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JADS JT&E-TR-99-014

JADS JT&E



JADS Management Report TF

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December 1999

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Joint Advanced Distributed Simulation
Joint Test Force
2050A 2nd St. SE
Kirtland Air Force Base, New Mexico 87117-5522

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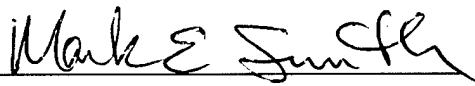
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31 December 1999

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 31 Dec 99	3. REPORT TYPE AND DATES COVERED 1 Oct 94 - 31 Dec 99	
4. TITLE AND SUBTITLE JADS Management Report			5. FUNDING NUMBERS N/A	
6. AUTHOR(S) Patrick M. Cannon, LTC, USA Olivia G. Tapia, Maj, USAF				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) JOINT ADVANCED DISTRIBUTED SIMULATION (JADS) JOINT TEST FORCE(JTF) 2050A 2 nd St. SE Kirtland Air Force Base, New Mexico 87117-5522			8. PERFORMING ORGANIZATION REPORT NUMBER JADS JT&E-TR-99-014	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) OUSD(A&T) DD, DT&E Deputy Director, Developmental Test and Evaluation RM 3D1080 3110 DEFENSE PENTAGON WASHINGTON DC 20301-3110			10. SPONSORING / MONITORING AGENCY REPORT NUMBER N/A	
11. SUPPLEMENTARY NOTES: before 1 March 2000 this report can be obtained from JADS JTF, 2050A 2 nd St. SE, Kirtland AFB, NM 87117-5522; after March 2000 the report is available from either HQ AFOTEC/HO, 8500 Gibson Blvd, SE, Kirtland AFB, NM 87117-5558, or the SAIC Technical Library, 2001 N. Beauregard St. Suite 800, Alexandria, VA 22311.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT DISTRIBUTION A - APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			12b. DISTRIBUTION CODE DISTRIBUTION A UNLIMITED	
13. ABSTRACT (<i>Maximum 200 Words</i>) The Joint Advanced Distributed Simulation Joint Test and Evaluation (JADS JT&E) was chartered by the Deputy Director, Test, Systems Engineering, and Evaluation (Test and Evaluation), Office of the Secretary of Defense (Acquisition and Technology) in October 1994 to investigate the utility of advanced distributed simulation (ADS) technologies for support of development test and evaluation (DT&E) and operational test and evaluation (OT&E). In accordance with the requirements of the Joint Test and Evaluation Handbook, this report was written. This report serves three purposes. First, it provides DDT&E with the Joint Test Director's assessment of the Joint Test and Evaluation to include accomplishment of the chartered mission. Second, it documents lessons learned for consideration in the organization and management of future Joint Test Forces. Third, it provides recommendations for actions to improve efficiency and effectiveness for future Joint Test Forces.				
14. SUBJECT TERMS			15. NUMBER OF PAGES 58	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNLIMITED	

Table of Contents

Executive Summary	1
1.0 Introduction.....	5
2.0 Program Overview	5
3.0 Assessment of Accomplishment of JADS Mission	8
3.1 Accomplishment of JADS Charter.....	8
3.2 Accomplishment of JADS Legacy	10
4.0 Lessons Learned Overview	13
4.1 Organizational Structure	13
4.2 Analysis	15
4.3 Network and Engineering	16
4.4 Support	18
4.5 Contractor Support	20
4.6 Manpower/Personnel	20
4.6.1 General Personnel Issues	20
4.6.2 Army Personnel	22
4.6.3 Air Force Personnel.....	24
4.6.4 Navy Personnel.....	25
4.6.5 Professional Development.....	26
4.7 Budget.....	27
4.8 Facilities	28
4.9 Supply Support	29
4.10 Security.....	30
4.10.1 Classification of Documents.....	32
4.10.2 Distribution Statements	33
4.10.3 Internet Publication Security Procedures.....	33
4.11 Test Management.....	33
4.12 Program Advocacy	35
4.13 Reporting/Legacy.....	36
4.14 JADS Drawdown	37
5.0 Conclusions and Recommendations.....	39

Annexes

Annex A Security Issues and Information.....	41
Annex B Legacy Issues and Lessons Learned.....	46
Annex C Acronyms and Abbreviations.....	52

List of Tables

Table 1. JADS Schedule	5
Table 2. JADS Test Issues	7
Table 3. Direct Funding Profile	28
Table 4. Indirect Funding Profile.....	28

Executive Summary

ES.1 Introduction

This report is intended to preserve the Joint Advanced Distributed Simulation (JADS) management experience for future test planners and directors: what did and what did not work; management lessons learned; assessments of JADS success in achieving chartered goals; and conclusions and recommendations on the JADS management experience.

ES.2 Program Overview

JADS was chartered in October 1994 to investigate the utility of advanced distributed simulation (ADS) for both developmental test and evaluation (DT&E) and operational test and evaluation (OT&E). JADS investigated the present utility of ADS, including distributed interactive simulation, for test and evaluation (T&E); identified the critical constraints, concerns, and methodologies when using ADS for T&E; and finally, identified the requirements that must be introduced into ADS programs if they are to support a more complete T&E capability in the future.

In order to provide the T&E community with tangible proof of the utility of ADS as a methodology, JADS performed three tests: the System Integration Test (SIT) explored ADS support of precision guided munitions (PGM) testing, the End-To-End (ETE) Test investigated ADS support for command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) testing, and the Electronic Warfare (EW) Test examined ADS support for EW testing. The joint test force was also chartered to observe, or participate at a modest level in, ADS activities sponsored and conducted by other agencies in an effort to broaden conclusions developed in the three dedicated test areas.

The following is a summary of the three JADS test programs.

The System Integration Test investigated the utility of ADS to complement T&E of precision guided munitions. SIT was a two-phase test. Phase 1, the Linked Simulators Phase linked hardware-in-the-loop laboratories (HWIL) at the Naval Air Warfare Center Weapons Division (Point Mugu, California, and China Lake, California) representing the shooter and target with an air intercept missile (AIM)-9 Sidewinder HWIL to execute a closed-loop, air-to-air engagement. Phase 2, the Live Fly Phase (LFP) was conducted at Eglin Air Force Base, Florida, where live aircraft flying over the Gulf Test Range represented the shooter and target and were linked to an AIM-120 advanced medium range air-to-air missile HWIL simulation. LFP had both open and closed loops.

The End-to-End Test examined the utility of ADS to complement the T&E of a C4ISR system. ADS was used to provide a robust test environment with a representative number of threats and complementary suite of friendly C4ISR and weapon systems with which the system under test interacted. The Joint Surveillance Target Attack Radar System (Joint STARS) suite of E-8C

aircraft and ground station module was chosen as a representative C4ISR system. The ETE Test was a four-phase test. The first two phases occurred in a laboratory environment suited for exploring DT&E and early OT&E applications. Phase 3 checked compatibility of the ADS environment with the actual Joint STARS equipment, and Phase 4 augmented live open air tests with a virtual battlefield in real time evaluating operational measures of performance.

The Electronic Warfare Test combined the results of three leveraged activities with a three-phase test of a self-protection jammer (SPJ). The leveraged activities were the Defense Modeling and Simulation Organization's (DMSO) High Level Architecture (HLA) Engineering Profederation, Office of the Secretary of Defense's CROSSBOW Threat Simulator Linking Activity (TSLA) Study, and the U.S. Army's Advanced Distributed Electronic Warfare System (ADEWS). The first phase of the SPJ test was a baseline data collection phase executed at both an open air range and a hardware-in-the-loop facility. Phases 2 and 3 replicated Phase 1 in an ADS environment linking the JADS Test Control and Analysis Center, Albuquerque, New Mexico, with the Air Force Electronic Warfare Environment Simulator (AFEWES) in Fortworth, Texas and the Navy's Air Combat Environment Test and Evaluation Facility (ACETEF) in Patuxent River, Maryland. The SPJ was represented with a digital computer model in Phase 2, while an actual SPJ in an installed system test facility was used in Phase 3.

ES.3 Assessment of Accomplishments

Two assessments were conducted: accomplishment of the mission in the JADS charter and accomplishment of the JADS legacy.

JADS did not execute within its original schedule or budget. Of the three chartered tests, the SIT required restructuring because of a 12-month delay in getting a key piece of software developed by a missile program office. The ETE Test execution had to be delayed 12 months as well because of inadequate funding in the first year of the test and difficulty getting a contract vehicle to Northrop Grumman set up. These delays increased the requirement for infrastructure and contractor support in the final year of JADS. Additionally, a mid-test assessment of technical risk determined that JADS had unacceptable funding margins based on the risk involved in the remaining test activities. As a result, the joint test director (JTD) provided a decision briefing requesting additional funding to the Deputy Director of Systems Assessment who provided another \$3.1 million in May 1997.

In spite of the schedule and budget changes, it is the JTD's assessment that JADS was nearly 95 percent successful in accomplishing its chartered mission. The results of the tests were the primary basis for addressing the three tasks in the charter. Present utility was determined to be case specific and proven to exist for certain classes of systems and suspect for others; concerns, constraints, and methodologies as well as requirements to facilitate increased use of ADS were identified and published in test and special reports. Inroads were made into many test organizations and acquisition programs that increased the use of ADS in all facets of test and evaluation. Significant positive impact was made by JADS on the development of the Department of Defense's high level architecture ensuring the needs of the T&E community were

addressed. Although there were many challenges, the work was technically stimulating and the joint test force (JTF) was highly motivated to succeed.

Overall, the JADS legacy program was an unqualified success. Newsletter, conference participation, web site, "ADS for T&E" professional development course, lessons learned videos and multimedia report formats allowed JADS to reach and influence a broad swath of the T&E community, both government and civilian. The T&E community was educated to at least consider using ADS to support future test programs. Testers were equipped with the basics needed to successfully plan and execute an ADS test, and JADS' products were institutionalized to provide a firm foundation on which to build. Success did not come easily in legacy. The tendency of the JTF was to focus on the successful execution of the three tests. Developing a legacy plan early in the program and assigning a high priority to legacy (including a full-time legacy manager) as well as committing much of the service deputies' time to legacy activities were critical to this effort. Subsequent "nagging" was required by the JADS staff to ensure legacy actions were occurring early enough and long enough to have an impact on the T&E community. Finally, many trips were required to get the users' attention through face-to-face meetings.

ES.4 Lessons Learned, Conclusions and Recommendations

JADS has enjoyed a reputation of being a particularly successful JT&E program. Although this will come across as over simplified, JADS' success can be attributed in a simple formula – excellent organization plus proactive legacy actions equals successful JT&E.

JADS used an approach to JTF organization that is quite different from what the JT&E Handbook calls for. The point is this – the Handbook is a guide. However, each JT&E program is going to be unique. Therefore, structure the organization in a way that best makes sense for your particular mission and working environment. Having said that, there are facets of JADS' approach we recommend to you regardless of the type of JT&E you have.

- The mix of matrix and functional area teams within JADS worked exceptionally well. On a related note, having all government and contractor personnel together and integrated into teams made for a highly cohesive team that worked together for the common good.
- Having the JTF under one single roof made mission execution an order of magnitude easier than if we had been geographically separated.
- Possessing all support functions within the JTF is, in our opinion, the only way to go. We witnessed innumerable cases of "non-support" from other agencies. JADS was always able to get the support we needed because we owned the support functions. In fact we found ourselves supporting other JT&Es as well.
- We started with a flat organization, but inserted a Chief of Staff when it became apparent the JTF traveled too much to provide day-to-day, hands-on leadership. This worked well.

JADS has been both criticized and praised for its legacy program. On one hand, JADS was praised for having the best legacy program ever seen. Though biased, we agree. Criticism, on

the other hand, fell in two areas – it cost too much and isn't relevant to other types of JT&Es. JADS' experience is that you can have a highly comprehensive legacy program for a modest investment. We devoted approximately four percent of our workforce (2 of 50) and 1.5 percent of our budget for legacy. As for relevance, "experts" said that, since JADS was a different type of JT&E than most, other JT&Es shouldn't need to do this aggressive style of approach to legacy. We beg to differ. Regardless of the nature of your JT&E, you have a user community you're working with, and both information and products you need to embed into this community to make lasting positive contributions. Therefore, the basic precepts of JADS' legacy program hold true, only the details differ. Here are some key points:

- Make a commitment to a legacy program from the very beginning of your JT&E program. Build it into your organizational structure, man it and fund it from Day 1.
 - A successful legacy program needs the full support of the JT&E leadership, most especially the JTD and Deputies.
 - Look for every way possible to get your word out on a continuing basis through the life cycle of your program. Interim reports, newsletters, videos, CDs, presentations at conferences your community attends, etc. should all be used.
-
- JADS was highly successful across the board. As an organization, it was praised for its cohesiveness, high morale, and expertise in getting the job done. As examples, our personnel, computer and finance people were called upon to help many others. JADS was also very successful in conducting rigorous T&E events which fulfilled JADS' charter and provided valid, believable data to our user communities. Finally, JADS is making widespread and long-lasting contributions to the community thanks to its superb legacy program.

1.0 Introduction

This report is intended to preserve the Joint Advanced Distributed Simulation (JADS) management experience for future test planners and directors: what did and what did not work; management lessons learned; assessments of JADS success in achieving chartered goals; and conclusions and recommendations on the JADS management experience.

2.0 Program Overview

The JADS Joint Test and Evaluation (JT&E) was chartered by the Deputy Director, Test, Systems Engineering and Evaluation (Test and Evaluation), Office of the Under Secretary of Defense (Acquisition and Technology) in October 1994 to investigate the utility of advanced distributed simulation (ADS) technologies for support of developmental test and evaluation (DT&E) and operational test and evaluation (OT&E). The program was Air Force led with Army and Navy participation. The joint test force (JTF) manning included 23 Air Force, 13 Army, and 2 Navy personnel. Science Applications International Corporation (SAIC) and Georgia Tech Research Institute (GTRI) provided technical support that varied between 15 and 20 man-years per year. The program was completed within its five-year schedule.

