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OOTW COST TOOLS

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OOTW COST TOOLS

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ABSTRACT

This document reports the results of a study of cost tools to support the analysis of Operations Other Than War (OOTW). It recommends the continued development of the Department of Defense (DoD) Contingency Operational Support Tool (COST) as the basic cost analysis tool for OOTWs. It also recommends modifications to be included in future versions of COST and the development of an OOTW mission planning tool to supply valid input for costing.

EXECUTIVE SUMMARY

This document reports the results of the Office of the Assistant Secretary of Defense (Special Operations/Low Intensity Conflict) (OASD (SO/LIC)) sponsored project to identify requirements for cost analysis tools for Operations Other Than War (OOTW) and Small Scale Contingencies (SSCs).

This report is based on the following foundation of understanding of OOTW cost tool requirements and current functionality:

- a 1996 US Pacific Command (USPACOM) sponsored project that identified unmet requirements for OOTW analysis tools [Hartley, 1];
- a 1997 Military Operations Research Society (MORS) workshop [Staniec, 2] that produced further insights, especially in the area of cost tools;
- a 1997-1998 Office of the Secretary of Defense/Program Analysis & Evaluation (OSD/PA&E) project that refined some of the concepts for implementation of OOTW analysis tools [Hartley and Packard, 3]; and
- a 1997 OSD Comptroller project, performed by the Institute for Defense Analyses (IDA), that identified the problems involved in cost estimation for OOTWs [Goree, *et al.*, 4] and a current Comptroller project, performed by IDA, that is creating the Contingency Operational Support Tool (COST), a tool for estimating the incremental cost of OOTWs [IDA, 5].

This report recommends an approved, standard tool for OOTW cost analysis and further actions to be taken:

- the recommended tool is the Comptroller tool, COST;
- COST, should be brought to Initial Operating Capability (IOC);
- a tool (or tools) to create the correct force structure for an operation should be created; and
- COST should be extended subsequent to IOC to include additional functionality beyond Comptroller needs.

ACRONYMS

CAA	Concepts Analysis Agency
CANTELOUPES	Cost Analysis Tool to Estimate Light Operations & Unfunded Peacekeeping Scenarios
CEAC	US Army Cost and Economic Analysis Center
CINC	Commander in Chief
COA	Course of Action
COST	Contingency Operational Support Tool
DFAS	Defense Finance Accounting System
DIA	Defense Intelligence Agency
DISA	Defense Information Systems Agency
DoD	Department of Defense
DSRD	Data Systems Research and Development Program
FALCON	Force Allocation & Contingencies
FOC	Full Operating Capability
FON	Freedom of Navigation
FORCES	The Force and Organization Cost Estimating System
IDA	Institute for Defense Analyses
IGTL	Interagency General Task List
IOC	Initial Operating Capability
IPR	In-Progress Review
JAMIP	Joint Analytic Model Improvement Program
JDS	Joint Data Support
JFAST	Joint Flow Analysis Tool
JTF	Joint Task Force
JWARS	Joint Warfare System
LIC	Low Intensity Conflict
LOGCAP	Logistics Civic Augmentation Program
M&S	Modeling and Simulation
MOE	Measure of Effectiveness
MOP	Measure of Performance
MORS	Military Operations Research Society
MTW	Major Theater War
NCA	National Command Authority
NEO	Noncombatant Evacuation Operation
NGO	Non-Governmental Organization
NIMA	National Imagery and Mapping Agency
NSA	National Security Agency
NSC	National Security Council
OASD	Office of the Assistant Secretary of Defense
ODBC	Object Database Connect
OOTW	Operations Other Than War
OPTEMPO	Operations Tempo

OSD	Office of the Secretary of Defense
OUSD(C)	Office of the Undersecretary of Defense (Comptroller)
PA&E	Program Analysis & Evaluation
PWS	Personal Web Service
QDR	Quadrennial Defense Review
SIPRNet	Secret Internet Protocol Router Network
SO/LIC	Special Operations/Low Intensity Conflict
SOCBAM	Special Operations Cost Benefit Analysis Model
SOF	Special Operations Forces
SSC	Small Scale Contingency
TPFDD	Time-Phased Force Deployment Data
TRANSCOM	Transportation Command
TUCHA	Type Unit Characteristics
USACOM	US Atlantic Command
USCENTCOM	US Central Command
USEUCOM	US European Command
USPACOM	US Pacific Command
USSOCOM	US Special Operations Command
USSOUTHCOM	US Southern Command

1. INTRODUCTION

The past several years have seen an increasing recognition of the need for analysis tools to support planning and execution of military Operations Other Than War (OOTWs). (The term Small Scale Contingency (SSC) appears to be replacing OOTW; however, for continuity, OOTW will be used here.) Analysis tools to support decision-making for large-scale combat operations (such as major theater wars (MTWs)) are relatively mature. In contrast, OOTW analysis tools are embryonic or non-existent. Because major U.S. military involvement in OOTWs is expected to continue, various authorities have argued that development of OOTW analysis tools should receive higher priority than continued enhancement of analysis tools for large-scale military operations [Haut and McCurdy, 6].

