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Opportunities for Integrating Deliberate and Time-Sensitive Joint Deployment Planning in USTRANSCOM Component Commands

Robert Edwards

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ENERGY DIVISION

OPPORTUNITIES FOR INTEGRATING DELIBERATE AND TIME-SENSITIVE JOINT DEPLOYMENT PLANNING IN USTRANSCOM COMPONENT COMMANDS

Robert Edwards

2 May 1988

NOTICE: This document contains information of a preliminary nature. It is subject to revision or correction and therefore does not represent a final report.

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ABSTRACT

The Decision Systems Research Section of the Oak Ridge National Laboratory (ORNL) is assisting the Deployment Directorate (formerly the Joint Deployment Agency) of the U.S. Transportation Command (USTRANSCOM) in identifying and evaluating opportunities for improving the automation support used in deliberate and time-critical deployment planning. USTRANSCOM, which is a unified command (i.e., personnel are drawn from all services), was created in the fall of 1987 to consolidate the functions of the former Military Transportation Operating Agencies (the Military Airlift Command, the Military Traffic Management Command, and the Military Sealift Command). An important factor justifying creation of USTRANSCOM was the possibility of combining and improving coordination in deployment planning between the organizations responsible for strategic transportation activities during times of crisis.

This report, the second in a series to be produced in the course of the ORNL study, presents three possibilities for integrating deliberate and time-sensitive planning. Two proposals recommended for use by MTMC and MSC build on cooperative planning initiatives already in progress in the two commands. A unique application of relative probabilistic measures is a key element in a proposal for improving MTMC/MAC airlift planning.

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OPPORTUNITIES FOR INTEGRATING DELIBERATE AND TIME-SENSITIVE JOINT DEPLOYMENT PLANNING IN USTRANSCOM COMPONENT COMMANDS

1. INTRODUCTION

On October 1, 1987, the Joint Chiefs of Staff (JCS) activated the U.S. Transportation Command (USTRANSCOM), the unified command authorized to exercise crisis-situation control of strategic air, sea, and land transportation resources. USTRANSCOM will consolidate the strategic lift provided by the Air Force's Military Airlift Command (MAC), the Army's Military Traffic Management Command (MTMC), and the Navy's Military Sealift Command (MSC). MAC, MTMC, and MSC are the former military transportation operating agencies (TOAs) now referred to as USTRANSCOM Component Commands. The Air Force, Army, and Navy will continue to operate their respective Component Commands during peacetime.

As part of its mission, USTRANSCOM is charged with establishing an infrastructure for operating during wartime. That is, it has a lead role in exercises, planning coordination, and command and control support, and will eventually assume the obligations of the former Joint Deployment Agency (JDA), including responsibility for the procedures and computers of the Joint Deployment System (JDS).

As described in a work statement attached to a Department of Energy/Department of Defense interagency agreement issued in the fall of 1987, the Oak Ridge National Laboratory (ORNL) is providing technical assistance to USTRANSCOM in three areas. First, it is surveying the status of deployment planning automation support within the Command. Second, it is helping with the identification and evaluation of possibilities for integrating the Command's contingency planning systems. Third, ORNL is studying the automated support necessary to facilitate transfer of military transportation management to USTRANSCOM in times of crisis.

In March 1988, ORNL submitted the first of four studies called for in the project work plan. That deliverable was a survey of deployment planning automated support in use or under development within the Command. The report that follows, the second

study of the series, explores possibilities for integrating contingency planning systems used within the Component Commands.

Section 2 of this report contains summary descriptions of deliberate and time sensitive planning as these functions are now carried out by the Component Commands. Remarks have been inserted throughout this section highlighting similarities and dissimilarities in planning procedures and automation support. Readers familiar with Component Command deployment planning may want to skip to Section 3, which is the new contribution provided by this report.

Section 3 presents possibilities for integrating planning functions across Component Commands. There are several opportunities for closer deliberate and time-sensitive planning coordination, including some possibilities for unified planning functions between MAC and MTMC and between MSC and MTMC.

2. CURRENT COMPONENT COMMAND DEPLOYMENT PLANNING

2.1 DELIBERATE PLANNING

2.1.1 Initial Plan Development

As far as the Component Command deliberate planners are concerned, OPLAN[1] development begins in earnest with the Phase I planning conference of supported and supporting commands. By the time the Phase I conference is convened, the supported CINC will have formed an OPLAN concept of operation, including a general statement of forces required and areas of operation, constructed an initial TPFDD, and, using the JOPS Transportation Feasibility Estimator, determined gross transportation feasibility. Also, the supporting CINC is likely to have sourced critical parts of the force requirements. The objective of the Phase I conference is to develop a preliminary, but fully sourced, TPFDD file, including units and their resupply.

About one week after the Phase I conference, USTRANSCOM and other supporting commands expect to receive a TPFDD from the CINC in machine-readable form. During the 60 days immediately following the conference, the Component Commands prepare informational copies of movement tables, which are exchanged among each other and with the supported CINC.

After the supporting commands have had time to analyze the data from the first conference and to prepare and coordinate movement tables, a Phase II conference is called to produce a transportation-feasible plan. At the Phase II conference, Component Command planners discuss combined transportation requirements and any shortfalls, and obtain approval from the supported CINC for the closure profile. If necessary, working groups are established to resolve problems by adjusting APOE/SPOE selections, ship schedules, EAD/LAD windows, resupply origins, and origin outloading capability. If significant changes are made, the Component Commands may need to reflow the requirements. Finally, transportation-feasible movement tables are made available to

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[1]The English equivalents of the acronyms used in this report appear in Appendix A.

Component Command subordinate commands, the Services, and other organizations affected by the transportation schedules.

