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Army Experiences with Deployment Planning in Operation Desert Shield

James P. Stucker, Iris M. Kameny

Arroyo Center
National Defense Research Institute

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Prepared for the
United States Army
Office of the Assistant Secretary of Defense

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Preface

The Army's Arroyo Center at RAND conducted a special assistance study on the Operation Desert Shield (ODS) deployments. Initiated in early September 1990 at the request of the Chief of Staff of the Army, its objectives were to understand and report on how the Army's experience in ODS might influence the future Army—its planning systems, force structure, support capabilities, equipment needs, and deployment requirements. The study also complemented several other Arroyo Center research efforts addressing the Army's involvement in the operations in Southwest Asia, including work sponsored by the U.S. Forces Command on alternative Army force structures and active and reserve mixes. These research projects provide a broad perspective on the challenges confronting the Army as it transforms itself into a force more oriented toward contingency operations.

This monograph documents the Army's experiences with deployment planning and with deployment-planning systems during ODS. It describes the planning environment and expectations prior to the crisis and then documents how ODS experiences differed from those expectations. It offers suggestions as to how, from the Army's point of view, planning personnel, procedures, and systems might have been used better during ODS and how they might be improved for future deployments.

Interest expressed by the Joint Staff in this research prompted RAND's National Defense Research Institute to contribute to its publication.

Although focused on Army experiences, this document should be of interest to operation and logistic planners in all the services and, especially, to the military and civilian officials charged with improving deployment procedures and execution.

The Arroyo Center

The Arroyo Center is the U.S. Army's federally funded research and development center (FFRDC) for studies and analysis operated by RAND. The Arroyo Center provides the Army with objective, independent analytic research on major policy and organizational concerns, emphasizing mid- and long-term problems. Its research is carried out in four programs: Strategy and Doctrine;

Force Development and Technology; Military Logistics; and Manpower and Training.

Army Regulation 5-21 contains basic policy for the conduct of the Arroyo Center. The Army provides continuing guidance and oversight through the Arroyo Center Policy Committee (ACPC), which is co-chaired by the Vice Chief of Staff and by the Assistant Secretary for Research, Development, and Acquisition. Arroyo Center work is performed under contract MDA903-91-C-0006.

The Arroyo Center is housed in RAND's Army Research Division. RAND is a private, nonprofit institution that conducts analytic research on a wide range of public policy matters affecting the nation's security and welfare.

James T. Quinlivan is Vice President for the Army Research Division and the Director of the Arroyo Center. Those interested in further information about the Arroyo Center should contact his office directly:

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Summary

During the six months of Operation Desert Shield (ODS), the U.S. Army selected nearly 300,000 troops and over 1,000,000 tons of equipment and supplies for deployment to Saudi Arabia. It informed the U.S. Transportation Command of where and when those troops, equipment, and supplies would be massed for intertheater movement, and then moved the troops and cargoes to those ports of embarkation. It loaded the ships. And, after the troops and cargoes were airlifted and sealifted to their ports of debarkation on the Arabian peninsula, Army personnel received the aircraft, unloaded over 400 ships, remated troops with their equipment and supplies, and organized transport to move the reconstituted units into combat positions. They also provided many of those services to elements of the Marines and other Services.

Analysis of ODS experiences suggests that, despite lack of comparable standards, Army deployments were planned and executed reasonably quickly and smoothly, and were possible (on such a scale and schedule) primarily because of the intelligence and can-do attitude of the personnel and the existence of modern planning procedures and computerized information flows. Analysis also reveals areas where those personnel, procedures, and support require improvement.

At the beginning of ODS, few U.S. planners were proficient in real-time operations. Recent military operations had been either small, well planned in advance, or both. Some planners were expert in deliberate planning—the slow and considered development of detailed and coordinated operation and deployment plans for well-specified exigencies. Others were expert in deployment operations, but almost exclusively in scenarios or exercises that had been preplanned (and well planned), and in which operations always proceeded according to plan. In fact, nearly all U.S. planning activities and exercises assumed that (a) the threat and the proper U.S. response to the threat (and thus the mission for the Army and other Services) were clearly defined; (b) the forces necessary to handle the crisis and the transport they required were obvious and ready; and (c) few changes or updates to the plans were ever necessary.

Operation Desert Shield did not follow that book; there was no early warning, no plan on the shelf ready to execute, and in the beginning not even a good idea of the U.S. mission or of how many troops might be needed. Instead, the Iraqi invasion of Kuwait and the threat to Saudi Arabia presented U.S. planners with

the challenge of planning the deployment of not-yet-specified forces, rapidly, into a theater cloaked by uncertainty. Planners had to improvise and build constantly evolving employment and deployment plans, while at the same time their colleagues were physically deploying the initial waves of combat and support units.

By the end of the deployments people had been trained, procedures had been debugged, and diverse systems had been patched together. In this sense, and because the enemy mounted few effective operations, ODS should be viewed as a valuable learning experience. It called upon to replicate those deployments today, the Army's actions and reactions (and indeed those of all the U.S. Services and defense organizations) would be substantially faster and smoother. The challenge is to learn and to generalize—to learn from ODS the improvements in procedures, systems, and practices that can be used effectively in future, dissimilar crises.

Procedures Should Be Improved

Perhaps the most important lesson from ODS is that we need to re-examine how we do deployment planning and execution in this post–Cold War era where unexpected and unplanned-for regional crises now seem to pose the most probable threats to the U.S. security.

ODS demonstrated that political sensitivities easily can cause initial planning activities to be close-held at the highest levels, forcing lower-level organizations either to bide their time or to initiate early planning without clearly stated missions or objectives. Even after the full planning and execution community was allowed access to and participation in ODS planning, however, major uncertainties continued as perceptions of the world, the enemy, our possible actions, and his possible reactions changed almost daily. Future crises may differ from ODS in many ways, but we expect that, at least in their initial stages, most will exhibit significant if not similar sensitivities and uncertainties.

Accepting that as the norm, ODS experiences suggest that procedures for deployment planning should be repackaged to emphasize flexibility and adaptability. Deliberate-planning activities should emphasize detailed planning only within the context of learning how to plan, of establishing relationships with other planning and execution organizations, and of acquiring familiarity with foreign regions and their customs and resources. Crisis-planning activities should stress and facilitate concurrent planning and execution; they should acknowledge that most crises will require either a new operation plan (OPLAN) and time phased force and deployment data (TPFDD) or, at the least, immediate and significant changes to existing but dated plans and databases.

Crisis action procedures should stress multilevel planning, the use of aggregate data to estimate first-round needs, capabilities, and possibilities, and the use of detailed data to plan and execute actual movements. ODS officials commonly worked with three and four levels of data: They used aggregate (force level and unit-level) data in much of their planning, in communications, and in situation reporting; they used more detailed (unit-line-number level) information whenever they were involved with the Joint Operation Planning and Execution System and its applications; and they used even more detailed information (at the piece and person level) in planning and executing the actual moves. That experience needs to be incorporated into manuals and training.

ODS experiences also suggest the Army should (a) develop tailorable force packages for both combat and support units, complete with equipment lists and stow plans, and (b) work with the Joint Staff in developing doctrine and institutions for support command and control organizations and for support packages for different classes of contingencies and different types of theaters.

Support Systems Should Be Rethought, Then Updated

After contingency-planning and execution procedures have been refocused, their computerized support equipment and applications should be reassessed.

Army experiences in ODS suggest that the computerized deployment-support systems need to be refocused and updated. At the highest level, planners at the National Command Authorities, Chairman of the Joint Chiefs of Staff, the theater Commander in Chief (CINC), and U.S. Transportation Command need automated tools for planning and gaming (in the form of what-if scenarios based on the CINC's evolving OPLAN or course of action) as aids in decisionmaking. They must have immediate access to aggregate planning tools that can operate with incomplete, preliminary information. They must have means for continually incorporating newer and more complete information and planning guidance into their analyses and evolving plans. Meaningful links must be developed between elements of information as they become available and are updated; this information must be maintained in a database from which selected, relevant subsets can be furnished to the Joint planning and execution community (JPEC).

As the planning proceeds, means must be established for linking the several levels of data—forces, units, unit line numbers (ULN), and persons/pieces—so that planning and deployments can be conducted effectively and efficiently by the operating and transportation commands and, at the same time, monitored and coordinated by the higher-level commands. How the systems and databases are integrated or interconnected is an open issue, but it must not be a simple bottoms-up system. Both national officials and mid-level planners must be able to specify and analyze force and unit-level operations whether or not ULN and person/piece data are available.

Similarly, means must be developed for linking the several levels of communications so that planning and deployments can be conducted by the operating and transportation commands and, at the same time, monitored and coordinated by higher-level commands. Additional actions the Army might take to upgrade its deployment capability are discussed in the body of this report.

Most importantly, however, Army and JPEC personnel must realize that for the foreseeable future, regardless of near-term or even mid-term improvements in the support systems, those systems will continue to exhibit deficiencies and short-falls and, in particular, that there will always be delays in getting up to speed fast enough in no- and short-warning crises. High-stress activities such as bringing systems up to speed, creating and improving databases, and working around bottlenecks and deficiencies will continue to challenge crisis-action procedures, systems, and personnel.

Personnel Skills Should Be Refocused and Upgraded

If we accept the premise that future crises will usually arrive unannounced and that planning and support systems will continue to evolve rapidly—constantly improving and expanding capabilities and constantly challenging operator skills—then the most critical element of the deployment-planning system will continue to be its personnel: the soldiers and civilians who, with whatever tools are then available, must quickly and correctly plan operations, select units for deployment, pass along cargo information, and supervise moves and employments. To better train, nurture, and reward those personnel, the Army should:

1. Strengthen career paths for planning personnel. Increase recognition of superior skills, qualifications, and performance.
2. Increase the training and practice of those personnel in realistic-plan, no-plan, and unexpectedly stressful scenarios. Restructure deployment exercises to require personnel to use the deployment support systems to their

maximum capabilities, including the rapid compilation of large TPFDDs, and the rapid analysis and integration of situational changes.

3. Create ways to use crisis-planning tools in day-to-day peacetime operations. This may be difficult, but it is necessary to ensure familiarity and continuing competence.

Acknowledgments

We received substantial help in surveying and understanding the deployment-planning procedures and support used in Operation Desert Shield from many individuals. Our guides, critics, and facilitators in the Army Chief of Staff's Analysis and Initiatives Group included COL Raoul Alcala and COL Robert Killebrew. They kept the study on track and opened doors for us throughout the world.

We offer sincere thanks to the many individuals who shared their Operation Desert Shield experiences with us. These include Lt Col Michael Whitney, MAJ William McLean, and SGT William Putnam of USCENTCOM; Col. James Hatch, CDR John Jonas, Lt Col Ralph Alexander, Joseph Cirrincione, Lt Col Taylor Huddleston, CDR Ronald Miller, LTC Lawrence Glicoes, LTC Charles Rash, Lt Col William Wetzig, LTC Donald Morrow, and COL Ronald Kelly of USTRANSCOM; LTC Yerry Kenneally and MAJ John Troxel of the 22nd Support Command; LTC Robert Balog of the Joint Staff; Lawrence Duch, MAJ Richard Jones, and Andrew Achiston of Fort Riley, Kansas; COL Kenneth Carlson, MAJ William Ewing, and Harold Crouch of USAREUR; LTC Stephen Bell of USEUCOM; and COL Gabriel Alcala, the WAM Program Manager. Thanks are also due to Col Melvin Hosaka, the AWIS Program Manager, and to James Bray, the AWIS Deputy Project Manager for explaining the AWIS program and plans.

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Finally, we owe thanks to our RAND colleagues Bruce W. Don and David Kassing, who provided guidance and leadership throughout the study, and to William McCoy, Fred L. Frostic, and Paul S. Killingsworth, who reviewed the draft and offered many suggestions for improving and clarifying the presentation.

Abbreviations and Acronyms

ADP	Automatic data processing
AFB	Air Force Base
AFSC	Armed Forces Staff College
AIS	Automated information system
ALD	Available to load date at the port of embarkation
AMC	Air Mobility Command
AMOPS	Army Mobilization and Operation Planning System
APOE	Aerial port of embarkation
ARC	Armored cavalry regiment
ARCENT	Army component, U.S. Central Command
ARPA	Advanced Research Projects Agency
AUEL	Automated unit equipment list
AUTODIN	Automatic Digital Network
AWIS	Army WWMCCS Information System
C-Day	Day on which the first movements in support of a specific OPLAN or OPORD begin
C2	Command and control
CAP	Crisis-action planning or crisis-action procedures
CENTAF	Air Force component, U.S. Central Command
CESPG	Civil engineering support plan generator
CIN	Cargo increment number
CINC	Commander in Chief
CJCS	Chairman of the Joint Chiefs of Staff
COA	Course of action
COMPASS	Computerized Movement Planning and Status System
COMPES	Contingency Operational Mobility Planning and Execution System
CONPLAN	Operational plan in concept form
CONUS	Continental (contiguous) United States
COSCOM	Corps Support Command
CPE	Conventional Planning and Execution
CRAF	Civil Reserve Air Fleet
CRD	CINC's required date
CS	Combat support
CSS	Combat service support

D-Day	Day on which a particular operation (a land assault, air strike, naval bombardment, etc.) begins
DART	Dynamic Analytical Replanning Tool
DBMS	Database Management System
DCA	Defense Communications Agency (now DISA)
DCSLOG	Deputy Chief of Staff for Logistics
DCSOP	Deputy Chief of Staff for Operations
DDN	Defense Data Network
DEMSTAT	Deployment, Employment, and Mobilization Status System
DEST	Destination
DIA	Defense Intelligence Agency
DISA	Defense Information Systems Agency (formerly DCA)
DLA	Defense Logistics Agency
DME	Data Management Environment
DoD	Department of Defense
DSSO	Defense Systems Support Organization (formerly JDSSC)
EAD	Earliest arrival date
EUR	Europe
FDBM	Functional database manager
FLOGEN	Flow Generator System
FM	Force modules
FMS	Force Module Subsystem
FORMDEPS	Forces Command Mobilization and Deployment Planning System
FORSCOM	Forces Command (U.S.)
FPF	Force Package File
FREF	Force Record Extract File
FRG	Force Requirements Generator
FRN	Force requirement number
FTS	File Transfer System
GAO	General Accounting Office
GDSS	Global Decision Support System
IDS/II	Integrated data store/II network model DBMS
IG	Inspector General
ILOC	Intermediate locations
IMP	Interface Message Processor
IOC	Initial Operating Capability
ITO	Installation Transportation Office/Officer
JCS	Joint Chiefs of Staff
JDA	Joint Deployment Agency

JDC	Joint Deployment Community
JDS	Joint Deployment System
JDSIP	JDS Interface Processor
JDSSC	Joint Data Systems Support Center (now DSSO)
JMAS	Joint Mission Application Software
JOGS	Joint Operations Graphics System
JOPES	Joint Operation Planning and Execution System
JOPS	Joint Operation Planning System
JPEC	Joint planning and execution community
JPG	JOPES Project Group
JS	Joint Staff
JSCP	Joint Strategic Capabilities Plan
JSE	JOPES support element
JSTPS	Joint Strategic Target Planning Staff
LAD	Latest arrival date at port of embarkation
LCE	Logistics Capability Estimator
LOGMARS	Logistics Marking and Reading Symbols
LOGSAFE	Logistics Sustainability Analysis Feasibility Estimator
MAIRS	Military Airlift Information Reporting System
MAPS	Mobility, Analysis, and Planning System
MARAD	Maritime Administration
MARCENT	Marine Component, Central Command
MCRR	Movement Control and Readiness Reporting
MEDEVAC	Medical Evacuation System
MEF	Major Equipment File
MPM	Medical Planning Module
MRG	Movement Requirements Generator
MSC	Military Sealift Command
MSPS	Mobilization Station Planning System
MTMC	Military Traffic Management Command
MTONS	Measurement tons
MWF	Medical Working File
NAT	Not air transportable
NAVCENT	Naval component, U.S. Central Command
NBC	Nuclear/Biological/Chemical
NCA	National Command Authorities
NCCS	Navy Command and Control System
NEO	Noncombatant evacuation operations
NMCC	National Military Command Center
NMCS	National Military Command System

NPE	Nuclear Planning and Execution
NPG	Nonunit Personnel Generator
NTC	National Training Center
ODS	Operation Desert Shield
O&M	Operations and maintenance
OPLAN	Operation plan
OPORD	Operation order
OPSDPS	Operational deputies
OPSG	Operation Planning Steering Group
ORG	Origin
PACAF	Air Force component, U.S. Pacific Command
PDD	Package Designation and Description File
PFF	Planning Factors File
PIN	Personnel increment number
PMO	Project Management Office/Officer
POD	Port of debarkation
POE	Port of embarkation
POL	Petroleum, oil, and lubricants
POSF	Ports of Support File
PWF	Personnel Working File
ROC	Required Operational Capability
RRF	Ready Reserve Fleet
RUM	Resource and Unit Monitoring
S&M	Scheduling and Movements
SCC	Service Component Command
SCI	Sensitive compartmented information
SDF	Standard Distance File
SEASTRAT	Sealift Strategic Planning System
SIOP	Single Integrated Operational Plan
SITREP	Situation report
SORTS	Status of Resources and Training System
SPOD	Sea port of debarkation
SRA	System Requirements Analysis or Systems Research and Applications Corporation
SRF	Summary reference file
STONS	Short tons
SupCom	Support Command
TAACOM	Theatre Army Area Command
TC-ACCIS	Transportation Coordinator's Automated Command and Control Information System

TC-AIMS	Transportation Coordinator's Automated Information for Movements System
TCC	Transportation Component Command
TCP/IP	Transmission Control Protocol and Internet Protocol
TFE	Transport Feasibility Estimator
TLCF	Teleconferencing
TOE	Table of Equipment
TPFDD	Time-phased force and deployment data
TRADOC	Training and Doctrine Command
TUCHA	Type unit characteristics
TUDET	Type unit equipment detail
TW/AA	Tactical Warning/Attack Assessment
UCFF	UTC Consumption Factors File
UEL	Unit equipment list
UIC	Unit identification code
ULN	Unit line number
UMD	Unit Movement Data
UNAAF	Unified Action Armed Forces
USAREUR	Army component, U.S. European Command
USCENTCOM	U.S. Central Command
USCINCCENT	Commander in Chief of the U.S. Central Command
USEUCOM	U.S. European Command
USLANTCOM	U.S. Atlantic Command
USSOUTHCOM	U.S. Southern Command
USTRANSCOM	U.S. Transportation Command
UTC	Unit type code
WAM	WWMCCS ADP Modernization
WIN	WWMCCS Intercomputer Network
WIS	WWMCCS Information System
WISDIM	Warfighting and Intelligence Systems Dictionary for Information Management
WISDIM	WWMCCS Information Systems Dictionary for Information Management
WWMCCS	World-Wide Military Command and Control System

1. Introduction

Deployment is a complex activity. Deployment planning involves identifying the threat; determining which types of U.S. units can best counter and conquer it; identifying specific units of those types that are combat ready, equipped, and available to move in accordance with the theater commander in chief's (CINC's) schedule; identifying and scheduling military and civilian aircraft and ships to move those units into the theater; providing for the reception and onward movement of those units; and sustaining them once they are there. All these tasks were accomplished in Operation Desert Shield (ODS).

The deployment tasks may appear simple, but they require many detailed and interdependent activities involving many organizations and agencies (see Figure 1). The major tasks that must be accomplished in reasonable order for any successful deployment include

1. When and as directed by the National Command Authorities (NCA), the Chairman of the Joint Chiefs of Staff (CJCS) tasks the theater CINC (for ODS this was USCINCCENT, the Commander in Chief of the U.S. Central Command) to develop the war plan. CJCS allocates forces and transport for that plan.
2. The CINC, in consultation with his component commanders, draws up his plan and decides on the types of forces he needs, roughly in what sequence or time-phasing he needs them, and then allocates his transport accordingly.
3. The Services' sourcing agencies (Forces Command [FORSCOM] for the Army), working with the CINC's requirements and the CJCS's allocations, then designates the particular units that will deploy.
4. The CINC's initial call is primarily for combat units. After those have been specified, the sourcing agencies, the Services, and the CINC jointly determine the support units and structure and the non-unit personnel, supplies, and equipment that will be needed.
5. The sourcing agencies identify specific support elements and coordinate ready-to-move dates for both combat and support units with the CINC and with the U.S. Transportation Command (USTRANSCOM).

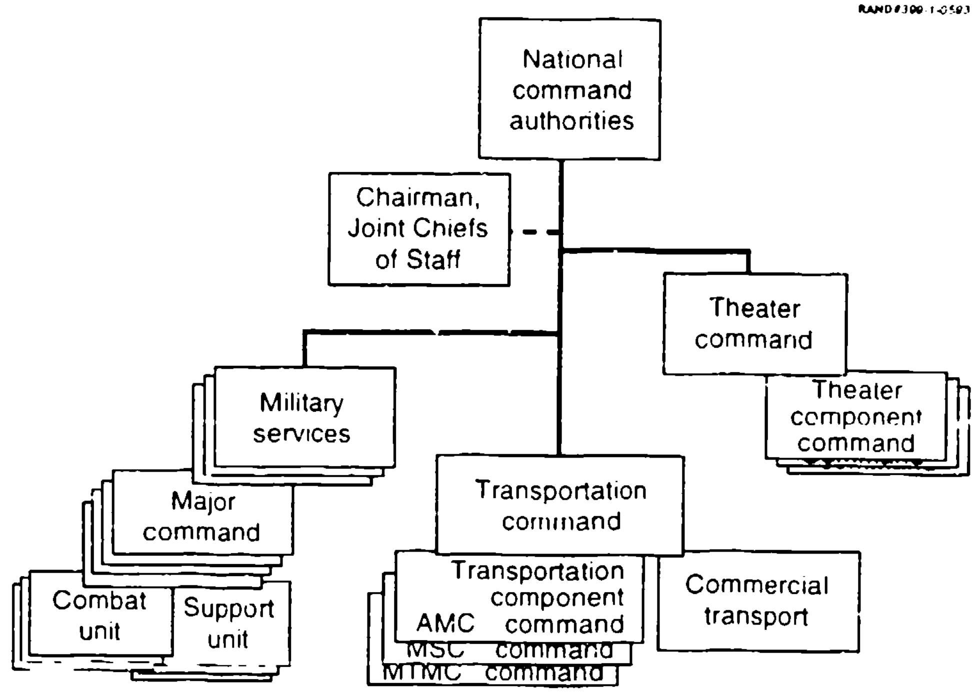

Figure 1—Deployment Planning Participants

6. Deploying units, with guidance from the CINC and the sourcing agency (and perhaps USTRANSCOM), estimate the number of personnel and the items of equipment (by number, type, weight, and size) they wish to move. The CINC continues to coordinate the detailed plan among the Services. He reserves the final authority over all latest arrival dates (LADs).
7. The installation transportation officers supporting the deploying units (in the Continental United States or CONUS) arrange the initial overland moves by road or rail. The Transportation Component Commands (TCCs) arrange for air and sea transport and for port activities.
8. The CINC coordinates in-theater reception of the deploying units and their movement to forward destinations.

This might all work efficiently and effectively *if* the plans were perfect (or nearly so) and *if* nothing that affected any of the plans ever changed. In real deployments, however, many things usually occur simultaneously, and changes constantly disrupt aspects of the plan. The planning, the corrections, the replanning, and the updates require reliable, secure, and often near-continuous communications among the participants.

Deployment planning requires high-level decisions concerning whether force should be employed, how much and which kinds of force to deploy, whether to call up the Civil Reserve Air Fleet (CRAF) and/or the ships in the Ready Reserve Fleet (RRF), etc. It also (see Figure 2) requires lower-level decisions and information flows identifying which troops and which cargoes will be loaded onto which ships and aircraft. The planning procedures and systems that define and facilitate those decisions and data flows are the subject of this report. We document and examine Army experiences with those procedures and systems during Operation Desert Shield and identify improvements and supplemental capabilities that may better serve future deployments.

Purpose and Approach

Operation Desert Shield provided the first large-scale test of modern deployment planning and monitoring procedures and their automated support equipment. Some procedures had proven useful in smaller operations and in operations that were not time sensitive, but ODS was different. ODS was a short-warning crisis requiring immediate deployments that evolved into the largest deployment of troops and equipment since World War II.

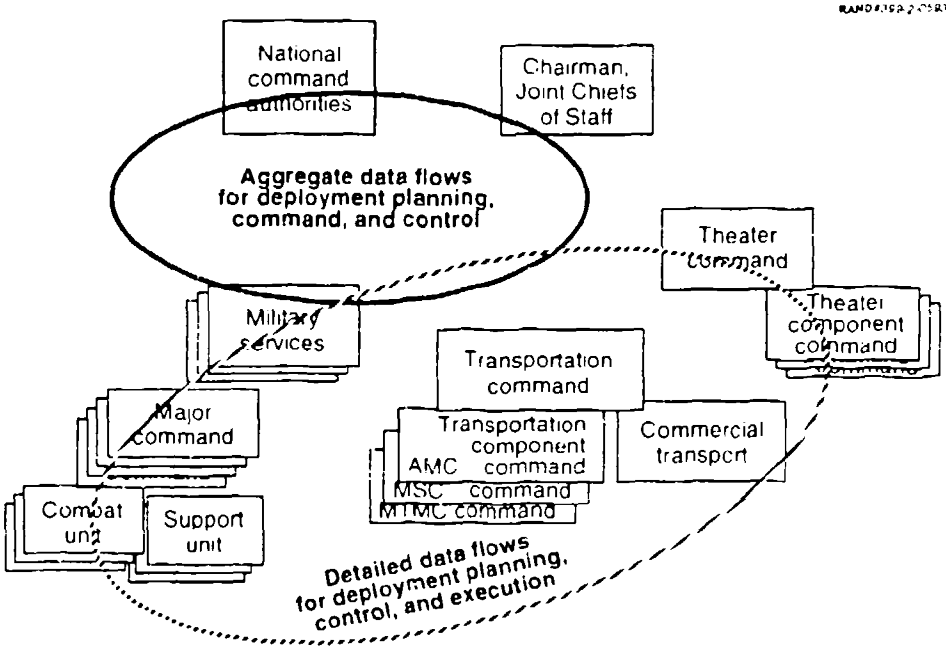

Figure 2—Planning Requires Multiple, Concurrent Data Flows

Throughout ODS the deployment planning community criticized the procedures and, especially, the support equipment. The recurring theme was that JOPES, the Joint Operation Planning and Execution System, and the other deployment-related systems were of little use, especially during the early stages of the deployment.