One of the needed analysis tools is a cost analysis tool. Because OOTWs are discretionary (to a greater degree than are wars), the expected cost of engaging in a particular operation is a reasonable factor in the decision process and early estimates are needed to engage the political process in seeking appropriate reimbursement of accounts typically used to fund OOTWs. Further, if OOTWs are expected to be an ongoing part of our military's operational activity, their expected costs should be part of the budgeting process. Unfortunately, the problems with cost estimating tools for OOTWs were painfully evident in the mis-estimates of the costs for the first year of Bosnian operations [Goree, *et al.*, 4].

1.1 PURPOSE

This document reports the results of the Office of the Assistant Secretary of Defense (Special Operations/Low Intensity Conflict) (OASD (SO/LIC)) sponsored project to identify requirements for Operations Other Than War (OOTW) cost tools. Tools are the analysts' force multipliers. They extend the analysts' reach, vision, and memory and they save time. Tools are not substitutes for analysis - properly used, they are supports to that analysis. This report is based on the following foundation of understanding of OOTW cost tool requirements and current functionality:

- a 1996 US Pacific Command (USPACOM) sponsored project that identified unmet requirements for OOTW analysis tools [Hartley, 1];
- a 1997 Military Operations Research Society (MORS) workshop [Staniec, 2] that produced further insights, especially in the area of cost tools;
- a 1997-1998 Office of the Secretary of Defense/Program Analysis & Evaluation (OSD/PA&E) project that refined some of the concepts for implementation of OOTW analysis tools [Hartley and Packard, 3]; and
- a 1997 OSD Comptroller project, performed by the Institute for Defense Analyses (IDA), that identified the problems involved in cost estimation for OOTWs [4] and a current Comptroller project, performed by IDA, that is creating the Contingency

Operational Support Tool (COST), a tool for estimating the incremental cost of OOTWs [IDA, 5].

1.2 GENERAL BACKGROUND

The US Pacific Command (USPACOM) instituted a project to define the requirements for analysis tools to support OOTWs. These requirements were to influence the development of OOTW analysis capabilities within the Joint Warfare System (JWARS), which is being developed under the sponsorship of OSD/PA&E. Because the original JWARS Requirements Document specified only limited OOTW analysis capabilities, the project would also identify opportunities for developing interim OOTW analysis capabilities, including exploratory tools for possible federation with JWARS.

The first workshop was held at the Naval Postgraduate School in Monterey in February 1996. This workshop was attended by representatives of the Office of the Secretary of Defense, the Joint Staff, the Unified Commands, the Services, and numerous other organizations. A draft document was based on that workshop, other conferences on OOTWs, and research of the literature on OOTWs. The second Monterey workshop was held in September 1996 to review and extend the draft document. This workshop identified and categorized the many types of operations that can be considered operations other than war; examined the attributes of different kinds of OOTWs; and identified similarities and differences of U.S. military tasks that must be performed in OOTWs. The draft document was refined, creating a second draft, and USPACOM circulated the result to the other Commanders in Chief (CINCs), the Services, the Office of the Secretary of Defense (OSD), and the Joint Staff/J-8 [1].

The USPACOM OOTW Tools Project identified 10 requirements for analysis tools, including a requirement for a cost analysis tool (Table 1). Each requirement is described in terms of functions needed to satisfy the requirement, the users that the requirement supports, the requirement's priority, and the recommended action. The priority definitions are: 1 = critical need, 3 = important need, 5 = enhancement, with 2 and 4 interpolated. All needs with priorities of 4 and 5 were dropped in creating a list of requirements.

Table 1. OOTW Analytical Tool Requirements from [1]					
Rqmt	Title	Description	Use	P	Act
1	Situational Awareness	supports the generation of a complete picture of the current and likely future situation	NCA, CINC, JTF, Service	2	start now
2	Impact Analysis	supports the analysis of the impact of human actions (own-side, opposition or neutral parties) on the current situation and on future plans	NCA, CINC, JTF, Service	1	R&D
3	Mission Definition & Analysis	supports mission definition in its broadest sense	NCA, CINC, JTF	2	do now
4	Force Planning: Design Forces	supports the design of supporting and supported forces for use in OOTWs, where the supported forces may consist of forces that belong in the supporting category in combat operations - both parts may include U.S. non-military and non-U.S. elements	CINC, Service	1	do now

Table 1. OOTW Analytical Tool Requirements from [1]					
Rqmt	Title	Description	Use	P	Act
5	Force Planning: Deployment Scheduling	supports the timing and prioritization of deployment scheduling, including U.S. non-military and non-U.S. elements	CINC	1	do now
6	COA Development, Analysis, Comparison	supports Course of Action (COA) development, analysis, comparison, estimates of success and casualty predictions, risk modeling, and recommendations	CINC, JTF	1	R&D
7	Transition Planning and Tracking of Operational Data	supports continued planning of the transition and tracking of MOEs, MOPs, end-state and transition criteria, and analysis of such things as casualties and medical treatments	CINC, JTF	3	do now
8	Communication Analysis	supports communications analysis, including interoperability of non-U.S. and non-military equipment	CINC, JTF	3	R&D
9	Cost Analysis	models costs of generic OOTWs for use in national force structure planning, input to decisions on engaging in an OOTW, and to estimate comparative costs during mission planning	NCA, CINC, JTF, Service	3	do now
10	Information Availability and Analysis	supports data collection and analysis and use by other tools	NCA, CINC, JTF, Service	1	do now

Further insight into the required tools was gained through the January 1997 MORS workshop [2]. Among other things, the participants of this workshop identified seven types of cost analysis that are required by various elements of the Department of Defense (DoD) at various times:

- 1 incremental costs of notional OOTWs, to support the long-term analysis;
- 2 probable incremental costs, to support the decision on engaging in a particular OOTW;
- 3 relative (full) costs, to support the selection of the mission plan;
- 4 costs incurred, to support recovery of those costs from other U.S. agencies and from foreign organizations and governments;
- 5 incremental costs of a particular OOTW, to support the Congressional Budget process;
- 6 cumulative costs of a particular OOTW, including equipment depreciation, readiness losses, increased reserve recruitment and training costs, and perhaps other costs, to support future acquisition, budgeting and training decisions; and
- 7 actual costs of a completed OOTW, to support improved estimates of future operations and reports to Congress on actual costs.

