DCN 961

Office of the Deputy Under Secretary of Defense
Installations

15 T&E - 2B

BRAC Knowledge Base

BRAC 1995

Joint Cross Service-Group For Test & Evaluation

Vol. 2 of 4

Meeting Minutes

June 7 through July 26, 1994

BRAC Knowledge Base No.

RD952

CLOSE HOLD

Material contained herein is sensitive. Deputy Secretary of Defense guidance restricts the release of data or analysis pertaining to evaluation of military bases for closure or realignment until the Secretary of Defense forwards recommendations to the Base Closure Commission on March 1, 1995. All individuals handling this information should take steps to protect the material herein from disclosure.

BRAC 95
Joint Cross-Service Group on Test & Evaluation

VOLUME 2

Office of the Deputy Assistant Secretary of Defense
(Economic Reinvestment and Base Realignment and Closure)

Base Closure and Utilization
Room 3D814
(703) 697-8048/8050

CLOSE HOLD

BRAC 95
JOINT CROSS-SERVICE GROUP ON TEST & EVALUATION
VOLUME 2

BRAC 95

Joint Cross-Service Group on Test & Evaluation

Tuesday, June 7, 1994

Minutes

The fourteenth meeting of the BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. Irv Boyles chaired the meeting. The agenda, a list of attendees, and handouts are attached.

NEW BUSINESS:

Mr. Frame commented on the proposed optimization model for cross-service analysis. Discussion ensued on how the model bands sites as 3-2-1. There was concern that Services might band all their installations as 3s (high value). The Group understood that because they will determine the inputs to the model and review the results there would be sufficient oversight to preclude this from happening.

Discussion then turned to the instructions currently in draft that explain the use of the model. There was concern that the instruction portrays the model as the sole process used in the cross-service analysis. It was emphasized that the current instruction does not speak to the entire cross-service analysis process as it doesn't take into consideration military judgement or the Cost of Base Realignment Actions model. The Group was assured they would have an input to any policy or instruction related to the cross-service analysis.

The subgroup then presented the Group with a status of excess capacity methodology and projected workload methodology. The subgroup briefed on three different calculations they examined for determining excess capacity. These are Potential Excess Capacity, Historic Excess Capacity and Available Excess Capacity. The subgroup recommended the Group not use the Potential Excess Capacity calculation to determine excess capacity because the unconstrained workload was judged to be an unrealistic assessment. The Group agreed not to use the Potential Excess Capacity calculation for determining excess capacity.

The subgroup then discussed the two remaining alternatives they are examining to calculate excess capacity. The subgroup was not prepared at this time to offer a recommendation to the Group, therefore the Group agreed to have the subgroup continue working these two alternatives and report back at the next meeting.

The subgroup then informed the Group that they have not made significant progress in determining workload projections. The subgroup will continue to meet and work out issues and inform the Group of their status at the next meeting.

The subgroup then briefed they are still developing weights, measures, and methodology for determining functional value and do not have proposals to consider at this time. They will continue to work this issue.

The final discussion centered on a review of previous meeting minutes to determine if there are past issues remaining unresolved. The subgroup presented a list of potential open items. The Group reviewed the list and determined the following:

8 Feb 94: Issue: need to verify a change to the Action Plan (not using Board of Directors to review BRAC products). Although this issue was left to the discretion of the Co-Chairs, the Group agreed that there was no longer a need to use the Board of Directors to review work in progress and the Action plan would be revised to remove taskings to the Board. Action: Subgroup to submit revised action plan. (Closed)

22 Feb 94: Issue: What defense agencies conduct T&E? Should we include them in our process? Action: None. The Group agreed that the subgroup did review other defense agencies as they developed the functional categories. The Group's approval of those categories constituted acceptance of applicable defense agencies, therefore no other defense agencies need to be considered within the context of this Group. (Closed)

22 Feb 94: Issue: How do we handle evolving technologies? Action: None. Since the Group agreed to use the FYDP as the source of future requirements, the only evolving technologies that can be considered are those that are budgeted in the FYDP. (Closed)

28 Feb and 8 Mar 94: Issue: How do we project workload? No decision on workload projection? Action: Subgroup continuing to work issue. (Open)

28 Feb 94: Issue: How do we handle classified facilities? Action: Mr. Toomer agreed to raise this issue to the Steering Group at the June 6 meeting. Additionally, the Service representatives were asked to determine if classified facilities were included in the data calls. (Open)

8 Mar 94 and 15 Mar 94: Issue: Assumptions, data analysis, excess capacity determination, measures of merit and data elements. Action: Subgroup. All of the above except excess capacity determination is closed as a result of the Group's approval of guidance to the Military Departments. Excess capacity determination is ongoing by the subgroup. (Open)

