. Follow-up discussion with the FSR indicated that while this time window does provides the minimum instructional period for Soldiers to learn basic OSRVT operation and setup, additional instructional time is necessary to elevate Soldier skill levels beyond basic competence and knowledge to more skilled system operation.

In considering the practical constraints of the limited three-hour training window, it is useful to also note that informal FSR observations over multiple pre-rotational training sessions indicate that most Soldiers enrolled in the pre-rotational training courses have never heard of the OSRVT. They also do not know why they were selected to attend the training. This is problematic given that motivation and perceived relevance are particularly important for successful adult learning outcomes (Salas & Cannon-Bowers, 2001; Colquit, LePine, & Noe, 2000). Consequently, many Soldiers in the course have little incentive to actively participate and master the course material. This is particularly problematic given the density of information that must be presented within the limited training window. In the absence of clear motivation and sustained concentration, those Soldiers receiving formal training are unlikely to acquire the skills and knowledge required to operate the OSRVT.

Conversely, it was also noted (and subsequent operator interviews confirm) that many of the Soldiers who ultimately use the OSRVT downrange never receive formal training. According to the FSR, "Seventy-five percent of those in the course will never use it [the OSRVT] and most of those who end up using it were never trained [in a course]." While the exact percentage could not be empirically verified, the general tenor of this comment was nonetheless consistent with our subsequent observations and discussions. None of the four operators interviewed in Phase 2 had received any formal OSRVT training. Moreover, as one interviewed leader noted, availability rather than responsibility determines who is sent to receive formal OSRVT training: "Usually pre-rotational training at JRTC is a waste because they typically send guys to fill the slots, not the correct people who will actually be using the system….[they] just send whoever."

Such mismatches between trained personnel and operator personnel represents a substantial barrier to training effectiveness and greatly limit the ability of TOCs to properly set up, operate, and employ the OSRVT. As one future OSRVT operator commented during Phase 2, the absence of formal training with system represents "a severe misallocation of resources."

OSRVT Operations and Battlestaff

The following sections detail five core themes that emerged from JRTC observations during Phase 1 and Phase 2. Although many descriptive schemes and groupings were possible, the following themes cover topics central for OSRVT operations and carry implications for both the ability to operate the system and the ability to utilize information from the system. These themes identify recurring operational issues that can be leveraged to improve training. In some cases, these themes represent persistent, Army-wide training challenges such as the degree of command emphasis on the system being trained, selection of the correct personnel for training, and the transfer of training to system employment. However, two additional themes tied to the use of OSRVT information by commanders and staff, are unique to the

OSRVT.

Centrality of command emphasis. Information gathered across Phase 1 and Phase 2 in differing TOCs indicated that command emphasis plays a critical role in the utilization of the OSRVT. In the most direct terms, in the presence of command emphasis, the system is typically set up and integrated into TOC operations. Although it was not readily clear whether command emphasis directly influences the selection of Soldiers assigned to formal OSRVT training, it was observed that TOCs effectively incorporating the OSRVT placed noticeably engaged and capable NCOs in the position of overseeing the system. Previous command experience with the OSRVT in Iraq and Afghanistan also appeared to increase the degree of command emphasis, with one leader citing his self-taught skills and previous in-theater experience with the OSRVT as the basis for integrating it into the JRTC exercises.

Even with command emphasis, however, the observed OSRVT use appeared was limited to the core live video viewing capabilities. Phase 1 observations indicated that video recording, telemetry, and the supplementary planning tools were not used extensively in any of the TOCs. Formal follow-up in Phase 2 confirmed these observations, with none of the four interviewed operators using these tools. Subsequent clarification indicated that these operators were either simply unaware of these capabilities or were aware but not sufficiently trained to use them.

A general lack of command emphasis both arises from and contributes to such utilization gaps. As with any system, current and future command emphasis for the OSRVT is fundamentally shaped by the *perception* of what the asset can bring and how well this perception aligns with the *true system capabilities*. A top-down approach in which commanders and leaders are formally familiarized with the OSRVT might help address this problem by aligning these perceptions with the system's true capabilities. This is consistent with the opinion of one interviewed leader who suggested that formal training for the OSRVT system and its capabilities could enable leaders to subsequently incorporate and guide effective OSRVT employment. Notably, current leader courses at the Maneuver Center of Excellence, such as the Maneuver Captains Career Course, have recently begun to incorporate the OSRVT, although the operational consequences of this exposure have yet to be determined.