Incremental costs, full costs and cumulative costs have extremely detailed definitions within the DoD; however, they may be roughly described as follows:

Incremental costs are those costs that exceed those budgeted by Congress for a given year. For instance, for active duty forces, regular pay and allowances would not be included, but not hazardous duty pay. For reserve component forces that are called up, all pay categories would be included as incremental costs. In another instance, for equipment that is used at a different rate from that scheduled (a different operations tempo (OPTEMPO)), the differential costs (positive or negative) would be (positive or negative) incremental costs. Services that are contracted (beyond those included in the budget) are incremental costs. Incremental costs reflect the cost of performing unplanned missions.

Full costs include both the budgeted costs and the incremental costs. Thus all pay categories for active duty forces would be included, just as all pay categories are included for reserve component forces. Full costs permit a comparison of the costs of options. For example, employing active duty engineers to perform a construction project, calling up and using reserve component engineers to perform the same task, or contracting for civilian engineers to perform the task. The difference between an incremental cost comparison and a full cost comparison lies in the assumption in incremental costs that the active duty forces have nothing better to do and are thus sunk costs, whereas the assumption in full costs is that there may be opportunity costs associated with the active duty forces and that one approximation is to act as if an additional unit of active duty forces should be procured. Different analyses will require different assumptions.

Cummulative costs add another dimension to the picture. All equipment has an expected lifetime, based on an assumed usage (OPTEMPO) profile. Excessive OPTEMPOs will require early replacement of the equipment, captured by depreciation costs in cumulative costing. Similarly, other costs that do not necessarily show up during a given mission are captured as cumulative costs.

In 1997-1998, OSD/PA&E sponsored work focused on analytic tools for OOTWs and their relationship to JWARS. This project used the requirements for tools from the previous work and developed means for obtaining them. The work involved three tasks:

- clarify what aspects of the OOTW mission are modelable with the JWARS theater level combat focus and resource constraints;
- define the remaining OOTW analytical support requirements; and
- recommend actions to meet the OOTW analytical support requirements.

This project identified the cost tools as part of the analytical support requirements that would not be met by JWARS and that should be undertaken by DoD as a whole [3]. As shown in Fig. 1, the cost tools are part of the whole picture and should be logically linked to the package of tools referred to as the Integrated Mission Planning Tool.

Fig. 1. Analytic tool groups from the PA&E project.

1.3 OOTW COST ANALYSIS BACKGROUND

The situation preceding the creation of COST is described in IDA's report [4]. The responsibility for cost estimation of contingencies lies with the DoD Comptroller, in coordination with the Joint Staff/J-8. These two organizations used a custom spreadsheet called the DoD Deployment Cost Model. This tool had been created and used for several contingencies prior to Operation Joint Endeavor, the Bosnia mission. The initial cost estimate for the first year of Bosnia operation was less than half the eventual actual cost for that year. The IDA estimate was that 42% of the inaccuracy was due to problems with cost component estimates, 31% was due to operations or policy changes, and 27% was due to not estimating some activities. IDA noted that, while almost a third of the problem was due to circumstances beyond the control of the cost estimators, operations or policy changes, more than two-thirds of the problem could be addressed by improving the estimating process. IDA recommended three actions:

- establishing a standard Cost Breakdown Structure (CBS) for contingency operations,
- documenting the estimated and actual costs of contingency operations, and
- building improved tools for estimating contingency costs.

The Comptroller's office is in the process of implementing these recommendations [5]. These actions, when supplemented by consideration for cost estimation needs outside of the Comptroller's office and by tools to improve the mission force definition process, should lead to superior cost analysis.

1.4 FUTURE EXPECTATIONS

The creation of cost analysis tools for OOTW represents the initial tangible result of the process of improving analytic tools for OOTW. The existence of other, ongoing work indicates that more results will be forthcoming in other areas.

2. OOTW COST TOOLS

The Department of Defense has an extensive mechanism for estimating and reporting costs. This system was designed for costing combat and garrison duties, however, and is ill-prepared to handle OOTWs: the reporting categories are insufficiently refined in some areas and the reporting structure is based on military combat structure (e.g., battalion, brigade, division, corps), which is often inappropriate for OOTWs. Despite the fact that the mass of the current cost mechanism makes rapid change difficult, progress is being made.

2.1 EXISTING OOTW COST TOOLS

Six specific cost tools have been identified as relevant to the costing issues for OOTW: the DoD Deployment Cost Model, the Special Operations Cost Benefit Analysis Model (SOCBAM), the Force Allocation & Contingencies (FALCON) tool, the Cost Analysis Tool to Estimate Light Operations & Unfunded Peacekeeping Scenarios (CANTELOUPES), the Force and Organization Cost Estimating System (FORCES), and COST. Each of these tools addresses the fact that there are major differences in costing OOTWs as compared to costing combat operations.