15 Mar 94: Issue: This subgroup would identify a technical baseline for functions, identify a workload baseline for excess capacity analysis, and identify workload for analysis. (Open)

22 Mar 94: Issue: The Group agreed to the cross-service analysis plan presented by the subgroup. Action: Remove statement from meeting minutes. The Group agreed this was not the case as a cross-service analysis plan was to be issued by the Steering Group and is currently being developed by the same. (Closed)

22 Mar 94: Issue: Milestone Schedule. Action: Since the Steering Group determined they will develop an overarching milestone schedule that all cross-service groups can use this issue is no longer applicable. (Closed)

22 Mar 94: Issue: Workload, excess capacity analytical process. Action: Subgroup. These two items are currently being developed by the subgroup. (Open)

OLD BUSINESS:

The issue from the last meeting on membership listings was raised. The Group recognized this issue is still open and members are in the process of refining their listing of attendees. (Open)

There being no other items for discussion, the meeting adjourned at 1020.

Approved: L H Frame
Lee Frame
Co-Chairman

16 JUN 1994

I E Boyles
Irv Boyles
Acting Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test & Evaluation

June 7, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. Irv Boyles, Acting Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
LTG (Ret) Howard Leaf, Air Force
Mr. Parker Horner, Air Force
Mr. Doug Nation, Air Force
Mr. Dan Stewart, Air Force
Lt Col Mark Bruggemeyer, Air Force
Lt Col George London, Air Force
Mr. Joe Dowden, Air Force
Mr. Gary Holloway, Army
Mr. Tom Roller, Army
MAJ Essex Fowlkes, Army
MAJ Jack Marriott, Army
Mr. Gerald Schiefer, Navy
Mr. Don DeYoung, Navy
CDR Mark Samuels, Navy
Ms. Kathleen Ruemmele, BMDO
Mr. Mike McAndrew, ODASD(ER&BRAC) BCU
Mr. Mark Flohr, OSD DNA
Mr. Joe Moore, OSD OT&E
Mr. Dave Vincent, DoD IG
Mr. Frank Lewis, OSD PA&E

BRAC 95
T&E Joint Cross-Service Group Meeting
0900, Tuesday, 7 June 1994
Conference Room, 1C730, Pentagon

Agenda

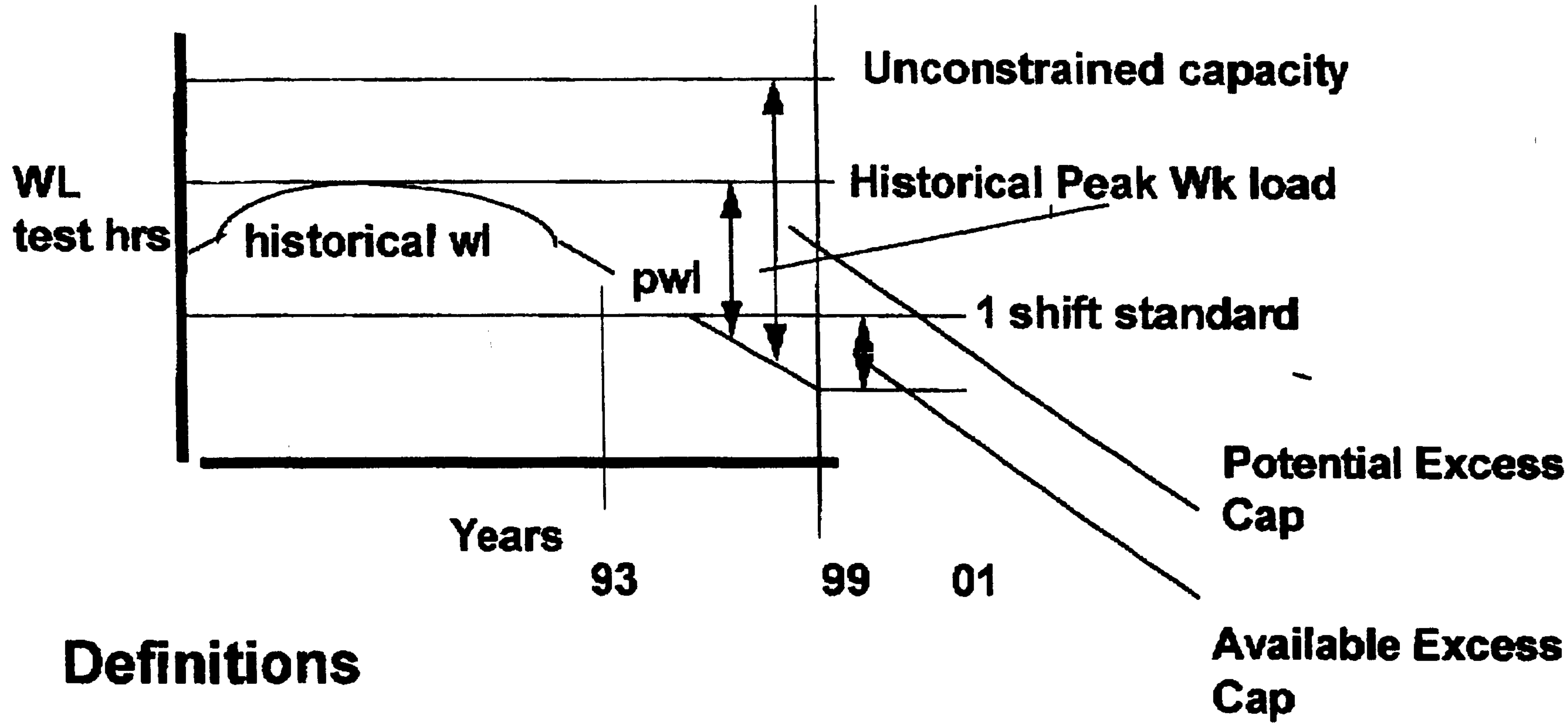
- *Opening Remarks*
- *Working Group Status Report*
- *Assessment of Previous Minutes for Unclosed Actions*
- *Discussion of Joint Cross-Service Analysis Process*
- *Action Items / Wrap Up*