The original JADS JT&E charter included only the End-to-End (ETE) Test and the System Integration Test (SIT), but the Deputy Director, Test, Systems Engineering and Evaluation tasked the JADS JT&E to conduct a second feasibility study expanding the test to include an electronic warfare (EW) environment. This feasibility study was conducted concurrent to the start up of the JADS JT&E program with no additional manpower added to the organization. The feasibility results were presented to the senior advisory council (SAC) in 1995 where it was recommended that JADS revise the proposed EW Test to lower costs. JADS revised the test and presented the results to the SAC in 1996. At that time, the SAC approved the addition of the EW Test to the JADS mission.

A high-level overview schedule of the JADS JT&E program is shown in Table 1.

Table 1. JADS Schedule

Date	Activity
Oct 93	Joint Feasibility Study (JFS) Charter
Oct 94	JT&E Charter (minus EW Test)
Aug 96	EW Test Charter
Nov 97	SIT Complete
Aug 99	ETE Test Complete
Nov 99	EW Test Complete
Mar 00	JADS Complete

The JADS problem domain included developmental testing (DT) and operational testing (OT) of all types of weapon systems. Obviously, the JADS JT&E could not conduct a DT and OT test for every kind of weapon system possible. Therefore, the JADS JT&E selected as many applications as time and resources permitted.

As finally approved, the JADS JT&E program included three tests: SIT, ETE Test and EW Test. The following is a summary of the three test programs.

System Integration Test. The SIT investigated the utility of ADS in complementing test and evaluation (T&E) of precision guided munitions (PGMs). The air intercept missile (AIM)-9 Sidewinder and AIM-120 advanced medium range air-to-air missile (AMRAAM) were chosen. Both DT&E and OT&E aspects were explored. DT&E applications were explored using a hardware-in-the loop facility to simulate the missile. This allowed detailed performance of missile subsystems to be monitored, typical of DT&E. The OT&E characteristics of the SIT result from the use of actual aircraft performing operationally realistic engagements. Of particular value was the launched aircraft fire control radar which operated in the real environment and was affected by weather, electronic countermeasures, clutter, and other variables for which good digital models do not exist. This meant that the T&E was more representative of the performance of the integrated weapon systems. SIT was a two-phase test. Phase 1 activities were conducted at Weapons Division (NAWC-WPNS) (Point Mugu, California, and China Lake, California), and Phase 2 activities were conducted at Eglin Air Force Base (AFB), Florida.

End-to-End Test. The ETE Test examined the utility of ADS to complement the DT&E and OT&E of a command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) system. ADS was used to provide a more robust test environment that provided more representative numbers of threats plus the complementary suite of other command, control, communications, computers and intelligence (C4I) and weapon systems with which the system under test interacted. The Joint Surveillance Target Attack Radar System (Joint STARS) suite of E-8C aircraft and ground station module was chosen as a representative C4I system on which to introduce ADS as a methodology in both DT&E and OT&E settings. The ETE Test was a four-phase test. The first two phases occurred in a laboratory environment suited for exploring DT&E and early OT&E applications. Phase 3 checked compatibility of the ADS environment with the actual Joint STARS equipment, and Phase 4 combined live open air tests with laboratory tests evaluating operational measures of performance in a notional corps scenario.

Electronic Warfare. The EW Test combined the results of three leveraged activities with a three-phase test of a self-protection jammer (SPJ). This multivector approach was designed to assess the utility of ADS to EW T&E by testing the ability of ADS technology to provide improved performance for EW T&E within an acceptable cost and schedule. The leveraged activities were the Defense Modeling and Simulation Organization's (DMSO) High Level Architecture (HLA) Engineering Profederation, Office of the Secretary of Defense's (OSD) CROSSBOW Threat Simulator Linking Activity (TSLA) Study, and the U.S. Army's Advanced Distributed Electronic Warfare System (ADEWS). The leveraged activities provided qualitative

data to be combined with the SPJ test, which provided quantitative data to assess the ability of ADS to solve the inherent limitations of the EW test process. These data were also used to evaluate the potential enhancements to the EW test process available through ADS.

The approach was to take historical data from previously executed tests, replicate those test environments in an ADS architecture and compare the results. These baseline comparisons were used to establish the validity of the data provided by ADS testing for each of the test programs. Once this baselining was accomplished, an assessment was made of where ADS could be used to address shortfalls in conventional testing. An assessment of the critical ADS implementation issues was also made.

During the life of JADS, there were many non-JADS ADS tests or demonstrations conducted. The JADS JTF participated with many of these activities and surveyed many others that complimented the three JADS test programs. The results from these non-JADS, ADS-enhanced tests were used to supplement the JADS specific results.

Once the results from specific systems were obtained and analyzed, the JADS JTF extended or extrapolated these results to classes of systems. Classes of systems were defined by example as air-to-air missiles, aircraft, C4I systems, EW systems, submarines, spacecraft, etc. Each of these classes of systems presented unique challenges to the T&E community responsible for its evaluation. The final step was to take the results of those classes of systems for which ADS test data were available and to extend them to as much of the total JADS problem as possible.

The test issues for JADS JT&E are shown in Table 2.

Table 2. JADS Test Issues

Test Issue #1	What is the present utility of ADS, including distributed interactive simulation (DIS), for T&E?
Test Issue #2	What are the critical constraints, concerns, and methodologies when using ADS for T&E?
Test Issue #3	What are the requirements that must be introduced into ADS systems if they are to support a more complete T&E capability in the future?

3.0 Assessment of Accomplishment of JADS Mission

This section contains two assessments. The first is an assessment of the accomplishment of the mission in the JADS charter, and the second is an assessment of transfer of JADS information and products to the services and OSD which will be referred to as the accomplishment of the JADS legacy.

3.1 Accomplishment of JADS Charter

The following is the critical tasking from the JADS charter.

“JADS is chartered to investigate the utility of advanced distributed simulation (ADS) for both developmental test and evaluation (DT&E) and operational test and evaluation (OT&E). JADS will investigate the present utility of ADS, including distributed interactive simulation (DIS), for T&E; identify the critical constraints, concerns, and methodologies when using ADS for T&E; and finally, identify the requirements that must be introduced into ADS systems if they are to support a more complete T&E capability in the future.”

Utility was assessed by first determining if the ADS-supported tests produced valid test data. This was done by comparing ADS-produced test data with previously conducted DT&E or OT&E test data. While validity was considered to be an essential condition for utility, it was not considered to be a sufficient condition. For ADS to have utility it also had to have benefits over conventional test methods. Benefits included cost savings as well as being able to overcome conventional test limitations. The SIT, ETE Test, and EW Test phase reports documented validity and benefits for the representative systems used in those tests. PGM, C4ISR, and EW class utility was then assessed in class reports by combining the three test results respectively with other ADS results. The *JADS Final Report* combined these results and assessments to make a general assessment. Although the original approach of determining validity by comparing ADS data with previously conducted conventional DT&E or OT&E test proved difficult, we were able, in most cases, to develop alternate methods which satisfactorily demonstrated the validity of the ADS-generated data. The benefit of overcoming conventional test limitations was successfully addressed by determining which of 40 previously identified common test limitations could be overcome by the three JADS tests. The ability to demonstrate cost savings was only partially successful. Although several cost comparison studies that showed cost savings for specific programs were conducted, the results were very assumption dependent. A general cost comparison methodology was developed and documented in the *JADS Special Report on the Cost and Benefits of Distributed Testing*, but there were inadequate data to validate the results over a broad range of applications.

Concerns and constraints were primarily addressed by identifying problems and lessons learned in the conduct of the three JADS tests. Concerns and constraints are documented in the test phase reports and in the networking and engineering, cost and benefits of distributed testing, verification, validation, and accreditation (VV&A) of distributed tests, and HLA special reports. Two categories of concerns and constraints were addressed: technical and programmatic. In

terms of sheer numbers JADS was very successful in identifying technical and programmatic concerns and constraints. Because the technology underlying ADS is advancing so rapidly, many of the concerns and constraints became outdated. The programmatic concerns and constraints, however, are more persistent. In most cases the programmatic issues, such as scheduling and security, are the same as in conventional testing only made more complex by the addition of ADS. For the three JADS tests the programmatic concerns and constraints were at least equal to the technical ones and may prove more difficult to resolve. The JADS charter did not require us to resolve all the concerns and constraints, only to identify them. We were certainly able to do this, but we were also able to develop tools and techniques to resolve many of the concerns and constraints that we encountered.

A general methodology that covered all phases of a test program from planning, development, execution, and evaluation was developed. The two areas where the ADS methodology was significantly different from a conventional test methodology were development and execution. The ADS development methodology required the addition of a network design and setup methodology and a modified VV&A methodology. The JADS approach to developing the VV&A methodology was to review existing Department of Defense (DoD) methodologies, modify as necessary, apply to our ETE and EW tests, and then update based on our findings. Test control during test execution was another area where a modified methodology was required, except in this case, no well-established DoD standards existed to start with. Different methods of test control were used in the three JADS tests and the results incorporated into the test execution methodology. Planning turned out to be the most difficult of the methodologies. The difficulty was in developing a methodology that was general enough to apply to all types of DT&E and OT&E tests for all possible types of military systems and specific enough to provide the detail needed for a specific program to determine the optimum mix of test methods, including ADS, to support that program. Although the JADS-developed methodology was a significant accomplishment, it should be considered a work in progress and not 100 percent complete.

The last task in the charter was to identify the requirements that must be introduced into ADS systems if they are to support a more complete T&E capability in the future. The requirements were primarily derived from the concerns and constraints task. The *JADS Final Report*, utility reports, and briefings documented these requirements and identified the appropriate programs and organizations for action.

JADS did not execute within its original schedule or budget. Of the three chartered tests, the SIT required restructuring because of a 12-month delay in getting a key piece of software developed by a missile program office. The ETE Test execution had to be delayed 12 months as well because of inadequate funding in the first year of the test and difficulty getting a contract vehicle to Northrop Grumman set up. These delays increased the requirement for infrastructure and contractor support in the final year of JADS. Additionally, a mid-test assessment of technical risk determined that JADS had unacceptable funding margins based on the risk involved in the remaining test activities. As a result, the joint test director (JTD) provided a decision briefing requesting additional funding to the Deputy Director of Systems Assessment. Another \$3.1 million was allocated in May 1997.

In spite of the schedule and budget changes, it is the JTD's assessment that JADS was nearly 95 percent successful in accomplishing its chartered mission. The results of the tests were the primary basis for addressing the three tasks in the charter. Present utility was determined to be case specific and proven to exist for certain classes of systems and suspect for others; concerns, constraints, and methodologies as well as requirements to facilitate increased use of ADS were identified and published in test and special reports. Inroads were made into many test organizations and acquisition programs that increased the use of ADS in all facets of test and evaluation. Significant positive impact was made by JADS on the development of the DoD's high level architecture ensuring the needs of the T&E community were addressed. Although there were many challenges, the work was technically stimulating and the JTF was highly motivated to succeed.

3.2 Accomplishment of JADS Legacy

The JTD defined the JADS legacy to encompass all actions the JT&E program took to ensure that its products were fully incorporated into the user community. The aspects to this approach fell into three nominally sequential (though overlapping) phases. These were (1) educating the user community and assimilating ADS into its thought processes, (2) equipping the user community with the proper ADS tools, procedures, and knowledge, and (3) institutionalizing JADS' products, which addressed a wide range of "things" from recommended directives to a home for the JADS library.

The education aspect was targeted at the DT&E and OT&E (as well as acquisition and industry) user communities and was further subdivided into a "familiarize" objective and a "consider" objective. To familiarize the user community with what ADS is, its potential uses in the T&E/acquisition processes, and the lessons learned from both tests and other key ADS activities, many tools were used. These tools included the JADS newsletter, *Reality Check*; a JADS web site; a JADS booth and technical articles at major T&E symposiums and workshops; JADS videos and multimedia compact disks; a JADS training course that was given on and off site; JADS reports; and numerous overview briefings given during site visits. The JADS training course was given on site 20 times. The course was given off site at locations such as GTRI; NAWC-WPNS; Air Force Development Test Center (AFDTC), Eglin Air Force Base, Florida; U.S. Army Test and Experimentation Command (TEXCOM); Commander, Operational Test and Evaluation Force (COMOPTEVFOR); U.S. Army Test and Evaluation Command (ATEC); Operational Test Command (OTC); U.S. Army Developmental Test Command (DTC); U.S. Army Evaluation Command (AEC); University of Texas, Austin, Texas; Boeing Company, Seattle, Washington; Fort Bliss, Texas; Pt Mugu, California; MITRE; and multiple International Test and Evaluation Association (ITEA) conferences at Orlando, Florida; Las Cruces, New Mexico; Fairfax, Virginia; Kauai, Hawaii; and Adelaide, Australia. Over 1400 people attended these training courses. Although reaching all of the user communities was a daunting task, through the use of these multiple tools JADS was able familiarize the majority on the use of ADS to support T&E.

The "consider" objective was to provide the user community with information or "evidence" that ADS has sufficient utility for T&E to consider using it on future programs. JADS provided a

significant amount of evidence in our phase, class and final reports and associated briefings. In addition, JADS targeted several programs in each of the services that were in the early planning stage and assisted them in considering the use of ADS. Because of the long lead times required to plan and implement a test program, it will be several years before the final assessment of this objective can be made.

The objective of the equipping aspect of legacy was to provide the user and implementer communities with the methodologies, procedures, knowledge, and tools needed to successfully implement ADS in their particular domain/application. For the user community, the JADS approach was to develop class reports that were domain/application specific and to develop a test planning methodology that included the use of ADS, and to provide ADS training courses. The approach for implementers was to participate in service and OSD working groups, to develop development, execution, and evaluation methodologies, to develop software tools, and to provide ADS training courses. Although the technology and the acquisition process itself are rapidly changing, JADS was successful in equipping the T&E users and implementers with the basics necessary for them to proceed.

The JTD saw three major objectives in the institutionalize aspect of legacy: (1) recommend policies and directives to facilitate the incorporation of ADS into the T&E process; (2) find and successfully access the appropriate repositories for JADS data and knowledge; and (3) find and successfully access the appropriate final homes for JADS-developed products and equipment.

The approach to the first of these objectives was to review current OSD and service initiatives, roadmaps, master plans, and policy guidance relevant to the use of ADS to support T&E and to then provide feedback to the respective originators on recommended changes that would facilitate its use. This was successfully accomplished.