This report identifies and discusses many real problems with JOPES, but it also argues that much of the criticism early in ODS was due to the unfamiliarity of the planning and deployment communities with the environment in which they suddenly found themselves. The uncertainties were greater in number and more substantive than expected. Because personnel had little realistic training in dynamic, no-plan operations, many of the initial efforts of the planning and execution community appeared confused and ineffective.

This report documents the Army's experiences with deployment planning and with deployment-planning systems during ODS. It describes the planning environment and expectations before ODS and then documents how ODS experiences differed from those expectations. It offers suggestions as to how planning personnel, procedures, and systems might have been used better during ODS and should now be improved for future deployments.

Outline of This Report

This report is divided into six sections. Sections 2 and 3 provide background by summarizing Army and Joint planning procedures and systems as they were perceived at the beginning of ODS. These sections set the stage for what follows.

Section 4 documents Army experiences with those procedures, systems, and support during the ODS deployments. In particular, it documents how the planning and execution environment for this operation differed from the practices and exercises that had gone before. Section 5 discusses and presents examples of the types of shortcomings that surfaced with respect to the computerized support systems during the deployment. Section 6 summarizes the experiences documented in the report and presents suggestions for structuring near-term improvements to the current procedures and systems and further research into the more basic, longer-term issues associated with deploying the Army of the future.

Several appendixes provide background information on the support systems. Appendix A contains detailed information on the Joint automated information systems assisting deployment and operations planning. Appendix B describes the major Army support systems and how they interact with the Joint systems.

2. Deployment Planning Prior to ODS

Deployment is a joint activity. Army and Marine units deploy on Air Force or commercial aircraft and on Navy or commercial ships, as directed by the commander in chief of a theater unified command and coordinated by the CINC of the U.S. Transportation Command.[1] This section discusses the joint planning process and the procedures for deliberate and crisis-action planning that were current at the time of ODS.

Military operations consist of a number of distinctly different activities, each of which must be planned, coordinated, and executed. Major activities include mobilization, deployment, employment, sustainment, and redeployment. Mobilization involves the selection, activation, equipping, and movement of reserve forces. Deployment involves the strategic movement of forces and support from their home bases to the location of the conflict. Employment involves the theater use of combat forces; sustainment involves the resupply of the theater forces. Redeployment involves the subsequent movement of deployed units back to their home bases or on to new locations.

Participants in the operation-planning process include the National Command Authorities (NCA), their advisers, supporting executive-level agencies, and a group collectively called the Joint Planning and Execution Community (JPEC). The JPEC consists of the commands and agencies involved in the training, preparation, movement, reception, employment, support, and sustainment of forces in a theater of operations. This includes the Joint Staff, the unified and specified commands, the Services, government agencies such as the Defense Communications Agency (DCA), the Defense Logistics Agency (DLA), and the Defense Intelligence Agency (DIA), non-Department of Defense (DoD) departments and agencies, and at times allied commands and agencies.

Joint publications detail two distinct types of contingency planning—*peace-time* or *deliberate planning* and *time-sensitive* or *crisis-action planning*—and state that the significant factor determining which type of planning to employ is the time

[1]The joint operational planning process is defined in Joint Pub. 2 as "a coordinate joint staff procedure used by a commander to determine the best method of accomplishing assigned tasks and to direct the action necessary to accomplish his mission." See The Joint Chiefs of Staff, *Unified Action Armed Forces (UNAAF)*, JCS Pub. 2, Washington, D.C., December 1986, pp. 3–41

available for planning.[2] Deliberate planning typically takes from 18 to 2[illegible] months and should be used when time permits the participation of numerous commanders and staff from the JPEC. Deliberate-planning activities produce a concept plan (CONPLAN) or operation plan (OPLAN), along with supporting plans, documents, and databases.[3] Crisis-action planning, on the other hand, is used when the time available for planning is short and armed forces may need to be deployed and/or employed quickly.[4]

There is another, even more significant, difference between them, however: Crisis-action procedures, unlike deliberate-planning procedures, involve both planning and execution. They result in an operation order (OPORD), a deployment database linked to the military command and control structure, and the deployment and employment of military forces.[5] Thus, even in a crisis with significant advance warning when some or all of the deliberate-planning activities might be used, the resulting plans, documentation, and data must be transferred into the crisis-action system before execution is possible.

Figure 3 shows the relationships between deliberate planning and crisis-action planning. We will soon discuss the differences between the two activities, but it is useful first to note the similarities and relationships between them. As can be seen in the figure, the *planning* procedures are much the same for the two activities, at least for the first four steps:

1. The Chairman of the Joint Chiefs of Staff, acting for the National Command Authorities, tasks a unified commander to develop a war plan. The CJCS allocates forces and transport for that plan. The tasked commander becomes the "supported" CINC; all other unified and specified commanders become "supporting" CINCs. The services are also designated to support the operation.

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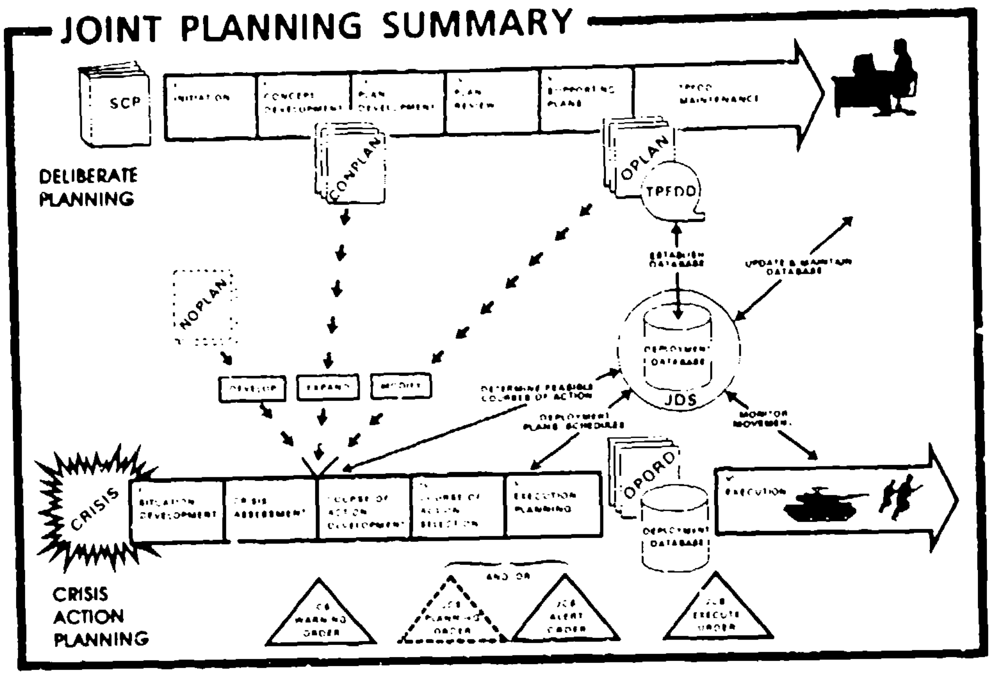
[2]Much of this information concerning the joint planning systems and their automated information system (AIS) support is taken from AFSC Pub 1, "*The Joint Staff Officer's Guide, 1991*," in particular, Sections 6 through 8 on deliberate planning, crisis-action planning, and future systems.

[3]The procedures of deliberate planning are described in Joint Operation Planning System (JOPS) Volumes I and II. Those volumes also give the administrative requirements for publishing the plan, its annexes, appendixes, etc. JOPS Volume III introduces the available automatic data processing (ADP) support.

[4]Each type of planning has, until recently, been supported by its own AIS. The Joint Operation Planning System was the system used for deliberate planning and the Joint Deployment System (JDS) was the system used for crisis-action planning and deployment. Currently, a new system, the Joint Operation Planning and Execution System (JOPES) is beginning to integrate JOPS and JDS and deployment planning and execution. Those systems are discussed in the next section.

[5]Procedures for crisis-action planning are described in Joint Pub 5-02.4, *Joint Operation Planning System*, Volume IV, "Crisis Action Procedures."



SOURCE: Armed Forces Staff College, National Defense University, *The Joint Staff Officer's Guide 1991*, AFSC Pub 1, Figure 7-20, Washington, D.C.: U.S. Government Printing Office, 1991, p. 7-40.

Figure 3—Joint Planning Summary

2. The supported CINC reviews the enemy situation and begins to collect necessary intelligence.
3. He develops his plan or course of action.
4. The plan is reviewed and the appropriate course of action selected.

At that point, however, the procedures diverge. Deliberate planning produces the plan, including the supported CINC's operation plan, supporting plans from all the supporting CINCs and Service organizations, and the time-phased force and deployment database (TPFDD). The TPFDD then becomes the basis of the deployment database. Continuing activities include the maintenance (updating) of those plans and databases.

Crisis-action planning differs because its results also include troop deployments and perhaps employments, so its fifth stage involves detailed execution planning. A final stage can include the movement, staging, and maneuver of forces.

As the figure suggests, crisis-action planning is helped significantly if there is a completed OPLAN that can be adopted or adapted during course-of-action development and an existing, even if embryonic, deployment database. If those do not exist for a particular exigency, then even an outline or concept plan can help. If neither exists, it is called a "no-plan" situation and crisis-action planners must create both the plan and the database. Operation Desert Shield reflected an intermediate case, where there was no OPLAN or database from the deliberate-planning process that could be directly and immediately used, but a partial plan existed from which initial information could quickly be abstracted. The challenge was to fill out and execute that plan quickly.

Operation Desert Shield covered the initial planning for and execution of the mobilization and deployment of U.S. forces from the United States and Europe, and the defensive employment of those forces in Saudi Arabia. In this report we focus on the deployment activities, but obviously we can discuss and consider those only within the overall context. The United States deployed forces only because it felt the need to employ them. Many units needed to be mobilized before they could be deployed or employed. All deployed troops and equipment needed to be resupplied. Planning procedures necessarily cover the full operation, although, as we will see, they and especially their computerized support currently focus on deployment.

Deliberate Planning

To put ODS in perspective, it is necessary to understand both deliberate planning and crisis-action planning. Deliberate planning logically comes first. The five phases of the deliberate-planning process begin when a theater commander receives a task assignment and end when an OPLAN with supporting plans and TPFDD have been approved by the supported CINC.

An OPLAN is a description of the CINC's concept of operations and identifies the forces and supplies required to execute the plan. It includes a movement schedule of those resources into the theater. Developing an OPLAN requires much time and effort and is appropriate only in selected situations: when a hostile situation is critical to U.S. national security; as a deterrent to an enemy in showing U.S. readiness through planning; or when the operation is expected to tax total U.S. capability in forces, supplies, or transportation. In less serious situations, the planning process is followed only through the development of the concept, and results in the abbreviated operation plan called the CONPLAN.[6]

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[6]There are basic differences between the OPLAN and CONPLAN. The OPLAN fully develops the CINC's concept of operations. The documentation includes annexes that describe the concept and explain the theater-wide support required in the subordinate commander's employment plan. The OPLAN concentrates on deployment of resources and contains a TPFDD. The CONPLAN is less

Phase I—Initiation

In Phase I, the CJCS forwards the planning task to the combatant commander (the supported CINC), directs him to produce either an OPLAN or a CONPLAN, and apportions major forces and strategic transportation assets for his planning.

Phase II—Concept Development

During this phase, the supported CINC derives the mission from the assigned task. He issues planning guidance to his staff and they begin to collect and analyze information concerning the enemy. As quickly as possible, the staff proposes and analyzes alternative courses of action (COAs), the CINC selects the best COA, and the staff develops and documents a concept of operations. By the authority of the CJCS, the Joint Staff reviews the concept and recommends approval or disapproval. The COA is a statement of how the commander expects to conduct the operation in terms of deployment, employment, and support of the apportioned forces. It identifies major objectives and target dates for their attainment. If the task assignment is to produce a CONPLAN, then at the end of Phase II the concept is documented in the CONPLAN, receives final review and approval, and the planning process is terminated. If the task assignment is to produce an OPLAN, planning continues into the next phase.

Phase III—Plan Development

In this phase, the supported CINC's concept of operations is expanded into a complete OPLAN. During the initial steps of this phase, the subordinate commanders in unified combatant commands (these are the Service Component Commanders or SCCs) begin developing the total package of forces required for the operation. They start by selecting the major combat forces from those apportioned in the original task-assigning document. Working closely with the staffs of their respective Service headquarters, other supporting commanders, and DoD agencies, the SCCs identify required support forces and sustainment. The supported CINC consolidates each component's forces and supplies, and details the phasing of those movements into the theater of operations. Required intratheater transportation movements are identified and assigned to apportioned intertheater transportation, to CINC-controlled theater

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detailed in documented presentation of the CINC's plan. Computer support is not generally required for the CONPLAN since detailed support requirements need not be calculated and strategic movements are not simulated. The CONPLAN does not generally include the detail found in OPLAN annexes, but may have selected annexes and a TPFDD if the CINC so directs.

transportation, or to transportation organic to the subordinate commands. Intertheater movements are simulated with a computer model until the CINC is reasonably confident that they are feasible using only CJCS-apportioned transportation assets. During the later steps of this phase, the Services replace hypothetical (notional) combat and support units in the plan with references to actual units. In a final step, USTRANSCOM and its component commands (Air Mobility Command or AMC, Military Sealift Command or MSC, or Military Traffic Management Command or MTMC) use more sophisticated computer models to again simulate the intertheater (and sometimes the intratheater) movements to ensure that the TPFDD is transportationally feasible. At the end of this process, USTRANSCOM copies the TPFDD into a deployment database.[7]

Phase IV—Plan Review

The CJCS, his staff, and advisers review all elements of the plan for adequacy and feasibility.

Phase V—Supporting Plans

Each subordinate and supporting commander who has been assigned a task in the supported CINC's plan now prepares a supporting plan and submits it to him for review and approval. When all supporting plans are complete, the CINC's plan is ready for implementation.

A continuing task is then to keep the plan up-to-date and ready for implementation. The supported CINC specifies how often maintenance and updating are required. Changes in sourcing, unit equipment, location, or state of unit readiness all affect the plan, since they may change the amount of materiel to be deployed or the port of embarkation where it will be loaded. All members of the JPEC share in responsibility for keeping the deployment database current.

Crisis-Action Planning

Crisis-action planning procedures are designed to be used by the JPEC to plan, deploy, and employ U.S. military forces in time-sensitive situations such as in Operation Desert Shield. As shown in Figure 4, the crisis-action planning system

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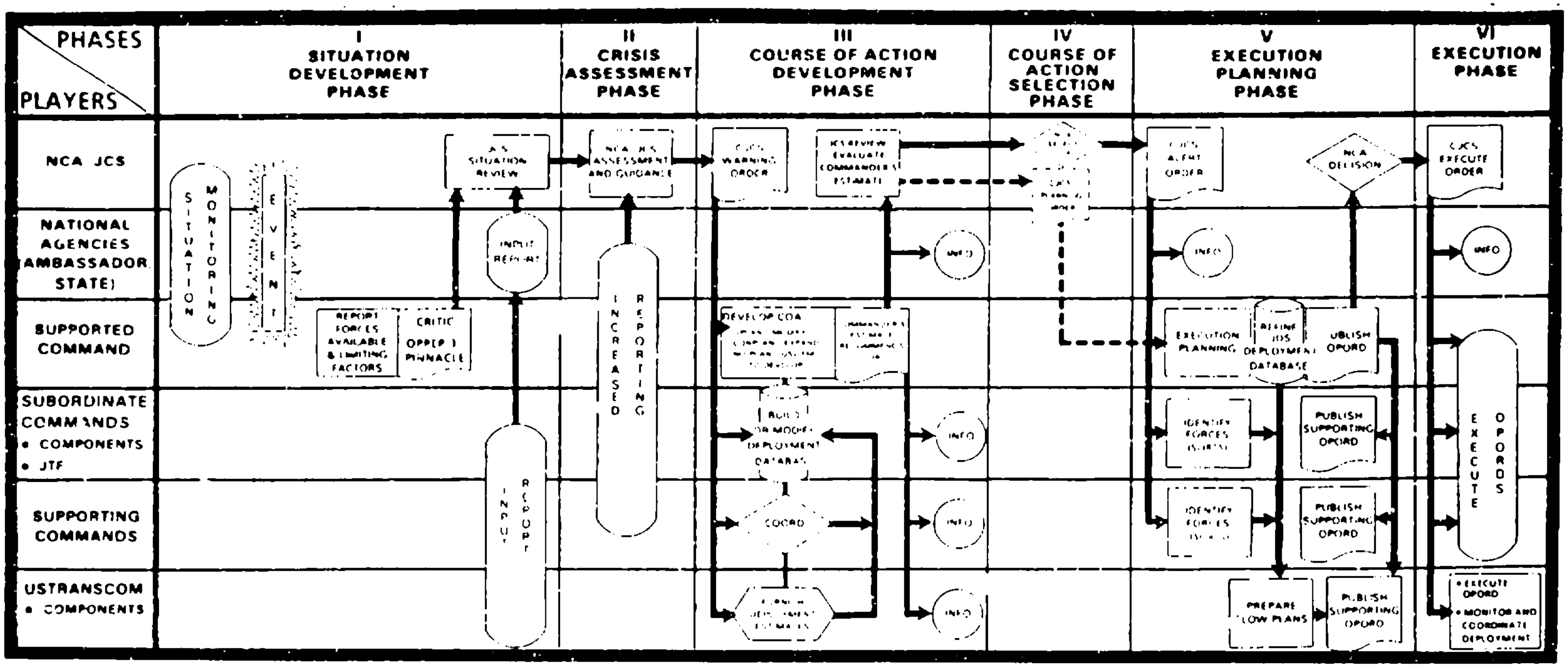
[7] As we shall see in the next section, this is the point at which the force deployment database is transferred from the JOPS format used by deliberate-planning AIS into the JDS format and system used by USTRANSCOM and the TCCs.



SOURCE: Armed Forces Staff College, National Defense University, *The Joint Staff Officer's Guide 1991*, AFSC Pub 1, Appendix K, Chart 5, Washington, D.C.: U.S. Government Printing Office, 1991.

Figure 4--Crisis Action Procedures

is divided into six separate phases, each with a definite start, and finish, and with actions to be performed by key members of the JPEC community.

Phase I—Situation Development

Organizations of the U.S. government routinely monitor world events for possible security implications. When such an event is identified it is reported to the National Military Command Center (NMCC) and, if the NCA deem it appropriate, Crisis-Action Procedures (CAP) are initiated.

In this first phase, the focus is on the theater CINC who will be responsible for all U.S. military action. His staff reviews OPLANs and CONPLANs for relevance. A secure, crisis-specific teleconference (electronic mail system) is established to allow rapid exchange of information. When completed the CINC's assessment is submitted to the CJCS and the NCA.

Phase II—Crisis Assessment

This phase emphasizes information gathering and the review of available options by the NCA. They and the CJCS analyze the situation to determine whether a military option should be prepared to deal with the evolving problem.

The NCA identify the national interests at stake; the national objectives related to those interests; and possible diplomatic, political, economic, and military options to achieve the objectives. They may decide that a crisis exists and that military COAs should be developed by the CINC. The CJCS assesses the situation from the military point of view and may recommend to the NCA that orders be published to prepare to deploy forces. This phase ends when the NCA decide whether or not to have military options considered.

Phase III—Course of Action Development

Following the decision of the NCA to develop possible military solutions to the crisis, the CJCS publishes a Warning Order giving initial guidance to the JPEC and requesting the supported CINC to recommend a COA to meet the situation. (In a fast-breaking crisis this can simply be a telephone conference with a follow-on for-the-record message to the JPEC.)

The supported CINC develops COAs with the help of subordinate and supporting commanders. When available, existing CONPLANs and OPLANs are consulted and existing deployment databases are used to develop force lists and support packages. The Services monitor the deployment planning and assess the readiness of their forces. As time permits, USTRANSCOM reviews the proposed COAs for transportability and prepares feasibility estimates. This phase concludes when the supported CINC releases his "Commander's Estimate."

Phase IV—Course of Action Selection

In this phase, the CJCS and the JS review and analyze the Commander's Estimate and present the COAs in order of priority to the NCA for decision. The supported CINC and the JPEC continue deployment and employment planning.

After the CJCS and his staff evaluate the COAs, the NCA select one and direct that execution planning should begin. The CJCS, under the authority of the Secretary of Defense, issues an Alert Order to the CINC. He may also issue a Deployment Preparation Order or Deployment Order.

Phase V—Execution Planning

The supported CINC now transforms the NCA-selected COA into an operational order (OPORD). This phase encompasses three major tasks:

- Execution planning—developing the OPORD by modifying an existing OPLAN, expanding an existing CONPLAN, or building it from scratch when no plan exists.
- Force preparation—selecting the actual units to participate in the planned operation and readying them for deployment.
- Deployability posture reporting—issuing situation reports (SITREPs) documenting the early attainment of, or deviations from, specified deployability postures.

Emphasis during this phase rests with the supported CINC and his subordinate and supporting commanders. However, other JPEC members are contributing also: The CJCS monitors the development of the CINC's OPORD and resolves shortfalls; CINC USTRANSCOM coordinates the changes to the forces and the strategic lift resulting from those shortfalls; the TCCs create the schedules for air and sea with concentration on the initial increment of movements, seven days by air and 30 days by sealift.

This phase ends when the NCA decide to execute the OPORD, to place it on hold, or to seek resolution by other means.

Phase VI—Execution

Execution begins with the NCA decision to choose the military option and execute the OPORD. The Secretary of Defense then authorizes the CJCS to issue an Execute Order directing the CINC to carry out the OPORD. In a fast-developing crisis, the Execute Order could be the first communication of record generated by the CJCS and might even be preceded by a voice announcement.

The Execute Order defines C-day (the day on which the first movements will begin) and the resource allocation and directs execution of the OPORD. The CJCS monitors deployment and employment of forces, directs the resolution of conflicts, and assesses the achievement of objectives. The supported CINC carries out the Execute Order, transmitting his own guidance to subordinates and supporting commanders. Those commanders execute their CINC-directed OPORDs, revalidate the sourcing and scheduling of units, report movements of organic lift, and report deployment movements. Execution continues until the operation is complete or canceled.

Summary

This was the status of deployment-planning procedures at the start of ODS. For major contingencies the deliberate-planning process was expected to slowly and laboriously produce detailed OPLANs and TPFDDs. In crisis-action situations, officials were expected either to pull a relevant OPLAN and TPFDD from the shelf and update them for use or to quickly and efficiently work through a

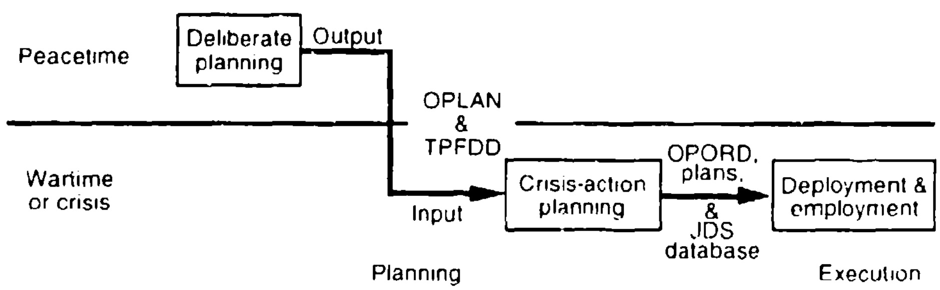


Figure 5—Planning and Practice Have Been Linear

compressed version of the deliberate-planning process, but in days, not months. In either case, planning would be complete and a detailed (and stable) description of the content and sequence of the deployment would be generated before anyone began to execute the deployment. Figure 5 illustrates this process.

Practice and exercises went by that book. Deliberate-planning activities were long and involved. Crisis-action activities, when they occurred, were short, intense, and involved only a few elements of the rapid-deployment forces. Deployment planning began with and centered on a stable TPFDD. Deployment exercises utilized that stable TPFDD, seldom acknowledging uncertainties that could cause changes in, for example, the CINC's priorities, the amount of equipment that units brought to their ports of embarkation (POEs), changes in the availability of transport ships and planes, or similar items.

3. Computerized Support

Computerized support for deployment planning consists of hardware and software designed for and sometimes by the joint community and the Services. Joint systems center on the Worldwide Military Command and Control System (WWMCCS) and its major set of software—the Joint Operation Planning and Execution System (JOPES). JOPES runs on WWMCCS hardware at 30-some sites throughout the world; sites are interconnected through the WWMCCS Intercomputer Network (WIN). The WWMCCS' primary mission is to support the NCA; secondarily it supports the Services and other DoD agencies.

Army planning is supported by the Army WWMCCS System (AWIS) program which provides interfaces between JOPES and Army-specific systems at eight Army WWMCCS sites. This includes several service-specific systems hosted at the Forces Command Headquarters WWMCCS site specifically supporting deployments. The AWIS program has two missions: supporting the Army's use of, and contribution to, the joint systems, and supporting the Army's unique strategic command and control mission.

These are all evolving systems in which older technology and capabilities are continually being replaced and updated. The systems and some of their interactions during the ODS period are briefly described in the following section. Readers desiring more information should consult the appendixes and the government documents referenced therein.