Command emphasis is not purely a top-down process however. Rather, command emphasis may also be shaped by bottom-up processes. For example, Phase 1 observations and interviews identified one particularly motivated NCO operator who had received formal pre-rotational training. His specific success in setting up and utilizing the OSRVT system ultimately drew commander attention to the system and led to its consistent incorporation into subsequent TOC processes (see below for additional related discussion). This outcome, while perhaps atypical, suggests that sufficiently skilled, motivated operators can effectively create an emergent command emphasis by bringing OSRVT system capabilities to bear on mission-relevant problems. It also further highlights the potential upstream impact of sending or not sending appropriate personnel to pre-rotational training.

Informal training and prior knowledge. While the gap between formal training and system operation is clearly important, those participating in the Phase 1 discussions indicated that Soldiers downrange appear to be overcoming some of these gaps, learning about the OSRVT through various combinations of informal peer-to-peer instruction, trial and error, and "quick cards". One operator interviewed in Phase 2 first learned to use the system in theater by sitting with the S-2 and receiving direct instruction. Soldiers operating the OSRVT prior to deployment might therefore provide some form of peer-to-peer instruction. One Phase 2 operator suggests that this might not always be practicable, however, noting that while there were other Soldiers in his unit that knew how to use the system, he did not know who they were.

Although it cannot be readily determined what the Soldiers are learning (or not learning) about OSRVT capabilities and operations through informal training, these opportunities do potentially increase

the number of functional OSRVT systems. Moreover, those already having some prior knowledge of the system might particularly benefit from the formal pre-rotational training (Shapiro, 2004; Schaefer & Dyer, 2012). The benefits of prior knowledge may also extend beyond Soldiers with prior OSRVT experience to those who are simply familiar with Small Unmanned Aircraft System (SUAS) or Shadow operations because they will already be familiar with the information those assets can effectively provide. One Phase 1 interview also suggested that even front-line experience can serve as informative prior knowledge because that experience facilitates more accurate and more immediately actionable interpretations of observed ground events. Another Phase 2 leader further indicated that his background in electronics was helpful in understanding system capabilities. While one must interpret these isolated cases with some caution, as a whole they do indicate the capacity of OSRVT training to leverage prior knowledge drawn from a range of experiences.

Of course, the potential advantage of prior knowledge for skill and knowledge acquisition also implies that the absence of prior knowledge impairs OSRVT utilization, at least in the short term. Our finding that three of the four operators interviewed in Phase 2 had never heard of the OSRVT prior to being selected as an operator provides stands as evidence that personnel selection issues beyond pre-rotational training may be impacting effective OSRVT use.

Operational difficulties linked to training. One consequence of the failure to formally train the appropriate OSRVT users was that most of the observed operational difficulties could be linked to topics directly addressed in pre-rotational training. These operational difficulties can be attributed to gaps in either equipment knowledge or software knowledge. Equipment-based problems included incorrect antenna positioning (e.g., placed on its side below the roofline and between two metal buildings) or incorrect cable connections during system setup. It is worth noting, however, that color-coded placards with reader-friendly diagrams were also provided by the FSR in each OSRVT container to guide those with little or no previous formal training. Thus, the failure to properly set up the equipment cannot be solely attributed to the absence of formal classroom training.

In the case of software, Phase 1 observations indicated that many Soldiers had difficulty obtaining the required radio frequencies or entering them in the user interface. Without the ability to obtain and set frequencies, one cannot access air asset data. As with equipment problems, these difficulties arose even though information about obtaining and entering the requisite frequencies is provided during pre-rotational training. These observations are consistent with comments from three of the four operators formally interviewed in Phase 2 who specifically wanted more information and training about system optimization and frequency selection.