Development of large plans and simultaneous development of multiple plans usually requires three conferences. The third conference focuses on logistics and is inserted between the usual Phase I (forces) and Phase II (transportation) conferences. The logistics conference permits in-depth attention to coordination of support and supplies, which is a critical aspect of large or multiple plan scenarios.

2.1.2 Plan Maintenance

Once the initial plan is developed and published, it is converted to a file suitable for initialization of a JDS deployment database. At the request of the CINC, supporting commands may be asked to participate in a plan maintenance activity to incorporate changes in sourcing, unit equipment, or state of readiness. Plan maintenance procedures are similar to those used for initial plan development; updates to the TPFDD are made using JOPS, followed by conversion of the data to JDS format.

Between plan maintenance cycles, supporting commands may need to make alterations to the TPFDD in the JDS deployment database, such as reflecting the substitution of a different unit when the one originally specified is tasked to support another plan or is participating in an extended exercise. Between plan maintenance cycles, supporting commands have procedures for entering such changes into JDS to keep the OPLAN deployment database current.

2.1.3 MAC Deliberate Planning

MAC deliberate planning begins with the receipt of the supported CINC's movement requirements via a file in JOPS TPFDD format. From the file, which contains requirements for land, sea, and air transport, the planners extract requirements marked for strategic airlift, then edit and reformat individual records, making sure that the dates in the records are in proper time sequence (e.g., LAD is not before EAD) and that APOEs and APODs are reasonable for the requirements being flowed. Any problems that

arise are worked out with the CINC's staff before the records are rolled up on APOE, APOD, ALD, EAD, and LAD.

In the next step, the JSCP is used to identify the type, number, and utilization rate of aircraft available to the plan. Using this data and the edited movement requirements just developed, MAC planners begin preparation of input for the computer program used for scheduling (the scheduler). The major part of this task is establishing a preliminary network consisting of the stations to be used and the flight paths between them. In formulating the network, the planners give consideration to threat areas, diplomatic agreements, aircraft ranges, crew scheduling constraints, air refueling points, and predicted station workloads. Requirements for air refueling are coordinated with HQ SAC, which responds based on an overview of all missions (SAC, TAC, and MAC) with such needs.

Once a candidate network has been proposed, the deliberate planners identify the needed airlift support (e.g., loading teams, loading equipment, fuel trucks, maintenance, and command and control resources) in consultation with other MAC directorates. To position the airlift support, the planners put the original TPFDD through a trial scheduling run with station capabilities set to large values. This under-constrained flow estimates the workloads at the stations; the estimates, in turn, help identify locations where the mission support resources should be placed. Next, the station parameters are set to realistic values, the air movement required for transportation of MAC mission support is converted to additional TPFDD records, and the composite set of requirements are flowed through the scheduler.

The preliminary network is subject to modification at this point based on an analysis of bottlenecks, station constraints, and refueling considerations. If network specification errors are encountered, they are resolved by trial and error.

Scheduling problems may be caused by a poor choice of stations in the CINC's requirements. If the planners determine that changes in the stations can improve the flow, such changes are made in close coordination with the supported CINC. If examination of the flow reveals that stations for the missions are poorly distributed, the planners may suggest ways to require fewer APOEs.

Scheduling difficulties can also be caused by a poor choice of EAD/LAD windows. If a window is too narrow to permit on-time delivery, the expected rate of delivery will exceed the available airlift resources or the station throughput. Low priority requirements with narrow windows may also disrupt the delivery of higher priority requirements competing for the same resources. Working with the CINC's staff, MAC planners minimize these problems by adjusting EAD/LAD windows and changing APOEs.

After any problems with the flow have been resolved, the TPFDD, as modified, is flowed a final time and movement tables are produced by unrolling the aggregated requirements data used to produce the schedules. This process allocates passengers and cargo in individual movement records to flights. Movement tables are included in MAC OPLAN annexes, and the completed OPLAN is sent to the supported CINC, MTMC, MSC, and other supporting commands.

2.1.4 MTMC Deliberate Planning

MTMC deliberate planning is handled in two parts, one for traffic from origin-to-POE and another for strategic airlift origin-to-APOE legs.

Currently, MTMC's major responsibility is to identify CONUS SPOEs and schedule the origin-to-SPOE leg for individual moves. MTMC Headquarters discharges this obligation for deliberate planning. However, during execution of an OPLAN, MTMC Area Commands are authorized to choose SPOEs because of their closer day-by-day contact with port resources and operations.

MTMC's Mobility Analysis and Planning Tool II (MAPS II) is the deliberate planning tool for selecting SPOEs. The primary data used by MAPS II are the JOPS TPFDD sea shipment data records and reference files containing data on origin outloading and port throughput capabilities. MAPS II scheduling uses preassigned and preferred SPOE files. The preassigned ports file is a listing of SPOEs that are normally used by Army major combat units named in an OPLAN. The second file lists up to three preferred SPOEs for cargo leaving particular origins.

Using the EAD/LAD window and the location of the SPOD, average sailing times, and SPOE throughput data, MAPS II back-calculates a departure date at the SPOE for each TPFDD requirement record. Another back-calculation is then made to determine the required date of departure from origin based on estimated origin outloading capacity and on origin-to-SPOE transportation mode and travel time tables. Now that the schedule for departure from the origin has been established, the dates and routes necessary to define the plan movement tables are available.

As a final check, MTMC analysts review the CONUS surface movement tables to identify bottlenecks in the transportation network, shortfalls in SPOE/origin outloading, and problems with container assets and truck/rail vehicles. The resulting updated movement tables are made available to USTRANSCOM, MSC, supported commands, FORSCOM, and other agencies.