Another aspect of institutionalization efforts was participation in the key professional society for distributed simulation and DoD's HLA efforts. JADS took several major leadership roles in the transition of the training-oriented DIS Workshops to the training-, acquisition- and analysis-oriented Simulation Interoperability Workshops (SIW) and the creation of the Simulation Interoperability Standards Organization (SISO). In the HLA area, JADS became a sitting member of the Architecture Management Group (AMG) and provided the only test and evaluation experimentation with early versions of AMG products.

A survey of OSD and service repositories was conducted, and homes were found for all JADS reports, lessons learned, and test data. In most cases, multiple homes were found for each item, so this objective was successfully addressed.

The final objective was to find final homes for JADS-developed products and equipment. The JADS transition plan documents the successful accomplishment of this objective.

Overall, the JADS legacy program was an unqualified success. Newsletters, conference participation, web site, "ADS for T&E" professional development course, lessons learned videos and multimedia report formats allowed JADS to reach and influence a broad swath of the T&E

community, both government and civilian. The T&E community was educated to at least consider using ADS to support future test programs. Testers were equipped with the basics needed to successfully plan and execute an ADS test, and JADS' products were institutionalized to provide a firm foundation on which to build. Success did not come easily in legacy. The tendency of the JTF was to focus on the successful execution of the three tests. Developing a legacy plan early in the program and assigning a high priority to legacy (including a full-time legacy manager) as well as committing much of the service deputies' time to legacy activities were critical to this effort. Subsequent "nagging" was required by the JADS staff to ensure legacy actions were occurring early enough and long enough to have an impact on the T&E community. Finally, many trips were required to get the users' attention through face-to-face meetings.

4.0 Lessons Learned Overview

Many lessons were learned during the conduct of the JADS program. The following represent those deemed most helpful for the management of future JT&E programs. The lessons learned were developed by the team leads or personnel in charge of the area and have been provided with only minimal editing. The lessons have been arranged into fourteen categories.

4.1 Organizational Structure

- **A matrix organization provided the JTF the ability to flex resources easily to meet the needs of each individual test and the JTF as a whole.**

JADS organized itself as a matrix organization primarily because it was going to run three distinctly different test programs that would overlap in terms of planning, execution and reporting. Two teams provided the bulk of direct support to the three test teams. The Network and Engineering (N&E) team provided all networking support for the tests and developed and managed our Test Control and Analysis Center (TCAC). The Analysis team provided analysis support to each test team and was responsible for overall JADS issues and objectives.

The concept of matrixing the N&E and analyst resources was decried by the test team leads as keeping them from getting the support they needed. However, as the test program went on, test teams became more adept at coordinating their requirements for support, and the knowledge gained by the matrix-support teams from previous testing greatly enhanced the execution of each test event. Using this approach, it was relatively easy to mass resources on the hot problem of the day or month.

The Support team provided the typical administrative functions for all JADS personnel. The most critical of these functions for test success were travel coordination and security. The security noncommissioned officer (NCO) ensured each test team had appropriate security classification guidelines available and reviewed all documents for both classification and distribution compliance. Having all support functions provided by personnel assigned to the JTF proved to be invaluable. The result was JADS personnel received the support when needed, versus not receiving needed support from an external agent.

The Program Control team consisted of the JADS budget person (an Air Force (AF) NCO), the legacy manager (GS-13) and an assistant. Halfway through the test, JADS converted the director's secretary position to a technical editor position and that position also fell under Program Control. The technical editor proved to be exceptionally valuable to JADS' success. If we were to do JADS over again, we would factor in a technical editor from the start.

- **Having a chief of staff supported by Program Control and Support team leads (and sometimes the executive officer) provided continuity of leadership during the many temporary duties (TDY) of the JTF.**

About twelve months after chartering, it became apparent to the joint test director that, because of the demanding travel schedule, JADS needed someone "in charge" on a daily basis when the JTD was not available. Consequently, the director established the position of chief of staff that became an additional assigned duty for one of the service deputies. The chief of staff was explicitly **not** put in the direct line of supervision between the team leads and the director and essentially became a facilitator for all JT&E operations. This approach maintained the responsibility and authority of the team leads that might have been lost if the position of deputy test director had been established instead. The only person rated by the chief of staff was the executive officer, a position only formally established periodically based on available personnel. For about 18 months, the senior enlisted advisor performed executive officer functions. Then a major was assigned as both Program Control and Support team lead and also performed executive officer duties. Finally a captain was assigned executive officer and legacy duties. The person serving as executive officer assisted the chief of staff.

- **A formal review body manned by JTF leadership (JADS formed a steering committee) greatly facilitated resolution of technical and programmatic issues and improved communication flow among the key members of the JTF.**

Within six months after the arrival of all the service deputies, it became apparent that there was no mechanism to enable the cross-flow of information among teams and between the teams and JT&E management (other than the director). This lack of cross-flow led to resource conflicts within the matrix organization and to the loss of focus on the "big picture." To resolve this problem, JADS established a steering committee to serve as the vehicle for information exchange. Membership consisted of the service deputies, the technical advisor and the principal investigator for the support contractor (the "Big Five") and all team leads. The director was explicitly left off the membership, though included in the steering committee E-mail group. This was to allow for free and open discussion by the group, which could be handicapped by the Director's presence. The Director occasionally called meetings of the steering committee, which he would preside over, to address specific issues.

Steering committee meetings were chaired by the chief of staff and could be called by any member. Meetings focused on programmatic and technical issues associated with JADS tests and were limited to two hours. (If there was unfinished business, another meeting was scheduled.) "Big Five" members were required to attend all meetings. Other steering committee members could attend if they desired. A charter was established for the steering committee that allocated no decision-making authority to the committee itself; however, all the decision makers in JADS except for the director were members of the committee. Consequently, the steering committee became a 'coercive' body designed to establish consensus or identify disagreements that could not be resolved. Another major function of the steering committee was the editorial review of all JADS documents, briefings and technical papers. As many issues as possible were resolved via E-mail discussions. The products of these steering committee meetings were normally options and recommendations provided to the Director for his action.

- **Having the entire test team collocated contributed to its efficiency and success.**

Despite the distributed nature of JADS' program, all personnel were housed under one roof. Additionally, contractor personnel were integrated into functional or matrix teams, based on their expertise. This eliminated any "us versus them" mentality. The result was a high degree of cohesion as an organization, synergy off the skills of one another, better communication, and more efficient mission accomplishment.

4.2 Analysis

- **A matrix organization structure provided synergistic effects, objectivity and independence in the area of analysis.**

The Analysis team provided support to each of the individual test teams and was also responsible for answering overall JADS issues and objectives. The Analysis team conducted the crosswalk of test MOEs/MOPs with the JADS MOEs/MOPs and monitored other programs using ADS so JADS could extend its findings beyond the scope of our three individual tests. Each test team had an attached analyst, whose primary job was to coordinate support requirements with the corresponding matrix-support team. This organization facilitated the daily sharing of ideas and lessons learned, which ensured that all the analysts stayed informed and kept abreast of each of the three tests. The cross-fertilization of ideas, intellectual discussions and collective approach to solving problems helped broaden the analysts' perspectives. It better prepared the analysts to support their individual test team as well as to address broader overall JADS issues and objectives. A matrix Analysis team, independent of the test teams, also helped ensure thorough and completely objective analysis. Individual test team leads were responsible for the planning and management of limited resources to execute their tests. Since support analysts were not directly assigned to the individual test teams, they could focus completely on the thorough and objective analysis and reporting of test results. Had they been assigned directly to the individual test teams, there may have been a tendency to refocus analysis efforts onto more immediate test execution concerns at the expense of less immediate data management and analysis requirements. The Analysis team's independence and objectivity led to more reliable and credible results.

- **A distributed test architecture required unique network analysis capabilities.**

The distributed nature of the tests and the JADS charter to address the utility of ADS for T&E necessitated unique network analysis capabilities. We dedicated one analyst to support each of the test teams including the N&E team in this effort. Although a member of the N&E team may have brought more detailed computer knowledge and experience to the network performance evaluation process, great benefit was achieved by having an Analysis team member perform this role. The network analyst worked closely with members of each test team to become familiar with each specific network architecture and with the team's issues and concerns for the network in being able to satisfactorily support the collection of quality system under test data. The network analyst then, with N&E assistance, directed network monitoring and characterization activities to determine the impact of network performance issues on the quantity and quality of data collected. The network analyst also ensured satisfactory dissemination of conclusions back to test team analysts. JADS chose the Cabletron System's SPECTRUM[®] network analysis package as its primary tool for real-time network traffic monitoring. Proficient use of

SPECTRUM[®] required approximately 3 days of vendor training and an underlying knowledge of basic UNIX[™] commands. Network analysis requires some in-depth understanding of data communications processes, network equipment and protocols, local area network (LAN) and wide area network (WAN) technologies, and network performance-monitoring techniques. This knowledge can be obtained via any training class that offers an overview of computer networking fundamentals.

- **The Analysis team became the de facto operational reserve for providing replacement personnel to the test teams, which negatively impacted analysis of JADS issues.**

As alluded to above, each of the test team leads was charged with the responsibility to plan, execute and manage the test with limited personnel resources. As these teams experienced personnel turnover, test execution schedules dictated that personnel be replaced immediately. To meet the immediate need for replacements, experienced analysts with a broad understanding of JADS analysis requirements were reassigned to an individual test team to fulfill other than analysis roles on the team. When new personnel eventually arrived they backfilled the analysis team. These personnel had to be trained and brought up to speed on JADS. They lacked the experience and depth of understanding concerning the analysis of the JADS issues and objectives.

4.3 Network and Engineering

The mission of the Network and Engineering team was to provide communications support to the JADS JTF. This included providing a LAN for 50 users and a multisecurity network for the TCAC that supported three tests. N&E was also responsible for determining the requirements for each test team, purchasing, installing and maintaining the equipment, and requesting, installing and maintaining all of the long haul circuits.

- **Determine whether your requirements are to be supported by your organization or another and the kind of support to be provided.**

As mentioned previously, JADS benefited significantly by having its support internal to the JTF. Types of support to be considered:

Voice telephone systems	LAN support
LAN	Test control facility
WAN	Classified facility
Communications security (COMSEC) account	Multisecured facility
Procurement of equipment	Request for circuits
Software-specific needs	Time synchronization
Inter-Range Instrumentation Group	(IRIG)/Global Positioning System (GPS)

- **A blend of contractor and military personnel was required to support all the above requirements.**

In your request for personnel, you have to be very specific as to the kind of person needed (Air Force specialty code [AFSC] or the Army military occupational specialty [MOS].) On the contractor side, a minimum of network engineering (local and wide area networks) and hardware and software engineering capability would be required. Getting the right people and having them available at the start of the program is the most crucial step for N&E.

- **Early requirements definition and site surveys for networking support are critical.**

Requirements have to be identified by the test teams and presented to the N&E team. Both teams then need to discuss the options for supporting those requirements and to develop a scheduled plan for purchasing, test bedding, and installing the equipment. Site surveys are very important and need to be conducted by representatives from both teams. All this has to be done in the early stages of your planning.

- **Personnel need to understand the time constraints for getting required support.**

For sole-ownership of long-haul circuits, organizations must submit an exception to policy to Defense Information System Agency (DISA) 180-210 days prior to the test date.

Circuit requests require a minimum of 150-180 days depending on the base procedures for requesting a circuit.

Establishing a COMSEC account requires a minimum of 180 days for training personnel and certification.

Ordering COMSEC material requires a minimum of 120 days.

Ordering equipment varies with the method of purchase:

- Credit card limit of \$ 2,500 allows local purchase or mail order items within a matter of days.
- Contract avenues vary anywhere from two weeks to several months depending on the specific contract and the type of equipment being purchased.
- Going through base procurement can take anywhere from three to eight months.

Units should establish an accredited classified facility as soon as possible to allow for corrective actions and to have the capability to conduct risk reductions prior to testing.

- **JT&E use of common user telecommunications services is now mandatory unless waivers are obtained.**

Assistant Secretary of Defense (ASD) (C3I) Policy, 5 May 97 mandated use of Defense Information Systems Network (DISN) or Federal Telecommunications System (FTS) common user telecommunications services for all DoD long-haul telecommunication requirements. Waivers or exceptions to policy are granted only under extraordinary circumstances. Detailed information of your requirements has to be presented to DISA for them to evaluate whether their network could or could not support your requirements.

Send exception requests to

E-mail: D3WAIIVE@ncr.disa.mil

DISA HQ D312
Courthouse Road
Arlington VA 22204-2199

4.4 Support

- **Structure Support team based on the structure of the JTF.**

The Support team was comprised of one Army personnel specialist, one Air Force personnel specialist, one Air Force supply specialist, and one Air Force administrative specialist. Support provided the typical administrative functions for all JADS personnel. As mentioned before, the most critical of these functions for test success were travel coordination and security. The administration specialist was also the security NCO and ensured all security issues were properly addressed. The Support team also conducted typical orderly room functions such as weight control management, physical fitness testing, awards and decorations, retirements, etc.

There were 13 Army authorizations and 19 Air Force authorizations, so it was determined early during the feasibility study that both an Army and Air Force personnel specialist would be needed. The Air Force personnel specialist arranged travel coordination for all JADS personnel minus contractors and also acted as the director's secretary. It was also determined that JADS needed a supply specialist because with distributed tests our equipment would be located throughout the United States. Finally, an administrative specialist was needed to handle administrative tasks and also act as security NCO. Another important service that the administrative NCO provided was to lead the archiving effort at the end of the test.

- **Have a good plan for archiving information and data and begin early.**

There are two joint test and evaluation archiving repositories: the SAIC Technical Library in Alexandria, Virginia, and Headquarters Air Force Operational Test and Evaluation Center, History Office (HQ AFOTEC/HO) Technical Library located on Kirtland Air Force Base, New Mexico. These two repositories maintain historical joint test and evaluation documentation/records and provide copies to authorized requesters. The two repositories maintain records only up to the secret level.

The types of records archived are charters, directives, plans, reports, pertinent high-level correspondence, key briefings, and relevant visual information (videos, tapes, slides, films and photographs). Raw data in any form, routine administrative material, or any information classified higher than secret are not archived. A detailed archiving list can be obtained from the HQ AFOTEC Technical Library repository.