WWMCCS

Computers have aided military planning and command and control for many years, and for just as long they have created problems and confusion. As early as the 1960s, it had become apparent that different types of computers, incompatible software programs, and inconsistent planning procedures and documentation were making it difficult for commands and commanders to communicate effectively. Work soon began on an integrated planning system to address those problems, and by 1973 some 35 WWMCCS sites had been set up and furnished with Honeywell 6000 computers. In the early 1980s, Honeywell upgraded the computers and the operating system. This equipment remains the "standard" ADP support for joint operations planning and execution. Since the late 1980s, it has been supplemented by IBM-compatible personal computers used as terminals and low-level workstations. Current modernization efforts seek to provide more powerful workstations and lessen dependence on the aging mainframes.

The WWMCCS Intercomputer Network links users around the world. Using WIN, planners can communicate with other users, review and update data from other WWMCCS locations, and transfer data between computers. Land line and satellite connections permit real-time top secret communications. With proper permissions, users can log onto remote host WWMCCS computers much the same as they log onto their local computer. WIN teleconferencing allows many WWMCCS sites to confer and exchange textual information simultaneously.

JOPS, JDS, and JOPES

The Joint Operation Planning and Execution System provides the automated support for major deployment-planning activities. JOPES at this stage of its development, however, is essentially a patched-together version of two rather dated systems: the Joint Operation Planning System and the Joint Deployment System. In order to understand JOPES—its problems and limitations as well as its potential—it is necessary to understand JOPS and JDS.

JOPS

JOPS is an ordered and comprehensive set of procedures for translating an assigned task into a plan of operations. "It is a WWMCCS standard computer-based system used in the deliberate-planning process by members of the JPEC to develop, analyze, refine, review, and maintain an OPLAN and to prepare supporting plans. Standard files, formats, and application programs provide support for force planning, determination of nonunit-related cargo and personnel movement requirements, transportation feasibility estimation, logistic factors, civil engineering support, and medical planning."[1]

The main purpose of JOPS is to assist in the plan development phase (Phase III) of deliberate planning. Service planners build the force list, calculate the flow of nonunit cargo and personnel, and complete specialized planning, such as civil engineering and medical support. They produce the initial version of the TPFDD. The CINC's planners then use JOPS to test the gross transportation feasibility of the TPFDD and to revise the database after the deliberate planning

[1]JOPS Volume III, SM-524-85, p. 1-2.

refinement conferences.[2] JOPS provides automated aid to strategic deployment planning and limited sustainment planning, but provides no aid to mobility or employment planning.

Here we will summarize the several steps of the plan-development phase that are important in understanding the Army experiences reported in the following sections. The entire phase is discussed at greater length in Appendix A.

Force Planning. In force planning the Service component commanders identify the forces needed to accomplish the CINC's concept of operations and indicate how they should be phased into the theater. Each commander develops his own notional force list composed of combat, combat support (CS), and combat service support (CSS) forces, using Service planning documents.[3] The collection of the components' force lists is merged by the CINC's staff and, when he approves, becomes the CINC's consolidated force list. The database becomes the OPLAN TPFDD.

Support Planning. In support planning, the Service commanders identify the quantities of supplies, equipment, and replacement personnel as well as civil engineering, medical, and fuel-related materials required to sustain the forces identified in force planning. Primary concern at this time is with the amount of strategic lift that will be needed to move the support requirements.

The calculations are generally made by the SCCs, who refer to Service planning guidelines and Service doctrine, but it is also possible for the supported CINC to perform the calculations using component-supplied force lists and Service planning factors.

Transportation Planning. After all the nominal force and non-unit record entries are entered into the TPFDD, the Services "source" the unit records; that is, they

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[2]JOPS allows for four levels of data. Level 1, aggregated cargo detail, expresses the total number of passengers (PAX) and total short tons (STONs) and/or total measurement tons (MTONs). This level facilitates gross movement estimates and overall order-of-magnitude judgments.

Level 2, summary cargo detail, expresses the number of PAX and STONS/MTONS of bulk, oversized, outsized, and non-air transportable cargo. This supports aircraft scheduling and allows determination of aircraft types required.

Level 3, detail by category of cargo, expresses square feet and STONSs/MTONs of cargo identified within a designated three position code (Cargo Category Code) which delineates general cargo characteristics, e.g., wheel vehicles, track vehicles, container compatibility, unit equipment, etc. This level supports aircraft scheduling when summary data are not present and allows more detail for planning transportation lift asset requirements.

Level 4, detail by type equipment, expresses quantity of type equipment to include length, width, height, pieces, square feet, and STONs/MTONs, e.g., Line Item Number, Truck Cargo 2 1/2 Ton, 6 pieces, 265 x 95 x 81, 175 sq. ft., 8.8 STONs, 29.5 MTONs. This level is used by the Supported Commander to tailor units to mission requirements.

[3]For example, the Army uses the four volume Army Mobilization Operations Planning Systems (AMOPS) document.

replace the force-type records with records tied to actual units with actual cargoes.[4] Then the initial transportation planning is done by the supported CINC. His planners simulate the intertheater movement of the troops and cargoes now on the force list using the Transportation Feasibility Estimator (TFE), a JOPS application. The goal is to tailor the sequenced force list so that all units can arrive according to the CINC's desired time lines, using only the intertheater transport capability that was allocated to this plan by the CJCS. This is typically difficult because transport is almost always limited. Transportation planning is an iterative process: When TFE indicates that the currently sequenced forces and non-unit supplies cannot be moved in time, planners identify the problems, evaluate the impact on the overall plan, incorporate solutions, and then run the simulation again.

Shortfall Identification. This step focuses on identifying and resolving transportation shortfalls highlighted by the TFE deployment simulation. The TFE identifies the late arrival shortfalls and the reasons for them, such as shortage of lift resources, overloaded mobility support facilities, excessive requirements for intratheater lift, etc. Planners identify unresolved shortfalls for corrective actions by higher-level decisionmakers or those that must be resolved with other commanders by compromise or mutual agreement. The CINC alone approves changes that affect the concept of operations or the concept of support.

Transportation Feasibility Analysis. More formal analysis of transportation requirements and capabilities occurs in this step. USTRANSCOM and its transportation component commands use their more sophisticated mobility simulation models to estimate when pickups and arrivals will occur, how many ships and planes will be needed, the congestion to be expected at ports, etc. Problems with cargoes are referred back to the CINC for resolution, often at a transportation refinement conference. If all problems can be resolved, the output of this step is termed a "transportationally feasible" TPFDD.

To summarize, JOPS primarily assists in the plan development phase (Phase III) of deliberate planning. Service planners build the force list, calculate the flow of nonunit cargo and personnel, complete specialized planning, and assist the CINC in constructing the TPFDD. A completed deliberate-planning process outputs an OPLAN, a series of supporting plans, and a transportationally feasible TPFDD

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[4]Before transportation planning begins, the component planners will attempt to designate as many actual units as they can to replace the type units in the force list. This improves the accuracy of the transportation requirements implied by the force list. In the Army, sourcing begins with the force selection by FORSCOM.

that can be converted into JDS format and used in deployment scheduling and execution.

JDS

As a further step in improving deployment capabilities, the Office of the Joint Chiefs of Staff in 1979 created the Joint Deployment Agency and directed development of an automated system to support deployment planning and execution.[5] The result was the Joint Deployment System for crisis-action planning and execution.

JDS is a system of people, procedures, communications capabilities, and ADP equipment; it is part of WWMCCS and interfaces with other command and control systems. JDS is built on a distributed database architecture with network control at Scott Air Force Base, Illinois. The JDS database is the primary repository of deployment-related information and can contain:

- Narrative information on plan concept, scope and status;
- TPFDDs that are either available from an existing plan, built line-by-line with force and cargo records, built with force modules, or created by a combination of these methods; and
- Notional cargo data that may be refined and updated; actual unit data that are sourced; and individual entries of cargo increments, personnel increments, and unit-related data that may be updated and refined to improve visibility as the situation changes.

The JDS is designed to allow the time-phased force and deployment data output from the planning process to be consolidated, combined with information from other transport-related databases, and viewed from various angles, facilitating the validation, scheduling, and tracking of passengers and cargoes. In particular, it allows the TCCs to match movement requirements against their own dynamic data concerning ship, aircraft, and crew availabilities and routings. It allows unit and force commanders to view movement-requirements records and validate (promise) that their movement packages will show up at the assigned POEs on the assigned dates with (only) the indicated amounts of cargo. It allows unit and force commanders, as well as the JCS and the NCA, to follow the departures, movements, and arrivals of the troops, equipment, and supplies.

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[5]Joint Deployment Agency (JDA) activities were incorporated into USTRANSCOM when that organization was established.

The JDS is rather rigid, however, and changes and real-world events cause problems, especially during execution. As we will see in Sections 4 and 5, for example, when a unit is not ready to deploy on the planned date, when an aircraft or ship breaks down and another must be substituted, or when only part of a planned load is actually shipped, the database cannot be adjusted. The only way to record the actual event is to go back and change the planned event to represent the actual occurrence. That is, except for certain events like time of departure and time of arrival, the database cannot show discrepancies between planned events and actuals. Thus, its utility for tracking units, preparing to meet aircraft, preparing to receive arriving units, and other real-time actions is not all that might be desired.

JOPES

Some of the contrasts between JOPS and JDS, as well as some of the similarities, should now be apparent. JOPS contains applications, databases, and procedures to support deliberate planning. It primarily aids the supported CINC—the combatant commander—and his Service subordinate commanders. Emphasis is on planning force employment and defining the desired flow of forces into the theater. Primary outputs are the OPLAN, a series of supporting plans, and a TPFDD.

JDS, on the other hand, focuses on deployment, primarily supporting USTRANSCOM and the TCCs. It accepts a JOPS-created TPFDD as input, matches it against similarly detailed information on aircraft and ship availabilities and capabilities, and assists planners in producing a complete movement schedule with cargoes matched up with vehicles on particular days and routes. Both JDS and JOPS are detailed, bottoms-up systems, and both can use either notional or actual cargo information.

Both systems were designed to aid planners in the enormously complex task of developing force and deployment plans. However, JOPS and JDS were developed independently and have incompatible file structures; data sharing between them has always been difficult and laborious.[6] A new system to integrate deployment planning and deployment execution was needed. Since 1981, the Joint Operation Planning and Execution System (JOPES) has been attempting to build such a system by modernizing, extending, and combining the functionality of JOPS and JDS.

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[6]Except, of course, for the transfer of the TPFDD from JOPS to JDS.

The main problem, of course, has been the difference in file structures. Data files used or produced by an application program on one system could not be used by an application program on the other. Originally, the only bridge between the two was a program that converted JOPS TPFDDs into a format recognizable by JDS software. That allowed the JOPS-created deployment movement requirements to be made available through WIN to the JPEC so that, in crisis planning, they could quickly be used as the starting point from which to develop an OPORD. Plans call for developing a bridge between the two systems that will eventually evolve into a truly integrated system of data and applications. But as of this writing—and, more importantly, during all of ODS—JOPS and JDS remained essentially separate systems.

JOPES Version 1, installed in November 1989, offered a high-level, loosely integrated interface to the JOPS and JDS subsystems. It allowed a user to access either JOPS or JDS applications without exiting one subsystem to enter the other subsystem.

JOPES Version 2 was installed in April 1990 and supported the beginnings of Operation Desert Shield. It offered three main improvements over Version 1. First, a new interface allowed users to run several JOPS applications using JDS data and then translate the JOPS output back into JDS format. Second, an interface processor improved data distribution handling. Third, it enhanced the ad hoc data retrieval capability.

JOPES Version 3 was installed in December 1990, during ODS. It again offered three enhancements: first, the implementation of an interface developed early in ODS from AMC's Global Decision Support System to JOPES; second, a fix allowing users to recover lost TPFDD records by retrieving information from the database transaction log; third, the ability to generate reports detailing database updates.

In summary, during ODS the JOPES consisted essentially of the then-current versions of JOPS and JDS patched together under a common user interface. This was in great contradiction to the public perception of JOPES. JOPES had been touted for years by its supporters as the system that would (eventually) integrate JOPS and JDS and planning and execution. This disconnection, illustrated in Figure 6, made it extremely difficult for commanders as well as planners to know what they could or should expect from the joint planning support systems.

Some of the later versions and plans for JOPES are described in Appendix A.

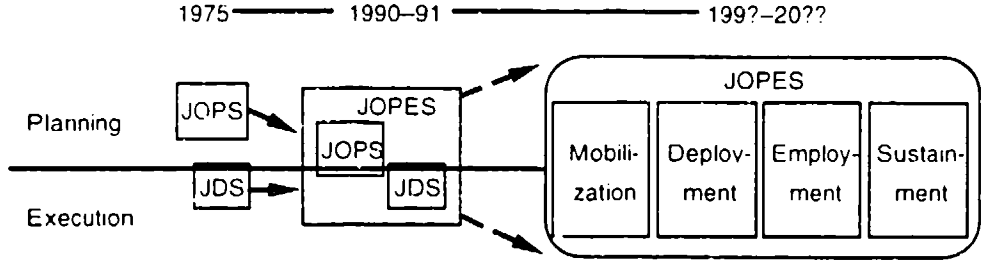


Figure 6—JOPES Immature but Highly Touted in 1990–1991

Army Systems

As part of the Joint community, the Army follows Joint planning procedures, but it also relies on a number of service-unique systems to assist in planning and execution. Department of the Army guidance for mobilization and deployment is established by the Army Mobilization and Operation Planning System (AMOPS). The Forces Command Mobilization and Deployment Planning System (FORMDEPS) establishes the Forces Command mobilization and deployment policy.

Forces Command (FORSCOM) has primary responsibility for (1) maintaining readiness and cargo data to support planning for mobilization and deployment, and (2) interfacing the Army components with the JPEC through JOPES. In crisis-action planning, FORSCOM's tasks include participation in Army combat unit sourcing; responsibility in coordination with Army component commanders for sourcing of combat support and combat service support units; participation in time-phasing and transportation planning; responsibility for validation of Army planning requirements; and responsibility for developing time-phasing of reserve units into mobilization stations to meet departure dates from those stations.

Figure 7 shows the Army planning systems interface to JOPES (and each other) at the WWMCCS FORSCOM site at Fort McPherson.[7]

The Army WWMCCS Information System (AWIS) provides information-processing capabilities for planning and execution at eight Army-supported WWMCCS sites: Forces Command; U.S European Command; Army component, U.S. European Command; U.S. Southern Command; Military Traffic

[7] JOPES and the other Joint systems also interface with Air Force and Navy AISs as well as with those of the TCCs. This report considers only the joint systems and the Army-specific systems.

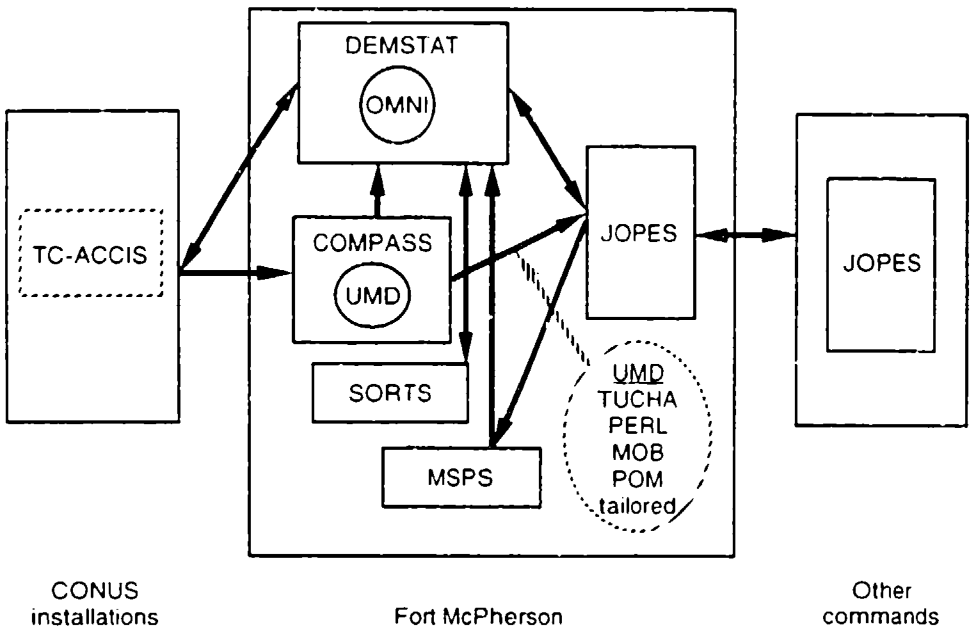


Figure 7—FORSCOM WWMCCS Site Showing Army AIS Interfaces to JOPES

Management Command; Army component, U.S. Pacific Command; Headquarters, Department of the Army; and the Army War College. AWIS provides the Army with (1) WWMCCS equipment, (2) centralized software development for all Army strategic command and control products as determined by the JOPES functional model, and (3) negotiations and support for interfaces between Army strategic C2 systems and JOPES.

The evolving AWIS software products are not intended to duplicate Joint or Army AIS software functionality, but to complement, supplement, and implement JOPES in those areas where JOPES software does not meet Army requirements. Several Army AISs appear prominently in the following sections and are introduced in the following list.[8] AWIS program plans and details on the major Army deployment-related AISs can be found in Appendix B.

DEMSTAT—The Deployment, Employment, and Mobilization Status System provides CONUS-based Army installations with simplified and common access to information from Joint and Army-specific planning systems: JOPES, COMPASS (Computerized Movement Planning and Status System),

[8]The definitions were taken from *FORSCOM Mobilization and Deployment Planning System (FORMDEPS)*, Volume VI, June 15, 1991.

SORTS (Status of Resources and Training System), etc. It provides a common interface to its database, allowing the installations to retrieve/read preformatted data reports but not permitting them to directly make changes.

COMPASS—The Computerized Movement Planning and Status System maintains Unit Movement Data (UMD) and provides the Automated Unit Equipment List (AUEL). The UMD, a listing of unit equipment by pieces, weight, and cube, are reported by Army units, collected here, and used to determine transportation lift requirements. COMPASS also contains notional Table of Equipment (TOE) data for use in the earlier stages of planning. These are in Type-Unit Characteristics (TUCHA) files.

TC-ACCIS—The Transportation Coordinator's Automated Command and Control Information System provides the installation and units (down to battalions and separate companies) with the capability to create, update, or modify unit movement requirements data, and to produce the necessary transportation documentation and reports using interactive terminals and application programs.

MSPS—The Mobilization Station Planning System is designed to support mobilization station planning of both active and reserve component units based on JOPES information. It maintains and displays mobilization and deployment planning information.

SORTS—The Status of Resources and Training System is a joint data system detailing the readiness of units of all the Services. It is updated once a day. FORSCOM (and other WWMCCS users) rely on SORTS for current information concerning the readiness and training of units.

Summary

Computerized support for deployment planning includes both Joint and Service-specific systems. Joint systems center on the WWMCCS and its major set of software, the JOPES. JOPES runs on WWMCCS hardware at 30-some sites throughout the world interconnected through the WIN. WWMCCS and JOPES' primary mission is to support the NCA; secondarily they support the Services and other DoD agencies. Army planning centers on the AWIS program, which provides interconnections with the Joint systems. AWIS supports the Army's use of, and contribution to, the Joint systems, as well as the Army's unique strategic command and control mission. Current Army concerns center on how to develop these systems concurrently while both maintaining necessary interfaces and increasing their interoperability.

The Joint and the Army-specific deployment AISs all support the generation of OPLANs, supporting plans, TPFDDs, OPORDs, and deployment databases. In deliberate-planning situations, sufficient time is usually available to use the systems—including the applications and the reference files—effectively. Crisis situations, on the other hand, require that much the same job—creating a COA, a TPFDD, and then a deployment database—be accomplished more quickly, and that the plans be executed. This places stress on the systems.

JOPES is attempting to integrate the planning and execution of deployments (see Figure 8), but currently it relies almost completely on JOPS and JDS capabilities. Like those systems, JOPES is a detailed, bottoms-up system that can use either notional or specific cargo information; like the JDS, JOPES is awkward in execution. Designed primarily to serve the NCA and the CJCS, it is also the only current conduit for much of the detailed cargo and movement information needed by force commanders and transportation managers.

At this point a word of caution is needed. Discussions of computerized support systems often imply that those systems do or will represent the major or even the exclusive means of communications among users. That is not only untrue in general, but it is especially untrue for the deployment community and for ODS. Figure 9 illustrates the point. The JPEC have available and use a variety of communication channels, including face-to-face discussions around a table or desk.[9] Some channels are (or can be) highly classified, others less so. Some

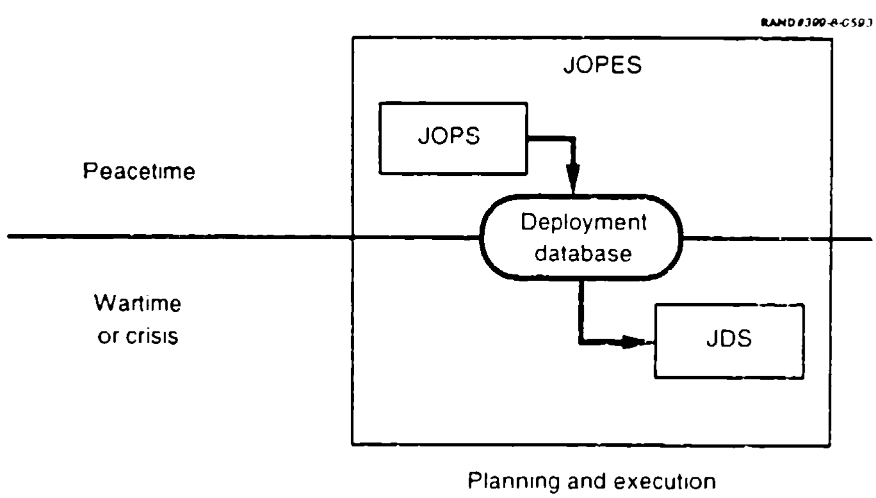
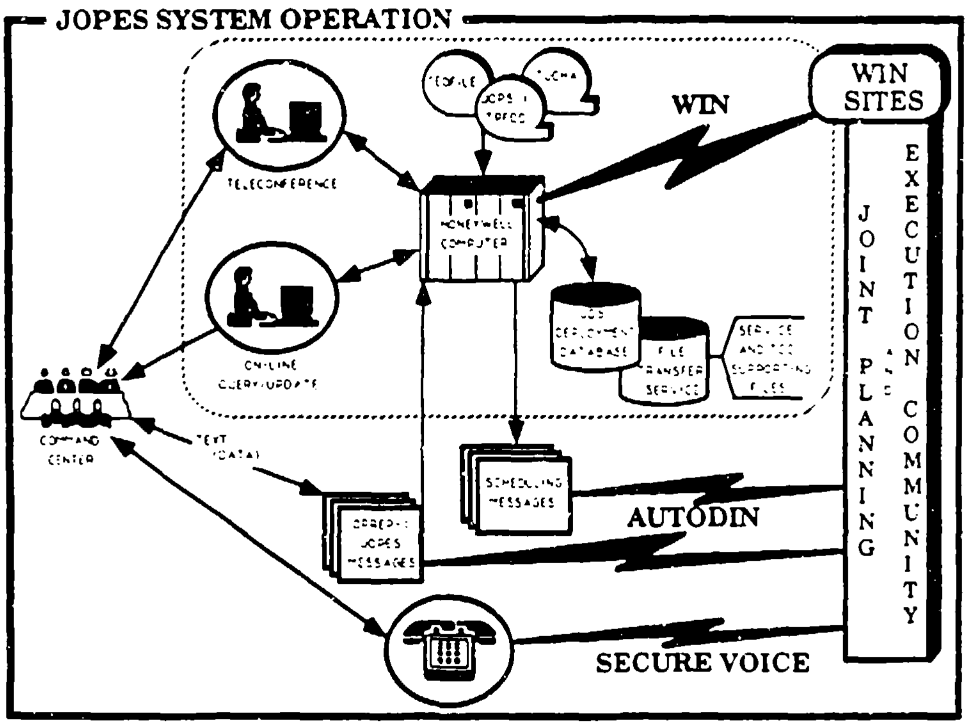


Figure 8—JOPES Integrates the Planning and Execution of Deployments

[9]These channels and this figure are discussed further in Appendix A.



SOURCE. *Joint Operation Planning and Execution System (JOPES) General Reference—Volume 1, User's Manual*, CSM UM 339-90 (Revised), Nov. 16, 1990, Joint Data Systems Support Center, Defense Communications Agency.

Figure 9—Deployment Communications

channels are immediate and generate instant feedback, others are slow and uncertain. We will see in the next section that although many ODS data flows occurred through the WIN, others used less secure or even unclassified channels. Much of the text traffic and summary-level data transfers occurred through WIN teleconferences. Many of the shorter and more time-urgent communications were by secure telephone.

This concludes our descriptions of the deployment planning and execution procedures and support systems existing at the start of ODS. The next section describes how ODS violated most of the deployment-planning rules: Troops began to deploy almost immediately "without a TPFDD"; and the majority of the planners were so busy coping with execution details needed for the following day or two that they could give little time (or thought) to looking further ahead and doing unit- or force-level planning.

4. Operation Desert Shield

Operation Desert Shield did not follow the book. Instead, it presented planners with the urgent need for the immediate deployment of a sizable force under a scenario for which they had no completed OPLAN or TPFDD. Planners had to improvise and to build, in real time, an employment plan and a deployment plan at the same time that they were deploying initial units. As it turned out, because little offensive action was directed against our forces, ODS resulted in badly needed large-scale testing of the U.S. deployment planning and execution systems.

This section begins with a short description of the status of deployment plans for the U.S. Central Command's area of responsibility as those plans existed late in July 1990, just prior to the crisis. It then documents in as much detail as possible the operations of the major organizations, units, and systems as they responded to the crisis, first by simultaneously planning and executing the deployment of the initial defensively oriented forces, and then more deliberately deploying the Phase II (offensive-enabling) forces.