MTMC origin-to-APOE scheduling uses the ALDs and APOEs from MAC airlift movement tables, origin outloading capability data, and CONUS origin-to-APOE routing/travel-time data to calculate schedules for departure from origin. Once schedules are generated, MTMC analysts prepare aggregate characteristics, such as origin outloading by day, for use in presenting the overall origin-to-APOE transportation concept to the rest of the JDC.

2.1.5 MSC Deliberate Planning

Unlike MAC and MTMC, which base their planning directly on the CINC's movement requirements, MSC depends on MTMC to add two critical items to the TPFDD data. These are the ALD and SPOE, which are computed and inserted into each movement record by MTMC's MAPS II scheduler.

Using the JCS JSCP as guidance, MSC planners determine ship resources available to the plan, and formulate initial ship positions based on expected and worst-case locations. Auxiliary data needed to determine the schedules consists of permissible ship routings, data on port throughput capacity, ship stow factors, and ship/cargo compatibility.

MSC is in the process of installing a new planning system, SEASTRAT, for determining ship routes and sailing schedules. SEASTRAT's scheduling module, SAIL, is quite different from the deterministic (or simulation) model used in its predecessor, SEACOP, in that SAIL uses a combination of heuristic and linear optimization techniques.

The SAIL algorithm first simplifies the constraints that cause the problem to be nonlinear, which permits using conventional transportation network techniques to develop tentative ship schedules. Then, decision rules are used to reincorporate the nonlinear characteristics of the problem. The two steps are repeated until routes are found for all ships.

Once routes are established, a linear programming algorithm assigns cargoes to ships. Requirements are then unrolled so that port assignments and ALDs at the SPOEs can be given to individual movement requirement records. These movement tables are supplied to MTMC for reconciliation with the movement data generated by MTMC's MAPS II scheduling process.

The MSC SAIL scheduler differs significantly from its counterpart now being developed by MAC for ADANS. As was mentioned above, SAIL makes extensive use of optimization techniques to guide a heuristic approach to determining ship schedules and routings. ADANS, which uses an insertion/deletion algorithm, takes an entirely different heuristic approach.

The second major difference between SAIL and ADANS relates to the way the network is established. In SAIL, the network is determined automatically during the course of the scheduling. In MAC scheduling (both in the present FLOGEN and in ADANS), preparation of the network is done externally to the scheduler using knowledge-based development tools.

2.2 TIME-SENSITIVE PLANNING

Time-sensitive planning is characterized by limitations in resources for exchanging information, conducting analysis, and correcting errors and oversights. Although time is

the major limiting resource, planning may also be limited by scheduling problems and competing interests for personnel and equipment.

In time sensitive planning, interest is usually focussed on the immediate future, with matters in distant time periods dealt with as generalities or with respect to critical information only. Analytical tools to support this type of planning should be able to calculate with greater precision for the immediate future, gradually shedding detail (and presumably using fewer computing resources) as events are determined in the more distant future. Likewise, both input data and results should be expressed in a continuum of resolution, with the immediate data in fine detail, gradually becoming less resolved as time recedes into the future. Presently, tools using these data concepts are not available. Moreover, there is no evidence they are even a topic of ongoing operations research.

Of the six Crisis Action System phases, only three involve time-sensitive planning: course-of-action analysis, execution planning, and execution. Each of the three requires different planning support tools.

Depending on the supported CINC's determination, planners at USTRANSCOM may or may not be involved in course-of-action analysis. If they are involved, analysis is likely to be done at the USTRANSCOM headquarters level and to exclude the Component Commands. Essentially, course-of-action analysis is the result of a simple question from the CINC to his supported commands, "Can you support the proposed concept of operation?" What the CINC is looking for is a simple "yes" or "no." Supporting information should consist of reasons why not, if the answer is "no," or areas of vulnerability if the answer is "yes." The supported CINC is unlikely to be interested in movement tables and results of an elaborate simulation during this phase of a contingency.

In the training material now provided for course-of-action analysis, much ado is made over providing a deployment estimate, which is basically the supporting command's estimated date for fulfilling a strategic deployment obligation. Such a measure of performance is not very useful in measuring transportation feasibility. Fortunately, few members of the JDC with responsibility for carrying out deployment obligations feel any need to actually obtain a deployment estimate or even to defend this outmoded concept.

During the execution planning phase of a contingency, the CINC refines force and materiel requirements to respond to the exigencies of the situation, and planner's data in the OPLAN's TPFDD is supplanted by actual data from shippers (i.e., the deploying unit's transportation officers and other shippers associated with the plan). The CINC's refinement includes force augmentation or substitution to accommodate readiness status of supporting units. The challenge in execution planning is to best use the time between warning and execution orders so as to be in as good a position as possible when execution commences.

Planning during execution can be thought of as a continual process of preparing for and executing reflow analysis. This planning must enable USTRANSCOM and its Component Commands to make adjustments in the transportation plan based on changes in requirements, availability of transportation assets, and operational constraints; make sure that the forecasts on changes in the transportation plan are available for use in operational decisions; and identify and analyze scenarios that affect the transportation operation. Tools based on overall optimization strategies are suitable for deliberate planning; planning during execution requires tools that take the present situation step-by-step into the future.

2.2.1 MAC Time-Sensitive Planning

Members of MAC HQ crisis action teams (CATs) refine airlift schedules throughout the execution planning and execution phases of a contingency. The schedules are determined with the same basic procedures and automation support as are used for deliberate planning. To begin the refinement of airlift schedules, MAC pulls up to 30 days of the supported CINC's TPFDD data from JDS, depending on the number of consecutive days of data that have been validated. During the MAC pull, JDS software is used to aggregate requirements based on APOE-APOD pairs, ALD, EAD/LAD windows. The overall priority of a particular aggregation is determined by the highest priority of its components.