In addition to problems with inputting radio frequencies, the TOCs also consistently failed to use the OSRVT tools available in the video toolbar (e.g., recording and stored target list) and the map control toolbar (e.g., “view”, “draw”, and “symbol” tools). In those cases where video information was acquired, telemetry information was not displayed. These observations collectively indicate that the OSRVT provides a number of underutilized tools, with a failure to master basic operational skills further hindering system utilization. One issue, however, may simply be the complexity of the system, with one Phase 2 operator specifically suggesting a separate class simply for the supplementary planning tools. Another Phase 2 operator noted that he was simply unaware of these additional capabilities.

In considering these observations, it is worth noting statements from one leader in Phase 2 who indicated that the operators have access to alternative software planning tools which they already know well (note: the specific tools were not specified). The underutilization of system features may therefore reflect redundant capabilities and does not necessarily reflect a weakness in TOC information processing or planning per se.

Intelligence and tactical applications. The information provided by the OSRVT can be used by battlestaff for intelligence, surveillance, and reconnaissance (ISR) preparation (i.e., planning future missions) or for reconnaissance, surveillance, and target acquisition (RSTA) execution (i.e., executing current mission). These two uses of OSRVT information significantly impact secondary training requirements for the system and require commanders to actively determine how the OSRVT is to be used. This training issue is also bound up with understanding effective utilization of the aircraft platforms providing data to the OSRVT.

In the case of ISR applications, a systematic, planned, and consistent use of the OSRVT is required to gain intelligence of enemy movements, patterns of life, and other important information regarding enemy operations. The frequent diversion of UAS assets from ISR duties to bring all eyes to a location "after the boom" rather than "before the boom", also appears to be a consistent problem downrange. In the words of one Soldier from Phase 1, "Once the boom happens, it's too late and it [the OSRVT] just becomes 'kill TV' ", wherein Soldiers passively observe the video feed rather than actively processing it in support of future actions. A disciplined planning for OSRVT information is therefore required for the system to be an effective ISR asset.

Likewise, OSRVT information can support RSTA operations by providing important information during the prosecution of a target or can free lines of communications when troops are in contact. As one BN CSM in Phase 1 stated, "Instead of wasting time and asking those on the ground 20 dumb questions, I can see the general relations in the [OSRVT] picture and ask the *one* question that I need answered to help those in contact with the enemy."

Although there is some concern that the OSRVT might be used to micromanage the fight from the TOC, it was generally felt that most commanders would readily recognize the problems with such an approach. Nonetheless, one leader from the Phase 2 interviews did state "Guys on the ground are too busy to deal with this stuff. They want something that can observe and fire."

Taken together, these statements reflect some degree of conflict about the current and ideal states of OSRVT use at the TOC level. This issue takes on a greater complexity when one also incorporates the contribution of the aircraft navigator responsible for providing the pictures. In cases where the assets are not providing the desired view, it is necessary for the OSRVT operators to directly or indirectly provide guidance to the navigator. Such communication, which depends on complex spatial cognition processes and situational awareness, is not straightforward (Levinson, 2003; Strater, Jones, & Endsley, 2001; Endsley et al., 2000). These conflicts leave ample room for confusion and the inconsistent application of available assets. Indeed, one leader in Phase 2 pointed to the need for training specifically focusing on effective communication with the aircraft navigator.

The challenges at the interface of the system and Soldier are potentially compounded by the inconsistency or absence of leader guidance on OSRVT use. For instance, while one leader interviewed in Phase 2 regarded the applications of OSRVT use as "self-evident", the Phase 1 observations detailed above instead indicated a fairly clear distinction between ISR and RSTA applications. Inconsistencies at the level of leadership are fittingly captured by Phase 2 operator comments such as "Our leaders are unsure and inexperienced about how to employ it" and "Our leaders are familiar with the system but there is no guidance on the usage of the system."

In sum, while the OSRVT can be a valuable tool for both ISR and RSTA missions, effective use of the system depends on a clear understanding of the OSRVT's role in the selected mission. Absent that clear understanding, the OSRVT simply becomes "kill TV" in the TOC.