Standard Form (SF) 135, *Records Transmittal and Receipt*, was used for archiving records. Required information includes the year of items being archived; volume of records in cubic feet (per box); a complete series description with inclusive dates; disposal authority (JADS JTF used Air Force Manual [AFMAN] 37-139, *Records Disposition Schedule*, AFOTEC Instruction 61-204, *Disseminating Scientific and Technical Information*, AFOTEC Instruction 84-101, *Requirements for OT&E Program Case Files and Other Historical Information*, and HQ AFOTEC letter guidance on OT&E and research and development program case files); and a proper disposal date for the records.

For shipping and storage of the records, specific archiving boxes were used. These boxes were numbered consecutively with the total number being shipped (example, 1 of 15). Classified records are **not** shipped together in the same boxes with unclassified records. Use separate boxes for classified records (secret and confidential may be shipped and stored together.) Mark classified records with the highest classification they contain, and mark the box with the highest classification it holds. Do not attach SF 704, *Secret Cover Sheet*, or SF 705, *Confidential Cover Sheet*, to any classified records being archived. Follow DoD Regulation 5200.1, *Information Security Program*, when preparing classified material for transmission.

NOTE: Copies of some documentation such as plans, test reports, and other documents of significant technical value completed by the joint test force were sent to the Defense Technical Information Center (DTIC) and the Modeling and Simulation Information Analysis Center (MSIAC). Both provide authorized copies (for a fee) of JT&E reports and other technical documents that they have stored in their optical databases upon request. DTIC and MSIAC hold records only up to the secret level.

Addresses:

SAIC Technical Library
2001 North Beauregard St. Suite 800
Alexandria VA 22311

HQ AFOTEC/HO
Technical Library
8500 Gibson Blvd SE
Kirtland AFB NM 87117-5558

Defense Technical Information Center (DTIC)
8725 John J. Kingman Road, Suite 0944
Ft Belvoir VA 22060-6218

Modeling and Simulation Information Analysis Center (MSIAC)
1901 N Beauregard St., Suite 400
Alexandria, VA 22311-1705

4.5 Contractor Support

- **Because of the fluid nature of JT&E issues and the uncertainty of many 'leveraged' test events, on-site contractor support was preferable to any other alternative.**

Science Applications International Corporation (SAIC) provided on-site contract support. The SAIC contract support team, on average, included a program manager (also performed as a senior engineer), a senior scientist, two senior engineers, three senior software engineers, three senior analysts, a graphic illustrator, two analysts, a network technician, and an administrative assistant. The program manager was responsible for staffing the SAIC technical support staff and arranging for outside assistance when required. Until the final phase-down began, the on-site support remained steady at about fifteen man-years per year. Occasionally specialized SAIC assistance was brought in to support specific program technical needs. The SAIC support was fully integrated into each of the three test teams, the network team, and the analysis team. Contract relations and deliverables were designed to allow free crossflow of information between all parties. The result was a highly effective working environment where there was only minimal differentiation between government and contractor personnel.

The Georgia Tech Research Institute (GTRI) provided three to four man-years per year off-site technical support for some aspects of the Electronic Warfare Test.

The preponderance of senior engineers and analysts proved necessary over the course of the program, as did the on-site approach to contracted support. The nature of the test planning, design, and implementation tasks required people with high levels of experience in T&E. The on-site approach proved crucial given the innovative nature of the work, the requirement for minute-by-minute technical coordination between government and contractor personnel, and the many changes in planning direction as technical surprises occurred.

The contractor/government mix worked well for this program, and the level of support was sufficient to accomplish the program objectives.

4.6 Manpower/Personnel

4.6.1 General Personnel Issues

- **Expect to take 9-12 months to fill personnel requirements.**

Once JADS was chartered in October 1994, a major effort ensued to ensure all requisitions with the appropriate service agency were on file to begin identifying personnel who would initially fill the vacant manpower authorizations.

Two civilians, who were assigned to the feasibility study, were ultimately permanently assigned to the newly chartered test force. This provided much needed continuity. On the other hand, identifying qualified military personnel as “best fit” for a particular position was difficult.

The director was the final authority in determining whether or not an individual was suitable to fill a position. For the most part, Air Force personnel had the needed credentials, but it was difficult and often impossible to identify an “available” and qualified Army asset. This necessitated the selection of a less-than-qualified person and then sending that person to school for training.

Navy personnel were extremely difficult to obtain, as is usually the case for JT&Es. The direct involvement of the Commander of the OPTEVFOR was the reason JADS received its first two Navy personnel.

Arrival dates for inbound personnel were the next major hurdle. Many individuals wanted to wait until the summer months to report. This was in large part due to family issues that involved children being in school. As much as possible, the director accommodated the service person’s desires.

In the end, it took between nine and twelve months from the JTF chartering to when sufficient numbers of personnel had arrived to begin test execution and other mission-related activities.

- **Get the right skill sets on board early, to include people with practical T&E experience.**

Because of the slow nature of manning the JTF, it is important to get the right types of people on board as soon as possible. This can be done to a limited extent via military and government manning. More likely, you will need to rely on your support contractor to front-load skills you identify as those you must have soonest. Don’t neglect people with practical T&E experience in this step, as they will pay big dividends in completing the Program Test Plan and readying you for your early test events.

- **Adequately manned and centralized administrative support was a key to JADS success.**

The test teams’ needs were satisfied from an operational perspective, but they lacked administrative support. There were basically two choices in an effort to satisfy this requirement: centralized or decentralized administrative support. Decentralized support would have given each test team a dedicated individual to meet the administrative needs: typing, filing, travel orders preparation, reproduction of reports, supply functions and other miscellaneous needs. However, it was determined that a centralized administrative/personnel function would best suit the needs of the entire JTF as a whole. This proved to be most successful because it precluded “one-deep” slots and provided flexibility when workloads became heavy and demanding. The centralization of all administrative functions also provided an avenue which facilitated cross-utilization training and precluded any administrative “down time” because all personnel knew one another’s areas of responsibility which included Army/Air Force administration/personnel

processing, supply, security, safety, report reproduction, travel functions and a knowledge of the points of contact from outside activities and supporting agencies.

- **Personnel turnover will be greater than you expect and will require close management.**

The initial charter reflected that the existence of the JTF would span a period of five years. However, with the eventual approval of the senior advisory council that the Electronic Warfare Test be chartered as an addendum to the original charter, the length of the JTF was increased to five years and six months. Maintaining qualified personnel in sufficient numbers became an issue of concern.

Because of the difficulty in obtaining personnel with the necessary qualifications, JADS felt secure that these individuals would be available for a minimum of three years. From an operational perspective this was true, but the personal side of things was never given much thought or consideration. Some individuals initially assigned had completed 20 years of active service and became eligible for retirement. Several individuals did eventually retire before the end of testing. To complicate matters, the Army and Air Force began to offer early separation and retirement options, and there were several individuals who took advantage of these opportunities. To make matters even worse, the needs of the Army mandated a permanent change of station for several assigned individuals who departed as early as after one year. And finally, there were others who, because of career progression concerns, felt it was in their best interest to apply for other assignments.

Although some of the transitions were identified far enough in advance to allow the JTF to adequately plan for the turnover, others were not, and these resulted in manpower shortages. Requisitions needed to once again be initiated, and then once an available person to fill a position was identified, it was a period of between four and six months before their arrival. As JADS moved into its last two years of existence, it became increasingly hard to acquire military personnel to fill vacancies. We were able to offset some of the problems through additional contractor support, however, there is a limit to the amount of contractor support any JTF can afford. The contract support team, if well organized, can provide some degree of stabilization and also be responsive to changing technical requirements.

4.6.2 Army Personnel

Coordinate closely with Army Test and Evaluation Command (ATEC) during development of the Table of Distribution and Allowances (TDA).

The TDA provides requirements for Army personnel positions and is managed by ATEC. It is not part of the ATEC TDA. Deputy chief of staff for operations and plans (DCSOPS) coordinates the establishment of a specific joint test TDA with the Army based on input from the JFS team. It is a good idea for feasibility study teams to get input from serving JT&E Army deputies when putting together their TDA requests. Once a TDA request is provided to ATEC, the joint test manager at ATEC will submit the TDA for approval in August of each year. Timing is critical to ensure the TDA is approved prior to JT&E chartering so that personnel can

be requisitioned immediately after chartering. Changes can be made to the joint test TDA, but they can only be approved in the August cycle.

- **During the majority of JADS' lifetime, the Army manned joint tests at nearly 100 percent and ATEC generated personnel requisitions.**

Until just recently, the Army manned JT&Es at or near 100%. Be advised that the Army is currently not doing so at least for the near term. The following paragraphs were written based on JADS' experience, when the level of Army manning was not an issue.

TDA requirements for enlisted personnel equate to authorizations for enlisted personnel. Once the TDA is approved, ATEC must submit a requisition to Army Personnel Command (PERSCOM) to have the position filled. Minimum fill time for enlisted personnel is approximately six months after the requisition is submitted.

TDA requirements for officers do **not** equate to authorizations. The Army has more officer requirements than officers and fills requirements based on an officer distribution plan (ODP) that fills different units at different percentages of fill. While ATEC is filled at only 60-80 percent, the joint test TDA is filled at approximately 100 percent. The joint test manager at ATEC is responsible for coordinating a joint test ODP and allocating an ODP among the various chartered joint tests. An ODP is provided by specialty and rank, and once you have a TDA requirement and an ODP, ATEC can requisition personnel from PERSCOM. Minimum fill time for officers is also approximately six months after the requisition is submitted.

- **Army deputies should directly coordinate with PERSCOM assignment officers/NCOs when fills or backfills are required or extensions are appropriate.**

The Army deputy should coordinate directly with PERSCOM assignment officers to ensure appropriate personnel are assigned. Assignment officers will have little or no clue about what a joint test is, what it does or where it is located. In JADS, we had to get backfills for personnel who retired or left service and those who needed to depart JADS for career development. Close coordination with assignment officers as early as possible makes for a more rapid replacement of personnel. Extensions for half of our officers were coordinated through ATEC (ATEC commanding general [CG] endorsed all requests) and approved by PERSCOM. Stating that an ODP existed for the positions and a backfill would be required if the extension was not approved were key to getting the extensions approved.

- **Stabilize Army enlisted personnel for three years.**

Little could be done to prevent individuals from retiring, but necessary measures were taken to stabilize all other personnel. This was an issue that emerged from the onset of the organization. There was no continuity of tour stabilization among the Army officers and enlisted personnel branches. The JADS Army personnel NCO initially addressed this with personnel at OSD. OSD addressed this with the different branches (ATEC for the Army) and resolved the issue by stabilizing all Army personnel for three years. An individual's records were subsequently coded

at the local personnel servicing center (after prodding from the JADS personnel NCO) to reflect this stabilization.

The justification for the tour stabilization of Army personnel assigned to JADS JTF was based on Army Regulation 614-5, *Stabilization of Tours*, Table 2-1, *Stabilized Tour Lengths of Organizations*, that lists offices of the Secretary of Defense (1B3AA) as a 36-month tour for commissioned officers, warrant officers and enlisted personnel.

Army enlisted positions were initially not coded for a three year stabilization which resulted in two NCOs receiving change of station orders within 12 months of assignment to JADS. The JADS Army personnel NCO worked through Fort Bliss, Texas, personnel management and ATEC to get all enlisted positions coded as stabilized for three years which greatly reduced turnover and turmoil.

- **Someone on the JTF support team should be responsible for coordinating Army in-processing**

All Army personnel assigned to the JADS JTF were assigned to Fort Bliss, Texas for administrative purposes and processed through that installation prior to arrival. Because of this, it was often difficult to keep personnel and financial records accurate and up to date. Many hours were spent on the phone trying to rectify errors in records and stabilize pay and allowances.

Army military members should maintain close contact with their assigned JTF support team while in-processing. This normally is the Army installation located closest to the JTF. This measure will ensure all required personnel and financial actions are taken.

4.6.3 Air Force Personnel

- **Coordinate with the Air Force Personnel Center (AFPC) for stabilization or operational deferments of Air Force personnel.**

The director prepared written justification to stabilize time on station of Air Force personnel for a period ranging from three to five years. The number of years was determined by the projected needs of the JTF. This justification was submitted to HQ AFPC, Randolph Air Force Base, Texas, through the director of personnel, 11th Wing, Bolling AFB, Washington D.C.

For the most part, the justification was accepted, and the authorization for the stabilization of personnel was published in *The Stabilization Tour Guide* (maintained at HQ AFPC). Specific officer assignment teams voiced exceptions to the justification to the extent that the needs of the Air Force could not support such a request. As a result, individuals in the communications-computer (33S3X) and analyst (61S3A) career fields were disapproved for stabilized tours of duty. Nevertheless, there is an "unwritten" rule that individuals more than likely will remain on station for three years. Although not totally confident in the unwritten rule, we had no recourse but to rely on the system to protect our personnel from being reassigned until after three years. This proved to be the case.

As the expiration for tours of duty for certain individuals drew near, it became apparent that the JTF could ill afford to lose these individuals and their expertise. As a result, the director once again provided justification and requested a one-year operational deferment that would extend the original stabilized tour of duty. In all cases, the operational deferment was approved. Without this request, individuals would have been reassigned. Had these individuals been reassigned with the amount of time remaining before the JTF completed its mission, there would have been no replacement personnel identified.

Stabilization of tours of duty and operational deferments (as needed) are a must for any JTF.

- **Air Force personnel's senior rater chain should go through OSD.**

When JADS was established, the opinion of some directors and their deputies was that if Air Force JT&E personnel were rated and evaluated for promotion within OSD channels their promotion opportunity was reduced. Several individuals felt, for example, if a communications-computer officer assigned to a JTF competed with an astronaut or special assistant to the President of the United States, the advantage would favor the latter two. For this reason, some JT&Es proposed reporting chains through their services rather than through the Deputy Director, System Assessment. The problem was that this approach violated Air Force directives.

The JADS personnel chief conducted a careful screening of past promotion board files and determined that officers assigned to a JTF did not compete at the same management level as personnel described above. Only those officers under the umbrella of the Under Secretary of Defense, Acquisition and Technology (USD [A&T]) compete with one another. The JADS senior enlisted person provided direct support for several USD (A&T) management-level review board proceedings and reported that officers with strong records and well-written promotion recommendations were the ones who were promoted.