An initial under-constrained flow of the requirements determines the MAC mission support requirements that will be needed to implement the specified flow. A REPGEN report provides an estimate of station workloads, airlift support needed to maintain the

flow, and missions necessary to move the requirements. The REPGEN output is given to the CAT to determine if MAC mission support requirements are available (e.g., transportation, maintenance support) and where they should be stationed. These MAC mission support requirements are then added to the supported CINC's requirements in the JDS TPFDD.

Next, the first seven days of the requirements in the revised TPFDD are flowed and schedules are produced for NAF review. Although MAC HQ CAT teams have every reason to believe the schedules are executable, NAF operators are likely to make extensive modifications to correct for invalid assumptions and changing requirements. The NAFs furnish their refinements to the HQ MAC CATs, who then disseminate the airlift schedules.

When a satisfactory schedule for the first four days has been developed, the schedule is converted to transaction format for entry into JDS. MAC transmits the completed schedule to USTRANSCOM for entry of the airlift carriers and schedules into JDS. The first four days are sent initially, then updates are produced one day at a time.

Although MAC produces airlift manifests during deliberate planning, it depends on USTRANSCOM for manifesting during a contingency. USTRANSCOM uses JDS software that matches MAC-created schedules and JDS TPFDD data to create planned airlift manifests. After manifests have been developed, any additional schedule changes to manipulate the payload are done manually by changing individual missions in the JDS database.

2.2.2 MTMC Time-Sensitive Planning

In the past, HQ MTMC has relied primarily on JDS for automation support in their HQ operation center. JDS is used extensively by MTMC Passenger Traffic analysts to extract passenger movement information and to enter manifests for CONUS origin-to-APOE movements. Also, MTMC has a number of skilled analysts trained in developing ad hoc report requests to meet time-critical analysis needs. Unfortunately, JDS is not useful for preparing operations reports, such as the PUB 15 R-5 report,

because MTMC area command operators do not update JDS with movements taking place or with those that have just occurred.

MTMC is developing an automation support system to meet HQ MTMC crisis action needs not adequately met by JDS. The new system, called the Strategic Deployment System (SDS), makes extensive use of a JOPES-like workstation concept to implement local optimization and simulation methods. A demonstration prototype, implemented on an 80286-based personal computer, has been shown to a number of organizations within the JDC.

MTMC is developing the Automated System for Processing Unit Movement Requirements (ASPUR) for use in managing data exchanged between ITOs and MTMC area commands. Like JDS, ASPUR arose from an analysis of the problems identified during the Nifty Nugget exercise. The original concept was to facilitate the transmittal of unit movement request data from ITOs to MTMC area commands and provide a better method of linking planned schedules and manifests (i.e., JDS TPFDD data) with actual CONUS surface movements and activity at ocean terminals. ASPUR is being implemented in ORACLE on DEC VAX minicomputers. Although ASPUR can be used for peacetime unit moves, such as travel to the National Training Center and exercises overseas, it is mainly a wartime system, so that there is no significant ongoing, peacetime usage that maintains skills and interest in the system. ASPUR has been used on an experimental basis at MTMC Eastern Area HQ for about two years. An ASPUR system was installed at MTMC's Western Area HQ during 1987.

ASPUR was designed to be a companion to TC/ACCIS, a system for management of unit movement data at installations with deployable units. Originally all installations with deployable units were to have TC/ACCIS systems, but to date only one, a prototype at Ft Stewart, Georgia, has been fielded.

Because of delays in completing TC/ACCIS, MTMC has fielded a scaled-down, microcomputer-based version of the system that meets basic functional requirements. The microcomputer version of TC/ACCIS was used experimentally with some success by several installations during the Fall 87 Proud Scout mobilization exercise.

2.2.3 MSC Time-Sensitive Planning

Like MTMC, MSC relies extensively on JDS for time-critical information retrieval, analysis, and reporting on plan data. Like the other Component Commands, MSC is responsible for updating the JDS schedules for which they are responsible, which for MSC means vessel schedules and routes. MSC also uses JDS to some extent to produce ad hoc and canned reports.

A key system presently used at MSC for execution support is a small-scale information system, the Contingency and Exercise File Acquisition/Retrieval System (CEFARS), which is used for tracking ship schedules and loadings. CEFARS is implemented using now-obsolete Tektronics intelligent terminal equipment connected to leased lines between MSC HQ and its area commands. MSC is presently in the process of replacing CEFARS with a personal computer system that will use DDN for communication between MSC HQ and the area commands. Unfortunately, some difficulties have been experienced in implementing the system, so the initial operating capability date is not firm. CEFARS data, which are keyed by OPLAN, are used to produce the daily R2 (Sealift Movement Summary) and R4 (Common User Sealift Resources Availability) reports called for by JCS PUB 15.

3. INTEGRATION OF COMPONENT COMMAND DEPLOYMENT PLANNING

3.1 MTMC/MSC DELIBERATE PLANNING

As described in Section 2, strategic sealift planning is presently divided at the SPOE: MTMC is responsible for the origin-to-SPOE leg of moves, and MSC handles the SPOE-to-SPOD leg. MTMC planners, using MAPS II, determine the SPOEs and ALDs. These are added to individual TPFDD records, which are then sent to MSC for determination of sailing schedules and routes. MSC scheduling is forced to view the ALDs and SPOE-assignments as constraints, even though ALDs and SPOEs are often rather arbitrarily determined by MTMC. Such a process results in sub-optimal ship scheduling.