The failure of the DoD Deployment Cost Model was described in section 1.3, above. IDA's analysis of the reasons for that failure [4], indicate why earlier existing tools were inadequate for the task. The DoD Deployment Cost Model was a custom spreadsheet, that had been added to and corrected as new contingencies were analyzed. However, the Bosnia operation consisted of major differences from the contingencies that had, in effect, created the tool. The failure also exposed structural weaknesses in the cost estimation process for contingencies. The Defense Finance Accounting System (DFAS) specified a CBS for reporting costs that was inadequate for contingencies and, because its elements were not well-defined, that was inconsistently interpreted by the Services. Further, the process for using the DoD Deployment Cost Model, involved obtaining cost estimates from the Services, each using its own tool and own assumptions. And no one was responsible for cost estimates for other organizations, such as the Defense Information Systems Agency (DISA), the US Special Operations Command (USSOCOM), the National Security Agency (NSA), the Defense Intelligence Agency (DIA), or the National Imagery and Mapping Agency (NIMA), all with significant impacts on Bosnia.

SOCBAM is a USSOCOM sponsored tool that uses linear programming to find optimal Special Operations Forces (SOF) for a given cost. The coverage of this tool is restricted to SOF. Its underlying optimization methodology represents a specialized purpose and is not suited for general costing requirements.

FALCON was created by SAIC to calculate the cumulative costs for Air Force missions and includes depreciation and tempo considerations. The coverage of this tool is also restricted, in this case to Air Force operations. It also is designed to meet a specialized purpose, that of cumulative costs.

CANTELOUPES is a US Army Concepts Analysis Agency (CAA) OOTW cost tool. Its coverage is restricted to Army operations. Reportedly, it uses a standard Army force costing database, which may not be appropriate for all OOTWs.

FORCES is another Army system; however, it is supported by the US Army Cost and Economic Analysis Center (CEAC). It is a suite of models and databases that can support a wide range of decision making analyses, notably cost estimates for operations and deployment options. Because it is weak in the contingency operations area, CEAC proposes to add a Contingency Operations Deployment Model that will complement COST by addressing Army unique requirements and data.

Other costing tools for the Services have been identified; however, either little information could be found about them or they suffer similar problems to those identified above: restricted coverage, specialized purpose, or weak support for OOTW specific cost elements.

2.2 THE DOD COST TOOL

The purpose of the COST project is to create a tool for estimating both planning-level and detailed costs for contingency operations. The objective of COST is to provide Office of Undersecretary of Defense (Comptroller) (OUSD(C)) and the Joint Staff with an easy to use comprehensive tool for estimating the **incremental** cost of contingency operations. (It is important to note that the requirements described later in this document for cost tools were **not** the requirements supplied to IDA for the development of COST.) The tool is being developed in increments to facilitate flexible maintenance of its components and future evolution of the tool and its data. The first increment is a tool that supports development of preliminary cost estimates at a relatively high level. These estimates typically are necessary to support a rapid-reaction task when little information is available about the detailed specifics of the intended operation. Following this, a second increment will be developed to prepare a more detailed estimate. This estimate can include inputs from multiple sources and at differing levels of detail. Subsequent work may be initiated in the future to extend capabilities to support congressional budget requests and justifications.

OUSD(C) in conjunction with the Joint Staff (J-8) has the responsibility to develop cost estimates for contingency operations. COST is being developed to provide support for the OUSD(C), the J-8, and the Services and Agencies to improve the cost estimates for proposed contingency operations of all types. The Services and their subordinate organizations will also be able to use the tool to facilitate development of their estimates prior to submission to OSD. OUSD(C) will use COST for modeling contingency operation costs based on standard cost factors, a centralized database, and a simple user interface. Plans are underway to make the application available to all users via the Secret Internet Protocol Router Network (SIPRNet).

As a central repository of cost and other estimating factors for contingency operations, COST will be available throughout DoD for developing preliminary and subsequent final cost estimates for proposed contingency operations. As an integration tool for Service and Agency cost data, COST will provide a centralized, standardized tool for estimating contingency operations costs throughout DoD. All costs within COST will be identifiable by the specific

force unit employed or separate activities not directly linked to forces that generate costs. Examples of forces might be a light infantry battalion or a specific type of air wing or naval vessel. Activities refer to tasks not associated with specific forces such as the construction of facilities or Logistics Civil Augmentation Program (LOGCAP) operations. Associating costs with identifiable units and activities allows the user to understand the specific drivers of an operation's cost as well as providing for easy updating of costs.

The high-level Inputs and Outputs for COST are schematically shown in Fig. 2. Fig. 2 indicates the four major cost areas that comprise the inputs for COST; Personnel, Personnel Support, Operations Support and Transportation. The costs are represented using a CBS that is based on the DFAS CBS for collecting costs for Contingency Operations. This CBS was specified in a regulation by the OUSD(C), which has officially asked the Services and Agencies to coordinate on the CBS. Costs that are generated by COST are assigned to one of the CBS elements. Because COST uses a more detailed CBS for its internal calculations than will be required for reporting to DFAS, all the COST detailed elements will roll up to the (new) DFAS CBS level for reporting. The database consists of cost factors associated with the CBS elements and situational weights and management factors for personnel and equipment used to modify the cost factors. The cost output from COST will reflect the estimates of the incremental cost of the contingency operation.