This issue continued to be debated at various forums, and each JT&E established its rating chain either through OSD or service channels until January 1999 when the Deputy Director, Systems Assessment established uniform performance evaluation and promotion recommendation policies for all JT&Es.

4.6.4 Navy Personnel

- **Getting Navy personnel required direct support from a Navy flag officer commanding an organization who wanted to help sponsor the work being done by the JTF.**

It is far more difficult for the Department of the Navy to provide human resources to JTFs. This is due to their personnel structure. If a naval organization provides any billets to a JTF, it will lose those billets for the duration of the JT&E. As previously indicated, COMOPTEVFOR provided two military members to JADS JTF. However, there were no permanent allocations of personnel. Rather, the joint test director working directly with COMOPTEVOR negotiated the release of two personnel to provide support to JADS. Under these conditions, the required skills

to fill a JTF position may or may not be available. About a year after JADS lost its Navy deputy and analyst, the JTF director negotiated for and received a Navy deputy (civilian) with a T&E and JTF background. Usually Navy facilities, which stand to benefit most from the JTFs outcome, are willing to provide some of the human resources. Negotiation with these organizations should start early in the JFS phase of the program.

4.6.5 Professional Development

- **Recommend the JT&E program manager establish a process for JT&E acquisition personnel to receive credit for test and evaluation activities and to compete for acquisition training slots through OSD channels.**

Acquisition training is required for personnel in various career fields and specifically acquisition career fields to meet the requirements of the Defense Acquisition Workforce Improvement Act (DAWIA). There are three levels of certification for eleven career functional areas. Each level identifies minimum requirements in education, experience (time served in acquisition duties), and formal training and builds upon the previous level. It is imperative that acquisition personnel receive the training necessary for their appropriate career level for them to advance in their career field. In many cases, their certification levels directly impact their follow-on assignments.

For various reasons, JT&E manpower positions are not identified as acquisition positions even though many of the positions are from acquisition career fields and the JT&E program is managed under USD (A&T). Therefore, JT&E personnel from acquisition career fields do not automatically get credit for time served in a test and evaluation organization, and their formal training is not actively managed nor sponsored by any organization.

Individuals, who were motivated to advance in their career field, researched course availability on the Internet, arranged with the course sponsors for vacant slots, and convinced the JADS director to sponsor them for the course by paying for travel expenses. JADS recommends that the JT&E program manager establish a process for acquisition personnel to receive credit for test and evaluation activities and to compete for acquisition training slots through OSD channels.

Until formal management is accomplished, JT&E directors should to be sensitive to this requirement, help individuals with their professional development and ensure that individuals get the training they need for advancement. This is something that needs to be followed closely by the JT&E to ensure that it doesn't "fall through the cracks."

- **Positions in Air Force Advanced Communications-Computer Systems Officer Training (ACOT) are not automatically assigned to officers assigned to a JT&E.**

ACOT provides mid-career training for the communications and information staff officer (AFSC 33S4). To be eligible to attend, officers must be in the grade of captain through lieutenant colonel with at least four years of field experience in the communications and information specialties. Additionally, officers must have at least eight, but no more than 13, years of commissioned service. Currently the course length is seven weeks and three days. ACOT is

necessary formal training for a career 33S4 officer. Since slots are given to major commands (MAJCOMs) and JADS JTF reports directly to OSD, this can and has caused problems for personnel wishing to attend the course.

During JADS tenure, we had one officer who met the criteria to attend ACOT. Unfortunately, she had to work her own slot. She called AFPC directly and through hard work and perseverance was able to obtain a slot enroute to her next assignment. This is not the optimal way to work slots.

The optimal way to work ACOT slots is to work with the 11th Wing at Washington D.C. It provides administrative support for such issues since JTFs do not have a host MAJCOM. The 11th Wing reviews communications officers' records for eligibility and sends requests to units for nominees. Nominees meet a board at the 11th Wing, and it is then determined who will get a slot as primary or alternate. Once selected, officers are given a class date.

4.7 Budget

- **One of the most critical positions on the entire test force is that of the person who manages both the budget and the resources, but that cannot be the only person who is responsible for developing and executing a budget.**

JADS was blessed to have a senior AF NCO who was very capable of managing the myriad of procedures and sources of money that every joint test will face. This budget/resource manager, if competent, needs to have the authority to interface with all members of the joint test force who have budgetary responsibility. In JADS, the team leads controlled their own budgets. They were given targets for test costs, travel and training by fiscal years (FY) and an overall budget for all years. This allowed them to control costs and have the flexibility to prioritize their requirements and cover overages within their budget without having to request additional funding from the JTD. This put the responsibility for test costs in the team lead's control. This allowed the team leads to negotiate cost and content to fit into their budgets and to find indirect or direct funding to cover the shortfalls.

- **Be prepared to adjust the JT&E budget as circumstances surrounding your program change.**

OSD provided the primary direct funding for the JADS JTF. The original proposed budgets:

JADS	\$18,043,000
JADS EW Test	\$ 6,725,000

Total actual OSD funding:

JADS	\$20,503,000
JADS EW Test	\$ 8,165,000

The increases of \$3.9 million in the budgets were for the SIT delays, additional effort for SIT and infrastructure costs in FY99 and FY00. The delays in the ETE Test made the FY99 completion date for JADS unlikely, which caused an increase for infrastructure costs for FY99 and FY00.

Tables 3 and 4 show the direct and indirect funding received by each source. The direct funds include funds received by Military Interdepartmental Purchase Request (MIPR) or budget allotments directly to JADS. Direct funding by the lead service included civilian salaries and training, maintenance, communication, General Services Administration (GSA) vehicle, and facility lease cost because Kirtland AFB could not provide office space in FY96. Indirect cost was the military personnel salaries.

Table 3. Direct Funding Profile

	FY 94	FY 95	FY96	FY97	FY98	FY99	FY00	TOTAL
OSD	\$477,905	\$3,257,000	\$6,330,000	\$8,100,000	\$5,430,000	\$4,219,000	\$ 832,000	\$28,645,905
CTEIP	0.00	\$ 650,000	\$ 500,000	\$1,100,000	\$ 400,000	0.00	0.00	\$ 2,650,000
CROSSBOW	0.00	\$ 596,827	\$ 164,919	0.00	0.00	0.00	0.00	\$ 761,746
AIR FORCE	\$ 22,900	\$ 240,572	\$ 425,283	\$ 416,716	\$ 452,813	\$ 506,500	\$ 230,800	\$ 2,295,584
ARMY	0.00	0.00	\$ 78,700	\$ 20,000	\$ 20,000	0.00	0.00	\$ 118,700
TOTAL	\$500,805	\$4,744,399	\$7,498,902	\$9,636,716	\$6,302,813	\$4,725,500	\$ 1,062,800	\$34,471,935

Table 4. Indirect Funding Profile

	FY 94	FY 95	FY96	FY97	FY98	FY99	FY00	TOTAL
AIR FORCE	\$50,052	\$730,772	\$1,228,542	\$1,235,876	\$1,389,704	\$1,335,651	\$455,797	\$6,426,394
ARMY	0	\$208,841	\$679,449	\$802,993	\$1,056,461	\$857,566	\$129,320	\$3,734,630
NAVY	0	\$41,454	\$159,612	\$156,751	\$51,520	0	0	\$409,337
TOTAL	\$50,052	\$981,067	\$2,067,603	\$2,195,620	\$2,497,685	\$2,193,217	\$585,117	\$10,570,361

4.8 Facilities

- **Leasing off-base facilities is an option if adequate government facilities are not available.**

Facility costs are funded with lead service operation and maintenance (O&M) dollars (one-year money). The lead service pays all costs to house the JTF: communications, utilities, lease and maintenance costs on administration machines and base support costs. If the lead service is unable to find a place for you to work, leasing is an option. The lead service pays all costs for the leased facility. The cost can be obligated/expensed by the terms of the lease not by fiscal year as stated in Public Law 2410a, Appropriated Funds Availability for Certain Contracts for 12 Months. It states that " Funds appropriated to the Department of Defense for a fiscal year shall

be available for payments under contracts for any of the following purposes for 11 months beginning at any time during the fiscal year.... (2) The lease of real or personal property, including the maintenance of such property when contracted for as part of the lease agreement." This means that if your lease is an August–July term, you can fund the whole first year using the FY money current for August.

Sources for getting a leased facility are GSA and the Army Corps of Engineers. GSA takes a few years to get the process done. JADS was able to obtain support from the Corps of Engineers in Baltimore. They did all the paperwork needed to get the facility when needed.

Their address is:

Department of the Army
Baltimore District
U. S. Army Corps of Engineers
P.O. Box 1715
Baltimore MD 21203-1715

The point of contact (POC) is D.R. Middleton, (410) 854-7039.

4.9 Supply Support

- **Have two avenues to choose from, the International Merchant Purchase Authorization Card (IMPAC) and a supply account, when purchasing supplies.**

When the determination was made that supply support would be necessary to the daily operation of JADS, certain records needed to be created through the local base supply organization. Because Kirtland AFB is the designated host for JADS JTF, Air Force supply manuals applied to the type of support received from base supply.

AFMAN 23-110, *USAF Supply Manual*, Volume VII, Part 13 outlines procedures for establishing organizational records and supply accounts. Base supply Records Maintenance element is the point of contact for establishing an account. A KAFB Form 219, *Establishment of Organization Records*, is used to create and record the organizational record. Records Maintenance maintains this form.

The creation of this record enables the customer to order from base supply. It enables supply to process listings for the organization to maintain their account. The record contains indicative data on the type of unit and its mission. It also reflects priority of support. This record is identified by a three-digit numerical code and is linked to the unit. A Project Funds Management Record (PFMR) allows ordered items to be paid for at the time of purchase.

The IMPAC card and the supply account combined gave the unit two avenues for acquiring resources, gave JADS maximum flexibility and enabled continuous operation. When parts or supplies were not available in base supply, the IMPAC card gave JADS the ability to purchase

those same items commercially on the local economy or from a catalog. This option saved enormous amounts of time that would have been spent waiting for back-ordered items from base supply.

- **Appoint an equipment custodian to keep track of your equipment.**

To support daily operations, certain equipment items were required. Equipment items are defined in AFMAN 23-110 Volume II, Part 13, Chapter 8 as “items of durable nature capable of continuing repetitive use. Items other than supplies needed to outfit a unit or individual.” These are also known as nonexpendable items and are required to be maintained on records for accountability. Equipment items are ordered on an AF Form 601, *Equipment Action Request*, and are approved at levels identified in the table of allowances. Air Force Materiel Command (AFMC) determines which items are to be coded as equipment items.

JADS established an equipment account for equipment accountability in accordance with AFMAN 23-110, Volume VII, Part 13, Chapter 8. The equipment account was established through the Equipment Management element at base supply. The organizational record (mentioned above) must be created prior to establishing an equipment account. The JADS director appointed a custodian to manage all the equipment for the unit. Equipment custodian responsibilities are listed in AFMAN 23-110, Volume VII, Part 13, Chapter 8.

4.10 Security

- **Building security in an off-base leased facility takes careful planning.**

Lease Agreement. The lease agreement with the building owners required securing the leased facility and premise. The following paragraph was part of the lease agreement: “The government shall have the right to secure the leased premise with the lessor’s approval, which shall not be unreasonably withheld.”

Off-Base Facility Security Survey. A security survey of the building was conducted. We used DoD references to determine security requirements.

- DoD Regulation 5200.8, *Physical Security Program*
- DoD Regulation 5200.1, *Information Security Program*
- Military Handbook-1013/1A, *Design Guidelines for Physical Security of Facilities*

Physical Security Assessment. Physical security, according to DoD Regulation 5200.8, involves the safeguarding of personnel; preventing unauthorized access to the facility, equipment, material, and documents; and safeguarding them against espionage, sabotage, damage, and theft.

The type and scope of the functions housed in the off-base facility will determine the threat level. Our facility was determined to be a threat type low (individual(s) or insider(s) working alone or

in a small group). Threat examples: casual intruders; pilfers and thieves; overt intelligence collectors; passive demonstrators. Pilferable items included supplies, computers, typewriters, merchandise, and equipment. The intruder's goal is likely to steal or destroy assets, compromise information, or disrupt operations. Vandals, activists, extremist protesters and terrorists usually target buildings rather than the assets housed in the buildings.

Under a low-level threat scenario, it is not considered practical to attack walls using only a limited set of hand-held tools. Such a threat would likely attack the doors, windows, or other more vulnerable part of the facility. Likewise, it is not practical to attack roofs or floors. Consequently any permanent roof or floor construction can be considered adequate for a low-level threat. Modifying door and windows, considered the most vulnerable points, to increase the protection level would be costly.

Being in an off-base leased facility does not offer any security in depth or a buffer zone normally expected from the secure environment on a military installation. As a result, it was prudent to lock building entrances on a daily basis.

Areas focused on during the building assessment included exterior security lighting; building entry/exit; windows; vehicle parking; open storage of classified information; classified meeting/conference area; telephone control room; use of existing vaults; electric control/breaker box; TEMPEST (special shielding against electromagnetic radiation) considerations; and publishing operating instructions for the facility.

Alarm Installation by an Industrial/Commercial Alarm Company. The building survey concluded that the following security intrusion detection devices should be installed:

- Door panic hardware
- Cipher lock (2 main entrance doors)
- Glass breakage sensors for all windows
- Interior building sensors
- Separate alarm partition for the Test Control and Analysis Center (TCAC) (secure room)

The type of alarm that was installed required issuing access codes to each individual. Personnel were trained on building code access and alarm procedures.

Because we were located off base and would not receive base law enforcement assistance, a civilian security response company was hired to respond within 15 minutes of an alarm activation.

As an added precaution for the protection of classified material, an alarm response team was established to respond in conjunction with the civilian security response company. The alarm company was provided with a list of names of individuals able to respond swiftly to alarm activation.

A lesson learned was that careful, documented communication with the alarm company is essential. Fax receipts or alarm company verification faxes are needed to confirm that all pertinent changes to the facility alarm system are received.