Better planning for strategic sealift would be achieved if a single scheduler were used to determine the entire move from origin to POD. All constraints associated with the flow (i.e., origin outloading capability, availability of CONUS transportation assets, SPOE throughput, vessel availability, lift capability and positioning) would be considered as a unit by the scheduler. However, current planning authorizations preclude this possibility because they assign responsibility for origin-to-SPOE scheduling to MTMC and SPOE-to-SPOD scheduling to MSC.

Given these authorization restraints, MTMC and MSC planners have been working to improve their combined effectiveness. One initiative involves streamlining the development of origin-to-SPOD movement tables. In the new procedure, MTMC and MSC are aggregating individual ports into port complexes as demonstrated in Table 1. MSC first establishes sealift schedules from a port complex rather than a specific SPOE as has been done in the past. MTMC then schedules the CONUS portion to individual ports, attempting to honor the port complex chosen by MSC on a record-by-record basis.

TABLE 1. EXTRACT FROM MSC/MTMC PORT COMPLEX DEFINITION TABLE

GEOLOC[2]	PORT NAME	ITC[3]	PORT COMPLEX NAME
DKSK	CHARLESTON	DFP	SAVANNAH
DKSD	CHARLESTON	PRT	SAVANNAH
UZXJ	SAVANNAH	PRT	SAVANNAH
LSCM	JACKSONVILLE	PRT	JACKSONVILLE
LSGP	JACKSONVILLE	POL	JACKSONVILLE
PPSH	MAYPORT TEST	PRT	JACKSONVILLE
TNPP	PORT CANAVERAL	DOC	JACKSONVILLE
MDXB	KEY WEST	PRT	MOBILE
QMFZ	MOBILE	PRT	MOBILE
SWYQ	PASCAGOULA	PRT	MOBILE
JTVH	GULFPORT	PRT	MOBILE
DHKZ	CHALMETTE	CTY	NEW ORLEANS
RQNK	NEW ORLEANS	PRT	NEW ORLEANS
SAXM	NORCO	CTY	NEW ORLEANS
AYYY	BATON ROUGE	PRT	NEW ORLEANS
BEGS	BELLE CHASSE	CTY	NEW ORLEANS
MQTE	LAKE CHARLES	PRT	HOUSTON
SLAW	ORANGE	PRT	HOUSTON
BBNV	BEAUMONT	PRT	HOUSTON
TNES	PORT AUTHUR	PRT	HOUSTON
AZWY	BAYTOWN	CTY	HOUSTON
LCMT	HOUSTON	PRT	HOUSTON
HQLL	GALVESTON	PRT	HOUSTON
WAGC	FREEPORT (TX)	PRT	HOUSTON
ENCN	CORPUS CHRISTI	PRT	HOUSTON
BFFZ	BELLINGHAM	PRT	SEATTLE
AHWQ	ANACORGES	PRT	SEATTLE
VDVN	SEATTLE	PRT	SEATTLE
WPVT	TACOMA	PRT	SEATTLE
RBZK	MUKILTEO	DFP	SEATTLE
TUJL	PUGET SOUND	NYI	SEATTLE
CHEX	BREMERTON	PRT	SEATTLE

[2]Geographic Location Code

[3]Installation Type Code: CTY=City, DFP=Defense Fuel Support Point, DOC=Dock, NYI=Naval Installation, PRT=Port, POL=POL Retail Distribution Station.

As a variation on the procedure, MTMC may also schedule to port complexes, thus deferring assignment of particular SPOEs for selection by MTMC and MSC area commands during the execution planning and execution phases of an operation.

A second initiative arising from cooperation between MTMC and MSC concerns improvement of the concept presently used as the basis for the SPOE available-to-load date (ALD), a data item carried in individual TPFDD movement records. By stating movement through the SPOE as a single date, rather than as an earliest/latest window, flexibility is lost in scheduling through the SPOE and in determining sailing schedules. MTMC and MSC deliberate planners propose replacing the ALD data in individual movement records with two dates to define an earliest-SPOE-load-date/ latest-SPOE-load-date window (ELD/LLD).

The actual procedure for determining the dates has yet to be worked out. One way this could be done is for MTMC to calculate the ELD in a movement record based on the unit's RLD, the origin outloading capability, CONUS transportation asset availability, and port throughput, marshalling, and staging constraints. MSC could independently determine the LLD based on ship characteristics and prepositions, sailing schedules and routes, and port complex throughput constraints. After determining movement tables, the two commands would review the ELD/LLD dates to make sure all ELDs are earlier than LLDs.

3.2 MTMC/MSC TIME-CRITICAL PLANNING

Probably the most important piece of shared information affecting MTMC and MSC time-critical joint planning is data on port status, throughput capacity, and throughput utilization. Specifically, the data consists of some information that is relatively static and other that can change hour-by-hour. In the first category is the number of berths by type and general characteristic (general cargo vs container) and the amount of vessel support (number RORO ramps and cranes of various types). Information subject to rapid fluctuation includes utilization of marshalling and staging areas and backlog of cargo to be loaded. Although time-averaged numbers for such statistics are suitable for deliberate planning, time-critical planning and execution-support systems have higher accuracy and currency needs.

By fortunate coincidence, MTMC is in the process of developing its Strategic Deployment System, which is to be used in execution planning and execution support, at the same time MSC is replacing its obsolete CEFARS execution support system. MTMC and MSC should take advantage of this coincidence to establish methods for automated exchange of data during a contingency. One such important type of data is the port status/port throughput data discussed above. If MTMC and MSC were able to share such data during a contingency, critical decisions involving port status and throughput could be based on the same information. As an additional benefit, sharing data on ports would ease reconciliation of results contained in two important Pub 15 daily reports, the SPOE data in MSC's R2 report (Sealift Movement Report) and MTMC's R5 report (Ocean Terminal Status Report).