Information flow. Although the ISR and RSTA approaches are somewhat different, they both represent an *active* rather than a *passive*, "kill TV" use of the OSRVT information. Observations and discussions carried out in both Phase 1 and Phase 2 indicate that the active use of OSRVT information may take the form of either "pulling" or "pushing". In information "pulling", a decision maker (i.e., a Leader) actively seeks a particular type of information for a given purpose (e.g., ISR), with the OSRVT system specifically setup to provide that information. Such "pulling" thus requires a decision maker who fully understands OSRVT capabilities and who has integrated the OSRVT into unit decision processes. Phase 1 observations suggest that "pulling" mostly occurs when a Leader has direct in-theatre command experience with the OSRVT. The Phase 2 observations were consistent with this initial finding, with the one leader already familiar with the OSRVT from previous in-theater experience indicating a preference for pulling information up to leadership.

By contrast, in an observed Phase 1 example of information "pushing," a motivated and skilled NCO provided OSRVT information to commanders who were not as familiar with the system. In this case, "pushing" OSRVT information provided Leaders with new information that would not have been otherwise available. It is important to note that according to the FSR, the observed NCO made an unusually strong effort to learn the material in the OSRVT pre-rotational course. As a result, it appears that particularly knowledgeable, skilled, and/or motivated staff may work to integrate OSRVT information into the chain of communication when command emphasis is lacking.

The limited number of observations precludes any comprehensive comparison of "pushing" versus "pulling" although there does not in principle seem to be a reason that both cannot be used effectively. This is consistent with comments from one Phase 2 operator who indicated that OSRVT information can be effectively pushed or pulled according to the specific mission (although no additional elaboration was provided).

Conclusions and Recommendations

The results indicated that a lack of knowledge at the command and/or staff levels currently limits the operational use of the OSRVT system. Chief among these issues is the assignment of appropriate personnel to the requisite formal OSRVT operator training already available at JRTC. The problems with basic OSRVT system setup and operations observed with different Brigades and TOCs across the two phases of data collection will likely continue until this operator training issue is systematically addressed. Leader knowledge of the system represents a second, closely-related critical concern as this impacts not only the selection of the personnel for training but also the role of the OSRVT in mission planning and execution. These two overarching concerns form the basis of the following specific recommendations:

- Operators and Leaders should be given brief familiarization training on the appropriate applications of the OSRVT with respect to both ISR and RSTA use. This will help insure that Leaders make informed, deliberate decisions regarding their use of the system within the TOC. In cases where Leaders have not received that information, suitably prepared operators can provide that information to leadership.
- Leaders should offer specific guidance to OSRVT operators and related staff on how OSRVT system capabilities will be integrated into current mission planning and/ or execution after they have been familiarized with the system capabilities. This includes the use of both "pushing" and "pulling" of information in accordance with staff capabilities and unit standard operating procedures.
- Leaders should give consideration to the value of prior knowledge with respect to selecting OSRVT operators where possible. These considerations include prior direct experience with unmanned air assets such as the Shadow, Raven, or Puma, in-theater experience with the OSRVT

system itself, or in-theater experience relevant to ground Soldier tactics or reconnaissance.

- Leaders should assign appropriate personnel to the available OSRVT pre-rotational training course (e.g., second lieutenants serving as S-2 collection managers). Alternatively, in cases where this is not possible or otherwise undesirable, the person assigned to the course should be given explicit responsibility for directly assisting the ultimate OSRVT operator with both system set-up and basic operations. This peer-to-peer instruction will serve to increase the engagement and motivation of those in the course who would otherwise have no future contact with the system. It will also reduce the learning burden for OSRVT operators lacking the direct formal training.

At a local level, the present findings suggest that undertaking any of these recommendations will substantially improve the contribution of the OSRVT system to mission planning and/or execution. Yet, at a broader level, the clear training gaps, the range of intended OSRVT applications, and the variable understanding of OSRVT capabilities for leaders and operators alike highlights the bigger challenge of contending with new technologies and yet more data in the present-day TOC. The observations of one leader interviewed in Phase 2 capture the current state: "We are just swimming in data and technology… Not everyone knows how to use these systems."