- **Maintaining and updating Air Force personnel security clearances should be done through the base security office.**

Periodic reinvestigations of Air Force members not read into a SAP were coordinated through the base security forces Personnel Security Office. The Air Force Automated Security Clearance Approval System (ASCAS) listing was used to maintain up-to-date clearance information on AF personnel. The ASCAS listing has now been replaced by the Sentinel Key Automated Database. The base security police also provided training and shared information on DoD-wide changes in security procedures.

- **Maintaining and updating Army personnel security clearances should be done through the servicing PSC.**

Periodic reinvestigations of Army personnel were coordinated through the servicing personnel services center (PSC). The PSC identified soldiers needing periodic updates during annual birth month or in processing record audits and notified them of the requirement to update their clearance. Defense Investigative Service conducted background investigations as required.

- **Contractor security clearances required certain specific information to be on file with the JTF.**

Initial contractor security clearances were faxed to the JADS security manager by the contractor-assigned organization security manager. All contractor security clearances required a contract number as well as full name, title, citizenship, social security number, type of clearance, date clearance granted, date of birth, place of birth, length of stay for work requirement (up to one year), and the facility identification (ID) of who granted the clearance. For contractors, in most cases, the facility that grants the clearance is the Defense Security Services Operations Center (DSSOC). A current list with proper clearance and identification of all JADS military personnel and contractor personnel was kept readily on file.

- **Document control required close interaction among the security manager, team leads and legacy personnel.**

4.10.1 Classification of Documents

The JTD was specifically delegated in writing as the organization's original classification authority (OCA). Technical documents/reports (original or derivative) created by JADS were reviewed thoroughly by a check system designed to comply with Executive Order 12958, *Classified National Security Information*. Executive Order 12958 requires that classified national security information be marked to alert holders and recipients of classified information, to identify the exact information or portion that needs protection, to provide guidance for

downgrading and declassification of classified information, to give the reason for the initial classification decision, and to warn the holders of any special access, controls, or safeguarding requirement. DoD Regulation 5200.1 and DoD 5200.1-PH, *DoD Guide to Marking Classified Documents*, were used to adhere to Executive Order 12958.

4.10.2 Distribution Statements

Technical documents created by JADS were reviewed under a check system for proper assignment of distribution statements. This check system complied with DoD Directive 5230.24, *Distribution Statements on Technical Documents*, and required that distribution statements be placed on all technical documents both classified and unclassified. The purpose of assigning distribution statements was to facilitate control of classified and unclassified documents for distribution release, dissemination without additional approvals or authorizations, and to eliminate the need to repeatedly refer questions to the originating activity. Ensure team leads are briefed on the responsibility of the OCA, Executive Order 12958, and DoD Directive 5230.24.

4.10.3 Internet Publication Security Procedures

An Internet web site was established to provide a place for the public to view and retrieve JADS information. All information on the site was reviewed under our check system for proper classification and assignment of distribution statements. Only those documents determined to be distribution A (approved for public release; distribution unlimited) were posted on the web site. Make authors of technical documents aware of the plan to put documents onto a web site. The writer can then focus on preparing the document for unlimited distribution.

- **The JADS JTF did significant work in the area of security administration. Annex A provides information appropriate for JTF personnel responsible for all areas of security administration.**

4.11 Test Management

- **While the outline test plan (OTP) was critical to obtaining Army resources to support the JTF, the test resource plan (TRP) was less critical for Air Force support and the consolidated resource estimate (CRE) provided utility only during the JFS and initial JTF stages.**

The CRE was put together during the feasibility study and updated irregularly during the first year and a half of the test. Once detailed planning and coordination of the tests was underway, updating the CRE became more difficult and provided little value to our test activities. The TRP was important in identifying Air Force resources required to man the JT&E but coordination for actual test support required a program introduction document (PID)/statement of capability (SOC) process with each Air Force participant. Most Air Force support could have been and was accomplished with a PID/SOC process and no TRP input. Army support however, required a detailed input into the OTP process. The OTP request was staffed through ATEC DCSOPS who worked the approval with the test schedule and review committee (TSARC). Once support was

approved by the TSARC, orders were passed through the various MAJCOMS to the units designated to support JADS testing. Changes in test support required updates to the OTP submission. Certain Army elements operate under a reimbursable basis, and a process similar to PID/SOC was used to contract for their support. For both the TRP and OTP, a major from each service was made responsible for submission of the requests. The service deputies reviewed the plans prior to submission to the director for signature and forwarding to the respective service.

- **Complex JTFs with overlapping test phases may require both an operations calendar and an administrative calendar.**

JADS tried a number of methods for maintaining a useful calendar. Initial attempts to have the director's secretary keep and update an administrative calendar failed because of the skill level of the secretary and the fluid nature of test activities. After investigating several software alternatives, the JADS executive officer developed an Excel spreadsheet calendar that was available to all JADS personnel on the server. Team leads were responsible for updating the calendar in their areas of responsibility. The calendar was reviewed at each weekly staff meeting.

As test activities increased in complexity and number, JADS needed to develop a mechanism for deconflicting internal resources among competing tests. The solution was an extension of the Excel administration calendar. A second calendar, the operations calendar, was added to the spreadsheet and managed by the Program Control/Support team lead. At monthly team meetings resources were scheduled in detail 30 days out and estimated 90 days out. This process allowed test team leads to shift critical activities to ensure adequate internal resources were available for their tests and gave the matrix-supported team leads visibility of upcoming requirements.

- Effective communication was a key ingredient in JADS' successes in testing, in the conduct of its overall mission, its efficiency and high morale.

JADS made a conscious effort to ensure open and effective communications both vertically and horizontally within the organization. The director conducted weekly staff meetings to identify and resolve issues, and to provide cross communication to other leadership team members¹ regarding plans and activities in areas of the JTF. Additionally, the director conducted monthly program reviews, attended by the leadership team, at which each functional area within the JTF was scrutinized. Finally, the director held monthly Director Calls, attended by all JTF personnel, both government and contractor. Information and/or training germane to the whole group was conducted, recaps of activities by team leads provided, awards and decorations administered, etc. The end result was a well-informed, cohesive and efficient JTF with high morale.

- **Leadership team off sites are critical to keeping the big picture focused and maintaining high organizational morale.**

¹ The Membership Team was comprised of the Director, technical advisor, Service deputies, team leads, contractor program manager, and secretaries (contractor and government).

The leadership team consisted of the JTD, technical advisor, service deputies, the SAIC program manager, team leads, senior enlisted advisor and secretaries. Their primary responsibility as members was to assist the director in keeping the JT&E focused on the critical areas of the mission and to ensure that JADS was an efficient and enjoyable organization. Each September, the director gathered the leadership team at an off-site location to develop goals for the upcoming fiscal year. Two sets of goals were developed: JADS goals relating to program execution and leadership team goals relating to creating an efficient and enjoyable organization. Once goals were established, the director briefed them to all JADS personnel, and quarterly on-site/off-site meetings were held to review the status of achieving each goal.

4.12 Program Advocacy

- **A significant amount of the JTD's time was required for program advocacy briefings and program reviews.**

A necessary task and a major demand on the test director's time and talent are the briefings required to get the program chartered, then to keep the program alive. Of equal importance are program reviews and updates to the various oversight functions and securing support from the many organizations whose voluntary services are vital to test execution. In an attempt to provide future test directors with an idea of the magnitude of the program advocacy demands, the major briefings, reports, and TDYs for program advocacy from initial feasibility study through the final test report are listed.

Program Reviews and Updates. This category covers all the post-charter trips and briefings required to maintain overall JADS JT&E support and funding from OSD and the services. Each trip lasted an average of two working days and involved the JTD and one or more members of the JADS staff (e.g., technical advisor, service deputy, principle investigator). A formal briefing was given on almost all trips. The briefings on the norm were forty-five minutes with fifteen minutes allocated for questions and answers. The shortest briefing lasted fifteen minutes and the longest was close to eight hours. A significant amount of staff time was required to prepare, review, and rehearse for each briefing. Reasonable estimates are as follows: for each hour of presentation, it took four hours to prepare a draft, five hours for staff review, three hours of graphics support, and two hours to rehearse and refine the presentation. So on the average, we invested fourteen hours in preparing for a briefing expected to last for one hour.

Technical Advisory Board (TAB)/SAC Briefings. The purpose of these visits was to update the TAB/SAC on JADS progress, obtain guidance on test issues, maintain program support, and provide interim results. Additionally, JADS was directed to investigate adding an additional test, the EW test, to our tasking. This potential change in charter required additional interaction with the TAB/SAC. During the approximately five-year life of JADS (including the JFS), we conducted ten TAB and five SAC briefings.

OSD Briefings/Reports. The purpose of most of these trips was to discuss administrative issues such as funding, manning, and schedule, although a few trips were devoted to technical issues. The JTD and several staff members made ten trips. The briefings associated with these trips

generally lasted two to three hours and required thirty to forty staff-hours in preparation time. In addition to these trips there were occasional on-site reviews conducted by OSD that normally lasted about eight hours. These annual reviews were considered critical to the health of the program, so considerable staff time was invested in preparation. A conservative estimate would be two hundred man-hours including administrative support.

In addition to briefings, monthly and annual reports were sent to OSD. Each monthly report was staffed internally to JADS and required approximately five staff-hours to prepare and review. The annual report required approximately thirty staff-hours per year.

Test Support Briefings. These trips were required to obtain and maintain service/organization support for the individual tests. These trips normally involved the JTD, the team lead, and a service deputy. The briefings associated with these trips usually lasted from one to three hours. Five trips were required for the SIT, thirteen for the ETE Test, and four for the EW Test.

Legacy. The JTD made at least forty-eight trips to support the legacy effort.

Summary. The JTD traveled an average of 40 times per year for meetings and/or briefings. Don't underestimate the amount of travel, or the amount of support required by other JT&E personnel for these trips.

4.13 Reporting/Legacy

There are several aspects of the JADS legacy program that merit some discussion. Key elements of the legacy program included a newsletter, a trade show display (booth), web site, brochures, multimedia presentation of reports and findings, videos and a professional development course. Significant lessons learned are listed below. Details on the execution of each of the aspects of legacy management are presented in Annex B.

- **Structure your legacy program to your specific customer base.**

In JADS' case, our primary customer base was the test and evaluation and acquisition communities from all the services, OSD and the civilian sector. Consequently, our program had a more marketing kind of feel than a JT&E whose customer base centered on a specific unified command or type of acquisition program. However, the basics discussed here are germane for any type of JT&E. JADS had a consistent, high level of attendance at the professional meetings of the T&E and modeling and simulation (M&S) communities. The JADS web site allowed broad access to information developed during testing. Because of the nature of our customers, JADS worked diligently to produce reports and papers that were unclassified with unlimited distribution.

- **Start early and dedicate a portion of your test force to full-time legacy management.**

Begin your legacy program early in the test's lifetime. Get everyone involved in defining the legacy program and build consensus and get buy-in as much as possible. Define who in the test

are going to do what for legacy and hold them to their responsibilities. Early on, it's difficult to get people involved in legacy, but it's critical to the program's success. A legacy built after the fact will not have the benefit of face-to-face interaction with the customer base over the years. People won't look for or care about a report from an unknown organization. Get out and build an identity early in the program. Make legacy a priority from the beginning.

Budget for legacy and dedicate manpower to its management. Products cost money, time, and effort. JADS had one full-time government service legacy manager and halfway through the JTF added another government service assistant. The amount of the total JT&E budget dedicated directly to legacy was approximately 1.5 percent.

- **Ensure your service deputies understand that legacy is an important aspect of their mission.**

An initial tendency, reinforced by the JT&E Handbook, is to place service deputies in charge of a particular aspect of your test program like analysis or test management and tasking them to ensure that their service is properly played in each of your tests. If you can avoid putting them in charge of day-to-day execution activities, it will free up their time to make your legacy program stronger, more focused and more effective. Only the deputies have the experience to properly identify your initial customer base and expand it as your emerging results and conclusions dictate.

4.14 JADS Drawdown

- **Develop a transition plan early.**

JADS generated the first draft of a transition plan in the fall of 1998, eighteen months before official close out. The three key elements of the transition plan were a personnel departure spreadsheet, an office equipment/furniture listing and a capabilities listing (those major items developed to support JTF test execution that needed a legacy home).

- **Delegate authority for getting rid of office equipment/furniture as low as possible.**

JADS supply and communications support personnel were charged with transitioning as much of the property as possible. They were tasked to follow the rules established by JT&E Management Office in equipment transfer. Ownership of equipment, particularly computer equipment, was hard to establish. Initially computers were purchased with Air Force money but upgraded with OSD money. JADS allocated ownership of computer equipment based on proportion of dollars spent (i.e., if Air Force and OSD money were equally spent, then each got half of the computer system). Supply accountability in relation to disbanding JADS was a joint effort between JADS and AFOTEC personnel. The inventory of items maintained at JADS provided a list of items for AFOTEC to review and disburse. The best possible way to attack turning furniture and other supply items back to AFOTEC was through attrition. As items become unnecessary, they were identified to AFOTEC. AFOTEC responded with the action JADS needed to take. This process

was repeated until JADS was relieved of the responsibility of all assets acquired during JADS operation.

- **Maintain open communications about the drawdown.**

The transition plan and specifically the personnel drawdown plan were placed on the JADS Intranet and made available to all JADS personnel. The JTD made it a point to discuss the drawdown at monthly director's calls when appropriate. Keeping all aspects of the drawdown as public as possible had a significant, positive impact on morale.

5.0 Conclusions and Recommendations

JADS has enjoyed a reputation of being a particularly successful JT&E program. Although this will come across as over simplified, JADS' success can be attributed in a simple formula – excellent organization plus proactive legacy actions equals successful JT&E. There are a huge amount of lessons learned and recommendations in the body of this report. A few will be highlighted here that you should go to school on.

5.1 Organization

JADS used an approach to JTF organization that is quite different from what the JT&E Handbook calls for. The point is this – the Handbook is a guide. However, each JT&E program is going to be unique. Therefore, structure the organization in a way that best makes sense for your particular mission and working environment. Having said that, there are facets of JADS' approach we recommend to you regardless of the type of JT&E you have.