3.3 MTMC/MAC DELIBERATE PLANNING

Basically, coordination between MAC strategic airlift planning and MTMC origin-to-APOE planning occurs through the transfer of movement table data from MAC to MTMC via a JOPS TPFDD. In the long view, joint planning is not necessary because the scheduling of origin-to-APOE legs can be worked out regardless of how airlift resources are to be used. On the other hand, short term changes to MAC schedules during execution can make origin-to-APOE schedules critical (e.g., if vital reserve units are on a bus 100 miles from their APOE and MAC decides to reschedule their flight ahead by four hours).

As was discussed in Section 2 of this report, MAC CAT planners expect that, after just a few days of a real-world contingency, differences in missions actually flown vs missions as planned are likely to result in the need for massive amounts of hand adjustment (usually delays) to the schedules loaded into JDS from the MAC scheduler (FLOGEN now; ADANS in the future). One has only to recall the confusion at a large commercial airport when a large number of flights have been delayed or cancelled to imagine the chaos that MAC planners expect to ensue if significant variation from the plan occurs. Even if MAC were to update its information in JDS the moment schedules change, many units would not arrive in-theater on time because of the time required for MTMC to pull changes out of JDS, rebook (or reschedule) CONUS air or surface origin-to-APOE transportation, and disseminate schedules (or routings) to deploying units. The

challenge for MTMC planners is to have in place the procedures and automation support that best accommodate the problem of last minute changes to strategic airlift schedules.

One solution is for MAC to provide MTMC with data on the probability that outloading will occur on the ALD (date and time) stated in the movement requirement. The probability can be calculated as a percentage using the sensitivity analysis feature being developed for MAC's ADANS system. As an example, MAC could use this feature to furnish MTMC with forecasts of the probability of outloading individual movement requirements within 12, 24, and 48 hours of the ALD appearing in the TPFDD record. MTMC could use this information to predict what bookings or surface movements are most likely to be affected by delays, and which ones can safely be ignored because of their independence of delays occurring in the rest of the airlift operation.

4. SUMMARY

MTMC and MSC are now taking two important steps toward improving coordination during deliberate planning to provide better sealift schedules. The improvements consist of replacing the single ALD date in the TPFDD with an ELD/LLD window and scheduling by port complex rather than specific seaports. USTRANSCOM is well advised to encourage these initiatives. However, in the long run, the best answer to strategic sealift deliberate planning is to use a single scheduling/routing system for the entire sealift strategic leg from origin to SPOD.

MTMC and MSC are also in the process of improving their execution planning and execution systems: MTMC has developed a demonstration prototype of their Strategic Deployment System; MSC is replacing their now-obsolete Contingency and Exercise File Acquisition/Retrieval System with a microcomputer equivalent. This coincidence provides an excellent opportunity to implement computer-to-computer transfer of common execution planning and execution support data, such as current port status and throughput data.

MAC planners expect to have to make many manual adjustments to airlift schedules on a continuing basis after a few days into a large deployment. Massive changes of this sort have the ability to wreak havoc in origin-to-APOE schedules unless precautions are taken. One method of mitigating the effect is for MAC planners to add probabilities associated with timely movement to each TPFDD record. According to the ADANS Functional Description, probabilities can be calculated using a sensitivity analysis tool that is supposed to be implemented as part of the airlift scheduler.

APPENDIX A.

TERMS AND ABBREVIATIONS

ADANS	Airlift Deployment Analysis System.
ADP	Automated Data Processing.
ALD	Available-to-Load Date. The date a unit or item of cargo will be ready to begin outloading at the POE.
Algorithm	A computational procedure for solving a problem.
ANSI	American National Standards Institute.
APOD	Aerial Port of Debarkation.
APOE	Aerial Port of Embarkation.
ASPUR	Automated System for Processing Unit Requirements.
AUTODIN	Automated Digital Network.
CAT	Crisis Action Team.
C-day	The unnamed day on which movement in a deployment operation begins or is to begin.
CEFARS	Contingency and Exercise File Acquisition/Retrieval System.
CESPG	Civil Engineering Support Plan Generator. An application subsystem of JOPS that helps the planner to determine manpower, equipment, and materiel needed to construct and upgrade facilities that support forces in an OPLAN.
Channel	The capability to move cargo from an origin to a destination during a set period.
CINC	Commander-in-Chief.
Close-hold	Not available for discussion within the deployment community.
Closure	When a supporting command's obligations for moving forces to a theater of employment are completed.
COA	Course of Action.
COBOL	Common Business Oriented Language.

Common-user	Military transportation services provided by the USTRANSCOM component commands to other DOD components under an industrial fund system.
Concept of Operation	A verbal or graphic statement, in broad outline, of a commander's assumptions or intent regarding an operation or series of operations.
CONPLAN	Concept Plan. An operation plan in concept format. An abbreviated plan that would require expansion into an OPLAN or OPORD before implementation. A CONPLAN includes a fully defined concept of operations. Some CONPLANS contain selected annexes and appendices, and even portions of a TPFDD (as may be required by the supported commander), but this is not the normal practice.
Contingency Planning	Planning for major contingencies that can reasonably be anticipated in the principal geographic subareas of the command.
CONUS	Continental United States.
Database	A collection of one or more computer files that represents all the data associated with or supporting the objective of an ADP system. For example, one JOPS database, the TPFDD/SRF, supports each OPLAN. It consists of two files, the Time-Phased Force and Deployment Data and the Summary Reference File.
DDN	Defense Data Network.
Deliberate	Routine development of operation plans as directed by JSCP or other tasking directive using
Planning	JOPS Volumes I, II, and III procedures.
Deployment Database	The JDS database containing the necessary information on forces, materiel, filler and replacement personnel movement requirements to support plan execution. The database contains information converted from an OPLAN's refined TPFDD, data developed during the various phases of the Crisis Action System, and the movement schedules or tables developed by the TOAs to support the deployment of required forces, personnel, and materiel.
Deployment Estimate	The estimated time required for all the units and nonunit cargo and personnel increments of a JDS deployment database to arrive at the POD(s). The deployment estimate is expressed in days and hours from the time of notification to deploy.
Deployment Flow	The rate at which deploying personnel, accompanying cargo, or nonunit personnel or cargo is moving over channels.
Deployment Planning	That part of operation planning concerned with relocation of forces to the desired area of operation.
DEPMAS	Deployment Management System (REDCOM).