Figure 10 summarizes the timelines for Operations Desert Shield and Desert Storm. On August 2, 1990, Iraqi troops attacked Kuwait. Crisis-action planning began immediately. The initial order to deploy combat forces to the Persian Gulf was issued on August 6. USCENTCOM began to deploy its combat forces on August 7, marking C-day, the beginning of Operation Desert Shield.[1] Between then and mid-November, Air Force, Army, Marine, and Navy units moved into the theater to protect Saudi Arabian and U.S. interests from Iraqi attack.

On November 8, President Bush announced the initiation of a new phase of deployments to Saudi Arabia. The subsequent movement of two and one-third armored divisions, an armored cavalry regiment, a combat aviation brigade, and selected elements of the VII Corps command and support structure from Europe and the 1st Infantry Division (Mechanized) from Fort Riley, Kansas, substantially increased U.S. capabilities in Saudi Arabia and allowed offensive operations to begin.

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[1]U.S. Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress, Pursuant to Title V of the Persian Gulf Conflict Supplemental Authorization and Personnel Benefits Act of 1991* (Public Law 102-25), Washington, D.C.: U.S. Government Printing Office, April 1992, p. 44.

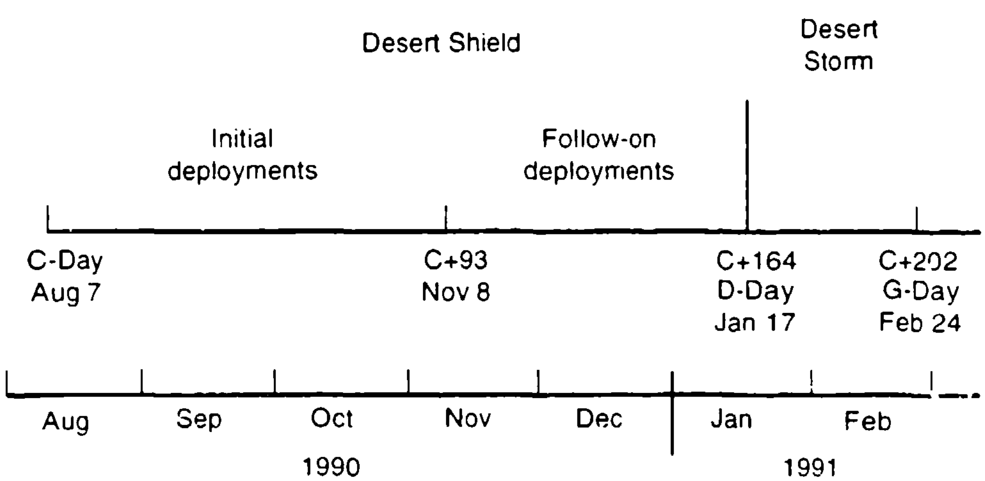

Figure 10—ODS Timeline

D-day marked the initiation of the air war on January 17, 1991, and G-day marked the start of the ground war on February 24. Then at 8:00 A.M. local time on February 28, offensive operations ended and both wars were essentially over. By March 9, SITREPS had reverted to designating time in C-days.

Prior to the Crisis

USCENTCOM had, in previous years, used the deliberate-planning process to generate a number of OPLANS for Middle Eastern scenarios, none of which corresponded very closely to the ODS situation. Fortunately, USCENTCOM had more recently conducted a major review of its primary OPLAN and decided to refocus on an exigency very similar to what was about to happen. This new plan, however, was still in the early stages of development.[2] USCENTCOM had also recently sponsored a Command Post Exercise ("Internal Look") exercising portions of the new plan—although it appears that this was almost exclusively a wargaming of the employment options, beginning about C+30. Finally, the XVIII Corps had recently submitted its portion of the movement requirements file of the new USCENTCOM plan to Forces Command for sourcing. These documents and databases existed at the end of July 1990, before the Iraqi invasion of Kuwait.

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[2]The DoD reports that USCENTCOM draft Operations Plan (OPLAN) 1002-90, Defense of the Arabian Peninsula, was undergoing final review in August 1990. Subsequent paragraphs, however, suggest that the concept of operations may have been set and the force requirements list partially completed, but that "TPFDD conferences, which involve representatives from all service elements, were scheduled for November 1990 and February 1991. A final deployment plan was due to be published in April 1991 and supporting plans in August 1991."

Deploying Forces—August Through October

On August 2, Iraqi troops attacked and overran Kuwait. U.S. intelligence sources had been following the buildup of Iraqi troops for some time but had not been convinced Iraq would attack until just a few days before it happened. The subsequent massing of Iraqi troops to the south, along the border with Saudi Arabia, caused further concern both for the integrity of existing Middle Eastern nations and for the safety of major oil fields. Seeing the need to react quickly, U.S. authorities consulted with Saudi Arabia and quickly called for the deployment of U.S. troops.

Consequently, crisis-action procedures were invoked with the knowledge that Iraqi troops had overtaken one nation and were poised to attack a second. Everyone felt that speed was vital. Major uncertainties abounded over what Saddam Hussein's intentions might be, what other nations in the region and around the world were thinking and how they might react to U.S. statements and actions, what courses of action the United States should take, what risks each course posed, and what alternative force lists might best be deployed.

This was not a completely "no-plan" situation, as the beginnings of the specific plan were available and parts of several older plans also were relevant. However much those may have helped, though, there was much less of a plan than most deployment officials were accustomed to dealing with in exercises or even in theory.

Initial Planning

The Joint Staff initiated the crisis-action planning for Operation Desert Shield. The beginning was chaotic: During the first 96 hours, USCINCCENT conducted close-hold planning. Decisions were made at the General officer level, mostly over telephones with hard copy (sometimes) following. Many of the major decisions were made before relevant data were (or could be) put into the databases.

Much of the initial planning took place at MacDill Air Force Base, home of USCENTCOM, and at Fort McPherson, home of FORSCOM. FORSCOM and ARCENT (Army component, U.S. Central Command) were the major Army-specific players in early ODS planning. In the previous section of this report we described some of the complexity of the decisions and the organizational interactions that are required to select, ready, and deploy forces. Those *could* all work efficiently and effectively together—*if* the plans were all perfect (or nearly so) and *if* nothing ever changed to affect any of those plans. In ODS, however, many things were going on simultaneously and changes were constantly being made to all aspects of the plan.

Still, it can be argued that the United States chose an appropriate balance in ODS between responsiveness and building the combat power necessary in-theater to transform a "short warning" scenario to a long warning one. The decision to build a significant presence in a (relatively) secure position, coupled with those military actions necessary to protect that buildup, allowed time to establish a worldwide coalition and move a capable force into the theater.

The United States accomplished this by moving forces in the following sequence:

- Air Force tactical aviation and strategic bombers provided a quick-response conventional deterrence capability.
- The Army airborne and air assault forces provided a quick-reaction security presence.
- Naval aviation augmented the conventional deterrence capability.
- Marine forces augmented this security presence and began to build a defensive capability in-theater.
- Naval forces provided security for shipping and ports to enable further reinforcement.
- Army armored combat power reinforced the theater's defensive combat capability and began to build a counteroffensive capability.

Choosing the right strategic alternative resulted in a markedly different military role than originally envisioned; a successful deterrence phase resulted in a counteroffensive phase. We now look more closely at the Army's portion of this.

Specifying Forces for the Initial Deployments

As noted earlier, this was not a completely *no-plan* situation and top-level planners at the White House, the Pentagon, and USCENTCOM quickly produced a fairly complete specification of the initial combat units to be sent to Saudi Arabia and informed the transportation community of their immediate needs and also of the magnitude of possible follow-on requirements.

Those actions allowed the combat forces to begin deploying almost immediately. The first division-ready brigade of the 82nd Airborne Division began to move on August 8; the first division-ready brigade of the 24th Infantry Division (Mechanized) began to move on August 9; and lead elements of the 101st

Infantry Division began to move on August 11. Communications among the top-level commands about the scope of ODS combat unit deployments appear to have been prompt and appropriate.[3]

The rapid-deployment units of all the Services are practiced in responding quickly to rapidly evolving crises. Doctrine requires them and their accompanying equipment and supplies to be inventoried and ready for immediate loading. Consequently, their transportation requirements can be quickly calculated, and since these forces are relatively small and their priorities are relatively high, they can be quickly deployed.

Even as those initial (and essentially preprogrammed) forces were being set in motion, however, serious planning for the remainder of the initial deployments was under way.

Moving the Combat Forces

During the first week of ODS, the CJCS allocated the entire AMC fleet to USCENTCOM. Normal procedure is for the CINC to attempt to allocate the available lift among the services in a somewhat stable manner, but USCENTCOM quickly found that events were changing too fast for that to work. They then set up a daily priority listing and coordinated that with USTRANSCOM. A problem for the analysts was to translate numbers of aircraft into numbers of passengers and tonnages of cargoes that they could carry over long distances, with the constraint that they were just learning which countries they could overfly, land in, refuel in, etc. They also had the initial constraint of having clearance to disembark at only a single airfield in Saudi Arabia.

In a fully planned operation, a pre-prepared TPFDD would identify units and their deployment dates. In the initial stages of ODS that information was passed in message traffic. The TPFDD would also contain estimates of the equipment in each unit and its weight and volume. Transport planners could then translate that information into appropriate airlift and sealift plans. ODS, however, was not a fully planned contingency. During most of August, people at the different organizations were all entering information into the deployment databases. The FORSCOM WWMCCS system was often overloaded, causing extended delays. It

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[3] During the next 90 days, the remaining brigades of the 24th, 82nd, the 1st, and the 101st were deployed, along with the 1st Cavalry Division, the 3rd Armored Cavalry Regiment, the 197th Separate Infantry Brigade, the 1st Brigade of the 2nd Armored Division, the 12th and the 18th Aviation Brigades, and major elements of ARCENT (the 3rd Army), XVIII Corps and the 1st Corps Support Command (COSCOM).

was not until late in the month that the databases contained sufficient information to be useful in actually moving the troops and equipment.[4]

During this period, and in fact during the entire operation, WWMCCS teleconferencing provided the main means of communications for both planning and execution. Established by USTRANSCOM in early August, a command teleconference served the CINCs, a more general teleconference interconnected all elements of the deployment community, and specialized USTRANSCOM and MTMC teleconferences served the major transporters.

Specifying the Support Forces

The process for non-divisional Army combat service support (CSS) was somewhat different. USCENTCOM's concept of logistics support provided that the "Services will provide logistics support," though USCENTCOM would exercise "overall directive authority" for logistics. FORSCOM thus provided most of the guidance and orders for Army logistics and other CS and CSS capabilities. On August 10, FORSCOM issued a deployment order identifying scores of non-divisional units. The message identified the units and defined available to load dates (ALDs), earliest arrival dates (EADs), and latest arrival dates (LADs) for each. Copies of this message went to USTRANSCOM, MSC, the Maritime Administration (MARAD), MTMC, and AMC. That started the deployment of support units. Then over the next two weeks FORSCOM issued at least nine messages to the same distribution providing corrections and additions to its initial list. The impression is one of full exchanges of information on the identification of deploying units between the Army and the transportation community, but also of major uncertainty and variability.

The establishment of the CSS force structure was an iterative process involving three major players: The Office of the Deputy Chief of Staff of the Army for Logistics (DCSLOG) recommended CSS structure to FORSCOM. FORSCOM scrubbed the list for feasibility and desirability and forwarded its recommendation to USCENTCOM. USCENTCOM made minor changes and then returned the list to FORSCOM as the "CINC's requirements."

Once a requirement was established it became FORSCOM's responsibility to source it if it was a unit requirement, or the responsibility of the Training and Doctrine Command (TRADOC) to source it if it was an individual/skill

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[4]To try to alleviate some of the overload, Honeywell quickly made available, through AWIS, two unused DPS-8 computers that were installed at FORSCOM in early September.

requirement. That is, FORSCOM would select truck companies, but TRADOC would identify additional drivers if they were needed.

Sourcing is generally not as simple as it sounds. Not only is it difficult to choose among similar units, but it is difficult to determine which unit is "more ready" (or can become ready by a particular date). In general, FORSCOM (and the Army staff) consult the readiness database (SORTS) to determine the status of units and how much training and equipping they would need before they could be deployed. Then they use the MSPS database to assess and schedule the flow of units through mobilization centers.

For Army units in CONUS, FORSCOM sources the "unit," but in almost every case that unit then has to decide (based on guidance from the CINC, FORSCOM, and others) which subsidiary units it needs to take along. That is, it needs to be tailored, or to tailor itself, for the job that the CINC has described.

Units can task only those subunits within their command; if an Army unit wants support from another unit, it must make a request through FORSCOM. For example, if the 7th Infantry Division needs a non-divisional truck company, it must request the company through FORSCOM.[5]

In ODS, USCENTCOM's needs and policies evolved over time. Early in the deployment it maximized the flow of combat units, deploying only enough support troops to manage the front end of the deployments and stagings. Then during the October/November time frame the policy evolved into developing a strong offensive capability, which required a full CSS structure. In early October, a table of organization and equipment for a theater army area command (a TAACOM) was faxed to the commanding general of ARCENT, initiating the establishment of personnel billets. Soon after, the augmentation package designed for the 21st TAACOM of USAREUR was sent to Saudi Arabia, providing the ARCENT Support Command (Provisional) with an additional general officer and several hundred augmentees. In December, the ARCENT SupCom (Provisional) officially became the 22nd Support Command with direct responsibility to USCENTCOM.

[5] In fact, sometimes FORSCOM does more than just support the CINC's plan. Honduras is an example of how FORSCOM can wear the hats of supported and supporting command at the same time. In that operation, the U.S. Southern Command did not feel comfortable using JOPES, so FORSCOM (1) built the plan, (2) developed the requirements, (3) sourced the requirements, and (4) gave the units goals of what to take and not to take.

Estimating Transport Requirements for the Support Forces

During this period FORSCOM was performing JOPES activities for most of the CONUS Army units. FORSCOM received deployment detail from units by e-mail, telephone, and special messenger and entered the data into JOPES for the units. This was done for several reasons; some units did not have WWMCCS terminals available to do it themselves, and others were not expert with the equipment they did have. Finally, it allowed FORSCOM to act as at least an informal reviewer of data before they were entered.

As a general rule, FORSCOM tried not to enter data into the deployment database until there was a high degree of confidence that they were correct and appropriate. This was accomplished by examining and coordinating the CINC's priorities with the component command's deployment data and USTRANSCOM's resources and plans. Even so, the data often underwent later changes.

For example, FORSCOM tried not to enter information concerning available to load dates (for particular units) into JOPES until those dates were coordinated both with the units and with USTRANSCOM. If the units could not be moved within a reasonable time after their ALDs, there was no reason to have them rush to be ready then or to wait at the ports. Thus, the deployment database often really represented the end of detailed negotiations which occurred by phone, fax, or e-mail.

During ODS (as during other recent operations), there were really three major channels for sharing deployment information. In addition to the official JOPES deployment databases and the WIN teleconferences, much use was made of more direct forms of communication, such as the telephone and fax. Typically, the more important information was communicated from Chief of Staff to Chief of Staff, or from Deputy Chief of Staff for Operations (DCSOP) to DCSOP, then FORSCOM was told what units were to go. Most teleconferencing, however, took place at the action officer-to-action officer level rather than higher up.

Moving the Support Forces

FORSCOM is officially responsible for planning the move of support forces and for continually updating the database as CONUS Army units move from their posts through to their destinations. If the unit is not deployed as planned, it is FORSCOM's responsibility to rephase it and to update the deployment database. FORSCOM had been validating movement requirements and recording movements during exercises for years, but those had been essentially empty tasks. In ODS, however, it quickly became obvious that those tasks were not appropriate for FORSCOM, and soon they were turned over to AMC. We discuss this more in Section 5.

Technical Assistance from USTRANSCOM

USTRANSCOM has, for several years, been responsible for crisis-action planning (the JDS part of JOPES). It conducts all the JOPES crisis-action training, and its personnel are well-known throughout the community. So it was natural that USTRANSCOM sent technical assistance teams to USCENTCOM (at MacDill) and FORSCOM early in ODS to help with deployment planning and database construction.

By August 10 when the USTRANSCOM team arrived, USCENTCOM and its components (ARCENT, CENTAF, MARCENT, and NAVCENT) had put together a general plan with some degree of notional units and phasing. It named some specific combat forces but was still mostly a wish list.

During the first few days, no one really knew which units were needed or, except for a few like the 82nd, the 101st, and the Marines, which ones were really available. So there was little real data, let alone time, to get them into the database. The CINC's "priority list," a mini-database that could be handled (and retyped several times a day) manually, provided the initial coordinations.

The problem during the first week of the crisis was not that units could not be moved, but that the CINC's *planning* could not be supported as it needed to be. The advantage of having (or of having access to) a common database is that it collects and shows the aggregate as well as individual resource movements and needs. If problems arise, or even more important, if the CINC needs to rethink any of his options, the analysts can quickly tell him the implications of those changes, in terms of what other unit movements must be slowed, abandoned, etc.

By the end of August USCENTCOM had the first really useful database describing how big the operation was and how the units were expected to phase into the theater, as well as indicating how much transportation would be needed and what had already been moved. That database had been built in 15 to 20 days, despite the uncertainties and despite the inefficiencies of JOPES and the lack of integration of the JOPS and JDS subsystems. This spoke well for the ability and dedication of the USCENTCOM and USTRANSCOM teams.

Deploying Forces—November Through January

On November 8, President Bush announced a new phase of deployments to Saudi Arabia. The movement of two and one-third armored divisions, an armored cavalry regiment (ACR), a combat aviation brigade, and selected elements of the VII Corps command and support structure from Europe and the 1st Infantry Division (Mechanized) from Fort Riley, Kansas, substantially increased U.S. offensive capabilities in Saudi Arabia. These deployments also provided further challenges for the U.S. deployment community.

Planning for these movements differed greatly from that for the earlier movements. Here, there was time to estimate the transportation feasibility of the moves and to build the deployment databases *before* the majority of the cargoes started to move.

One story heard from several sources concerns the transportation estimates. USTRANSCOM was asked about the feasibility of moving the two heavy divisions plus the ACR plus the support elements from Germany to Saudi Arabia by January 15, 1991. USTRANSCOM made its estimates and replied that, yes, it could be done if certain amounts of airlift and sealift were dedicated to that task. So the move was called "transportationally feasible."

However, USTRANSCOM had assumed an immediate start for the deployments, while in reality the deployments were not announced by the President and the movements were not allowed to begin until several weeks later. This resulted, as we all know, in many of the cargoes arriving several weeks after January 15.

The moral of the story is that even if the transportation community does have time to estimate its current capacity and its capability for moving specified forces, those plans are only as good as their weakest assumption. Just because a set of movements is transportationally feasible under one set of assumptions it is not necessarily feasible under another set, or in the real world of constant change.

Improved Cargo Lists

By November some Army units could generate detailed deployment cargo data and electronically forward those to FORSCOM and the transportation organizations. For example: At Fort Riley the installation transportation office had TC-ACCIS records on the equipment and supplies owned by the 1st Infantry Division (Mechanized). When it learned which companies were to be deployed it called in their S-4 representatives and updated the holdings information as much as possible. Then it transmitted those unit equipment lists (UELs) to FORSCOM and to MTMC. At FORSCOM the information was entered into COMPASS, where transactions were generated to put it into the Unit Movement Data (UMD) subfile of JOPES.

The TC-ACCIS systems at the installations also generated bar-code labels for each piece of equipment identified in the automated unit equipment lists (AUELs). It is the formatted AUEL information that is forwarded to MTMC. The Logistics Marking and Reading Symbols system (LOGMARS) creates, produces, and reads the "bar coded" labels that are stuck on all types of military items. The transportation-related labels referred to here contain the Transportation Control Number for the particular piece of cargo (this includes a code identifying the owner of the cargo), a bumper number, model number, dimensions (length, width, height), weight in pounds, cube in feet, measurement tons (this is a notional factor equal to 40 cubic feet of typical military equipment), commodity number, type pack, and an item description (e.g., 1TRAILER ACFT MAINT, 1HELICOPTER UTILITY, 1BOX SHIP METAL 20 FT, etc.). MTMC uses this information to alert the ports as to what is coming, to open (or size) contracts with the railroads, and to call for ships. It passes the information to its units working the ports.

For example, the 1191st Terminal Transportation Unit worked the port at Houston that processed the 1st ID's equipment. Members of the unit received the cargo listing from MTMC telling them what to expect. When the trains arrived, they scanned the LOGMARS labels as each piece of equipment was offloaded and moved to the storage area. Then they scanned the labels again after each piece was stowed aboard ship, noting its stowage location. This last process produced the "ship's manifest." It was MTMC's task to be sure that manifest data was then entered into the JOPES deployment database.[6]

Deployments from Europe

On November 8, the secrecy blanket was lifted on planning for the movement of troops and equipment from Europe. By Sunday, November 11, USEUCOM had received liaison officers from USCINCCENT, USCINCCENT (rear), and from USTRANSCOM. USTRANSCOM in fact dispatched a number of support teams to the theater, including three to USEUCOM: one to help prepare the TPFDD;

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[6]In contrast to the piece-level information in the manifests, however, the JOPES entries were only at the unit line number (ULN) level

one to assist with use of the DART system;[7] and one to supervise JOPES inputs. USTRANSCOM also dispatched a three member team of JOPES experts to USAREUR.

WWMCCS teleconferencing provided the main means of communications during both planning and execution in Europe. Within the theater a teleconference named TRANSEUR that had been set up in February was being used intensively for local messages. The major ODS teleconferences, established by USTRANSCOM back in August, were also available to qualified commands: The command teleconference was used by the CINCS, and the USTRANSCOM and MTMC teleconferences were used by those organizations and monitored by almost everyone else.

USAREUR submitted its first troop list and draft OPORD to USEUCOM on November 10. On November 11, it received its deployment order.

The deployment database for the movements from Europe was prepared in about 10 days. The joint systems planner at HQ USEUCOM took charge of the structure of the TPFDD, the planners at USAREUR created the force composition and flow for the Army units, and USCINCCENT set the EADs and LADs.

The first version of the deployment database was based on notional units and data from the JOPES Type Units Characteristics (TUCHA) file, as the equipment inventory information for some of the units was out of date. Then, as TC-ACCIS was imported from CONUS and more up-to-date information became available, they converted the notional plan to an actual plan. Throughout this period USAREUR insisted on working with Level 4 data even though USCENTCOM indicated it would have preferred a (faster) initial turnaround with Level 2 data.

MTMC Europe also expressed concern for the TUCHA data and for the delays in waiting for the TC-ACCIS information. It based its initial estimates of cargo requirements for sealift on different data and claimed better accuracy. It accessed the Requisition Validation files for the moving units, claiming those files were more representative of what the units actually had on hand. That may have been true, but soon thereafter the TC-ACCIS data became available and improved all of the estimates.

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[7] DART, the Dynamic Analytical Replanning Tool, had just been assembled from off-the-shelf hardware and software by the Advanced Research Projects Agency (ARPA) and Rome Air Development Center to demonstrate to USTRANSCOM the benefits of current computer technology for deployment planning. During ODS it proved useful to both USTRANSCOM and USEUCOM in tracking the number of ships required for the second-phase deployments and as a handy means for making daily backups of portions of the deployment database.

All of the organizations we interviewed in Europe—USEUCOM, USAREUR, and MTMC-EUR—operated with Version 3 of JOPES, which had been installed only a few weeks previously. They all expressed some concern that the changeover from Version 2 had taken place right in the middle of ODS operations, causing their systems to be down for the better part of a day when they could least afford the delay.

Differences Between Initial and Subsequent Deployments

There were a number of important differences between the organizations deploying in Phase I and Phase II. For example, USAREUR had a relatively large number of people who were experienced with JOPES and USEUCOM had a good base of information to start with in their primary OPLAN.[8] This made it easier for them to identify units and gave their planners more time to think about how to move things. In addition, the situation in the Gulf was more stable at this time so the planning information was less subject to change. In spite of all the lessons learned up to that point, however, the timeliness and accuracy of cargo data was a continuing problem.

USTRANSCOM reports that one of the major successes of the Phase II deployments was the use of TC-ACCIS data, especially in Europe. USTRANSCOM contends its components need Level 4 detail or better, so USAREUR had to task all of the deploying units' S–4s to count and measure their vehicles and equipment. Each unit had many nonstandard items and modified equipment. This information was all entered into TC-ACCIS; then it was all re-entered manually into JOPES (this alone took five days), since there was no link between the two systems except at FORSCOM.

USTRANSCOM personnel contend that for execution JOPES needs bottom-up force information. They believe that if TC-ACCIS could directly update JOPES or their Global Transportation Network it would make execution much easier. FORSCOM, on the other hand, believes the updating should only be through command channels. They say that if the UEL update process begins to work as intended and the AWIS transportation product line provides for more rapid updating of JOPES, then most of the shortfalls would be satisfied.

The USTRANSCOM team reported, however, that even with the help of TC-ACCIS the early estimates of cargo movements from Europe were still about

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[8]On the other hand, European-based units had not expected to deploy to another region and had never trained to deploy.

1 million square feet off from what was actually moved. This is an error of between 5 and 10 percent. No one has a good idea of how far off the estimates were for the Phase I deployments, however, so the two cannot be compared.

Summary

Participants who planned and conducted the ODS deployments all report that aggregate cargo requirements varied considerably during the first month or so. They say that they could have done a better job if they had had a better grasp of what was needed; if the true magnitude of the ultimate effort had been known from the outset, decisionmaking could have been faster and more precise. For example, decisions about activating Ready Reserve Force (RRF) ships and chartering commercial ships might have been more timely.

Still, it is unrealistic to believe that the "true" magnitude of the ultimate effort will ever be known early in any contingency. It is likely that the conditions of ODS—evolving and uncertain requirements—will reoccur in future crises. There will always be uncertainty. The task is to develop a command and control system that can cope with uncertainty and to train personnel to take risks into account in preparing for deployments.