While many technologies may have the capacity to provide information that enhances survivability or lethality, the present results indicate that consideration of these systems in isolation and not in context is problematic. Successful use of the OSRVT depends on a range of integrated issues including leadership, personnel selection, training exposure, communication, prior knowledge, and information flow. Effective use of information technologies such as the OSRVT does not therefore depend solely on inherent system capabilities. Rather, it depends on the system's effective integration into the training and operational dynamics of the organization in which it is placed (Nissen & Burton, 2011; Nissen, 2011). To be sure, the OSRVT is a relatively new system of perhaps secondary import. The issues identified here do not therefore necessarily directly generalize to more primary systems. Nonetheless, the OSRVT does maintain strong conceptual and in some cases operational links with other, newer intelligence and reconnaissance systems including SUASs (e.g., Raven, Puma) and small unmanned ground vehicles (SUGVs). Understanding and successfully addressing the issues identified in the present case may thus promote more effective, efficient operational integration of these and future systems.

References

Cook, T.D. and Campbell, D.T. (1979). *Quasi-experimentation: Design and analysis issues for field settings*. Houghton Mifflin. Boston.

Colquitt, J.A., LePine, J.A., & Noe, R.A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology, 85*, 678-707.

Endsley, M.R., Holder, L.D., Leibrecht, B.C., Garland, D.J., Wampler, R., & Matthews, M.D. (2000). *Modeling and Measuring Situation Awareness in the Infantry Operational Environment* (Research Report 1753). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (DTIC No. ADA372709)

Levinson, S.C. (2003). *Space in language and cognition.* Cambridge University Press: Cambridge

Nissen, M.E. (2011). Designing inter-organisational collectivities for dynamic fit: stability, maneuverability and application in disaster relief. *International Journal of Design and Engineering, 1,* 276-291.

Nissen, M.E. & Burton, R.M. (2011). Designing organizations for dynamic fit: System stability, maneuverability, and opportunity loss. *IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Human, 41*, 418-433.

Salas, E. & Cannon-Bowers, J.A. (2001). The science of training: A decade of progress. *Annual Reviews of Psychology, 52,* 471-499.

Schaefer, P. S. & Dyer, J.L. (2012). Bridging the gap between adaptive training research and Army practice, *Military Psychology, 24,* 194-219.

Shapiro, A.M. (2004). How including prior knowledge as a subject variable may change outcomes as learning research. *American Educational Research Journal, 44,* 159-189.

Strater, L.D., Jones, D., & Endsley, M.R., (2001). *Analysis of Situation Awareness Training Requirements* (Technical Report 1123). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (DTIC No. ADA399391)

Acronyms

BDE	Brigade
BN	Battalion
FSR	Field Service Representative
ISR	Intelligence, Surveillance, and Reconnaissance
JCOP	Joint Command Outposts
JRTC	Joint Readiness Training Center
MRE	Mission-readiness Exercises
NCO	Non-commissioned Officer
OSRVT	One System Remote Video Terminal
RSTA	Reconnaissance, Surveillance, and Target Acquisition
RTO	Radio Telephone Operator
SUAS	Small Unmanned Aircraft System
TOC	Tactical Operations Center
UAS	Unmanned Aircraft System

Appendix A

OSRVT Leader Interview Protocol

Observer_____Location JRTC/ NTC Date_____Time_____
Unit/ Cell _____Soldier Duty Position_____Soldier Rank_____

Leader Interview

1) Did your OSRVT operators receive formal classroom training?

2) Do you think your operators need additional training for OSRVT operations? If so, on what aspects of operation?

3) Do you trust your OSRVT operators to efficiently and competently provide the information you need?

4) Have you directly operated or assembled the OSRVT system?

5) How did you become familiar with the OSRVT system?

6) How did you select your OSRVT operator?

7) Did you receive formal classroom training for OSRVT operation?
    a. No
    b. If Yes
        i. Where did you receive formal training?

        ii. Was the formal training useful?

        iii. Did your training include hands-on experience?

        iv. Did you know what the OSRVT system was before the training?

        v. Do you know why you were selected for training?

        vi. Did you expect to use the system?

8) Did you receive formal classroom training on leader employment of the OSRVT?
    a. No
    b. If Yes
        i. Where did you receive formal training?

        ii. Was the formal training useful?

        iii. Did you know what the OSRVT system was before the training?

        iv. Do you know why you were selected for training?

        v. Did you expect to use the system?

9) Are there aspects of OSRVT employment for which you would like to receive more training? If so, which ones?

10) Where/when do you think OSRVT training for leaders would be most useful (e.g., MCCC)?