Fig. 2. COST Inputs and Outputs.

Initial estimates will typically be prepared by the OUSD(C) in coordination with the J-8. The cost data will originate with the Services, Agencies, CINCs, or their subordinates. Subsequent estimates may be assembled from initial estimates to include partial estimates prepared by subordinate organizations (e.g., Major Commands and component commands) and passed to the Services, Agencies, and CINCs for review or modification. These estimates will then be passed from the Services, Agencies, and CINCs electronically to OUSD(C) via the SIPRNet to be reviewed and, potentially, further modified. (CINC representatives will be able to pass comments forward even though they will not prepare separate estimates.) OUSD(C) will ultimately be responsible for preparing the final estimate. Both proposed and accepted cost estimates will be maintained for review within the COST system. Fig. 3 illustrates these relationships.

As shown in Fig. 4, COST will allow the user to develop a cost estimate at several levels of specificity, ranging from a Rough Order of Magnitude (ROM) to very detailed costing using Time-Phased Force Deployment Data (TPFDD). Fig. 4 also shows that COST allows iterative estimation as more detailed information about the contingency operation becomes known over time.

Fig. 3. COST Concept of Operations.

Fig. 4. COST operating process.

The COST application interface will include an "Assistant" feature for guiding the user through the cost estimating process. The "Assistant" feature will provide access to a context-sensitive checklist, prompting the user for required information, and using default (but editable) assumptions for costing.

COST will also be available for the Services and their subordinates to use in their preparation of estimates and for automated transfer of their individual cost estimates to OUSD(C). Hence COST will provide a common, standard tool with a common database structure to facilitate the preparation of cost estimates for contingency operations throughout DoD.

Assumptions used for the cost estimate will be documented by the tool. Data entries will be source and time stamped. The system will provide convenient and frequent opportunities to document assumptions and will require user annotation when non-standard cost factors are used.

COST is the obvious candidate for selection as the DoD cost analysis tool. Section 3 describes the OOTW analysis requirements and the degree to which COST meets the requirements.

3. ACQUIRING OOTW COST ANALYSIS FUNCTIONALITY

Seven types of cost analysis in support of OOTWs have been identified by potential users. It is important to note that these requirements are not officially sanctioned requirements, but are the considered opinions of knowledgeable individuals concerning the general needs of DoD that include and go beyond the needs of OUSD(C). As such, they should be given the status of recommendations deserving consideration by DoD. The tool or tools needed are either spreadsheet or database tools (such as COST) that permit calculations of the appropriate costs. These tools should be developed with joint (rather than single Service or Agency) Modeling and Simulation (M&S) support to ensure the most complete coverage possible and to avoid duplication of effort.

COST is the only reasonable option for meeting these requirements; however, it has not been designed to meet all the needs at Initial Operating Capability (IOC). Several modifications and additions are suggested for inclusion in the Full Operating Capability (FOC) version. However, discussions with potential users indicate that these improvements will only yield better cost estimates if better means of defining the mission to be costed have been created.

3.1 GENERAL OOTW COST MODEL REQUIREMENTS

Seven different requirements for cost tools were identified in the MORS workshop [2]. Their object is to calculate the cost information for various aspects of OOTWs. The goal is to provide cost information on:

- 1 incremental costs of notional OOTWs, to support the long-term analysis;

(The concept is to have a simple cost model of a generic Noncombatant Evacuation Operation (NEO), a generic Freedom of Navigation (FON) operation, etc., each with only a few variables, representing cost drivers.)

(COST was not specifically designed to meet this requirement; however, COST can perform this function.)

- 2 probable incremental costs, to support the decision on engaging in a particular OOTW;

(The concept is a complete cost model that permits iterative refinements as the mission becomes increasingly well-defined.)

(COST will meet this requirement.)

- 3 relative (full) costs, to support the selection of the mission plan;

(The concept is for the model to support comparison of the costs of alternative COAs, whether incremental or full costs are required for valid comparisons.)

(COST would need to be modified to permit selection of full costs as outputs to satisfy this requirement. Such an option has been discussed and has been deferred for the time being.)

- 4 costs incurred, to support recovery of those costs from other U.S. agencies and from foreign organizations and governments;

(The concept is to ensure that all recoverable costs are identified, supporting differences in allowable cost definitions, depending on the organization paying the bill.)

(To meet this requirement, COST would need an additional database to identify allowed categories for each paying organization. COST would also have to support the capture of actual costs [requirement 7].)

- 5 incremental costs of a particular OOTW, to support the Congressional Budget process;

(The concept is to ensure that long-term, ongoing OOTWs (e.g., the Sinai Peacekeeping operation) and foreseeably repetitive OOTWs (e.g., South American counterdrug operations) are correctly budgeted.)

(COST should support this requirement at FOC.)

- 6 cumulative costs of a particular OOTW, including equipment depreciation, readiness losses, increased reserve recruitment and training costs, and perhaps other costs, to support future acquisition, budgeting and training decisions; and

(The concept is to capture the costs of replacing capabilities lost through participation in OOTWs, e.g., excess depreciation caused by excessive OPTEMPO and loss of personnel in reserve units caused by frequent call-ups.)