- The mix of matrix and functional area teams within JADS worked exceptionally well. On a related note, having all government and contractor personnel together and integrated into teams made for a highly cohesive team that worked together for the common good.
- Having the JTF under one single roof made mission execution an order of magnitude easier than if we had been geographically separated.
- Possessing all support functions within the JTF is, in our opinion, the only way to go. We witnessed innumerable cases of “non-support” from other agencies. JADS was always able to get the support we needed because we owned the support functions. In fact we found ourselves supporting other JT&Es as well.
- We started with a flat organization, but inserted a Chief of Staff when it became apparent the JTD traveled too much to provide day-to-day, hands-on leadership. This worked well.

5.1 Legacy

JADS has been both criticized and praised for its legacy program. On one hand, JADS was praised for having the best legacy program ever seen. Though biased, we agree. Criticism, on the other hand, fell in two areas – it cost too much and isn't relevant to other types of JT&Es. JADS' experience is that you can have a highly comprehensive legacy program for a modest investment. We devoted approximately four percent of our workforce (2 of 50) and 1.5 percent of our budget for legacy. As for relevance, “experts” said that, since JADS was a different type of JT&E than most, other JT&Es shouldn't need to do this aggressive style of approach to legacy. We beg to differ. Regardless of the nature of your JT&E, you have a user community you're working with, and both information and products you need to embed into this community to make lasting positive contributions. Therefore, the basic precepts of JADS' legacy program hold true, only the details differ. Here are some key points:

- Make a commitment to a legacy program from the very beginning of your JT&E program. Build it into your organizational structure, man it and fund it from Day 1.

- A successful legacy program needs the full support of the JT&E leadership, most especially the JTD and Deputies.
- Look for every way possible to get your word out on a continuing basis through the life cycle of your program. Interim reports, newsletters, videos, CDs, presentations at conferences your community attends, etc. should all be used.

5.3 Program Success

JADS was highly successful across the board. As an organization, it was praised for its cohesiveness, high morale, and expertise in getting the job done. As examples, our personnel, computer and finance people were called upon to help many others. JADS was also very successful in conducting rigorous T&E events which fulfilled JADS' charter and provided valid, believable data to our user communities. Finally, JADS is making widespread and long-lasting contributions to the community thanks to its superb legacy program.

Annex A Security Issues and Information

A1. Storage of Classified Material

General Services Administration-approved security containers were obtained for proper storage of generated or acquired classified information.

A2. Receiving Classified Information/Federal Express of Classified Material

An account with the Base Information Transfer System (BITS) office on base was established in order to receive and dispatch official government mail. The off-base address was used for receipt of unclassified and nonsensitive mail. JADS used the on-base military address to receive incoming first class registered classified mail. Organizations were directed to use the on-base address when mailing classified information to JADS.

Federal Express of Classified Material. Classified packages were delivered to and picked up from our facility by a Federal Express courier. After courier pick-up hours, packages were hand delivered to a Federal Express office location for further delivery.

A3. Carrying Classified Material On and Off Base

A Department of Defense (DoD) Form 2501, *Courier Authorization Card*, was issued to individuals who had a recurrent need to carry classified information to and from the Air Force base. The JADS administrative support team fell under this provision during official mail runs.

A4. Traveling Within the Continental United States (CONUS) With Classified Information

Only JADS military members were authorized by the joint test director or security manager to handcarry classified information to and from the facility within the CONUS (DoD Regulation 5200.1, *Information Security Program*). The contractor's home office security manager made arrangements for contractors carrying classified material within the CONUS.

A5. Visit Requests

Visit requests for JADS military members were dispatched to locations requiring clearance verification. Their servicing home office security manager initiated contractor clearance verification visit requests. The sponsor unit's security manager approved need-to-know verifications. A database for incoming visit requests was established to keep track of clearances for intermittent visits.

A6. Information Security Overview

JADS employed current DoD security requirements and, when necessary, developed new processes and procedures for designing a secure advanced distributed simulation (ADS) architecture. These new processes and procedures are addressed in JADS-level security documentation, such as the JADS Security Management Plan and the Trusted Facility Manual. In addition to the security concerns associated with any military operation, such as personnel security, there are several security concerns associated with ADS testing. For example, security instructions and regulations may vary at each test site depending on the classification of each site's network. Information on an unclassified network system may be unclassified but sensitive; the network may be classified; or JADS may require the transfer of data from unclassified networks to classified networks. The proper accreditation and authorization at all sites must be obtained. This included establishing the accreditation for all automated information systems (AIS) equipment in JADS and establishing security memorandums of agreement (MOAs) with other sites connected to JADS. Also, there were concerns associated with the specific protocols used in ADS. For example, there were distributed interactive simulation-specific concerns with the broadcasting of packets containing equipment-specific data across a network. Similarly, there were security concerns regarding the use of multicasting during high level architecture testing.

A7. Information Security Concerns

The test teams in consultation with the security manager should develop security requirements. The security manager can not plan for facility and information system security until the teams' requirements are established.

A8. Classified Processing Area

Choose facilities that are capable of supporting the level of security that is required. Classified processing areas may need to be inspected for emissions security. The JADS classified processing area, the Test Control and Analysis Center (TCAC), was located in the basement of an old bank building and was surrounded on two sides by concrete and earth. Its construction and location made it very easy to convert into a classified processing area. The only "beefing up" that was needed was the placement of access control devices and upgrading the electrical power to support all the data processing equipment. The physical location of the classified processing area was a very important consideration.

A9. Support

Determine what local tenant organization provides security support at the location of the test sites. Contact them immediately so that a working relationship can be established. Sometimes they may have requirements in return for their support.

A10. Service Agency Guidelines

In the joint service test arena, it is important to determine which service agencies' security regulations your organization will be following. Obtaining their regulations and manuals will give you more specific guidelines in establishing a security program. JADS followed Air Force and DoD guidelines because of the close support received from Kirtland Air Force Base (AFB).

A11. Multilevel Processing

“Multilevel processing is processing information with different classifications and categories that simultaneously permits access by users with different security clearances, but prevents users from obtaining access to information for which they lack authorization.” Is multiple security level processing required? Find out the local and service requirements to accomplish this mode of processing.

A12. Outside Agency Security Contacts

If there are sites at outside organizations, contact them early to establish MOAs for facility, networking, or computer system use and placement. You will need to establish and maintain a close working relationship with these people. After all, you may be requesting to connect your information system into their already established system. In some cases this could be a real headache for them. Delays in MOAs can be very time consuming, so your working relationship with them is critical.

A13. References

Below are some information security references that JADS used. Depending on which services' guidelines you follow, you will either need these or, at least, find them very useful in establishing information security guidelines and education.

- National Computer Security Center (NCSC)-TG-005 Version 1, *Trusted Network Interpretation*
- NCSC-TG-029 Version 1, *Introduction to Certification and Accreditation*
- Air Force Instruction 31-401, *Information Security*

A14. Information Protection

Information protection (IP) includes measures to protect friendly information systems by preserving the availability, integrity, and confidentiality of the systems and the information contained within the system. The Kirtland AFB and Air Force Operational Test and Evaluation Center (AFOTEC) IP offices provided assistance in setting up our security documents and accreditation procedures. All classified and unclassified information were protected according to the security classification guides, security master plans, and program protection plans for each site and system. These plans included the following documents:

- Electronic Security Command/Joint Surveillance System, *Joint Stars Security Classification Guide*, Appendix, 9 Mar 94 (This document is classified secret.)
- Navy Operational Instruction C5513.2B, *AIM-9M Security Classification Guide*, 25 Oct 95
- Assistant Secretary of Defense/YME, Advanced Medium Range Air-to-Air Missile (AMRAAM) Directorate of Engineering, *AMRAAM/HAVE IMPACT Security Classification Guide*, 1 May 91
- Headquarters United States Air Forces Europe/TERZ, *HAVE WINTER Security Classification Guide*, 2 Dec 94
- JADS JTF Operating Instruction 33-1, *Security Requirements for Automated Information Systems*, 18 Jan 96

If your security personnel are new to the field or not experienced in the general field of information protection/security, they should contact the Defense Security Service (DSS). The DSS provides valuable training courses.

- Department of Defense Regulation 5200-1, *Information Security Program*
- Air Force Instruction 33-206, *Information Protection*
- <http://www.afmc.wpafb.af.mil/HQ-AFMC/SC/cso-scs/scss/compusec.htm>
- http://www.p-and-e.com/pubs_AF.htm
- <http://lcweb.loc.gov/global/Internet/security.html>
- <http://www.dss.mil/training/>

A15. Computer Security (COMPUSEC)

Computer security (also referred to as automated information system security) is an assembly of computer hardware, software and/or firmware configured to collect, create, communicate, compute, disseminate, process, store, and/or control data or information. The JADS COMPUSEC program was operated under Air Force guidelines. The references listed below were used to establish that program.

- Air Force Systems Security Instruction (AFSSI) 5102, *COMPUSEC Program*
- <http://lcweb.loc.gov/global/internet/security.html>
- http://www.p-and-e.com/pubs_AF.htm
- Air Force Instruction 33-202, *The Computer Security Program*
- AFSSI 5025, Volume I, *The Certification and Accreditation (C&A) Process*
- AFSSI 5024, Volume II, *Certifying Official's Handbook*
- DoD Computer Security Center (DoD CSC)-Standard-003-85, *Computer Security Requirements*
- NCSC-TG-004 Version 1, *Glossary of Computer Security Terms*

A16. Emissions Security

Emission security (EMSEC) is the protection resulting from all measures taken to deny unauthorized persons information of value which might be derived from intercept and analysis of

compromising emanations from crypto-equipment, information systems, and telecommunications systems. The JADS facility received communications services from AFOTEC and the base information protection office. Because of the heavy ties between JADS and the Air Force, all AIS equipment within the JADS classified processing facility (TCAC) were installed according to Air Force emissions security requirements. These requirements are described in Air Force Instruction 33-203, *The Air Forces EMSEC Program*, and specific countermeasures for JADS equipment are described in Air Force Security Systems Manual (AFSSM) 7011, *The Emission Security Countermeasures Review*. Emanations concerns at remote locations were addressed in the MOA between JADS and the remote sites. The JADS designated approval authority and the information systems security officer ensured that the remote locations maintained emanations security standards in accordance to those required by the Air Force, even if the remote location was not on an Air Force installation. An integral part of the TCAC local area network (LAN) certification was to have an EMSEC inspection of the facility that housed the TCAC LAN. A qualified inspection officer from AFOTEC conducted the EMSEC inspection and assessment.

A17. Communications Security (COMSEC)

COMSEC includes measures taken to deny unauthorized persons information derived from telecommunications of the U.S. Government concerning national security and to ensure the authenticity of such telecommunications. Communications security includes crypto-security, transmission security, emission security, and physical security of communications security material and information.

The JADS facility received communications services from Kirtland Air Force Base. COMSEC material was treated according to the *Secure Data Network System (SDNS) User Representative and COMSEC Accounting Procedures*, and the *JADS COMSEC Emergency Action Plan*. All remote locations also maintained individual COMSEC accounts and received cryptographic keying material (KEYMAT) from the Air Force.

The base and the Cryptologic Management Directorate, Logistics Management Division of the San Antonio Air Logistics Center helped determine security requirements and COMSEC equipment capabilities. After approval, JADS updated Allowance Standard 658, which authorizes COMSEC equipment; then, submitted an AF Form 601, *Equipment Action Request*, to order equipment. The base COMSEC accountant set up a requirement for KEYMAT and equipment. The base COMSEC office also conducted biannual COMSEC inspections. Additionally, JADS was required to have safes for storage and an emergency action plan to ensure proper destruction of KEYMAT.

Annex B

Legacy Issues and Lessons Learned

B1. Web Site

JADS chose to design and develop its web site in house using simple, static hypertext markup language (html) for the majority of the site. While html is difficult to maintain (it requires manual update), it is simple and straightforward to implement. (If JADS was redesigning the site today, a more dynamic approach using easily updated databases, Cold Fusion, and style sheets in place of static html would be considered.) However, much of the JADS web site's success was due to the following factors, which hold true no matter how the site is technically implemented.

- **Content is king.** The JADS web site was information rich, offering valuable insights into distributed simulation (what it is, how it works), lessons learned, frequently asked questions, other distributed simulation programs and technical papers on every aspect of distributed simulation. The site was designed to offer more than a description of the test. JADS provided extensive information, and the test and evaluation and modeling and simulation communities responded very positively.
- **3 clicks to content.** Organize your information so it is easy to use. Users shouldn't have to dig for information. By the third mouse click, they should have reached some value-added information. More clicks may be required to delve into detail, but the content should be there by the third click.
- **Presentation is critical.** No matter how technical the subject matter, people respond well to attractively presented information.
- **Use everyday language as much as possible,** not technobabble or acronym-ese.
- **Graphics count.** Attractive graphics add considerably to the appeal of the site. Without attractive graphics, your site is likely to get overlooked. Graphics should be small in file size, however. People will not wait long for a page to download. Background graphics, which can be very small, can add significantly to the page without adding much to the download time. Photographic images are best compressed in Joint Photographic Experts Group (JPEG) format, while vector graphics are best compressed using Graphics Interchange Format (GIF) format.
- **Links can be helpful resources.** JADS built an extensive list of links related to the subject matter. This was beneficial to JADS because it brought customers back to the site often and to the customer because it provided a valuable service. However, limit outside links to the "links" page (JADS called its page "jump points") as much as possible. Whenever you provide a link to an outside web site, you're inviting customers to leave yours, and they may never return.
- **Use a commercial Internet service provider.** A commercial Internet service provider can be more cost effective, easier to manage, and more reliable than maintaining your own server. JADS found that it was cheaper to hire a service provider (and prices keep going down); someone who would respond promptly when something went wrong. The service provider guaranteed high (99 percent or better) availability. JADS originally hosted the site on its own server and experienced many problems with base communications, and very limited,

sometimes long-awaited support, and unpredictable availability. The service provider was also a ready source of expertise when needed.

B2: Training

JADS developed a customer training program that was very well received. The course served as an excellent method to share results and lessons learned, which was a major objective of JADS. Customers were pleased with a free training course, and JADS was able to spread the word to an extensive group – some 1,400 people. JADS offered this course locally each quarter and took it to many organizations that requested it. The main secret to success was getting the word out via E-mail; web; attractive, printed announcements; and actively following up with customers who expressed an interest.