This section described the major features of the planning for and the execution of the ODS deployments from CONUS and Europe. The next section will focus on problems that arose with the planning procedures and systems.

5. Problems with the Computerized Support

JOPES and the other systems were crucial to ODS. They allowed establishment of a common database that provided visibility of the day-by-day progress of the deployment to members of the JPEC. If this capability had not been present, or had not been present on the scale of JOPES/WWMCCS, the ODS deployments would have taken substantially longer and the frustration level of the JPEC would have been substantially higher. Nevertheless, definite problems emerged during ODS. The Army, the focus of this report, experienced many problems with the computerized planning and monitoring support systems. Even though those systems enabled the large deployment, compared to commercial standards the military support systems were unfriendly, slow, and prone to data loss. Four general types of problems occurred.

- Unfriendly, overloaded support systems resulted in slow and incorrect data entries.
- The design and control of the distributed database resulted in several losses of significant amounts of previously entered data. This slowed the creation of databases and reports and reduced their usefulness.
- Procedures for collecting and entering crucial information into the support systems had not been well thought out beforehand.
- The support systems themselves lacked certain crucial capabilities and interfaces.

The first two types of problems slowed the computer support, frustrated personnel involved in data input and systems operation, and may have delayed some deployments slightly. The latter two types had more severe repercussions, especially during the first several months of the deployments. These resulted in transporters not knowing what cargoes and personnel were supposed to move, unit commanders not knowing the status and sometimes the location of their resources, and in-theater organizations not knowing what would arrive on the next ship or plane.

The remainder of this section documents examples of those problems.

Unfriendly, Overloaded Systems

There are never enough trained operators. USTRANSCOM offers a number of training classes, but since users do not use JOPES every day, their proficiency deteriorates over time. At the beginning of ODS there was a general lack of knowledge about how to use the system.

Some of the training problems were caused by continual staff rotation. On the other hand, purple-suit rotation may have helped at times because those rotated back into their services had some experience and training with using JOPES for planning. USEUCOM and U.S. Atlantic Command (USLANTCOM) had well-trained people because they have relatively low personnel turnover. USCENTCOM was in pretty good shape when ODS started but then forward deployed some of its WWMCCS people to the theater before the JOPES workstations arrived in-theater. The workstations did not arrive until 30 days later because, except for the Marine version, they were not very transportable. When the equipment did arrive, USCENTCOM found that the through-put capacity for satellite communications between Saudi Arabia and the United States was less than desired for fully effective JOPES operations. So the majority of USCENTCOM's JOPES transactions continued to be entered from MacDill.[1]

Other systems also were overwhelmed. The European Telephone System was particularly overloaded early in Phase II. So many demands were placed on that system, the carrier for most open as well as secure military phone calls within Europe, that some commands found it to be virtually unusable between 7 A.M. and 8 P.M. during much of November. MTMC-EUR adapted by purchasing half a million dollars worth of cellular phones and reported that worked well until other organizations moved in and swamped the cellular system also.

Very little error checking is available within JOPES. In fact, personnel at both USTRANSCOM and USEUCOM, where DART was available, suggest that one of the major benefits of that system is its ability to check for missing or inconsistent

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[1]Most entries into JOPES are made one line at a time, and most editing is done one line at a time, so it takes a long time to enter and to edit data.

It was not until January that AWIS provided ARCENT and USCENTCOM with TELNET access from the theater to JOPES on the FORSCOM WWMCCS node at Fort McPherson. The AWIS office had made no initial plans to deploy an Army WWMCCS capability in-theater, since deployment planning was mainly handled from CONUS (though, as noted earlier, USCENTCOM deployed taking some of its WWMCCS terminals and link equipment with them). However, with the possibility of a longer war and the need for troop rotation, it became evident that a WWMCCS capability in-theater was needed. The AWIS Project Management Office/Officer (PMO) realized it might be too difficult to deploy and maintain a portable mainframe in Saudi Arabia (which they could have acquired from USEUR) Instead they decided to provide transportable WWMCCS terminals and WIN communications on trucks to Riyadh and Dhahran. The AWIS community around the world volunteered the equipment.

data. Errors discovered in that manner were corrected in the DART database and then (independently) corrected in the JOPES database because of the fear of overwriting valid data (see the following). Almost everyone agreed that JOPES needs to be more flexible and to have a friendlier interface.

Lack of Safeguards for the Databases

Deployment databases currently can be accessed by a number of people and organizations, with little control over who can do what to each record. The following "horror story" suggests the types of things that happened.

USEUCOM personnel report that early in their TPFDD-building process, after consultations with USCENTCOM, USAREUR, MTMC-EUR, and USTRANSCOM, they entered selected dates and locations into their version of the database. Independently, USAREUR had pulled a copy of the database for itself and was identifying units, their origins, availabilities, and cargo details (a lot of data) and entering those into its version of the database.

USEUCOM finished its work first and sent its updated version of the database to the local JOPES computer. Later, having completed its additions, USAREUR put its version into the same computer, erasing all the changes that USEUCOM had entered. Fortunately, the majority of the additions had been made at USAREUR, so this was not as disastrous as if the copyover had been in the other direction. On a smaller scale, anyone who has write access to the system can rather easily change or erase entries made by anyone else.

This story was not meant to single out USEUCOM, which in fact is one of the more experienced organizations. Problems with this type of database will continue until modern safeguards and backup systems are incorporated.

Consistency and Timeliness Problems with the Army Systems

The Unit Equipment List (UEL) reporting procedures from Army installations to COMPASS often result in a long delay before a COMPASS report is returned to the installation for validation. This is expected to improve with TC-ACCIS.

Even with TC-ACCIS, however, AUEL data cannot be directly input to JOPES but has to be entered through COMPASS to JOPES or COMPASS to DEMSTAT to JOPES. This allows FORSCOM to review and validate the data but it also reduces their timeliness to other JPEC users such as USTRANSCOM. USTRANSCOM has indicated it would like to receive the AUEL information directly from TC-ACCIS, but if that were to happen, USTRANSCOM would most likely have information that was inconsistent with that in COMPASS, DEMSTAT, and JOPES.

DEMSTAT collects data approximately once every 12 hours from sources such as JOPES, COMPASS, and SORTS, making it available to units for review and updating. However, when a unit attempts to correct or update some of its records, the updates are not entered in the DEMSTAT database directly, but create transactions into the source databases. The units then have to wait until the next data collection from those sources updates the DEMSTAT database to ascertain that their transactions were correctly entered. In a fast-moving deployment-planning situation, units are often looking at data that are outdated and inconsistent.

Misunderstanding of Crucial Procedures

Some organizations had problems with the database, many had problems with data entry and checking, and most suffered from lack of trained operators. Problems with requirements validation and with the entry of scheduling and manifesting information, however, were more basic and more severe.

Verification of Movement Requirements

Prior to ODS, military planning had been done with the expectation that units would know how many troops and how much cargo they had to move, and that the transport commands would be able to make solid commitments as to when they would pick up and deliver those troops and cargoes. But ODS did not work like that. Units were receiving people, equipment, and supplies (being "brought up to strength") right up until they got on the planes and trains. Units were told, or decided on their own, to take substantially more cargo than anticipated. The priorities for transport kept changing. Planes and ships sometimes broke down.

Many people expected the databases to handle all of this. And they might have—*if* all changes could have been entered immediately (and correctly), and *if* everyone could have been made instantly aware of all the changes that everyone else was entering. But that was asking too much.

AMC requests five days of solid requirements data so it can schedule its aircraft effectively and efficiently. Deploying units request nearly that much notification so they can have their troops ready and still give them 24 hours of free time with their families.

JOPES procedures call for each deploying unit to officially "validate" each of its movement requirements, that is, to confirm that so many passengers and so much cargo is (or will be) on that ramp destined for that location on that day. This is to be done five days before the move. AMC (for air cargo) is suppose to take the validated requirements from JOPES five days in advance, do its scheduling, and then put the schedule information back into JOPES three days ahead of time.

ODS provided the first test of this procedure, and several things quickly became obvious: few units could really validate what they were going to take; there were many changes; one unit could not knowledgeably and effectively ask another unit to substitute if it could not be ready; and AMC could not schedule and return schedule information to JOPES in two days.

AMC solved this problem for the early CONUS deployments by telephoning each unit two days or so before the unit was shown in the database as moving to verify for itself that the unit would be ready and would be at the aerial port of embarkation (APOE) on time. This phone call also notified the unit that AMC was, in fact, sending a plane.

In theory, the notification should be done by JOPES creating Automatic Digital Network (AUTODIN) messages for transmission to the unit, but that could not be done in ODS because it often took six hours or more to deliver the AUTODIN message. This is allowable for port calls when units are to move by sea because the messages can be issued some days in advance, but when units are scheduled to move by air, and they and AMC receive only 48 hours notice of the movement, then AMC has to telephone them because AUTODIN is too slow. WWMCCS messages were sometimes feasible, but not all units had terminals.

Entering Movement Information

Information on incoming cargoes is critical to the efficient operations of PODs. When in-theater receiving crews know ahead of time what is loaded on the next aircraft or ship, they can alert the proper reception and off-loading personnel, position needed handling equipment, arrange for temporary storage and/or staging areas, and, perhaps most importantly, inform the relevant in-country units that they will have cargo/personnel arriving. Without advance information, all that must wait until the vehicle has arrived and its contents have been examined and perhaps disassembled.

JOPES procedures say that the force providers are to verify that passengers and cargo are placed on the proper planes and ships. This is the way it had been done in exercises. But during the real deployment, it turned out that FORSCOM could not have representatives at all the pickup points to report that "x" number of troops and "y" tons of cargo from unit "z" did in fact depart on plane "n" at time "t." FORSCOM tried, but could not keep up.

To make things work, USCINCCENT gave USTRANSCOM the mission of collecting the manifest data and entering them into the scheduling and movement deployment database. USTRANSCOM did this by tasking AMC to send personnel from its Inspector General (IG) teams around to all of the pickup points to make sure data were gathered and entered. This worked fine after a bit. The troops loading onto the planes had trouble at first with their ULNs, the unit line numbers which are needed to relate the information to the proper JOPES data record.[2] Therefore, the word had to be spread to the deploying units to make sure that they knew their ULNs, and then to be sure to pass them on to the IG representatives as they departed.

Initially this information was reported by secure phone to AMC HQ where it was both passed in an AUTODIN message to FORSCOM and manually input to JOPES. After a few days, however, the second task was semi-automated: A patch was developed that allowed the information to be input (by the IG representative) into the nearest node of AMC's command and control system (GDSS) and then passed along through several other systems into JOPES.

Early sealift movements suffered similar problems. Equipment may have been loaded onto trains or convoys by ULN, but once it reached the ports, the cargoes were mixed. MTMC was tasked to enter the ULNs, tonnages, etc., of cargo leaving the ports into JOPES, but had little information.

Later deployments, especially those during Phase II, were better organized. As mentioned in the previous section, installation transportation officers were able to input their equipment inventories into TC-ACCIS and to create LOGMARS labels for each piece of cargo. At the dock then, each piece of cargo loaded on a particular ship was scanned, identified, and automatically entered on the ship's manifest. The manifest for each ship thus listed each piece of cargo in or on that ship. A copy of each manifest was then forwarded to the seaport of debarkation (SPOD) but was reportedly not too useful there because the detail was not summarized and port personnel had little time to search all the entries.

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[2]ULNs serve as the key for cataloging TPFDD records in JOPES, but the Services' primary unit identifier is the unit ID code or UIC. The Defense Transportation System also keys on UIC for movement identification. The JPEC needs a viable, automated method of relating UICs to ULNs (and vice versa).

For later deployments MTMC was usually able to update the Scheduling and Movements database with the ULNs dispatched on each ship. This more aggregate information was more meaningful to deployment officials.[3]

Lack of Crucial Capabilities and Interfaces

Sometimes it turned out that scheduled troops or cargoes were late in arriving at their scheduled POE so others were put on "their" plane or ship. Other times, scheduled planes and ships broke down or were delayed and others were substituted. When this happened, visibility was often lost as JOPES was not designed to accept those types of changes.

Correcting Movement Information

In theory, CINCs, unit commanders, installations, etc., can query JOPES (the schedule and movements [S&M] database) at any time and receive up-to-date information about which ULNs have been moved, on which aircraft and ships, and how the actual arrival and departure dates and times from the POEs and PODs relate to the ALDs, LADs, and the scheduled arrival and departure dates and times. JOPES is even designed to aggregate information and to show the percentage of each UIC or force module that has been moved.

However, the S&M database was designed to the AMC and MSC requirement that they be given five and 30 days, respectively, of solid, unchanging movement requirements as input to their scheduling activities. AMC and MSC are first supposed to put vehicle data into the S&M database; second, "pull" data concerning troops and cargoes from the requirements database; third, to do their scheduling; and fourth, to push the scheduling data back into the S&M database. Finally, the deploying units (or AMC in the case of ODS) manifest specific ULNs or portions of ULNs against those vehicles.

That information is then not supposed to change. Fields exist for actual arrival and departure times to be input after the movements actually occur, but no allowances are made for changes in carriers or in routes. If someone attempts to adjust a movement (for example, to reflect that a particular ULN actually moved to a different POD than it had been assigned to), JOPES will simply not allow that change to be made unless the operator goes all the way back to the

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[3]Note, however, that only on-line, real-time access to the detailed ship's manifest information will ever allow post personnel or unit commanders to answer questions such as "which ship contains the three radar transmitters for the 1143rd ADA?"

requirements database and corrects the original preferred POD. This means that changes occurring within the three, four, or five days before a movement is to be made will not be reflected in the database.

This reflects the design (and peacetime use) of JOPS, JDS, and JOPES as planning tools. They allow only movements that pick people up from where they are supposed to be, move them directly to where they are supposed to go, and then drop them off there.[4] The Chairman of the Scheduling and Movements Working Group at USTRANSCOM described for us how personnel worked around this limitation in ODS, and how they now hope to improve the database and the interface so that actual movement information can be entered directly and without replacing the descriptions of the planned movements.

Using Data from Existing OPLANs

Another problem with the current design of the databases is that converting TPFDD data from one OPLAN (theater) format to another is difficult. Planners at USEUCOM told us that as they were converting the force lists from their major plan and adapting them into what eventually became the European segment of USCENTCOM's ODS OPLAN, one of the major problems was in converting the USEUCOM ULN structure into the USCENTCOM ULN structure.

USEUCOM planners eventually got around that by taking the current version of their plan, pulling off the forces (ULNs) that were needed for ODS, and calling this part by an intermediate name. They changed the USEUCOM ULN structure into the USCENTCOM ULN structure and then called those resulting data the first draft of their portion of the USCENTCOM plan.[5]

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[4] Note that these deficiencies currently exist despite the presence of the "E" for execution in the acronym JOPES.

[5] USCENTCOM personnel reported other problems with ULNs and force modules. During the war everyone wanted to know how big the major units, and the divisions in particular, were; how many and what type of companies they were taking along, and, especially, when they would close. That information, however, was difficult to provide. It required either (a) the use and maintenance of a logical ULN structure, or (b) the construction and maintenance of force modules. They emphasized that both approaches had real problems.

Even in deliberate planning where they had lots of time and where few things change, it was difficult. At PACAF several years ago a database for a particular OPLAN was set up using Force Modules (FM) to describe the organizational structure of the units and using ULNs to describe the functional relationships. It was easy to set up, but as the data evolved and units were changed, it quickly became very complex. Each time an individual unit was moved into or out of the deployment sequence, planners to adjust the FM. If one individual was keeping track of the force module and another individual, say at a component, entered additional units, those units could quickly become lost among the thousands of records. The same held for the ULNs.

Those were some of the major problems the Army experienced with the deployment-planning systems during ODS. Those and more need to be addressed and corrected before the next real deployment.

6. Conclusions and Recommendations

We can now categorize the problems associated with planning for Army ODS deployments into two broad groupings: (1) problems arising because uncertainties inherent in ODS (or, indeed, in any contingency) require critical skills of planners and deployment personnel, skills that prior to ODS only some had practiced and few had mastered; and (2) problems associated with the then-current versions of the computerized support systems.

Uncertainties Affected Procedures

During peacetime it is easy for planners to become complacent, get wrapped up in their scenarios, contingencies, and plans, and really believe that they have *the* answer to this situation or that problem. It is easy to forget that we do not know which situation or problem will actually occur and that we cannot predict how U.S. commanders will respond to particular situations let alone how opposing commanders will react to U.S. initiatives.

The mindset in many quarters before ODS was that we had done lots of planning, gone through many exercises, and knew pretty much what had to be done. Unfortunately, much of that planning and most of those exercises had evolved over the years into simple efficiency drills where all uncertainties had been eliminated: We knew exactly which troops and equipment would be used; we knew when those troops and equipment would be ready; we knew when the ships and planes would arrive to pick them up (and if they were not on time we would complain and call "foul"); we sometimes had even studied just how tightly to pack each piece of equipment into a particular ship. But a crisis, by definition, is not like that. In a crisis we must not only know how to execute under real-time pressures, we must also *know how to plan* so that we can create and constantly adapt deployment and employment plans under those same pressures. We must know how to plan *in* emergency situations, not just how to plan *for* emergency situations.

At the beginning of ODS some personnel were familiar with deliberate-planning procedures, some were familiar with crisis-action planning procedures, and a few were familiar with both. But very few had experience in working in real time to simultaneously plan and execute the deployment of a large military force.

Desert Shield differed from the training and practice: There was no early warning, no plan on the shelf ready to execute, and, in the beginning, not even a good idea of the Army's mission or of how many soldiers might be needed. Planners had to improvise and build constantly evolving employment and deployment plans at the same time that their colleagues were physically transporting the initial combat and support units.

USCENTCOM had no OPLAN and TPFDD it could pull off the shelf. It had been building a new and surprisingly appropriate plan but was months away from completion. The automated deployment-planning systems designed to facilitate data creation, exchange, and visibility were being updated: Versions 1 and 2 of JOPES had recently been fielded and not all personnel were familiar with the look, the operation, or even the concept of the system; other joint and service-specific support systems were evolving in similar if less radical fashions.

Nearly all of the planning activities and exercises that deployment personnel had been through had assumed that (a) the threat and the proper U.S. response to the threat (and thus the mission for the Army and other Services) were clearly defined; (b) the forces necessary to handle the crisis and the transport they required were obvious; and (c) the majority of the transportation resources of the nation were immediately available to the military. ODS differed significantly from those activities

- There was uncertainty concerning Iraqi capabilities and intentions: Would Iraq attack Saudi Arabia immediately, or wait? What tactics would be employed? Would chemical or biological or nuclear weapons be used?
- There was uncertainty concerning U.S. capabilities and intentions: What capabilities were required to counter each of the potential threats? Was there a *robust* combination of capabilities we could field? Which units could be ready for deployment? Under what schedule? How much lift would be available? When? What type of support units were needed? When? Who should furnish them?
- Finally, within that context there was substantial uncertainty concerning the proper and efficient real-time use of the deployment-planning procedures and support: How can we plan and execute at the same time? How can we work at two levels (with details for the units currently deploying; with aggregates for those to deploy in two weeks) simultaneously? Who sources the combat units? The support units? Who validates their readiness and availability? Is it really necessary to provide centralized visibility of manifesting and movement information?

Thus, the uncertainties inherent in the threat and in our responses, combined with a lack of practice with and trust in official procedures, provided significant challenges to Army planners. A critic might say that the success of the ODS deployments was due as much to the caution and ineptitude of the enemy as to the quality and performance of our personnel, procedures, and support. A fairer depiction suggests that, despite lack of comparable standards, Army deployments were planned and executed reasonably quickly and smoothly, and were possible (on such a scale and schedule) primarily because of the intelligence and can-do attitude of the personnel and the existence of modern planning procedures and computerized information flows. This depiction also suggests that ODS experiences provide insights into a number of problems and issues for further research.

Uncertainties will always be present and can never fully be controlled. We must never expect to experience a contingency that fits perfectly with some plan that has thoroughly been worked through and documented—we will always find some discrepancies. On the other hand, we should never expect a pure no-plan crisis. Portions of existing plans and, as time goes by, more and more prepackaged combat and support modules will be available. The challenge is first to learn to plan generically and then to learn to work interactively to integrate and improve.

Support Systems Hindered Operations

JOPES and the other systems were crucial to ODS deployments. They allowed establishment of the common database that provided the JPEC with visibility of the day-by-day progress of the deployment. If this capability had not been present, or had not been present on the scale of JOPES/WWMCCS, the ODS deployments would have taken substantially longer and the frustration level of the JPEC would have been substantially higher.

Nevertheless, definite problems emerged during ODS. JOPES, the Joint Operation Planning and Execution System, may someday fully support the planning and execution of mobilization, deployment, employment, and resupply activities as its plan specifies, but during ODS and for at least the next several years, it focuses on deployment and, especially, on planning. Current versions of JOPES rely on older JOPS and JDS capabilities. Designed to be the primary wartime command and control system of the NCA and the CJCS, JOPES also carries much of the detailed cargo and movement information needed by force commanders and transportation managers.

At the beginning of ODS, some people were familiar with JOPS deliberate-planning applications; some people were familiar with JDS deployment-planning applications; and a few people were familiar with the JOPES interface for JOPS and JDS. But very few had experience in using JOPS and JDS together to simultaneously plan and deploy a large military force.

Consequently, during ODS few people used the planning and analysis tools available in JOPES. Those tools can work with either notional units or actual units, so that once the major combat units for the initial deployments were identified (and that happened quite early), JOPES could have been used in its notional mode to estimate the support and resupply required by those combat units as well as the transportation feasibility of the total package. The Joint Staff did use notional units to estimate the number of reserve ships that might be needed under various "what-ifs," but most of the organizations focused on acquiring and inputting detailed data after particular units had been selected for deployment or simply waited until others had input those data. That is, because they addressed transportation requirements only from the bottom up, most organizations were not able to provide even rough estimates of aggregate transport requirements until all the detailed data were collected and input. Most high-level planning was done without benefit of existing planning tools, tools that if used effectively could have substantially reduced the confusion and disorganization that occurred, especially in the first weeks of the operation.

Focusing on the way the support systems actually were used in ODS, four general types of problems have been described in this report.

- Unfriendly, overloaded support systems resulted in slow and incorrect data entries.
- Problems with the design and control of the deployment databases resulted in the loss of significant amounts of previously entered data, slowing the creation of databases and reports and reducing their usefulness.
- Procedures for collecting and entering crucial information into the support systems had not been well thought out beforehand.
- The support systems lacked several crucial capabilities and interfaces.

The first two types of problems were ubiquitous. Every organization reported shortages of JOPES operators and supervisory personnel. Every organization agreed that the military's automated information systems were relatively inflexible, not user friendly, and negligent in assuring data integrity and consistency. These problems slowed support to ODS, frustrated personnel involved in data input and systems operation, and probably delayed some deployments.

The latter two types of problems had more severe repercussions, especially during the first several months of the deployments. Because recent exercises had not realistically portrayed the difficulties of collecting and inputting data during no- and low-plan operations, some crucial procedures were ill defined and/or allocated to inappropriate organizations. Also, because the support systems emphasized planning more than execution, important information on unit, vehicle, and movement changes still could not be entered directly. These problems resulted in some transporters not knowing what they were supposed to move, some unit commanders not knowing the status and sometimes even the location of their units, and some in-theater organizations not knowing what personnel or equipment would arrive on the next ship or plane.

Recommendations

By the end of the ODS deployments, people had been trained, procedures had been debugged, and systems had been patched. In this sense, and because the enemy mounted few effective operations, ODS can be viewed as a valuable learning experience. If called upon to replicate those deployments today, the Army's actions and reactions (and indeed those of all the U.S. Services and defense organizations) would be substantially faster and smoother. However, the knowledge gained from ODS will degrade with time as people transfer and organizations change. The challenge is to learn and to generalize—to learn from ODS the improvements in procedures, systems, and practices that can be used effectively in future, dissimilar crises.

Procedures

Perhaps the most important lesson from ODS is that we need to re-examine how we do deployment planning and execution in the post–Cold War era where unexpected and unplanned-for regional crises now pose the most probable threats to the U.S. security and well being.

ODS demonstrated that political sensitivities easily can cause initial planning activities to be close-held at the NCA and CJCS level, forcing lower-level organizations either to bide time or to initiate early planning without clearly stated missions or objectives. *Even* after the majority of the JPEC was allowed access to ODS planning, however, major uncertainties continued because the CINC's priorities changed almost daily in response to changing perceptions of the world. The *real* issue is that ODS is probably not an unusual scenario in these times and that many or most future contingencies, at least at the beginning, will have strong elements of uncertainty and secrecy.

Accepting that as the norm suggests that procedures for deployment planning should be repackaged to emphasize flexibility and adaptability. Deliberate-planning activities should emphasize detailed planning—not for completeness--but within the contexts of learning how to plan, how to establish relationships with other planning and execution organizations, and how to acquire familiarity with foreign regions and their customs and resources. Crisis-planning activities should stress and facilitate concurrent planning and execution; they should acknowledge that most crises will require either a new OPLAN and TPFDD or, at the least, immediate and significant changes to existing but dated plans and databases.

Crisis-action procedures must stress multilevel planning—the use of aggregate data to estimate first-round needs, capabilities, and possibilities, followed by the use of detailed data to plan and execute actual movements. ODS officials commonly worked with three and four levels of data. They used aggregate (force-level and unit-level) data in much of their planning, in communications, and in situation reporting; they used more detailed (ULN-level) information whenever they were involved with JOPES and its applications; and they used even more detailed information (at the piece and person level) in planning and executing the actual moves. That experience needs to be incorporated into manuals and training.