(To meet this requirement, fairly major modifications to COST would be needed. An alternative would be to build an external model, such as FALCON, and create an interface between the two.)

- 7 actual costs of a completed OOTW, to support improved estimates of future operations and reports to Congress on actual costs.

(The concept is to capture actual costs in accounts that can be compared to those of the forecasts, permitting improved forecasts of ongoing operations and better planning factors to generate improved future forecasts.)

(To meet this requirement, COST would need a database to contain the actual costs. The principal difficulty would be the collection process, not the modifications to COST. There are plans in place for DFAS to capture the additional OOTW costs, then to import these costs into COST for display and analysis.)

The required precision of the cost estimates may differ for differing uses. It may also be true that the size of the organization providing support (and thus being impacted by the cost) may affect the level of precision required for a given use for that organization. For example, a variation of a million dollars might be acceptable within the entire Army, but might wreak major havoc on USSOCOM. (It should be noted that COST supports this concept.)

Table 2 shows some of the information that has been identified for each of the cost analysis types in the list above. The contents of this table are preliminary and should be modified as more information is gathered. It should be noted that historical data on past OOTWs are poor at best and references to historical data should be taken to include the capture of data from ongoing and future operations to support future analyses.

Table 2. Types of Cost Analysis Required							
Attribute	Cost Analysis Type						
	1	2	3	4	5	6	7
Users	J8, PA&E, Comptroller, Services, TRANSCOM	J3, J8, Comptroller, TRANSCOM	Comptroller, CINCs, TRANSCOM, DISA, NSC	J8, OSD, Services, CINC Component Commands, TRANSCOM	Comptroller, Services, CINC Component Commands, TRANSCOM	PA&E, Services, TRANSCOM	PA&E, Services, TRANSCOM
COST will meet need	yes	yes	not planned	not planned	at FOC	no	at FOC
Priority	4	1	2	3	5	6	1
Other tools	no	no	no	no	no	expanded FALCON model	no
Done now?	yes	yes	yes, by components	yes, by components & Services	yes, by components & Services	seldom	no
Purpose	budgeting	supplemental budget requests	budgeting, relative cost effectiveness	cost recovery	budgeting	QDR, budgeting & strategy	reconciliation & database update
For whom?	OSD	Comptroller	Component Commander	Services, Dept of State, UN	Comptroller	Comptroller	Comptroller

Table 2. Types of Cost Analysis Required							
Attribute	Cost Analysis Type						
	1	2	3	4	5	6	7
Decisions based on results?	Strategy, O&M Budget	Engagement, budget strategy	Deployment force size & makeup	Requests for reimbursement	Budget makeup & strategy	Budget strategy	Improving cost system, management
Other uses	Selling usefulness of military to Congress	Selling Congress & public on engagement	no	no	unknown	impact on readiness	?
Expected accuracy	± 50%	± 35%	± 35%	± 25%	± 35%	± 50%	± 20%
Level of resolution	appropriation category	appropriation category	line item	line item	appropriation category	line item	line item
Data sources	historical OOTWs	historical OOTWs, specific crisis info	historical OOTWs, specific crisis info	costs incurred (actuals, if possible)	costs incurred (actuals, if possible)	costs incurred (actuals, if possible)	costs incurred (actuals, if possible)

3.2 SUGGESTED IMPROVEMENTS TO THE DOD COST TOOL

In downloading software and documentation from the COST web site and in exercising COST, several areas for improvement were identified and referred to IDA staff. These areas are listed below and, where appropriate, segregated by immediacy of change. COST is undergoing incremental development and is constantly updating the contents of the web site. Naturally, this results in periodic inconsistencies among COST software elements or software and documentation elements.

3.2.1 Web Site Download Issues

Early in the effort, there were some incorrectly linked items resulting in the wrong software element or document being downloaded. The download process required downloading:

Main software package	from IDA,
Report module	from IDA,
Personal Web Service (PWS)	from Microsoft, and
Object Database Connect (ODBC)	from Microsoft.

The customer who is not comfortable with web operations, personal computer configurations and data structures will be discouraged by this. (The version of COST posted on the Web on July 27, 1998 was downloaded for evaluation by the authors. This version simplified the process by combining the Reports module into the main package. Subsequently, the PWS has been omitted for security reasons.) Use of this system is far from intuitive and there appears to be little or no on-screen help. The authors will continue to communicate

difficulties encountered to the IDA staff with the intent of increasing the user-friendliness of the application and contributing to the planned Assistant feature.

Most COST customers are probably operating from versions distributed on CD-ROM and thus few have attempted to download this software from the web site. Greater exercise of the web site by the customers will improve its quality.

3.2.2 System Configuration Requirements

The system requirements of COST may be a problem to some users. The required screen resolution of 1024 x 687 is probably higher than most potential customers are now using and changing to that resolution may impact some other applications. In addition, a computer powered by an Intel 80486/66mhz and 16 MB RAM running Windows 95 is only marginally adequate: COST runs painfully slowly on such a system. As time passes and users upgrade their computers, this problem will diminish.

3.2.3 Suggested Improvements for IOC

The most important item concerns data update and maintenance. Software and manual procedures for periodic update and maintenance must be developed and defined and must be implemented as Standing Operating Procedures (SOP).

Table 3 contains several suggestions for improving COST for IOC. Many of these suggestions will have been implemented by the publication date of this report as OUSD(C) and IDA review these suggestions (and others from other sources) and determine their value (and costs).