DOD	Department of Defense.
EAD	Earliest Arrival Date. The day and time, relative to C-day, L-hour, specified by the CINC as the earliest date that a unit, item of cargo, or personnel increment can be accepted at the in-theater port of debarkation. When used with the latest arrival date, it defines a delivery window at the port of debarkation.
ELD	Earliest Date to Load at the POE.
Employment	The strategic or tactical use of forces and materiel within the area of operations.
Execution Planning	The phase of the Crisis Action System in which an approved operation plan or other designated course of action is adjusted and refined to fit the prevailing situation and converted into an OPORD that can be executed at a designated time. Execution Planning can proceed on the basis of prior deliberate planning, or it can take place under a NOPLAN situation.
Feasibility	An operation plan review criterion. To meet this criterion, the plan must assure that the assigned tasks could be accomplished by using available resources.
FLOGEN	Flow Generator subsystem of IMAPS.
Flow	(verb) To produce movement schedules and carrier itineraries for a particular set of movement requirements and availability of lift assets.
Force Module	A group of key combat units, their associated support and sustainment to accomplish a designated function. Force modules can by used to great advantage in time-sensitive planning to reduce time required for sourcing and determining transportation requirements.
Force Requirement	A statement of the forces needed to support a military operation.
GDSS	Global Decision Support System.
Heuristic	An algorithm which uses some key feature specific to the problem being considered to quickly obtain a good, but not necessarily optimal, solution for the given instance of the problem. Heuristics provide a pragmatic way to solve complex routing and scheduling problems that are too difficult to be solved optimally.
HQ	Headquarters.
IDS	Integrated Data Store (data management concept used with Honeywell computers).
IMAPS	Integrated Military Airlift Planning System.

JCS	Joint Chiefs of Staff.
JDA	Joint Deployment Agency.
JDC	Joint Deployment Community. The headquarters, commands, and agencies involved in training, preparation, movement, support, reception, employment, and sustainment of military forces assigned or committed to a theater of operations or objective area. The JDC consists of the OJCS, Services, certain major commands, unified and specified commands and the Service component commands, DLA, joint task forces, and certain defense agencies (such as the DIA), as may be appropriate for a particular scenario.
JDS	Joint Deployment System. The personnel, procedures, directives, communication systems, and computer systems for supporting time-sensitive planning and execution. JDS complements peacetime deliberate planning by providing an efficient means of converting OPLANs to OPORDs and coordinating the exchange of deployment status data during execution of an OPORD.
JOGS	Joint Operations Graphics System Prototype 3.0. A prototype analysis aid developed by the plans division, USTRANSCOM. It is not a command-approved system.
JOPES	Joint Operation Planning and Execution System. The planning and execution system now being developed as the successor to JOPS and JDS. It will integrate deliberate and time-sensitive planning and execution support.
JOPS	Joint Operation Planning System. The DOD-directed, JCS-specified system for global and regional joint military operations planning.
JSCP	Joint Strategic Capabilities Plan. The part of the Joint Strategic Planning System defining the strategic concept of support for national security objectives. By providing guidance to CINCs and the Services on the resources available for accomplishing military objectives, it is used for allocating forces and lift assets available to a particular OPLAN or family of OPLANs.
JSIT	JDS Information Trace. A generalized JDS retrieval system that displays JDS information directly to the display terminal.
LAD	Latest Arrival Date. A date and time, relative to C-day, L-hour, that the CINC specifies as the latest arrival of a unit, item of resupply, or replacement personnel at the port of debarkation consistent with an OPLAN concept of operation. When used with the EAD, it defines a delivery window at the in-theater port of debarkation.
LCE	Logistics Capability Estimator. An application subsystem of JOPS used to generate estimates of nonunit cargo for units in an OPLAN TPFDD. Selected data elements from the TPFDD and Logistics Factors File are combined to generate the nonunit cargo records.

LLD	Latest Date of Loading at the POE.
LP	Linear programming (a mathematical optimization technique)
MAC	Military Airlift Command.
MAPS II	Mobility Analysis and Planning System, Version II.
Mobilization	The process by which the armed forces or part of them are brought to a state of readiness for war or other national emergency. This includes activating all or part of the Reserve components as well as assembling and organizing personnel, supplies, and materiel for active military service.
MODES	Mode Optimization and Delivery Estimation System.
MOPEX	Mobility Planning and Execution System (MSC).
Movement Requirements	Transportation required to support mobilization, deployment, resupply, and redeployment of forces in a military operation.
Movement Table	A table prepared by the TOAs for each force requirement and each nonunit-related cargo or personnel increment of the TPFDD concerning the scheduled movement from the origin or POE through intermediate location to POD or destination. The table is based on the estimated or planned availability of lift resources and hence is not an execution document.
MPT	MAC Planners Toolkit.
MSC	Military Sealift Command.
MTMC	Military Traffic Management Command.
MTON	Measurement ton. The unit for volumetric measurement of equipment associated with surface-delivered cargo. Measurement tons equal total cubic feet divided by 40 (1 MTON = 40 cubic feet).
Nonunit Cargo and Personnel	All equipment, supplies, and personnel requiring transportation to an area of operations, other than those identified as the unit equipment or accompanying supplies of a specific unit. Nonunit cargo would be required for resupply, military support for allies, and support for nonmilitary programs, such as civil relief. Nonunit personnel would include filler personnel, replacements, temporary duty/temporary additional duty, civilians, medical evacuees, and retrograde personnel.
Notional	Use of a concept having one or more key characteristics which are yet to be specified. For example, a movement requirement record for a notional tank battalion may contain complete data for type cargo, tons to be shipped, dates and locations of the shipment, etc., but lack the unit identification number because the actual unit to be used has not yet been chosen.