Planners must be taught to expect uncertainty, to expect to initially receive less-than-accurate, less-than-complete, constantly changing information, and to expect to work initially with rough, aggregate tools. In the first days of a crisis, especially one without well-defined objectives, high-level planning should be based on generic information on mission type, time window, task force, and transportation allocation. The initial goals should be to develop strategic options, estimate force and transport requirements, and establish realistic time windows. This will involve negotiations among high-level officials and planners if aggregate analyses indicate the postulated resources cannot handle the required operations within the time windows. As early as possible, the CINC should establish a priority list and task the Services to select combat units and prioritize their moves.

Then as planning proceeds downward, it necessarily becomes more detailed and, at the unit and command levels, the data flow and analyses should work from the detailed to the aggregate, from the bottom up. Summed information from the units' detailed planning can then be used as a check against the aggregate estimates from the higher-level planning. If the aggregates are not within tolerance, then officials must negotiate changes at the unit level and/or reconsider the higher-level plans.

Additional improvements and enhancements to procedures suggested by the ODS experiences include:

1. Development of tailorable force packages for both combat and support units at all levels, complete with equipment lists and stow plans.
2. Development of doctrine and institutions for the command and control of support organizations and for support packages for different classes of contingencies and different types of theaters.

Systems

Army experiences in ODS suggest that the computerized deployment-support systems need to be refocused and updated. At the highest level, planners at the NCA, CJCS, supported CINC, and USTRANSCOM need automated tools for planning and gaming (in the form of what-if scenarios, based on the CINC's evolving OPLAN or COA) as aids in decisionmaking. They must have immediate access to aggregate planning tools that can operate with incomplete, preliminary information. They must have means for continually incorporating newer and more complete information and planning guidance into their analyses and preliminary plans. Meaningful links must be developed between elements of information as they become available and are updated; that information must be maintained in a database from which selected, relevant subsets can be furnished to the JPEC.

As the planning proceeds, means must be developed for linking the several levels of data—forces, units, ULNs, and persons/pieces—so that planning and deployments can be conducted effectively and efficiently by the operating and transportation commands and, at the same time, monitored and coordinated by the higher-level commands. How the systems and databases should be integrated or interconnected is an open issue, but it must not be a simple bottom-up system; both national officials and mid-level planners must be able to specify and analyze force- and unit-level operations whether or not ULN and person/piece data are available.

Similarly, means must be developed for linking the several levels of communications so that planning and deployments can be conducted by the operating and transportation commands and, at the same time, monitored and coordinated by higher-level commands.

Additional actions the Army might take to upgrade its deployment capability include:

1. Offload Army-specific functions from computers used for deployment planning and execution.
2. Improve the user-friendliness of Army deployment-support systems and Army interfaces into the joint-deployment systems.
3. Procure portable deployable hardware that allows deploying commands to maintain contact with the JPEC and to continue their planning, analysis, and control activities as and after they deploy.
4. Work with the Joint Staff, Defense Information Systems Agency (DISA), USTRANSCOM, and the deployment community to:

   A. Develop methods for overcoming the over-writing and other problems associated with the lack of concurrency control in the current JOPES databases.

   B. Determine more appropriate and productive means for (1) providing Army units with up-to-date visibility of deployment databases and (2) providing the transport community with more direct access to units' equipment inventories without usurping FORSCOM's responsibilities and without overloading JOPES and WWMCCS.

   C. Develop means for linking planning ULNs to the actual progress of the deployment in order to ensure visibility throughout the entire process as well as to support later operations and analysis. Often several ULNs need to be tied to one transport carrier identifier and perhaps as often a single ULN becomes split across several carriers. Detailed data systems must identify the portion of the requirement being transported by each carrier.

   D. Develop procedures within the data systems for more efficiently rolling-up ULN (JOPS Level 1 and 2) data to the UIC and force-module level and for standardizing and reconciling JOPS Levels 3 and 4 data with the even more detailed information available from TC-ACCIS and the AMC and MTMC data systems.[1]

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[1]Plans for USTRANSCOM's Global Transportation Network may include the latter tasks.

E. Express aggregate as well as specific cargoes in square feet as well as tons to facilitate sealift planning.

Most important, however, Army and JPEC personnel must realize that for the foreseeable future, regardless of near-term or even mid-term improvements in the support systems, those systems will continue to exhibit deficiencies and shortfalls and, in particular, that there will always be delays in getting up to speed fast enough in no- and short-warning crises. High-stress activities such as bringing systems up to speed, creating and improving databases, and working around bottlenecks and deficiencies will continue to challenge crisis-action procedures, systems, and personnel.

Personnel

If we accept the premises that future crises will usually arrive unannounced and that planning and support systems will continue to evolve rapidly—constantly improving and expanding capabilities and constantly challenging operator skills—then the most critical element of the deployment planning system will continue to be its personnel: the soldiers and civilians who, with whatever tools are then available, must quickly and correctly plan operations, select units for deployment, pass along cargo information, and supervise moves and employments. To better train, nurture, and reward those personnel the Army should:

1. Strengthen career paths for planning personnel. Increase recognition of superior skills, qualifications, and performance.
2. Increase the training and practice of those personnel in realistic-plan, no-plan, and unexpectedly stressful scenarios. Restructure deployment exercises to require personnel to use the deployment support systems to their maximum capabilities, including the rapid compilation of large TPFDDs and the rapid analysis and integration of situational changes.
3. Create ways to use crisis-planning tools in day-to-day peacetime operations. This will be difficult, but it is necessary to ensure familiarity and continuing competence.
4. Civilians should be trained as JOPES operators. During high demand periods contractors should be used to augment this stabilized workforce.

Appendix
A. Joint Planning Support Systems

This appendix contains information on the joint planning systems: JOPS, JDS, and JOPES. It begins with a brief historical overview and then provides more detailed discussions of the WWMCCS and the three planning systems.

A Brief Overview

The routine use of data processing for military planning began in the 1960s. Soon after, it became apparent that different types of computers, incompatible software, and inconsistent planning procedures and documentation made it difficult to communicate between commands. To address these problems, work began in 1967 on the development of a new planning system. By 1973, 35 new Honeywell 6000 computers had been installed as part of the WWMCCS to furnish ADP support for the new planning system. Unfortunately, many application programs were incompatible with the new computers. To remedy the situation the Joint Chiefs of Staff directed the rapid development of temporary computer programs until new software could be introduced. Four efforts were designed and developed: the Force Requirements Generator (FRG) to build and time-phase a force list; the Movement Requirements Generator (MRG) to compute the support required to sustain a military force; the Transportation Feasibility Estimator (TFE) to simulate the strategic deployment of forces and support; and the utility programs to allow the other programs to communicate and produce a meaningful OPLAN database. These programs worked so well that they were adopted as the standard AIS for joint operation planning. In 1975, JOPS Volume III was published, describing the JOPS computer support system often referred to as JOPS III. JOPS III has undergone many updates since its original version.

In 1975–1976, a small number of WWMCCS computers were interconnected in a Prototype WWMCCS Intercomputer Network (PWIN) fashioned after the ARPANET. In the 1978 NIFTY NUGGET exercise, a new version of JOPS software and network programs was hosted on WWMCCS to simulate a deployment exercise involving the mobilization of reserve forces. When the computers and communications systems were overloaded, and proved unable to perform the tasks required in the time available, urgent demands were made to modernize the WWMCCS.

In 1979, the Office of the Joint Chiefs of Staff created the Joint Deployment Agency to centralize mobilization and deployment planning and direct development of an automated system to support deployment planning and execution. The result was the Joint Deployment System (JDS) for crisis-action planning. In the same year, a GAO study recommended that a WWMCCS project manager position be created with responsibility for all WWMCCS and WWMCCS-related computer-based information systems, as well as the authority to implement necessary changes. In response to the GAO report, DoD Directive 5100.57 created a WWMCCS Engineering Organization as a separate entity within the Defense Communications Agency. The PROUD SPIRIT exercise in 1980, however, again indicated there had been no major improvement in performance, despite major investments in JDS and in the computer network.

In 1981, the DoD and Joint Chiefs of Staff, in an effort to correct planning- and execution-related deficiencies, formed a Joint Planning and Execution Steering Committee, under the direction of J-3, and assigned it the task of overseeing a review of the planning and execution process. In July 1982, the Operation Planning Steering Group (OPSG) was formed to give permanent flag and general officer direction to the development of follow-on systems to JOPS, JDS, and WWMCCS. A timetable was established for the improvement of the WWMCCS Information System, with development between 1982 and 1985; testing beginning in 1985, and implementation beginning in 1986, to attain partial operation by 1988. As part of this effort, the JOPES Required Operational Capability was approved on July 5, 1983.

As a result of the Goldwater-Nichols DoD Reorganization Act of 1986, the JCS J-7 Operational Plans and Interoperability Directorate was formed and is now the proponent for JOPES. The OPSDPs (operational deputies) serve as the principal policy guidance body, replacing the OPSG. The new USTRANSCOM was to act as the implementing agency for CJCS/JCS-approved JOPES policy, as well as a conduit for user input. The WWMCCS upgrading effort became known as WIS, with the Air Force the designated lead agent. The Air Force developed a comprehensive program that involved replacement of hardware and software but budgetary constraints caused a redirection of the effort.

In the spring of 1989, because of increasing high-level frustration with the progress of the program, the Defense Communications Agency (DCA), specifically the Joint Data Systems Support Center (JDSSC), was given control of that part of the WIS program that was concerned with JOPS/JDS modernization. WIS ceased to exist, and DCA has designated its effort the WWMCCS ADP Modernization (WAM).

WAM was designed to remedy existing deficiencies in command and control systems, e.g., lack of efficient standard force status capability, lack of automated support for no-plan and multiplan situations, and lack of an on-line plan modification system. The JOPES requirements were the principal focus of the WAM effort. Those requirements were to be satisfied through new applications software, new procedures, an integrated database, and improvements to the WWMCCS Standard ADP baseline as approved by the WAM management structure. The initial program focus was on the crisis, deliberate, and conventional deployment planning and execution tasks. The software development was to be modularized into a series of versions, the first of which tied together JOPS and JDS with a common-user interface. In November 1989 JOPES Version 1 was released, followed by Version 2 in April 1990, and Version 3 in December 1990.

The Macintosh workstation was designed to be an integral part of the WAM and a hardware platform for parts of the WAM program to support distributed processing of JOPES programs. It would interface the user with all host-based services. Operational assessment of Version 4, however, was disappointing and led in the summer of 1992 to the suspension of most JOPES development efforts. The following section discusses these topics in more detail.

The WWMCCS Concept[1]

The World-Wide Military Command and Control System (WWMCCS) is defined in Joint Pub. 0-2, *Unified Action Armed Forces*, as "the system that provides the means for operational direction and technical administrative support involved in the function of command and control of U.S. military forces." WWMCCS furnishes a multipath channel of secure communications to transmit tactical warning and intelligence information to the President and Secretary of Defense, and a channel from them to give direction to U.S. combatant commanders. The system's goal is to establish effective connectivity among the members of the defense organization.

WWMCCS is made up of the National Military Command System (NMCS), the command and control systems of the unified and specified commands, the WWMCCS-related management/information systems of the military departments, the command and control systems of the headquarters of the Service component commands, and the command and control support systems of DoD agencies. The primary mission of WWMCCS is to support the national-level command and control function. On a noninterference basis, the system is

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[1] This material is taken from AFSC Pub. 1, pp. 5-19 to 5-24

available to support combatant commanders in their command and control responsibilities.

Conceptually, WWMCCS includes five basic elements: tactical warning systems, communications capabilities to convey information, hold conferences, and issue orders; data collection and handling to support WWMCCS information requirements; executive aids for using the WWMCCS, and WWMCCS command facilities (primary or alternative command centers). The WWMCCS supports four "functional families" of command and control applications: Resource and Unit Monitoring (RUM), Conventional Planning and Execution (CPE), Nuclear Planning and Execution (NPE), and Tactical Warning/Attack Assessment (TW/AA).

The JOPS System

Before November 1989, deliberate planning was supported by the JOPS and crisis-action planning by the JDS. JOPS is an ordered and comprehensive set of procedures to translate an assigned task into a plan of operations. It can be used to develop, review, and execute global and regional plans. JOPS is a WWMCCS standard computer-based system used in the deliberate planning process by members of the JPEC to develop, analyze, refine, review, and maintain an OPLAN and to prepare supporting plans. The Joint Data Service Support Center has been responsible for supporting and maintaining JOPS.

During crisis or time-sensitive planning, as shown in Figure 3, OPORDs may evolve from an existing OPLAN, from a CONPLAN, or from a no-plan situation. The JDS supports the crisis-action planning procedures by providing the capability to handle information rapidly during a crisis. It bridges the gap between deliberate planning and crisis execution by ensuring that a joint OPLAN with its associated TPFDD can be transitioned rapidly into an executable OPORD, which can be monitored during execution. The USTRANSCOM has had responsibility for administering and operating the JDS.

JOPS and JDS, however, could not effectively interface with each other and did not perform all the functions necessary for plan development and execution. To correct this deficiency, JOPS and JDS have been replaced by the follow-on JOPES system.

"JOPS ADP provides the JPEC planner an automated tool for use in the development, analysis, refinement, review, and maintenance of joint operation plans and in the preparation of supporting plans. Standard files, formats, and application programs provide support for force planning, nonunit-related cargo and personnel movement requirement determination, transportation feasibility estimation, logistic factors, civil engineering support, and medical planning." (JOPS Volume III, SM-524-85, p. I-2.)

JOPS is used in the plan development phase by the Service components to build the force list, calculate the flow of nonunit cargo and personnel, and complete specialized planning, such as civil engineering and medical support. An outcome of this process is the TPFDD. JOPS can be used to test the gross transportation feasibility of the TPFDD and to revise the database based on the deliberate planning refinement conferences. JOPS provides automated aid to strategic deployment planning and limited sustainment planning, but provides no aid to mobility or employment planning other than establishing the force list.

In this section, we describe the JOPS database files and application programs. We then describe how these are used by the JPEC in the Plan Development phase of deliberate planning.

Database Files[2]

The JOPS database files are maintained on disk and use the Honeywell 6000 ISP indexed sequential file structure format. ANSI COBOL is the programming language used to maintain these files. Users are not authorized to modify program files or accompanying software without prior approval from the Office of the Joint Chiefs of Staff. Use of the data contained in the file, except as provided for by the JOPS programs, must be accomplished through command-unique programs.

a. Figure A.1 shows JOPS standard reference files.

b. JOPS-generated plan-unique files include the Time-Phased Force and Deployment Data file and the Summary Reference File as well as a number of other files described in JOPS Volume III, SM-524-85.

PFF (MRG):	Planning Factors File (MRG)
PWF:	Personnel Working File
PFF (LCE):	Planning Factors File (LCE)
FREF:	Force Record Extract File
POSF:	Ports of Support File

[2]This section was taken from *Joint Operation Planning System Volume III*, SM-524-85, pp. III-4 to III-10

APORTS	*AERIAL PORTS AND AIR OPERATING BASES FILE*	• Airfield planning factors, e.g., throughput capacities for free-world air facilities, runway length & width, weight-bearing capacity, A/C parking space, fuel & cargo storage capacity, etc
ASSETS	*TRANSPORTATION ASSETS*	• Time-phased availability of common-carrier air- & sealift • Types and source of military and commercial transportation assets • Created from data in JSCP
CHSTR	*CHARACTERISTICS OF TRANSPORTATION RESOURCES*	• Standard planning factors for airlift available for deployment planning, e.g., utilization rate, passenger & cargo capacity, speed, range, load/off-load times, etc • Standard planning factors for sealift available for deployment planning, e.g., ship category, cargo capacity, average speed, load/off-load times, etc
PORTS	*PORT CHARACTERISTICS*	• Information on physical and operating characteristics of selected free-world ports, e.g., size, depth, number of berths, beach data, categories & capacities of cargo-handling & storage facilities
SDF	*STANDARD DISTANCE FILE*	• Distance between POE-POD pairs listing mode of transport, POE-POD, GEOLOC code, Suez/Panama Canal status, OPLAN identification, number of stops, computed distance
TUCHA	*TYPE UNIT DATA*	• Movement characteristics for standard deployable units • Force descriptions for nondeployable unit types
TUDET	*TYPE UNIT EQUIPMENT DETAIL*	• Descriptions & dimensions of -- specific pieces of wheel/track equipment for TUCHA file type units -- all hazardous cargo -- non-self-deployable aircraft -- floating craft -- items measuring more than 35'
LFF	*LOGISTIC FACTORS FILE*	• Standard logistic planning factors to compute resupply, determine ESI, and identify shortfalls
CEF	*CIVIL ENGINEERING FILES*	• Description of deployable facility sets • Operational capability of Service construction units • Description of Service facility component systems
FM LIBRARY	*FORCE MODULE LIBRARY*	• Collection of Service joint force modules for C, CS, CSS forces plus 30 days sustainment

SOURCE: Armed Forces Staff College, National Defense University, *The Joint Staff Officer's Guide 1991*, AFSC Pub 1, Figure 6-13, Washington, D.C.: U.S. Government Printing Office, 1991, p. 6-43.

Figure A.1—JOPS ADP Standard Reference Files

UCFF:	UTC Consumption Factors File
TFE Control File:	Transportation Feasibility Estimator Control File
MWF:	Medical Working File

TPFDD: The time-phased force and deployment data file [illegible] an OPLAN-unique file developed by the [illegible]ners dur[illegible] plan development and contains the type of units or [illegible]ctual units required by the supported comm[illegible]der, nonunit related cargo required by the supported commander, nonunit-related personnel including medical units and noncombatant evacuation operations (NEO), and preferred routing; and timing of required type and actual units and nonunit-related cargo and personnel.

SRF: The summary reference file is developed in conjunction with the TPFDD. It provides summary and detail data and all nonstandard unit movement characteristics created during the development and analysis of an

OPLAN. The OPLAN dependent SRF records contain all Transportation Component Command (TCC) generated movement tables.

c. Two WWMCCS files are accessed by JOPS:

GEOFILE: The geographic location file contains worldwide geographic data for locations specified by different commanders.

SORTS: The status of resources and training system file provides general information for units, such as unit name, unit type code, origin, equipment and personnel readiness data, and command relationships.

d. JOPS plan-generated but plan-independent files are also described in JOPS Volume III, SM-524-85. These are:

PDD: Package Designation and Description File

FPF: Force Package File

MEF: Major Equipment File

SDF: Standard Distance File

Applications:[3]

System Monitor: This control program allows the planner to interact directly with the FRG, MRG, NPG, LCE, MPM, FMS (Force module subsystem), and TFE in a conversational mode at a terminal during computer operation. It permits the planner to enter and change parameters, select options, and specify outputs.

FRG: The force requirements generator allows the planner to select, assist in analysis of, tailor a variety of force options for, and produce a time-phased deployment scheme that will support the mission.

FMS: The force module subsystem allows JPEC planners to link the force, nonunit-related cargo, and nonunit-related personnel information logically within a JOPS III TPFDD and SRF.

MRG: The movement requirements generator generates gross nonunit-related cargo transportation requirements based on the forces to be supported and the duration of the planned operation. It uses factors provided by the Service planner in developing the daily requirements for resupply and supply buildup.

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[3] This material is taken from *Joint Operation Planning System*, Volume III, SM-525-85, pp. IV-1 to IV-6.

TFE: The transportation feasibility estimator determines the gross transportation feasibility of the deployment scheme developed in support of the operation plan. It consists of a strategic transportation analysis using common-user lift. The TFE compares movement requirements of deploying forces, supplies, equipment, and replacements with available sea and air transportation resources and considers specified time-phased reception and discharge capabilities of the deployment airfields and seaports.

CESPG: The civil engineering support plan generator aids the JPEC in developing and evaluating civil engineering support for OPLANs.

MPM: The medical planning module provides automated assistance to the planner in quantifying the impact of an operation on an existing or a proposed medical system.

NPG: The nonunit personnel generator generates gross nonunit personnel transportation requirements for replacement personnel in support of TPFDD forces based on MPM projected losses.

The Plan Development Phase of Deliberate Planning

The main purpose of JOPS is to assist in the plan development phase (Phase III) of deliberate planning. Using JOPS application programs, planners create a TPFDD computer file by entering the data supplied by sources throughout the JPEC.

There are eight steps in the plan development phase:

- Force planning
- Support planning
- Chemical/nuclear planning
- Transportation planning
- Shortfall identification
- Transportation feasibility analysis
- TPFDD refinement
- Documentation

Step 1: Force Planning. The purpose of force planning is to identify all forces needed to accomplish the CINC's concept of operations and phase them into the theater. Force planning is ultimately the responsibility of the supported commander, but most of the work is done by the Service components. Each Service component commander develops his own force list composed of combat,

combat support (CS), and combat service support (CSS) forces, using Service planning documents (the Army uses the four-volume Army Mobilization Operations Planning Systems, or AMOPS, document). Although the apportioned major combat forces may have been described in relatively large fighting units such as Army division and brigade, the final product for each Service component's total force list will include detail down to the unit level (e.g., battalions, squadrons, etc.). The Services have Service-unique systems for reporting detailed unit information and Service-unique systems for doing their planning. These systems may be hosted on a WWMCCS node and interface to JOPES to upload and download planning data.

Deployment planning requires the development of movement information for each unit from (1) its origin (ORG) to its port of embarkation (POE), where strategic air or sea transportation begins; (2) from the POE to the port of debarkation (POD), the airport or seaport within the theater of operations where strategic transportation is finished; (3) from the POD to its destination (DEST); and (4) for intermediate locations (ILOC) between ORG and POE, between POE and POD, or between POD and DEST. Since the timely arrival of units at the DEST is the key to successful participation in the CINC's movement plan, planning is built around several critical times that include: CINC's required date (CRD); the times of the earliest and latest arrivals of the elements of the unit at the POD; the earliest date the unit is available at the origin for transport to the POE; the earliest time the unit can begin loading at the POE; the earliest date the loading can be completed at the POE; and the earliest departure date from the POE.

A force list can be built in several ways. The planner can create a force unit by unit, starting with the apportioned combat forces and adding all necessary CS and CSS forces, which is extremely time-consuming. An alternative method uses force modules, which are groupings of combat, CS, and CSS forces as well as a calculated amount of sustainment. Force modules are convenient for manipulating, identifying, and monitoring groupings of forces. There are three types of force modules: the Service/joint force module contains combat, CS, and CSS type units with their associated sustainment; the OPLAN-dependent force module is like the first but is developed by a CINC to meet specific demands of a particular OPLAN; and the force-tracking force module consists of major combat units, is OPLAN-independent, and does not contain sustainment data.

Force planning usually begins with using the characteristics (e.g., personnel, categories of cargo, weight of equipment and accompanying supplies, etc.) of notional or typed units that are found in the TUCHA reference file by unit type code (UTC). The TUCHA is updated quarterly by the Services. A TUCHA unit is a hypothetical unit with the approximate physical and movement characteristics of all the actual (real-world) units it represents.

Each separate force record on a force list is assigned a plan-unique alphanumeric code called a force requirement number (FRN). Characteristic blocks of FRNs are identified for each supported commander, and each OPLAN uses a separate FRN to identify each unique force requirement. When an FRN has been assigned to a unit, it is general not changed in the course of a plan. It is useful because it allows the planner to track a unit that may have changed sequence in the TPFDD. Two additional characters, called fragmentation and insert codes, may be added to the FRN to identify a force entry that requires more than one iteration of the FRN to satisfy the force requirement, such as three individual brigades to satisfy the requirement for a division. This resulting identifier becomes the unit line number (ULN).

The JOPS Force Requirements Generator (FRG) application is used to help the planner in creating a force requirements file, analyzing the data, and changing the data. It consists of a series of modules that (1) aid the planner with clerical tasks such as selecting, deleting, or modifying type units or force modules and modifying the information-defining movements; (2) split the movement of a force record into air and sea shipment; (3) assign unit parameters to individual units or groups of force records; (4) reorder the list of movements based on planner-selected criteria; (5) selectively create summaries of transportation requirements; (6) identify for analysis a categorized list of support forces; and (7) lay the groundwork for analyzing gross transportation feasibility of force records. The FRG uses most of the JOPS reference files described earlier.

The Force Module Subsystem (FMS) allows the planner access to the Force Module Library, which contains previously defined force modules—complete combat packages made up of combat, CS, and CSS forces in addition to some nonunit cargo and personnel. The FMS allows the planner to build a new TPFDD; modify an existing TPFDD; go into an existing TPFDD and group force entries into a new or existing force module; define new force modules; modify and delete existing modules; and audit the file's Cargo Increment Number (CIN) for nonunit cargo, Personnel Increment Number (PIN) for nonunit personnel, and ULN. It also allows large groupings of force entries to be identified for ease in monitoring during plan execution.

A component planner uses the FRG and its standard reference files to create a total component force list. Given the mission, the planner reviews the type of combat forces apportioned in the task-assigning document and determines applicable CS and CSS units from the Service planning documents. The plan is built by selecting individual units by Unit Type Code (UTC) or an entire force as an FM. When UTCs are entered individually or collectively as a force module into the TPFDD, the FRG automatically copies the unit's description and its movement characteristics data from the TUCHA and adds them to the working TPFDD.

The collection of the components' force lists is merged by the CINC's staff and becomes the CINC's consolidated force list. The database is called the OPLAN TPFDD. When the supported commander concurs with the consolidated force list, the components then add any missing information needed to deploy their Services' forces from origin to destination, such as mode and source of transportation, POD, priority off-load at POD, etc.

Step 2: Support Planning. The purpose of support planning is to identify the quantities of supplies, equipment, and replacement personnel as well as civil engineering, medical, and POW materials required to sustain the forces identified in force planning. During the support planning step, planners are primarily concerned with how much strategic lift will be needed to move the support requirements, but before the OPLAN is complete, requirements will be defined in more detail. Support planning is completed when all significant support requirements have been determined, consolidated by the supported commander, and then entered into the TPFDD file.