Table 3. Miscellaneous Suggested Improvements for COST IOC
Software and manual procedures for update and maintenance of data must be developed.
Continue to make progress on unit types and echelons. As of the 5/20/98 In-Progress Review (IPR), the developer was struggling with unit types and the questions of how far down (in echelon) to go and what types are most likely. The use of Type Unit Characteristics (TUCHA) data presents problems: it is hard to group types and there is no coding/nomenclature to assist the process. Some users want to use the same unit data as Joint Staff/J-3. (Probably resolved by publication date.)
Provide for inclusion of parts of units (different routes or modes of transportation). Provide more latitude in transportation costs. COST currently estimates movement of people and equipment separately. What happens when the unit moves with its own equipment? is there a saving? (Probably resolved.)
Defaults need to be flagged as defaults. Currently, users must find the defaults in the output.
Provide a default for communications costs. Currently not handled because communications costs cannot be calculated - range too wide. (Probably resolved.)

We recommend that the COST project move forward into the second increment with maximum user involvement to accelerate the identification and improvement of characteristics supportive of the end users.

3.2.4 Suggested Intermediate-Term Improvements

Table 4 lists the three categories of intermediate-term improvements. These are described following the table.

Table 4. Suggested Intermediate-Term Improvements to COST
Refine the CBS to better reflect OOTWs.
Continue to improve available reports.
Provide for interfaces with external models.

First, the CBS needs to be refined to provide more specificity in areas that are significant for OOTWs (beyond OUSD(C) needs), the non-standard military units and actions and non-military areas that provide both positive and negative costs. These and similar changes will reduce double counting of costs where the user adds Other Costs that the default already includes. Examples include:

- include a category to deal with lost/destroyed/abandoned/donated equipment;
- provide for more subdefinition of non-combat types;
- estimate transportation costs for evacuees in NEO;
- define factors (vice various 'other' factors) to cover support to coalition, Non-Governmental Organization (NGO), media, etc.;
- define factors for expected payments from others; and
- define groupings for various partners, e.g., coalition, NGO, media, corresponding to the groupings for the Services. (The idea is not to provide cost estimates for these partners, but to segregate the assumption that some costs will be born by others, reducing DoD costs.)

Second, continue to improve available reports. For example, provide tools to create additional or user-defined output formats and provide an option to see all of the CBS, whether used or not, as reminder of other possible cost elements.

Third, provide for interfaces with external models for increased precision of detailed cost estimates. For example, interface with a transportation flow planning tool such as Joint Flow Analysis Tool (JFAST) to generate refined transportation cost estimates; interface with force definition tools to permit estimate of cost of good operational plan; and provide tools to resolve generic unit decisions with detailed tailoring.

3.2.5 Suggested Improvements for FOC

Table 5 lists the categories of suggested improvements for FOC. These categories are described following the table.

Table 5. Suggested Improvements for COST FOC	
Generate high, low and expected estimates.	
Add functionality	
	Provide for full cost as an output (requirement 3).
	Provide for segregation of recoverable costs (requirement 4).
	Support budgeting for ongoing operations (requirement 5).
	Provide for computation of cumulative costs, depreciation, readiness losses, etc. (requirement 6).
Continually improve the 'Assistant' and the user interface.	

First, improve the value of COST by extending the calculations. Generate high, low and expected estimates (variance). The variance should decline as specificity increases. Show the structural components of variance (e.g., in front-end, burn-rate of operation, back-end costs). Include an option to provide the user a list of cost drivers. There are two useful definitions of cost drivers: simple large dollar items or areas and large dollar variance items (percent variance times dollar cost). Two types of presentation are needed: CBS oriented, e.g., items or areas, and scenario oriented, e.g., population, area, or severity of damage. Variance analysis aids in showing where to increase specificity of the mission definition.

Second, extend the analytic value of COST by adding functionality.

- Provide for full or total cost as an output (requirement 3).
- Provide for segregation of recoverable costs, dependent on the organization from which the costs are to be recovered (requirement 4).
- Provide for segregation of costs to support budgeting for ongoing operations (requirement 5).
- Provide for computation of cumulative costs, depreciation, readiness losses, etc. (requirement 6), or connection to a model that does this computation.

Third, improve the usability of COST by continually improving the 'Assistant' and the user interface.

3.3 BETTER INPUT TO THE DOD COST TOOL

The essential required improvement to COST is not internal, but external. OUSD(C) has said that details are never the cause of a major mis-estimate, the fault is always caused by a

major oversight. The structural problems with the previous process are being corrected with an improved CBS and the use of a common tool and common assumptions. These actions will correct the first order problems. However, the second order problem of choosing the correct force structure to cost remains. A representative of USPACOM said that refining COST beyond IOC (third order problems) would be a waste of time, effort and money if the wrong force package is costed. The problem of major input errors is not correctable within COST: the problem lies in the fact that there is no good tool to aid in mission planning for OOTWs. Thus, producing an integrated mission planning tool (see Fig. 1) that supports planning for military assets, task organized for OOTW, rather than for combat, is a priority need. This tool would feed COST with force package data. That this tool is also needed for both deliberate and crisis action planning increases the likelihood of its creation.