Customers seemed to like the lessons learned part the best, especially JADS' honesty and willingness to share information.

JADS tried using interactive multimedia as part of the presentation but found it cumbersome for the instructors when compared to the familiarity and ease of using PowerPoint. Presentation slides were enhanced with graphics, which made them quite large. So, presentations were split into five sections. For the course books, the PowerPoint slides were copied into Adobe Pagemaker with a header and footer, page numbers, and lines for notes on each page. JADS added an acronym list, a cover with a flashy graphic, a list of recommended resources, and table of contents. Instructors distributed and reviewed evaluations after each course. The course was then updated regularly based on comments or new content.

Part of the training initiative was to institutionalize some of the training products into established training programs and centers. JADS worked with Defense Systems Management College, among others, to establish this remaining legacy.

B3. Multimedia

The use of multimedia was very helpful to JADS. Interactive, multimedia compact discs (CDs) gave customers an alternative way to see results from JADS tests rather than reading extensive technical reports (which were also available on the CD). The CDs were extremely popular and much easier to carry than the reports.

Multimedia is expensive. Video is the most expensive part, so choose carefully which pieces of information to highlight with video. JADS spent about \$50 thousand to develop the first two CDs (the second was an expanded version of the first) and the first two videos. Much of the video development and the digitization of the video and narration were contracted out.

The subsequent videos and CDs were primarily developed in-house and with help from the Kirtland communications squadron. Since they were not working on a fee-for-service basis, the cost of our final three videos was reduced to approximately \$5 thousand apiece. The last four

CDs were produced for between \$2 thousand and \$4 thousand apiece with most of that cost coming from our own labor.

JADS examined many different pieces of software (Macromedia Authorware, Macromedia Director, Adobe Acrobat) to implement the multimedia CDs and chose Adobe Acrobat because of its simplicity, widespread use, and cross-platform capability.

JADS ran into some difficulties when trying to use QuickTime (to make the presentation cross-platform) since Adobe Acrobat 3.0 doesn't support QuickTime 3.0. It was decided to move to audio video interleaved (AVI) (video for Windows) and make the CDs personal computer (PC)-only.

Video clips were developed in Adobe Premiere, an easy-to-learn desktop video editing program. All videos were scripted with a thorough review by the JADS steering committee before editing began.

The screens were laid out in Adobe Pagemaker, converted to Adobe Acrobat, and linked according to a storyboard approved by the JADS steering committee. Reports were separate Acrobat files linked from the "document library" portion of the project.

B4. Newsletters

The JADS newsletter, *Reality Check*, was one of the first legacy projects undertaken. It served a vital role in creating a customer base and establishing continuing communication between JADS and its customers.

Important points about developing a newsletter:

- **Keep it short.** An 11 x 17 sheet, double-sided, folded, with an 8.5 x 11 sheet insert was a good length. This accommodated about 7-10 short articles per issue.
- **Use color.** Color is a critical attention-getter.
- **Make it easy and enjoyable to read.** Use everyday language. Limit acronyms and spell them out whenever you do use them. Use first person as much as possible. This makes people feel like you're talking to them.
- **Offer it in different formats.** JADS offered its newsletter on paper, on the web, and via E-mail.
- **Use quality paper.** The feel of quality makes a difference in customers' perception of the product.
- **Make it easy to get.** Customers could sign up for the newsletter at conferences or on the web. Also, every training course attendee was added to the newsletter mailing list.

The JADS newsletter was laid out in Adobe Pagemaker. It was originally color copied on base until there was a problem with base graphics support. A cost comparison--having it color copied using base printing versus buying color printers and printing it in house--indicated that while more labor intensive, printing in house was the most cost-effective option. Newsletters were

printed on inexpensive Hewlett-Packard deskjet 1120C deskjet printers. This also gave JADS a level of control over its products and production process that was very helpful in ensuring its products were high quality and effective.

B5. Brochures

JADS needed an informational brochure from the start, something to inform people what JADS was about, what it was doing, and why. The legacy manager designed a color pocket folder that was used throughout the program. Fact sheets enclosed in the pocket explained the three tests, the analysis approach, the test control approach, and the legacy program and products. The fact sheets were updated to reflect current status.

Brochure lessons learned:

- **Design the front cover as an attention-getter.** Have the main message displayed prominently. Don't clutter it with information.
- **Don't put contact information and phone numbers on the main printed brochure.** Use stickers to attach that information to the brochure itself, have a place to insert a business card, or include the contact information on the inserts. JADS reorganized several times after the brochure was printed, several of the main players left, and it moved to a different address.
- **Don't try to include too much information.** Just stick to the main message on the printed piece.
- **Use attractive graphics that convey the subject matter.** A signature graphic that the organization uses in many places (brochure, booth, web, etc.) is a great way to build identity.

B6. Technical Papers

One of the ways JADS spread information, results, and lessons learned on various technical aspects of our tests was to present technical papers at key forums that its customers attended. Over 60 papers were written, and delivered at more than 50 conferences. JADS targeted four main conferences per year and recommended paper topics and suggested points of contact for each. Additional papers were always encouraged, and several were presented at conferences other than the four major ones. All papers were hosted on the web site after they were presented at the conference, and copies were handed out at our booths. The effort was well worth the travel and conference fees. Without this concerted effort and high level of encouragement, many aspects of our tests would never have been documented. Customers learned directly from technical experts and had a chance to critique and ask questions; JADS got a chance to learn about others who were doing similar work. JADS earned a high level of respect and credibility through its people, and it was good career development for them as well.

JADS also found key forums to get involved in and played a major part in them. This was done to satisfy a part of JADS' charter – "Identify T&E-related requirements for future ADS systems". For example, JADS was involved in the Simulation Interoperability Standards Organization from its infancy and played a major part in how things were set up and managed. JADS personnel volunteered to chair discussion panels, conference sessions, and training courses at relevant

conferences and workshops. This effort gave JADS a level of exposure and credibility that was invaluable to the legacy program and the ability to influence the direction of the technology we worked with.

B7. Displays/Trade Shows

Having booths at relevant conferences served as the most useful way to build our mailing list, interface with customers face-to-face, and distribute products.

Lessons learned about booths:

- **Use the booth as an attention-grabber.** Don't try to put too much information on the booth itself. Use a single large graphic and a few words to convey the main message.
- **Have informational handouts.** Handouts explain everything else you want to say to your customers, but don't try to cram too much information into any one handout. Short handouts are always taken, while thick reports are generally passed by. Customers will often take many, many short handouts, the equivalent of a large report, but won't take the large reports. CDs, videos and diskettes are even more desirable.
- **Get names and addresses of the customers who visit the booth.** Offer them something (like a subscription to the newsletter).
- **Renting versus buying a booth.** JADS decided to purchase a booth that could be set up a number of different ways. Look at your program over its lifetime and hypothesize different ways you might want to use the booth. When choosing a booth, also take into account shipping costs and logistics, as well as storage space (or places to hide your extra products). Early in the program, we covered the entire booth with very large graphics to get customers' attention. Late in the program we had so many products to distribute, storage space was crucial. The graphics had to be smaller, but customers already knew us and were looking for information.

B9. Videos

Legacy struggled with the videos. While there was a push to develop videos early in the program (an introductory video would have been helpful), we didn't have any film to work with or anybody with video experience on our team. When we finally completed two videos several years into the project, they were distributed to training organizations and customers unfamiliar with JADS. Videos were also useful to convey lessons learned.

Video lessons learned:

- **Plan storyboards well in advance of the actual test event.** This allows you to film what you want rather than "making do" with the footage provided.
- **Gather photos and video from events while they're happening.**
- **Learn which outlets are okay for the videographers to use.** This may seem insignificant, but in our first test, the videographer unknowingly plugged his equipment into the wrong

outlet, blew a circuit and brought the entire test control center down. After that event, the outlets were clearly marked and color coded.

- **Don't have lights on for hours during a test.** The generated heat can shut down the computers.
- **You need hours of footage for minutes of finished video.** Take into account any video you might need for multimedia work as well as for videos. However, the more footage you have, the longer it will take to select the footage you want.
- **Have someone from the legacy team on site to direct the videographer.** Make sure the videographer shoots footage from several different angles and under different lighting. You will likely only get one chance to film a test event. The people running the test won't want to be bothered with video, won't know what's needed, and simply won't put as much effort into it as someone who is responsible for the final product.
- **Use stock footage as much as possible.** Much is available from the Department of Defense library. Ask for footage and photos from the video/communication squadrons at the bases or posts involved in your test.

Annex C

Acronyms and Abbreviations

ACETEF	Air Combat Environment Test and Evaluation Facility, Patuxent River, Maryland; Navy facility
ACOT	Advanced Communications-Computer Systems Officer Training
ADEWS	Advanced Distributed Electronic Warfare System; Army sponsored
ADS	advanced distributed simulation
AEC	Army Evaluation Command
AF	Air Force
AFB	Air Force Base
AFDTC	Air Force Development Test Center, Eglin Air Force Base, Florida
AFEWES	Air Force Electronic Warfare Evaluation Simulator, Fort Worth, Texas; Air Force managed with Lockheed Martin Corporation
AFI	Air Force instruction
AFMAN	Air Force manual
AFMC	Air Force Materiel Command
AFOTEC	Air Force Operational Test and Evaluation Center, Kirtland Air Force Base, New Mexico
AFPC	Air Force Personnel Center
AFSC	Air Force specialty code
AFSSI	Air Force systems security instruction
AFSSM	Air Force systems security manual
AIM	air intercept missile
AIS	automated information systems
AMG	Architecture Management Group
AMRAAM	advanced medium range air-to-air missile
AR	Army regulation
ASCAS	Automated Security Clearance Approval System
ASD	Assistant Secretary of Defense
ATEC	Army Test and Evaluation Command
AVI	audio video interleaved
BITS	Base Information Transfer System
C3I	command, control, communications and intelligence
C4I	command, control, communications, computers, and intelligence
C4ISR	command, control, communications, computers, intelligence, surveillance and reconnaissance
CD	compact disk that can hold a large quantity of computer data
CG	commanding general
COMOPTEVFOR	Commander, Operational Test and Evaluation Force
COMPUSEC	computer security
COMSEC	communications security
CONUS	continental United States
CRE	consolidated resource estimate

CROSSBOW	Office of the Secretary of Defense committee under the Director, Test, Systems Engineering and Evaluation
CSC	Computer Security Center
DAA	designated approval authority
DAWIA	Defense Acquisition Workforce Improvement Act
DCSOPS	deputy chief of staff for operations and plans
DDSA	Deputy Director, System Assessment
DIS	distributed interactive simulation
DISA	Defense Information Systems Agency
DISN	Defense Information Systems Network
DMSO	Defense Modeling and Simulation Organization, Alexandria, Virginia
DoD	Department of Defense
DSMC	Defense Systems Management College
DSS	Defense Security Service
DSSOC	Defense Security Services Operations Center
DT	developmental testing
DT&E	developmental test and evaluation
DTC	Developmental Test Command
DTIC	Defense Technical Information Center
E-mail	electronic mail
EMSEC	emission security
ETE	end-to-end; JADS End-To-End Test
EW	electronic warfare; JADS Electronic Warfare Test
FTS	Federal Telecommunications System
FY	fiscal year
GIF	Graphics Interchange Format
GPS	global positioning system
GSA	General Services Administration
GTRI	Georgia Tech Research Institute, Atlanta, Georgia
HITL	hardware-in-the-loop (electronic warfare references)
HLA	high level architecture
HQ	headquarters
html	hypertext markup language
HWIL	hardware-in-the-loop (system integration references)
ID	identification
IMPAC	International Merchant Purchase Authorization Card
IP	Internet protocol; initial point
IRIG	Inter-Range Instrumentation Group
ISSO	information systems security officer
ITEA	International Test and Evaluation Agency
JADS	Joint Advanced Distributed Simulation, Albuquerque, New Mexico
JFS	joint feasibility study or JADS Joint Feasibility Study
Joint STARS	Joint Surveillance Target Attack Radar System
JPEG	Joint Photographic Experts Group
JT&E	joint test and evaluation

JTD	joint test director
JTF	joint test force or Joint Test Force, Albuquerque, New Mexico
KEYMAT	cryptographic keying material
LAN	local area network
LFP	live fly phase
M&S	modeling and simulation
MAJCOM	major command
MIPR	military interdepartmental purchase request
MITRE	a company that provides engineering services
MOA	memorandum of agreement
MOE	measure of effectiveness
MOP	measure of performance
MOS	military occupational specialty
MOU	memorandum of understanding
MSIAC	Modeling and Simulation Information Analysis Center
N&E	network and engineering
NAG	National Assessment Group
NAWC-WPNS	Naval Air Warfare Center Weapons Division
NCO	noncommissioned officer
NCSC	National Computer Security Center
O&M	operations and maintenance
OCA	original classification authority
ODP	officer distribution plan
OSD	Office of the Secretary of Defense
OT	operational test
OT&E	operational test and evaluation
OTC	Operational Test Command
OTP	outline test plan
PC	personal computer
PERSCOM	Army Personnel Command
PFMR	project funds management record
PGM	precision guided munitions
PID	program introduction document
POC	point of contact
PR	preliminary review
R&D	research and development
RTI	runtime infrastructure
SAC	senior advisory council
SAIC	Science Applications International Corporation
SAP	special access program
SCI	sensitive compartmented information
SCIF	sensitive compartmented information facility
SF	standard form
SISO	Simulation Interoperability Standards Organization
SIT	system integration test; JADS System Integration Test

SIW	Simulation Interoperability Workshop
SOC	statement of capability
SOP	standard operating procedure
SPECTRUM®	an instrumentation suite used to measure bandwidth utilization
SPJ	self-protection jammer
SSO	special security officer
T&E	test and evaluation
TAB	technical advisory board
TCAC	Test Control and Analysis Center, Albuquerque, New Mexico
TDA	table of distribution and allowances
TDY	temporary duty
TEMPEST	special shielding against electromagnetic radiation
TEXCOM	U.S. Army Test and Experimentation Command
TRP	test resource plan
TSARC	test schedule and review committee
TSLA	Threat Simulator Linking Activity
USDA&T	Under Secretary of Defense for Acquisition and Technology
VV&A	verification, validation, and accreditation
WAN	wide area network