The actual support calculation uses consumption rates developed and maintained by the Services under their responsibility to supply, equip, and maintain their forces assigned to combatant commanders. This calculation is generally made by the Service component commanders, who refer to Service planning guidelines and Service doctrine, but it is also possible for the supported commander to perform the calculations using component-supplied force lists and Service planning factors.

Support is computed for unit-related supplies and equipment including a unit's organic equipment, basic load or quantities required to be on hand within a unit, and additional accompanying supplies specified by the CINC. These are identified in the TPFDD with the unit. Nonunit-related supplies and equipment include all support requirements not in the TUCHA or augmented by accompanying supplies. Categories include pre-positioned war reserve materiel stocks, sustaining supplies, resupply, supply buildup, and replacement personnel.

The Movement Requirements Generator (MRG) is the JOPS application program used in support planning. It calculates the gross non-unit-related equipment and sup[illegible] support the OPLAN. These calculations determine the nonunit mov[illegible] requirements by using numbers of personnel, number and types of UTCs, Service planning factors, and user-supplied CINC planning guidance.

These gross determinations for supplies are translated into weights and volumes and added to the TPFDD.

The MRG allows the planner to use data from a reference file to create an OPLAN-dependent ports of support file (POSF) categorized by Service, supply destination, air and sea transport, and ammunition and POL. It also allows the planner to use data from a reference file to create planning factor files (PFF) and UTC consumption factor files (UCFF) based on Service-developed logistics factors, and to calculate the nonunit movement requirements. The planner can selectively aggregate the data to reduce the number of nonunit cargo records using the earliest to latest date of arrival window at each port of support and, thus, can better pattern the movement requirement for containerized cargos.

The Civil Engineering Support Plan Generator (CESPG) application is used to analyze engineering requirements of planned contingency operations. These include facility asset data, anticipation of new facility requirements, projection of war damage, recognition of actual and projected civil engineering forces, determination of required civil engineering materials, and acknowledgment of available support from the host nation. The CESPG allows the planner to maintain unit and facility information in existing files; analyze troop and facility requirements from the TPFDD; determine facility requirements based on forces employed, unit mission, and war damage; schedule existing engineering manpower; and prepare reports to identify facility and construction requirements and develop scheduling informatic

The Medical Planning Module (MPM) is a menu-driven subsystem that predicts and evaluates medical requirements in support of the OPLAN. The process considers the population at risk, length of stay in the hospital facilities, and Service-developed frequency data for injury and death. The result is a planning tool to determine patient load, requirements for patient evacuations, and both Service and component medical planning requirements. The products of the MPM are used as medical annexes to the OPLAN documentation, input to MRG, input to the Nonunit Personnel Generator (NPG), input to sustainment planning modules, identification of possible medical deficiencies in the OPLAN, and analysis of the impact of COAs on medical requirements.

The NPG application program offers an automated capability to generate TPFDD records for the movement of nonunit replacement personnel.

The Logistics Sustainability Analysis Feasibility Estimator (LOGSAFE) is under development to replace the MRG and Logistics Capability Estimator (LCE). It will perform essential sustainment item modeling and general supply modeling.

Step 3: Nuclear/Biological/Chemical (NBC) Planning. The component commands submit their chemical warfare requirements to the supported command. Service component commanders' plans for operation in a chemical environment are consolidated into a single joint stand-alone TPFDD file, separate from the OPLAN TPFDD.

Nuclear planning for strategic retaliatory strikes in general war is conducted by the Joint Strategic Target Planning Staff (JSTPS) at Offutt AFB, Nebraska, in coordination with U.S. unified and specified combatant commanders and certain allied commanders. The product of this planning is the Single Integrated Operational Plan (SIOP). JSTPS planning does not use JOPS.

Step 4: Transportation Planning. Transportation planning is done by the supported commander. The task is to simulate the strategic movements generated by component planners during the force planning and support planning steps using the apportioned strategic transportation resources. The goal in transportation planning is to produce a feasible strategic transportation movement in support of the CINC's plan, a very difficult thing to do. It is an iterative process—if the simulation indicates that the forces and nonunit supplies cannot be moved in time, planners identify the problems, evaluate their impact on the overall plan, incorporate solutions, and, if necessary, simulate the strategic move again.

The first step of iterative transportation planning is to complete the force and nonunit record entries and to enter all available information in the TPFDD. The next step is for the component planners to designate as many actual units as they can to replace the type of units in the force list. This is known as *sourcing*. In the Army, sourcing begins in the force selection by FORSCOM. Real-world units are sourced in the force list by matching each ULN with a unit identification code (UIC) that uniquely identifies each active, Reserve, and National Guard unit of the Armed Forces.

The Transportation Feasibility Estimator (TFE) application is used to simulate strategic movement. TFE is made up of four phases:

- The TPFDD evaluation phase allows the planner to display and analyze the information already in the TPFDD.
- The simulation preparation phase sets the planning parameters for running the simulation. In this phase, the movement information is extracted from the TPFDD, distance data are generated from reference files, port constraints are identified, strategic transportation assets are selected to match the apportioned forces from the JSCP or task-assigning document, the asset characteristics are defined, and the attrition rates are introduced.

- In simulation execution, the transportation flow is modeled based on the identified parameters; the results are displayed in either summary or detailed form.
- Post-simulation processing produces reports that identify the computed estimated departure date from the POE and feasible arrival date at the POD. Modules in this phase display information requested by the planner to analyze the movements, such as an exception report of unmatched records that did not close (i.e., a shortfall is said to exist when it is determined that the expected arrival of forces and supplies at the DEST does not conform to CINC requirements).

The requirement to transport personnel and materiel from the theater of operations requires close coordination. The movement of equipment requiring repair, noncombatant evacuation operations (NEO), and medical evacuation out of the combat theater are also concerns of the logistics planner. Recent experience with computer simulations has demonstrated this is more of a problem than originally thought. To consolidate these operations, a separate retrograde TPFDD is created. The Medical Evacuation System (MEDEVAC) is the application that focuses on the movement of medically evacuated personnel and cargo from the theater. The MPM generates the number of evacuees, and the data are received from MPM's medical working file. The product of MEDEVAC is added to the OPLAN TPFDD.

Step 5: Shortfall Identification. Shortfalls are identified and resolved throughout the planning process. This step focuses on identifying and resolving transportation shortfalls highlighted by the TFE deployment simulation. The TFE not only identifies the late arrival shortfalls but also identifies the reasons for them such as shortage of lift resources, overloaded mobility support facilities, excessive requirements for intratheater lift, etc.

Planners identify unresolved shortfalls for corrective actions by higher-level decisionmakers, or those that must be resolved with other commanders by compromise or mutual agreement. The CINC alone approves changes that affect the concept of operations or the concept of support.

If shortfalls are not resolved, the OPLAN is submitted based on capabilities, and the Plan Summary will assess the impact of the shortfalls and limiting factors and list the tasks that cannot be accomplished. A separate TPFDD is submitted identifying the shortfall force and nonunit cargo records; these shortfalls are considered unsourced rather than just late closures.

Step 6: Transportation Feasibility Analysis. Formal analysis of strategic transportation occurs in this step. The tools have been identified—a computer simulation and, if necessary, a plan development conference of key players will be held to resolve the shortfalls or to assess their impact on the OPLAN. After the computer simulation and, possibly, several iterations of the transportation steps, the product is the conclusion by the CINC that the OPLAN is grossly transportation feasible.

Step 7: TPFDD Refinement. The plan development phase consists of several subphases: forces, logistics, and transportation, with shortfall identification associated with each phase. The plan development phases are collectively referred to as TPFDD refinement.

Step 8: Plan Documentation. The objective of this phase is to document the operation plan in JOPS format for submission and distribution. The fully documented plan, including the refined TPFDD, is an operation plan in complete format (OPLAN).

The JDS System[4]

JDS is a transaction-oriented, distributed database system that allows the user to update the local database, which then may be transmitted to other sites over the WIN. It is a system of people, procedures, communications capabilities, and ADP equipment that manages the timely flow of deployment data within the JPEC. The JDS is part of WWMCCS and interfaces with other command and control systems.

In this section we discuss JDS capabilities, the JDS integrated database system, and the JDS application programs.

Capabilities

JDS can:

- simultaneously build, maintain, and manage exercise and real-world deployment plans;
- establish OPLANs or COAs from JOPS-created deployment plans or force modules;
- create a JOPS-formatted deployment plan from the JDS database,
- add, change, or delete information by using computer terminals or automated system interfaces;

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[4] This material is taken from AFSC Pub 1, Chapter 7.

- schedule or monitor deployments;
- offer close-hold capabilities to develop OPLANs; and
- manage deployment information to: automatically alert units and installations of scheduled deployments via AUTODIN; monitor ongoing system performance; integrate force module capabilities; and improve the timeliness and accuracy of deployment information.

Integrated Database

The JDS is built around a centralized integrated deployment database established and maintained on the USTRANSCOM WWMCCS computer at Scott Air Force Base, Illinois. Several sites duplicate the database and can serve as backup if it should become inoperative. The JDS database is resident on the Honeywell IDS I database system. It is the primary repository of deployment-related information and contains:

- narrative information on plan concept, scope and status;
- time-phased force and sustainment requirements that are either available from an existing plan, built line-by-line with force and cargo records, built with force modules, or created by a combination of these methods;
- hypothetical (notional) data that may be refined and updated; actual unit data that are sourced; and individual entries of CIN, PIN, and ULN data that may be updated and refined to improve visibility as the situation changes; and
- movements requirements that are visible and accessible for preparing the transportation schedule and building the manifest

System Operation

Interactive user entries generate transactions that update the local database and may then be transmitted over the WIN to update the central deployment database at USTRANSCOM and, nearly instantaneously, all other affected sites in the JPEC.

JDS supports the planner's functional requirements with the following application subsystems:

- plan information: displays and updates narrative plan information;
- requirements: enters, stores, updates, and retrieves force and sustainment information;

- unit information: retrieves and updates selected unit data;
- force module: using Service/Joint or OPLAN-dependent force modules, rapidly builds and tailors requirements in support of OPLAN or COA;
- schedule and movement: reviews and updates schedules, and manifests movement information during planning and execution;
- retrieval: retrieves and reviews database information;
- information resource manager: performs local database management functions;
- automated scheduling message: generates AUTODIN-format messages from JDS data.

JOPES

JOPES is the new, evolving system for performing joint planning that combines both peacetime and wartime planning. This section discusses JOPES' overall system goals, organizational responsibility for JOPES, and future plans.[5]

Goals

JOPES is the joint command and control system for conventional operation planning and execution and is intended to address mobilization, deployment, employment, and sustainment mission areas. It is designed to support commanders and planners at national, theater, and supporting levels.

The primary goals of JOPES are to:

1. Support the development of OPLANs within 45 days of concept approval and the development of an OPORD within three days after NCA COA selection in a no-plan situation.
2. Permit theater commanders to start, stop, or redirect military operations effectively and rapidly.
3. Support peacetime, crisis, and wartime planning and execution.
4. Integrate mobilization, deployment, employment, and sustainment activities.
5. Standardize policies and procedures which will be similar, if not identical, in peacetime (including exercises) and crisis situations.

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[5]The rest of this section up to Organization Responsibilities has been taken mainly from the *Joint Operation Planning and Execution System Volume I, Executive Summary*, February [illegible], 1989. It discusses the relatively firm plans for JOPES that were official up until the summer of 1992, when most developments were suspended.

6. Support the rapid development and evaluation of military options and COAs in single or multitheater scenarios.
7. Exploit ADP and communication advances being made in the WWMCCS Information System (WIN) and Defense Data Network (DDN).
8. Expedite the development of military estimates of a situation.
9. Ensure the dissemination and presentation of timely, accurate, and properly aggregated information.
10. Allow planners to identify resource shortfalls (personnel, transportation, materiel, forces, medical, and civil engineering services).
11. Secure the system from unauthorized access, data manipulation, or data retrieval. System hardware must be TEMPEST-qualified (or placed in a secure control zone) and must be security-certifiable for TOP SECRET sensitive compartmented information (SCI).

JOPES embodies a single set of joint procedures that addresses all classic functional aspects of joint conventional planning and execution during peace, crisis, war, or exercises. Previously, joint planners were required to be proficient in procedures of several systems that were limited in scope and focused on deployment.

JOPES procedures are supported by an integrated AIS support structure. Previously, planners were required to be proficient on multiple systems. Communication among elements of the JPEC was difficult due to the incompatibility of the different AISs. Data communication was hampered because systems did not have the capability to efficiently pass data because of the lack of standardized data elements. Complex algorithms had to be developed before data could be readily exchanged between systems. The JOPES evolution begins by integrating JOPS and JDS capabilities and developing the WISDIM (Warfare and Intelligence System Dictionary for Information Management) as the central repository for all standardized data elements for the JPEC.

JOPES procedures provide a guide for the JPEC to follow in executing the JOPES activities of mobilization, deployment, employment, and sustainment. The result is a set of executable joint OPLANs and OPORDs.

The JOPES Concept of Operations describes JOPES as a set of seven interrelated processes that support decisionmaking, planning, and execution. These processes are threat identification and assessment, strategy determination, course of action development, execution planning, implementation, monitoring, and simulation and analysis. Monitoring and simulation and analysis provide continuous support to the other five functional processes.

Organizational Responsibilities

Figure A.2 shows the organizations that were responsible for JOPES during the ODS period and their relationships to each other. JS/J7 is the office of primary responsibility for the JOPES process and procedures as well as the JOPES AIS R&D program and O&M. The WWMCCS ADP Modernization (WAM) office allocates JOPES R&D funds.

The JOPES Project Group (JPG), co-located with USTRANSCOM, reports to J7 and is responsible for developing the future requirements of JOPES in accord with the JOPES ROC (required operational capacity), coordinating working groups, overseeing the development and testing of research prototypes, setting priorities and schedules, and defining the version plans.

The JOPES ROC contains JOPES support elements (JSEs) with bedrock milestones and functional requirements. The JPG supports prototyping to help define requirements (e.g., 23 prototypes) and recommends priorities and dollars. JPG has three basic ways of fulfilling the JSEs: they update existing JOPES applications to satisfy a JSE; they adapt and incorporate other systems to satisfy the JSE; and they develop (or contract for the development of) prototypes.

The JPG coordinates JOPES Project Working Groups in functional areas established in the JOPES Terms of Reference. These look at the functional needs of users and then attempt to define and refine JOPES requirements.

The Defense Information Systems Agency (DISA) and its Defense Systems Service Organization (DSSO) have two major JOPES responsibilities; they develop JOPES versions under the WAM program in response to J7 through JPG

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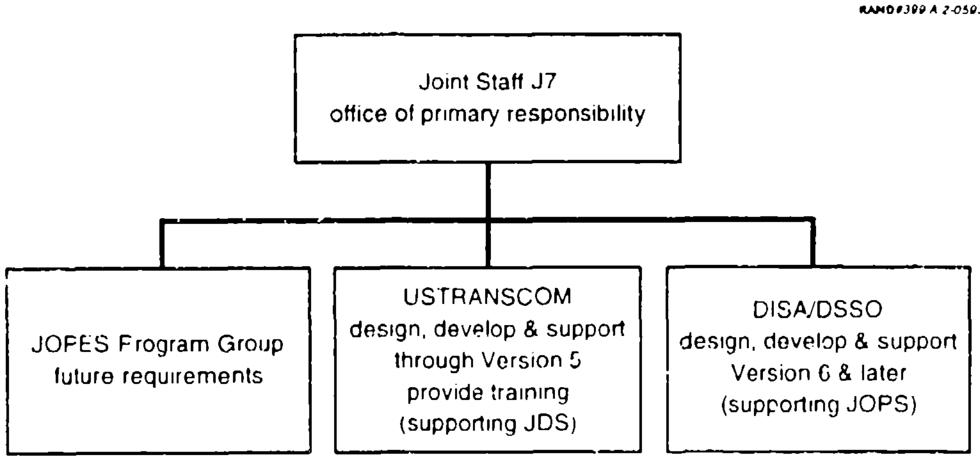

Figure A.2—JOPES Development Organization and JOPES O&M in response to J3. Because of the emphasis on deployment in the early JOPES versions, USTRANSCOM was to play a major role in JOPES R&D through Version 5. USTRANSCOM's responsibilities included R&D for JOPES through Version 5, O&M support for JDS through FY92 (support from the Air Force), and responsibility for JOPES training (support from the four services).

The JOPES Terms of Reference lay out the relationships between the different groups. The DSSO has been responsible for supporting JOPS and the JOPS subsystem of JOPES. USTRANSCOM has been responsible for JDS, which is the second major subsystem of JOPES. (Since ODS was a crisis-planning situation, the major JOPES player was USTRANSCOM.)

Future Plans

JOPES, as an evolving system, was scheduled to be fielded in discrete developmental steps called *versions*. The first four versions, as an aggregate, were designed to provide a quantum improvement in the supporting software for the JPEC. Figure A.3 summarizes the JOPES development strategy for versions 1 through 4.

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	Version 1	Version 4
Language	COBOL 68	COBOL 74/ADA
DBMS	IDS-I/ISP	IDS-II
HOST	Mainframe	Mainframe / workstation
Operating system	GCOS-TSS	GCOS-TP8/AUX
Local area connect	Direct	Direct (LAN)
Wide area connect	WIN	WIN

Figure A.3—JOPES Development Strategy

Version 1 was fielded in November 1989 and demonstrated the JOPES Initial Operating Capability (IOC). It provided enhanced capability on the current hardware suite in the following ways: (1) it allowed the user to log-on to a single system with menu selection to all JOPS and JDS subsystems and to move between applications without logging off; (2) it allowed the user to assess a plan for logistic and transportation feasibility whether the plan was built using JDS or JOPS subsystems; and (3) a JDS/JOPS data interface enabled a selective batch routine to reformat data in on-line JDS format to JOPS TPFDD/SRF (summary reference file) format for immediate use in the TFE, MPM, NPG, and MRG subsystems.

Version 2, installed in April 1990, was operational at the onset of ODS. It provided enhanced capability on the current hardware suite by: (1) expanding the JDS/JOPS data interface by allowing direct input to the on-line JDS database from JOPS, MRG, NPG, and MPM (MEDEVAC); (2) providing the first opportunity for functional prototypes; (3) expanding the navigation capabilities from JOPS subsystems; and (4) offering an ad hoc query capability through the Joint Operations Graphics System (JOGS).

Version 3 was installed in December 1990 and provided enhanced capability on the current hardware suite mainly in the graphics area with the use of Harvard Graphics, a commercial off-the-shelf product. It also added the following features developed during ODS: (1) baseline installation of an interface from MAC's GDSS to JOPES; (2) a fix to allow users to recover lost TPFDD records by retrieving the records from the database transaction log; and (3) capability to generate a report on database updates.

Version 3.1 was installed in May 1991. It provided enhanced graphics and allowed user-defined ranges for dates.

Version 4, which was scheduled to be released in 1992, would have provided the JOPES New Plan Build option to sites having WAM workstations. In addition to the features shown in Figure A.3, the software was to include: reengineered JOPS and JDS components, integrated ad hoc data retrieval and presentation (tabular and graphic), retention of JDS interfaces and addition of JMAS (Joint Mission Application Software) interfaces, new data network distribution software, new database update software, improved data integrity capabilities, and GEOFILE, PORTS and APORTS data files integrated into a relational database on the workstation.

Because of problems with the Honey-Mac workstation, however, much of the development effort for Version 4 was moved to a Sun workstation in November 1990. The WAM office hoped to continue prototyping on the Sun and then port the implementation to the Honey-Mac workstation so that the Honey-Mac could remain the approved workstation in the field, since many sites had already invested in the equipment. Continuing frustration with Version 4, however, eventually caused its suspension and the suspension of most other JOPES developments.

At that time the Air Force was directed to integrate several of the more needed (and more ready) capabilities, such as a new scheduling and movement subsystem that allows tracking of actual, as well as planned, shipments into the existing Version 3. The general future of WAM and JOPES is currently very uncertain.

The JOPES AIS[6]

Overview. JOPES AIS is a planning and execution system that provides for a timely flow of deployment data throughout the JPEC. The main portions of the system are provided by JDS and JOPS subsystems, JOPS standard reference files, and an evolving integration package that consolidates and improves existing software. JOPES is hosted by WWMCCS and interfaces with other AISs. JOPES applications are run against an on-line database that can be distributed either locally or worldwide. Viability of the database depends upon: (1) TPFDD development and maintenance, (2) timely and accurate information update during deployment planning and execution, and (3) standard JPEC procedures to ensure interoperability between peacetime and crisis environments.

The Version 3 JOPES interface provides support for deliberate and crisis-action planning through a two-way interface between JOPS and JDS that allows direct input to the on-line JDS database from most JOPS applications (except for the Force Requirements Module and the Force Module Subsystem).

WWMCCS Host and Communications Network. JOPES resides on the standard AIS equipment for WWMCCS, a Honeywell Information Systems (HIS) Series 6000 or 8000 computer system. Terminal support is provided by Honeywell Visual Information Projection (VIP) terminals or personal computers (e.g., WISCUC, IBM AT, Zenith 248, etc.) modified for forms mode operation. Graphics-capable terminals provide additional terminal support. A new generation Honeywell-Apple PC will also be available as the first of a new family of workstations.

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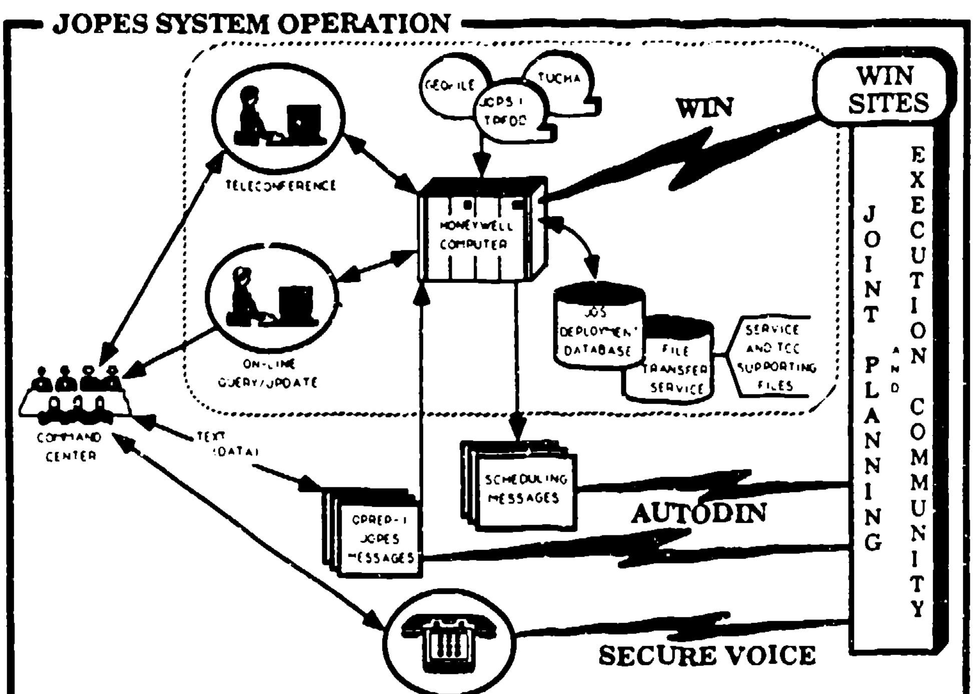
[6]This part of the report was mainly taken from *Joint Operation Planning and Execution System (JOPES) General Reference, Volume 1 User's Manual* CSM UM 339-50, November 16, 1990, and *Volume 2*, April 27, 1990.

JOPES relies on WIN and AUTODIN for data communications. A dedicated packet-switching data communications subnetwork interconnects WIN sites. It includes a store-and-forward interface message processor (IMP) and medium- and wide-band communication circuits. The JDS Interface Processor (JDSIP) interacts with WIN to route and manage database updates to appropriate JPEC sites. Other WIN software utilities support terminal-to-computer, computer-to-computer, and terminal-to-terminal communications as shown in Figure A.4. Capabilities include TELNET, File Transfer System (FTS), and Teleconferencing (TLCF).

Through the use of JOPES TLCFs, JPEC planners can share electronic mail messages within specified groups. TLCFs are usually arranged as soon as crisis action is initiated. Each TLCF may be focused on a particular area of mobilization, deployment, employment, or sustainment. Each has its access limited to a specific list of authorized users, and each resides at a WWMCCS site and is controlled by the functional database manager (FDBM) at that site. A TLCF is limited to a certain amount of disk space. When more space is needed, a



SOURCE: *Joint Operation Planning and Execution System (JOPES) General Reference—Volume 1, User's Manual,* CSM UM 339-90 (Revised), Nov. 16, 1990, Joint Data Systems Support Center, Defense Communications Agency.

Figure A.4—Availability of WIN to the JPEC new teleconference is set up with the same name but a new volume number. Teleconferencing was used extensively during ODS, often to alert others that changes had been made to the deployment databases.

Security. JOPES meets the TOP SECRET security requirements for WWMCCS. The application software programs are unclassified, and users may classify the data up to TOP SECRET, and unless authorities have downgraded the data, must handle display screens and computer printouts as TOP SECRET. Users executing JOPES must have permission to access JDS and have separate permissions to different application catalogs.

Access control to OPLANs is undergoing change as JOPES evolves. Currently when planning begins, the responsible CINC will notify the USTRANSCOM functional database manager as to the list of JOPES/WWMCCS sites that will share the plan information if there is to be limited distribution of the plan. With normal distribution, the USTRANSCOM FDBM distributes the OPLAN throughout the network; with limited distribution, the plan is distributed only to the CINC's list of sites. Closely held or local (nondistributed) plans limit the plans to the originating site with no backup site. Limited-access plans may also restrict access to specific users and terminals at specific sites. Use of terminal ID restrictions will prevent users from access via TELNET. The CINC may also specify a backup site in case the originating site suffers a failure; if not, the default backup site is USTRANSCOM. When ODS began, the plan was closely held at USCENTCOM and not shared with other sites. This caused some problem when the USCENTCOM site had a failure and there was no backup site.