4. RECOMMENDATIONS

The recommendations of this report (summarized in Fig. 5) consist of a sanctioned tool for OOTW cost analysis and further actions to be taken:

- The recommended tool is the Comptroller tool, COST. This tool promises to contain the most complete model of the cost structure for OOTWs and the best methodology for maintaining the requisite data of all tools examined.
- COST should be brought to Initial Operating Capability (IOC). At the time this report was being written, IOC had not yet been achieved; however, that status appeared to be imminent.
- The Integrated Mission Planning Tool to create the correct force structure for an operation should be created (shown in Fig. 1 and in Fig. 6). Comments from the expected users lead to the conclusion that further refinement of COST would result in a more refined estimate of the costs of imperfect operations and that further efforts should first be aimed at improving the definition of the operational forces required. Work is in progress at the time this document was being prepared that will significantly aid in defining the functional description of the Integrated Mission Planning Tool. OSD (PA&E) has commissioned IDA to prepare a detailed Interagency General Task List (IGTL) for OOTWs [Lidy, 7], and it is leading a collaborative experiment in the transportation and logistics analysis of OOTWs, using a large failed state-scenario [Brundage, *et al.*, 8]. In addition, OASD (SO/LIC) has commissioned the authors to work with the CINC analytic cells, the Services, OSD, the Joint Staff, and others to extend this work to the force definition area.
- COST should be extended to include additional functionality. Analysis of the tool has revealed several areas in which improvements could be made. Further, relatively simple extensions to the tool will support the additional functionality to respond to other cost analysis requirements.

RECOMMENDATIONS	
Tool	Actions
IDA COST	Achieve COST IOC
	Develop Correct Force Structure Input Tool
	Expand COST Functionality

Fig. 5. Recommendations.

Fig. 6. Mission Planning and Cost.

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127. Maj Philip Schlatter, US Army Chemical School, ATTN: ATZN-CMC-CA (LTC Schlatter), BLDG 1081, RM 207, Ft McClellan, AL 36205-5020
128. Dr. Bernie Schneiderman, Code D4204, SPAWAR Systems Center, 675 Lehua Ave, Pearl City, HI 96782-3356
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130. Ms. Crisanna Shackelford, Simulation & Analysis Center (OSD, PA&E, SAC), 1401 Wilson Blvd, Suite 300, Rosslyn, VA 22079
131. Mr. Ed Shapiro, USSOCOM/SORR-RCB (budget), 77-1 Tampa Point Blvd., Macdill AFB, Florida 33621-5323
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135. Ms. Elaine Simmons, OSD - PA&E/ Joint Data Support (JDS), c/o Mr. Joe Rovanseck, OSD - PA&E, 1225 Jeff Davis Hwy, Suite 300, Arlington, VA 22202
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137. Dr. Dennis Skocz, Department of State PM, 2201 C Street N.W., Washington, DC 20520
138. Mr. Matt Skoien, Office of the Secretary of Defense, Program Analysis and Evaluation (PA&E), Room 2C270, The Pentagon, Washington, DC 20301-1800
139. COL Pat Slattery, US Army War College, Center for Strategic Leadership, ATTN: COL Slattery, Carlisle Barracks, PA 17013-5050
140. Mr. Jean Smith, USA MICOM Command Analysis Directorate, Attn: AMSMI-CA-SA, Redstone Arsenal, AL 35898
141. Mr. Robert L. Smith, Raytheon E-Systems, 1725 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
142. Mr. Nat Sojourner, Joint National Test Facility (JNTF), ATTN: LTC Chris O'Connor, Deputy for Wargaming & Simulations, 730 Irwin Avenue, Falcon AFB, CO 80912-7300
143. Dr. Mike Sovereign, C/O Superintendent, Code O8 (Dr. Purdue), U.S. Naval Postgraduate School, Monterey, CA 93943-5419
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149. Mr. Tom Sweeney, US Army, AWC, Carlisle Barracks, PA 17013
150. CDR Sam Tangredi, US Navy N5, OPNAV N513, 2000 Navy Pentagon, Washington, DC 20350-2000
151. Mr. Clayton Thomas, Headquarters, US Air Force, Assistant Chief of Staff for Studies and Analyses, ATTN: AS/SAS, The Pentagon, Room 1E386, Washington, DC 20330-1570
152. Mr. John Titmas, HQ USAREUR/ODCSOPS, CMR 420, BOX 2787, APO AE 09063
153. LTC Michael Toner, US Army SAFM-BUC, 109 Army Pentagon, Washington DC 20310-0109
154. Mr. John Trifonovitch, HQ US Air Forces Europe/Warrior Preparation Center, Unit 3050, Box 20, APO AE 09094
155. Mr. Milton Tulkoff, OSD/PA&E RAMD, Room 2C270, 1800 Defense Pentagon, Washington, DC 20301-1800
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166. Dr. D. S. Hartley III
167. Mr. S. L. Packard
168. Ms. C. E. Snyder
169. Ms. S. E. Jacobsen
170. Office of the Assistant Manager for Energy Research and Development, Department of Energy, Oak Ridge Operations, P.O. Box 2001, Oak Ridge, TN 37831-8550
171. DRSD Resource Center, 1099COM, RM S07, MS7615
172. Y-12 Central File, Bldg 9711-5, MS 8169
173. Y-12 Central File, Bldg 9711-5, MS 8169 (OSTI #1)
174. ~~Y-12 Central File, Bldg 9711-5, MS 8169 (OSTI #2)~~

> both received
1 discarded