11) Did you incorporate OSRVT capabilities previous to this JRTC/ NTC rotation?
    a. No
    b. If yes,
        i. Home unit?

        ii. In theater?

        iii. How long have you been incorporating the OSRVT system?

        iv. When was the last time you used the system before JRTC/NTC rotation?

12) Where you familiar with UAS assets (e.g., Raven, Shadow) before employing the OSRVT?

13) Have you exchanged information with your peers or other leaders about effective OSRVT use?
    a. No
    b. If yes, how did you exchange this information (e.g., direct conversation, email, etc.)?

14) Do you or your intelligence officers use the telemetry information provided by the OSRVT?

15) Is the OSRVT a regular part of TOC operations?

16) Do your operators use any of the software planning tools available in the system?
    a. No
    b. If yes, which ones?

17) Do you use the OSRVT system for planning when there are no assets in the air?

18) How familiar are the other commanders/ leaders with the OSRVT?

19) Do you usually ask for or “pull” specific information OR do you usually have information “pushed” to you?

20) How do you use the OSRVT?

21) Do you use the OSRVT chiefly as a tactical asset or as an ISR asset?

Appendix B

OSRVT Operator Interview Protocol

Observer_____Location JRTC/ NTC Date_____Time_____
Unit/ Cell _____Soldier Duty Position_____Soldier Rank_____

Operator Interview

Training

1) Did you receive formal classroom training for OSRVT operation?
    a. If No
        i. Do you know why you were selected to use the system?

        ii. Did you know what the OSRVT system was before being selected to operate the system?

        iii. How did you learn to operate the system?
            1. Peer
            2. Self-taught using "quick cards"
            3. Other_____
    b. Yes
        i. Where did you receive formal training?

        ii. Did your training include hands-on experience?

        iii. Was the formal training useful?

        iv. Did you know what the OSRVT system was before the training?

        v. Do you know why you were selected for training?

        vi. Did you expect to use the system?

2) Are there aspects of the OSRVT for which you would like to receive more training? If so, which ones?

Operations

3) Have you operated the OSRVT previous to this JRTC/ NTC rotation?
    a. No
    b. If yes,
        i. Home unit?
        ii. In theater?
        iii. How long have you been using the OSRVT system?
        iv. When was the last time you used the system before JRTC/NTC rotation?

4) Where you familiar with UAS assets (e.g., Raven, Shadow) before using the OSRVT?

5) What technical problems do you usually have with the OSRVT?

6) What do you do when you have problems or questions about the OSRVT?

7) What tools (e.g., "quick cards", training aids) do you use to help you use the OSRVT?

8) Do you provide telemetry information to your unit/ TOC?

9) Is the OSRVT a regular part of TOC operations?

10) Do you use any of the software planning tools available in the system such as Map Control with lines of sight displays or using symbols to mark targeted areas?
    a. If no, why do you not use the planning tools available within the OSRVT system?

    b. If yes, which ones?

11) Do you use the OSRVT system software when there are no assets in the air?

Leadership and Utilization

12) Is your command/leadership familiar with OSRVT system?

13) Is your command/leadership broadly familiar with OSRVT limits and capabilities?

14) When providing OSRVT-specific information to command/ leadership, does command/leadership usually ask for specific information OR do you usually "push" information that you think is useful?

15) How do you use the OSRVT?

16) Do you use the OSRVT chiefly as a tactical asset or as an ISR asset?

17) Are there other Soldiers in your unit that also know how to operate the system? How many?

Appendix C

General Unit Data Collection Sheet

Observer_____ Location JRTC/ NTC Date_____Time_____
Unit/ Cell _____

General Unit Observations

Equipment out of the box	Yes	No	N/A
Equipment plugged in	Yes	No	N/A
Equipment functioning	Yes	No	N/A
Antennae properly mounted	Yes	No	N/A
Video feed displayed	Yes	No	N/A
Telemetry information displayed	Yes	No	N/A
Number of feeds available	_____		
Active assets providing feeds	1_____	2_____	3_____4
Data/ Video feeds visible to TOC	Yes	No	N/A
Planning tools used	Yes	No	N/A
OSRVT actively observed	Yes	No	N/A
Who has the OSRVT asset?	BD S-2	BD S-3	BN S-2 BN S-3 CoIST Other_____