The FDBM at each JOPES/WWMCCS site is responsible for OPLAN access at that site, and he controls individual user access to the networked database and its related applications at that site. This includes users accessing the site remotely from terminals or workstations. At the current time, the FDBM has no control over users with proper access and permissions at other sites changing the planning data his site has responsibility for.

As a further restriction, data stored in the networked database are divided into two subsets—one that pertains to JSCP OPLANS and one that pertains to exercises or system training. All user access and permissions are maintained for each subset of the database and a user may access only one of these database subsets during a given session.

JOPES had no audit trail of data transactions except for the database management system (DBMS) transaction log until Version 3, when the capability to generate a report of database updates was installed.

System Performance. JOPES is designed to provide precise, timely information to the JPEC. Deployment data precision depends on the level of detail required. For example, COA development needs less information detail than execution planning because of uncertainties in specifying the current situation and time limitations. During COA development, these constraints may preclude development of detailed force lists with exact strengths and tonnages for each option. In execution planning, where a specific option has been selected, more-precise data are required to better manage actual deployment. For TCC scheduling, unit movement weights are specified to the nearest tenth of a short ton or to the nearest measurement ton. TPFDD data sometimes go to Level 6 (e.g., describing personnel to the job-code level). The on-line distributed database is not currently capable of processing or storing that level of detail and either moves it into the SRF, truncates it within the data fields, or eliminates the data when no comparable field exists. In most cases, though, the on-line distributed database accepts the precision of the reference data files from which it draws the information.

JOPES Standard Reference Files

JOPES uses the standard reference files described above under JOPS AIS: APORTS, ASSETS, CHSTR, PORTS, TUCHA, TUDET, LFF, CEF, TPFDD, SRF, GEOFILE, and SORTs.

It also uses the WWMCCS standard reference file, NMCS Automatic Control Executive and AUTODIN (NACE/AUTODIN) files, to create temporary files of incoming and outgoing AUTODIN-transmitted messages. The Automated Scheduling Message (ASM) subsystem uses the temporary files to transmit ASMs to AUTODIN.

Service and Transportation Command Data Interfaces. JOPES has interfaces to a number of JPEC AISs.

Army systems:

DEMSTAT: the Deployment, Employment, and Mobilization Status System provides movement data of existing Army units via an interface processor to JOPES and downloads JOPES data for review by Army components.

COMPASS: the Computerized Movement Planning and Status System contains summarized unit detail data and provides the necessary data to determine movement requirements for FORSCOM units.

Others:

FLOGEN: the Flow Generator System is used by AMC to schedule aircraft against movement requirements. FLOGEN summarizes air movement requirements into aircraft loads by deployment time frames, POEs, and PODs.

COMPES: the Contingency Operation/Mobility Planning and Execution System is used by the Air Force to standardize and automate procedures to select, deploy, and monitor contingency forces. This interface is designed to source Air Force OPLAN requirements so that the TCCs can schedule actual unit movements.

NCCS: the Navy Command and Control System contains command and control information used to manipulate Navy data for OPLANs.

MAIRS: the Military Airlift Integrated Reporting System is used by AMC to monitor aircraft arrivals and departures.

MAPS II: Mobility, Analysis, and Planning System Version II is used by the MTMC to schedule CONUS movement requirements.

SEASTRAT: Sealift Strategic Planning System is used by MSC to schedule sealift movement requirements.

Subsystems. JOPES consists of 28 subsystems and/or subfiles. Eight of these are former JOPS subsystems: FRG, FMS, NPG, MRG, LCE, TFE, CESPG, and MPM. Six of these are JDS interfaces to AMC, MTMC, Navy, Air Force, Army, and MSC. The rest are former JDS subsystems and/or JOPES developed subsystems.

JDS Subsystems

Plan Information Subsystem/subfile provides the capability to establish and maintain OPLAN identification, description, and movement information. Additional features include capabilities to display status of OPLAN loads and Transportation Component Command (TCC) carrier scheduling activity.

Requirements Subsystem/subfile provides the capability to create, modify, and delete force and non-unit records in the JDS database. Several displays and reports assist in analyzing and editing data. Applications allow for changing deployment dates automatically and converting the JDS database into a JOPS TPFDD format. This subsystem provides the capability to merge requirements from different sources into a target OPLAN and to rename requirements for an

OPLAN. A subsystem function can be used to create a partial or complete JOPS TPFDD tape or disk file from the JOPES database with limiting options available. Creation of a JOPS TPFDD file allows use of JOPS procedures to update the database. Also, other JOPS modules can be used to analyze transportation feasibility or generate resupply, medical support, personnel replacements, or civil engineering support requirements.

Units Information Subsystem/subfile performs selected retrieval and update functions on units identified to fill OPLAN force requirements. It provides the capability to review and analyze selected SORTS data, unit tasking, and deployment status. (This subfile contains 26 of the approximately 126 SORTS data element characteristics that describe a unit.)

Force Module Subsystem/subfile provides the capability to rapidly build and modify requirements in support of COA or OPLAN development during crisis situations. The user can update or delete force modules; build or delete OPLANs; display title, description and requirements data; and print reports.

Scheduling and Movement Subsystem allows the user to review, update, schedule, and manifest TCC carrier and organic movement information both before and during deployment. It provides the capability to review and analyze an extensive variety of scheduling and movement data such as scheduled and actual departures and arrivals of TCC and organic carriers. The user can modify TCC carrier movement manifest data to fully utilize transportation assets, update the manifest subfile as movements occur, update the subfile with actual departure and arrival time for TCC carriers, and update the subfile with actual departure and arrival times for organic carrier movements.

Records are entered into this subfile whenever a carrier schedule is built. The manifest data are first entered as planned allocation of requirement against carrier schedule, indicating the planned ULN to be loaded on the carrier but with zero passengers and cargo. In the ideal situation, the amount of passengers and cargo could be input from the requirements and that would be exactly how the manifest would read. This worked in exercises but not in ODS. In ODS, the manifest data sometimes differed from the planned allocation and the planned allocation was overwritten to show the actual ULN and the amount of passengers and cargo loaded. The actual manifest data was entered by AMC as ULNs were loaded onto aircraft.

Retrieval Subsystem allows review of data from one or more subsystems through on-line display, printed report, or graphic output. It provides a single point of entry to all standard reports and displays.

Information Resource Manager Subsystem allows JDS managers to perform local database management functions including managing user IDs, managing file space for OPLANs, loading OPLAN TPFDDs, etc.

Automated Scheduling Message Subsystem/subfile produces AUTODIN-formatted messages from JOPES data to provide movement schedules and summaries to deploying units, command headquarters, and port managers.

JDS/AMC Interface Subsystem permits a direct link between JDS and the AMC Flow Generator (FLOGEN) unique database. This allows AMC systems to receive air movement requirements needing AMC transportation and JDS to receive schedules for AMC air carriers.

JDS/MTMC Interface Subsystem permits a direct link between JDS and the MTMC Mobility Analysis and Planning System, Version II (Maps II). Two functions are provided—modification of the MTMC movement table and building MTMC carrier schedules and manifests.

JDS/Monitors Subsystem provides the capability to monitor the JDS Update Processor, JDS Interface Processor, local and network transaction activity, and the local/network status. This subsystem is used to monitor overall network performance by monitoring the last origin sequence number generated by or received from each site in the JOPES network.

JDS/Navy Interface Subsystem permits a direct link between JDS and the Navy Command and Control System (NCCS) unique database.

JDS/Air Force Interface Subsystem permits a direct link between JDS and the Contingency Operation/Mobility Planning and Execution System (COMPES) unique database. This sources Air Force requirements in OPLAN so TCCs can schedule actual unit movements.

JDS Transaction Editor Subsystem provides the capability to edit and enter scheduling and requirement transactions residing in a user file.

JDS/MSC Interface Subsystem permits a direct link between JDS and the MSC Sealift Strategic Planning System (SEASTRAT) unique database to provide data for MSC transportation scheduling.

JDS/Army Interface Subsystem allows direct linkage between the FORSCOM DEMSTAT and the COMPASS, and JOPES UMD subfile and TPFDD. Functions allow the user to recover UMD data from tape and update JDS OPLAN data with UMD data from FORSCOM, and to identify erroneous and/or incomplete data before entering it into the update process.

Reference Files allow the user to scan the Reference Files Data Header, the TPFDD, SORTS, new APORTS, CHSTR, TUCHA, TUDET, GEOFILE, LIF, OUAPORTS, SDF, new PORTS, etc.

Joint Operations Graphic System (JOGS) is a prototype graphics system that supports OPLAN/TPFDD data graphs and displays on graphics-capable terminals.

Non-standard Cargo Subfile contains non-standard cargo data about units tailored to differ from the TUCHA type unit characteristics data (e.g., detailed cargo information for a unit configured to deploy without its jungle cargo will be found in this subfile rather than the TUCHA).

Unit Movement Data (UMD) subfile contains information for Army units provided by FORSCOM and indexed by UIC. It is the "real" cargo detail data that has been validated and input by FORSCOM through its COMPASS interface to JOPES. It describes cargo details (e.g., type, count, and weight of vehicles).

JOPS Subsystems. In this section we describe the JOPES capabilities to use these subsystems with JDS subsystems/subfiles where appropriate.

FRG: the force requirements generator (no JDS capability).

FMS: the force module subsystem (no JDS capability).

MRG: the movement requirements generator provides the following JDS capabilities—it generates nonunit-related records from a JDS OPLAN, and it generates nonunit-movement requirements in the on-line JDS OPLAN by using the JDS "add" transaction.

LCE: the logistics capability estimator provides the following JDS capabilities—it creates JDS transactions which may be used to "add" non-unit records to a specified on-line JDS OPLAN, and it creates the Force Record Extract File (FREF) from a JDS OPLAN.

TFE: the transportation feasibility estimator allows the selection of a JDS OPLAN input to generate TFE movement requirements.

CESPG: the civil engineering support plan generator (no JDS capability).

MPM: the medical planning module provides the capability to create JDS transactions which may be used to "add" nonunit records to a specified on-line JDS OPLAN.

NPG: the non-unit personnel generator provides the capability to create JDS transactions which may be used to "add" nonunit records to a specified on-line JDS OPLAN.

Capabilities. JOPES provides capabilities to:

- Build, maintain, and manage exercise and real-world deployment plans and databases simultaneously.
- Create an OPLAN from TPFDD/SRF format or from Force Modules.
- Convert an on-line OPLAN into TPFDD/SRF format.
- Add, change, or delete deployment information using on line computer terminals and automated systems interfaces.
- Schedule and monitor deployments.
- Provide on-line access to deployment information using DoD standard reference files, e.g., TUCHA, TUDET, SORTS.
- Display deployment information on a computer terminal or produce reports from a computer printer.
- Alert units and installations of scheduled deployments automatically by system-generated AUTODIN message.
- Monitor the ongoing database system performance and workload at any location throughout the network.
- Integrate Force Module capabilities fully.
- Provide a close-hold environment in which to develop OPLANs.

System Functions. JOPES provides the following system functions:

- Establish and maintain a deployment database expressing the supported commander's requirements, allowing the JPEC to coordinate and refine these requirements prior to scheduling. The deployment database consists of OPLANs, COAs, or OPORDs containing the status, concept, scope, and detailed time-phased movement requirements for forces and sustainment.
- Coordinate deployment schedules with TCCs. This includes developing detailed deployment schedules, identifying transportation and delivery shortfalls, and manifesting scheduled carriers.
- Monitor deployments. This includes general AIS support functions associated with system use and performance, such as providing access control to deployment movement requirements.

- Model gross sustainment requirements (nonunit-related supply and personnel, and medical planning).
- Assess gross transportation feasibility of a TPFDD/SRF or OPLAN.

B. Army Planning Support Systems

In its deliberate planning and crisis-action planning activities, and during deployment and employment of its forces, the Army follows joint planning procedures. It maintains a number of Service-unique systems, however, to assist it in planning and execution. This appendix briefly describes those systems.

The Army Mobilization and Operation Planning System (AMOPS) establishes Department of the Army guidance for mobilization and deployment. The Forces Command Mobilization and Deployment Planning System (FORMDEPS) establishes the Forces Command (FORSCOM) mobilization and deployment policy.

FORSCOM is the organization with primary responsibility for (1) maintaining standard movement data to support planning for mobilization and deployment, and (2) interfacing the Army components with the JPEC through JOPES. In crisis-action planning, FORSCOM's tasks include: participation in Army combat unit sourcing; responsibility in coordination with Army component commanders for CS and CSS sourcing; participation in time-phasing and transportation planning; responsibility for validation of Army planning requirements; responsibility for assigning CAPSTONE[1] alignments derived from OPLAN TPFDDs; and responsibility for developing time-phasing of reserve units into mobilization stations to meet departure dates from those stations.

Figure B.1 shows the Army planning system interfaces to JOPES (and each other) at the WWMCCS FORSCOM site at Fort McPherson. The next section briefly describes the Army systems, databases, and reference files shown in the figure, followed by a discussion of how they work together and future plans. The last section discusses Army WIS (AWIS).

DEMSTAT

The Deployment, Employment, and Mobilization Status System is the management system set up and maintained by FORSCOM specifically to provide CONUS-based Army installations with simplified and common access to information in a number of Joint and Army-specific planning systems: JOPES,

[1]CAPSTONE is the Army program that aligns units, regardless of component, into a wartime command structure.

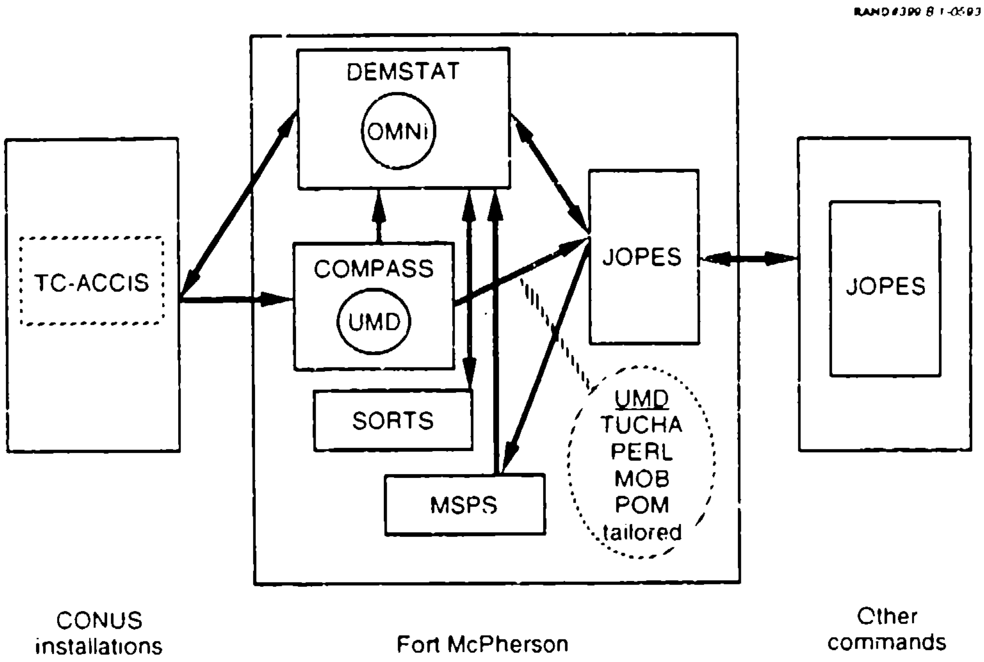


Figure B.1—FORSCOM WWMCCS Site Showing Army AIS Interfaces to JOPES

MSPS, SORTS, and COMPASS. It does this by providing a common interface to its OMNI database, allowing the installations to retrieve/read preformatted data reports but not permitting them to directly change the OMNI database.

For example, if a user reviewed OMNI SORTS data and noticed an error in his unit's report, he would make the correction in his next report to SORTS. The new SORTS data would then (with a time lag) appear in the OMNI database for further review by the unit. Similarly, a user noticing an error in the JOPES time-phased plan for his unit would notify FORSCOM and enter a line-by-line correction into DEMSTAT. FORSCOM would check with the proper authority as to correction of the error and, with approval, forward the unit-prepared transaction to JOPES (but OMNI would not show the update until it was later made from the JOPES database).

The DEMSTAT interface thus accomplishes several functions: (1) it provides users at remote installations with the ability to review larger amounts of JOPES data than their workstations can support; (2) it protects JOPES from users inadvertently changing data that should be protected by the JOPES software but is not; and (3) it allows FORSCOM to fulfill its data review and validation role. A disadvantage is that OMNI data may be out-of-date since OMNI is updated only twice a day.

COMPASS

The Computerized Movement Planning and Status System is a FORSCOM-unique system designed to support unit movement planning and requirements for active-component and reserve-component units. COMPASS provides the equipment (cargo) profile of deploying units for JOPES.

COMPASS's main function is to collect, maintain, and pass on unit movement data (UMD). The COMPASS master file includes five basic UMD types:

- TUCHA: notional TOE data.
- PERL: reflects equipment and accompanying supplies to be shipped from CONUS to a prepositioned equipment set overseas.
- POM: reflects deployment requirements (planned/actual).
- MOB: reflects Home Station to Mobilization Station Movement requirements for Reserve Components.
- TAILORED: UMD for specific movement scenarios (exercises, NTC, etc.).

Four levels of equipment data are sent by COMPASS to JOPES. These are:

- Level 1, Aggregated: total number of passengers and tons of cargo.
- Level 2, Summary: number of passengers; tonnages differentiated as bulk, oversized, outsized, and NAT (not air transportable) cargo.
- Level 3, Detail by category: tonnages and dimensions for each cargo category (e.g., wheeled vehicles, containerized, etc.).
- Level 4, Detail by type equipment: tonnages and dimensions for each type of equipment (e.g., type xx tank, type xy tank, type yy 5-ton truck, etc.).[2]

TUCHA contains data about notional units and is one of the main reference files accessed by the JPEC in planning using type unit information. Periodically in peacetime, FORSCOM prepares TUCHA data from information supplied by the

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[2] Sealift experiences during ODS demonstrated the need for expressing cargo measures in square feet in order to facilitate loading and storage.

Department of the Army, the Training and Doctrine Command, and MTMC and sends it to Headquarters Department of the Army and to JOPES.

Under peacetime conditions COMPASS is updated once a day, but it could be updated two or three times a day. Normally, COMPASS sends JOPES transactions to update the Unit Movement Data subfile once a week, but during ODS it often updated JOPES more or less frequently depending on whether WWMCCS was overloaded and on the level of confidence FORSCOM had in the UEL data.

FORSCOM prepared updated UMD for ODS. Initially, the ODS data was a combination of TUCHA and unit reported POM or MOB data. Then a special file was set up on COMPASS and the units were asked to update their information. In many instances, (perhaps 40 or 50 percent of the time) units said that their UEL had not changed and COMPASS retained their previous planning data. But as the deployment operation evolved, the data were corrected to reflect the actual movement requirements reported by more and more of the units.[3]

COMPASS data also helps FORSCOM to source units. When a new plan begins, DEMSTAT pulls a copy of the then-current COMPASS, UMD Level-2 detail into the OMNI database so it will have the equipment-level data available to review and for sourcing the TPFDD. This was done at the start of ODS.

TC-ACCIS

The Transportation Coordinators' Automated Command and Control System is a second-generation system that will automate the collection and management of UEL information at the Army unit/Army installation level. It is intended to be a decentralized AIS tool available to Installation Transportation Officers (ITOs) at each Army installation. TC-ACCIS is the Army system or a portion of TC-AIMS (Transportation Coordinator's Automated Information for Movements System), an evolving joint system that will someday include detailed cargo information and information on approximately 50 deployment and execution events.

Currently, the Unit Equipment List (UEL) information is filled out manually (through a series of forms) by each unit and given to the unit's Installation Transportation Officer where the data are entered onto a 9-track tape that is sent by AUTODIN to FORSCOM to be logged by WWMCCS security and read by

[3]Note that in JOPES the cargo details for a unit (or, more appropriately, for a ULN) can be stored in one of three places: the TUCHA reference file, the UMD subfile, or the non-standard cargo subfile. The non-standard cargo subfile contains data tailored from the TUCHA data. It is used, for example, when a unit has been tailored to deploy without its jungle cargo.

COMPASS. It currently takes about three to four days to move the data from installation to COMPASS, much of which is taken up by transporting the tape, logging it, etc. With this procedure, there is no database accessible to the unit until it gets a report back from COMPASS perhaps a month later. That is the earliest opportunity they have to correct errors in their UEL. Because of this time lag, during ODS COMPASS was sometimes updated directly by a unit faxing or e-mailing its UEL to FORSCOM.

The future use of TC-ACCIS will automate this collection process.[4] The installation will have its UEL database available to units for review, manipulation, and correction before sending it to COMPASS via DDN or AUTODIN. TC-ACCIS and COMPASS may support more-detailed equipment information than JOPES, and both support multiple scenarios, i.e., a unit may have many different AUELs representing its deployment requirements and configurations for different situations.

The installation TC-ACCIS systems can also convert the UEL information into the LOGMARS (Logistics Marking and Reading Symbols) system format and generate LOGMARS labels for each piece of equipment to be moved. LOGMARS creates, produces, and reads the "bar coded" labels that are stuck on all types of military items. The transportation-related ones contain the Transportation Control Number for the particular piece of cargo (this includes a code identifying the owner of the cargo), a bumper number, model number, dimensions, weight in pounds, cube in feet, measurement tons, commodity number, type pack, and an item description. At MTMC request, COMPASS will forward LOGMARS-formatted UEL information to MTMC via the WWMCCS File Transfer System.

TC-ACCIS systems are already installed at several Army installations including Fort Riley and USAREUR, and future plans call for them to be installed throughout the Army.

Other Systems

Two other systems listed in Figure B.1 are:

MSPS—Mobilization Station Planning System. A system designed to support mobilization station planning of both active and reserve component units based on JOPES information. It maintains and displays mobilization and deployment-planning information.

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[4] A recent test, made after ODS was over, of sending the data directly from TC-ACCIS by DDN to FORSCOM reduced the turnaround time to about 12 hours

SORTS—Status of Resources and Training System. This is a joint data system detailing the readiness of units. It is updated once a day. FORSCOM relies on SORTS for basic current information about a unit, as does JOPES.

Several of the more important datafiles are:

UMD—Unit Movement Data. UMD describes unit transportation requirements (pieces-weight-cube). This is maintained by FORSCOM through COMPASS and in peacetime is updated weekly.

AUEL—Automated Unit Equipment List. This is a product of COMPASS. It is a specialized format of UMD designed specifically to facilitate unit movements. It is produced by COMPASS in hardcopy and electronic media.

TUCHA—Type Unit Characteristics File. This provides planning data on movement characteristics for unit personnel, equipment, and accompanying supplies associated with standard deployable type units of fixed composition. These data are used in developing and reviewing unit movement requirements in support of operation plans. Each record in the file is uniquely identified by a Unit Type Code (UTC).

Army WWMCCS Support

AWIS provides information-processing capabilities for planning and execution at eight Army-supported WWMCCS sites: Forces Command; U.S. European Command; U.S. Army Europe; U.S. Southern Command; Military Traffic Management Command; U.S. Army, Pacific; Headquarters, Department of the Army; and the Army War College. AWIS provides the Army: (1) WWMCCS equipment; (2) centralized software development for all Army strategic command and control products as determined by the JOPES functional model; and (3) negotiations and support for interfaces between Army strategic C2 systems and JOPES. The Army WWMCCS sites receive Army funding for maintenance of their WWMCCS hardware.

WWMCCS equipment in use at FORSCOM includes four Honeywell H8000s machines (substantially upgraded from H6000s) running the operating system GCOS-8.3. Most decentralized terminal functions are now performed by XT-level PC "workstations," but almost all are being used simply as dumb terminals. Applications have been successfully recompiled from IDS I to IDS II. The current Army planning systems at FORSCOM, DEMSTAT, and COMPASS, and their interfaces with JOPES, were developed and are maintained by FORSCOM.

AWIS development plans are to replace DEMSTAT and the parts of COMPASS that serve the Army uniquely.

The evolving AWIS software products are not intended to duplicate Joint or Army MIS software functionality, but are designed to complement, supplement, and implement JOPES in those areas where the modernized JOPES software does not meet Army requirements.

The current AWIS focus is on building a modern relational Data Management Environment (DME) using Sybase on the DEC VAX machine. The DME relational database design was a result of a full functional analysis of the strategic command and control needs, which examined processes across organizations utilizing Yourdon and Demarco methods. All data elements are defined in accordance with data element standards supported by the Army Corporate Database effort. The new database will be an integration of databases from many stovepiped systems, and Sybase tools will be used to represent data dependencies to ensure data integrity and validation. In addition, every piece of data will have a delegated owner who has sole authority and responsibility for any change. One difficulty has been to work through the security problems in integrating databases belonging to systems that had been individually accredited.

The AWIS software lines are currently being developed in an order of importance based on fund availability, current software limitations, and the greatest number of common requirements that can be satisfied by common software for the largest number of staff users at the largest number of supported headquarters. The product line names currently funded and under development a e Mobilization, Movement Control and Readiness Reporting (MCRR), Logistics, Personnel, and Unit status.

The AWIS PMO goal is to develop the DME and AWIS product lines while at the same time maintaining required interfaces with the various WWMCCS/JOPES versic ıs. The PMO has found it wise to plot a course separate from JOPES becau e of past problems in evolution of the joint systems such as failure to produce products as specified or on schedule. A recent concern has to do with the new DISA responsibility for information standards and future development across the whole DoD. The AWIS PMO feels that the Army is ahead in developing standards and is concerned that AWIS product plans may be slowed down or halted while awaiting DISA standards and development decisions and that AWIS funding earmarked for product development may be channeled to DISA. What will happen is uncertain, but the AWIS PMO feels it would be a mistake to halt the current product line plans and implementations.