Operation Plan	A plan for the conduct of a single military operation or series of connected operations to be carried out simultaneously or in succession in a hostile environment, prepared by the commander of a unified or specified command in response to a requirement established by the Joint Chiefs of Staff. It usually is based on stated assumptions. The term "operation plan" is a generic term that can refer to either an operation plan in complete format (OPLAN) or an operation plan in concept format (CONPLAN). An operation plan may be put into effect at a prescribed time and then becomes an operational order.
OPLAN	Operation Plan in Complete Format. A plan that can be converted to an OPORD for conducting military deployment and employment operations. A computerized TPFDD for units and their cargo, personnel increments, and resupply is an essential element of an OPLAN.
OPORD	Operation Order. A directive, usually formal, issued by a commander that instructs subordinates to carry out an operation.
Origin	The beginning point of a deployment; the point or station at which a movement requirement is located. For type (notional) requirements, the origin will be the most likely station at which the requirement will originate.
ORNL	Oak Ridge National Laboratory.
Personnel Increments	Nonunit personnel for replacement of casualties, etc.
POD	Port of Debarkation. The geographic point (seaport or airport) in the routing scheme where a movement requirement will complete its strategic deployment. The POD may or may not be the same as the destination.
POE	Port of Embarkation. The geographic point (seaport or airport) in the routing scheme where a movement requirement will begin its strategic deployment. This point may or may not be the same as the origin.
RDD	Required Delivery Date. The date and time, relative to C-day, L-hour, when a unit or item of cargo must arrive at its destination to support the CINC's concept of operations.
REDCOM	U.S. Readiness Command, a disestablished JCS unified command.
Reflow	Redirection of forces to respond to the needs of a changing military situation.
REPGEN	Report Generator Module of MAC's Integrated Military Airlift Planning System (IMAPS).
RLD	Ready to Load Date. The date and time, relative to C-day, L-hour, when a unit is ready to depart its home station in support of a military operation.
SAIL	Scheduling Algorithm for Improving Lift, a subsystem of MSC's MOPEX.

SEACOP	Strategic Sealift Contingency Planning System.
Shortfall	The lack of forces, equipment, personnel, materiel, or capability - apportioned to and identified as a plan requirement - that would adversely affect a command's ability to accomplish its mission.
SORTS	Status of Resources and Training System.
Sourcing	The process of identifying the actual units, their origins, POEs, and movement characteristics to satisfy the time-phased force requirements of a supported commander.
SPOD	Seaport of Debarkation.
SPOE	Seaport of Embarkation.
Standard Reference Files	Files maintained in WWMCCS and JOPS containing unchanging information, such as the cruise speed of a certain category of ship or the load-carrying capacity and range of a type of aircraft.
STON	Short tons.
STRADS	Strategic Deployment System.
Supported Commander	The unified or specified commander having primary responsibility for all aspects of a task assigned in the Joint Strategic Capabilities Plan (JSCP) or otherwise assigned. The commander has responsibility for developing OPLANS as directed by the JCS.
Supporting Commander	A commander who furnishes augmentation forces or other support to a supported commander or who develops a supporting plan.
TC/AIMS	Transportation Coordinator's Automated Information for Movements System.
TFE	Transportation Feasibility Estimator. The JOPS ADP application program that assists planners in evaluating (in a gross sense) the feasibility of the deployment scheme developed in support of an operation plan. The program takes into consideration the desired scenario for deployment of forces, supplies, equipment, and replacement personnel, the available transportation resources (sea and air), facility constraints at ports and aerial ports used for the deployment, and other planning factors bearing on the strategic movement. The program modules interface with the standard JOPS files and the TPFDD file. TFE execution is in four general phases: TPFDD evaluation, simulation preparation, simulation execution, and post-simulation processing.
Throughput	The estimated traffic (expressed as an average daily capability of measurement tons, short tons, and/or passengers) that can be moved into and through a port/aerial port. The total port/aerial port movement capability is a function of reception, discharge, and clearance - the smallest of these is the estimated throughput.

TOA	Transportation Operating Agency.
TPFDD	Time-Phased Force Deployment Data. A computerized file describing detailed dates, locations, characteristics of personnel and material, and other information associated for the transportation of the forces and nonunit cargo and personnel required to support an OPLAN.
USTRANS-COM	United States Transportation Command. The agency that supports the Joint Chiefs of Staff and supported commanders in strategic planning and deployment execution. As directed by the Joint Chiefs of Staff, the USTRANSCOM is responsible for coordinating deployment planning and execution and will act as the focal point for coordinating TPFDD refinement and maintenance of the current, accurate database in the JDS. During execution, USTRANSCOM will monitor the movement of forces deploying by organic lift, and advise the JDC on deployment matters.
WIS	WWMCCS Information System.
WWMCCS	Worldwide Military Command and Control System.

APPENDIX B.

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