Working Group Status

- Excess Capacity Analysis
- Workload Projections
- Functional Values

FOR OFFICIAL USE ONLY

Capacity Analysis 6 June 94



Definitions

Potential Excess Cap (surge) = UC - Projected WL
Available Excess Cap = 1 shift standard - Projected WL
Historical Excess Cap = Peak Workload year - Projected WL
Max Throughput = Unconstrained capacity

Capacity Recommendations

- Do Not Use Potential Excess Capacity

- Continue Resolution of Excess Capacity Methodology

  - Available Excess Capacity
  - Historical Excess Capacity
  - Other

Functional Values

- Continuing to Develop Scoring Scheme for Quantifying Data Call Questions

- Looking for Other Methods that Allow us to Focus More Quickly and Simply

Workload Projections

- Agreement to Date
  - FY92/93 Base for Workload and Funding
  - Projection Index = (FY92/93 WL) / (FY92/93 $)
  - Projections = (Future Year $) X Index
  - FY00, FY01 Same as FY99
- Under Discussion
  - Weighting RDTE vs Procurement

Potential Excess Capacity (PEC)
[UC - PWL]

Advantages:

1. PEC provides an estimate of the maximum output capacity of a facility given the existing infrastructure and assuming manpower and consumable supplies are unlimited.

2. PEC may identify the greatest number of potential opportunities for realignment, consolidation and closure

Disadvantages:

1. PEC utilizes the Unconstrained Capacity calculation which could present an unrealistically large capacity picture. This creates the potential for undue audit attention (i.e.: GAO) if taken out of context. Misuse of results by auditors/reviewers could result in charges of not taking full advantage of the opportunity presented. This approach, which employs a derived estimate, may not be as defendable as historical workload data:

   a. PEC utilizes the Unconstrained Capacity calculation which is driven by facility downtime rather than personnel staffing. This artificially drives the "maximum" through-put and does not necessarily optimize personnel workload.

   b. The Unconstrained Capacity calculation does not automatically adjust for increased downtime due to increased usage. If the Unconstrained Capacity worksheet is not filled out correctly, there exist a strong potential that activities will not adjust their current downtime to reflect an estimated three shift operation. This will inflate the potential capacity.

   c. Three shift operation for most T&E facilities is unrealistic.

2. PEC does not ensure retention of surge capability for mobilization purposes.

MINUTES REVIEW

1 Feb	No unresolved issues
8 Feb	Need to verfiy a change to the Action Plan (Not using BoD to review BRAC products)
15 Feb	No unresolved issues
22 Feb	Open - What defense agencies conduct T&E? Should we include them in our process?
	Open - How do we handle evolving technologies?
28 Feb	Open - How do we project workload?
	Open - How do we handle classified facilities?
8 Mar	Open - No decision on workload projection.
	Open - Assumptions, data analysis, excess capacity determination, measures of merit, and data elements
15 Mar	Open - Workload, excess capacity determination, utilization
	Open - This subgroup would identify a technical baseline for functions, identify a workload baseline for excess capacity analysis, and identify workload for analysis
22 Mar	Open - The Group agreed to the cross-service analysis plan presented by the subgroup
	Open - Milestone schedule
	Open - Workload, excess capacity analytical process

NOTE: The minutes of each meeting must include all briefing slides presented as an attachment.

DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20350-1000

MM-0209-F4
BSAT/MS
9 June 1994

MEMORANDUM FOR THE CO-CHAIRMAN, T&E JOINT WORKING GROUP

Subj: NAVY REPRESENTATIVES FOR T&E CROSS-SERVICE EFFORTS

As requested in the 31 May 1994 T&E Cross-Service Working Group meeting, the following information is submitted to satisfy the DOD BRAC Internal Control Plan requirements to notify the OSD BRAC Steering Group of all Navy personnel working in the T&E Cross-Service area.

As specified in previous letters, all Navy personnel involved in the Joint Working Groups are members of the Navy BRAC team. The Navy BRAC team members were selected by the Under Secretary of the Navy, to encompass the expertise required to make the technical and operational recommendations for the BRAC process.

Mr. Gerald Schiefer continues to be the Navy's Principal to the T&E Joint Working Group. His Alternate is CAPT Dave Rose. In addition to these two personnel, CDR Mark Samuels, Mr. Don DeYoung, Mr. Dave Wennergren and Dr. Ron Nickel will provide support in sub-group activities, and other efforts as required.

CDR Samuels will be the Principal for Cross-Service Optimization Model and COBRA Model operation. Mr. DeYoung will be the Alternate. Dr. Nickel and Mr. Wennergren will provide technical oversight and assistance for these model operations as required and ensure coordination with all other Navy efforts associated with other Cross-Service Working Groups.

As was discussed during the Steering Group meeting of 8 June 1994, we share the OSD concern with the potential for predecisional public disclosures which open avenues for challenges as well as outside comment on what is an internal process before decisions are announced by the Secretary of Defense. Lack of controls over access to efforts and continually changing participants will greatly contribute to this problem.

C. P. NEMFAKOS
Vice Chairman,
Base Structure Evaluation Committee

TOTAL P.02

BRAC 95

Joint Cross-Service Group on Test & Evaluation

Tuesday, June 14, 1994

Minutes

The fifteenth meeting of the BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. John Burt chaired the meeting. The agenda, a list of attendees, and handouts are attached.

NEW BUSINESS:

The meeting began with an update on the June 8 Steering Group meeting. The first discussion pertained to the agreements reached by the Military Departments on cross-service analyses. Three specific agreements were that the analyses would be based on Joint Cross-Service Group instructions, the Tri-Department teams from the Military Departments BRAC offices will conduct the analyses, and the optimization model is a tool to help the JCSGs. The optimization model will be run at least twice--unconstrained based on JCSG functional data and constrained based on Military Department installation military value. Other agreements reached are the optimization model runs would be in September and JCSG alternatives for Military Department consideration would be finalized in October.

The next discussion turned to four unresolved issues introduced to the Steering Group: What role should installation military value play in the model; how many objective functions the model would solve; should the model output include sensitivity analysis; and, will use of the model be mandatory. The Steering Group discussed the roles of installation military value in the model. One point was that it was not needed since installation military values are not comparable. The other point was that in practical terms it would be difficult to exclude it from consideration. The Steering Group generally agreed that the model will solve for multiple objective functions, will include sensitivity analysis and we should consider making it mandatory for all JCSGs. No decision was reached on any unresolved issue and in particular on the use of installation military value in the model.

The last discussion on the Steering Group meeting centered on what needs to be accomplished next. The Steering Group perceived the next steps to be to hammer out issues on what model will be used (a Navy or Air Force proposal), conduct training for JCSGs on how the model works, ensure JCSGs begin developing excess capacity and functional value methodologies (as well as methodology for using the model), have a Steering Group team review these methodologies with JCSGs, have the Steering Group approve the methodologies, and then and only then have the Military Departments send the JCSGs data inputs from the data calls.

There was considerable discussion within the Group on ensuring the optimization model would have all objective functions defined that each of the JCSGs would need. As part of the training the Group would receive on the model, notional data runs would be performed to help determine if objective functions need to be added. It was also pointed out that joint optimization model training with the Laboratory JCSG would be beneficial since the labs and T&E functions in some categories are so closely related. It was suggested that there may be a need to run joint optimization model runs with the Lab JCSG for this same reason.

The meeting then turned to the subgroup to update the Group on capacity, workload projection and functional value. Discussion ensued on the terminology used by the subgroup in their slides. They stated the names may change as definitions are finalized to more accurately portray the term. One example was the term "surge" used differently in two places. The subgroup then briefed the Group on the definitions of the different capacity terms and the factors that make up the calculations.

Discussion then ensued on the pros and cons of Historical Excess Capacity (HEC) and Available Excess Capacity (AEC). Upon completion of this discussion the Chairs asked the Group members to discuss their support for a capacity methodology. Members' comments ranged from HEC not sustainable to HEC not being the best estimate of capacity. The Group then agreed that AEC would be used as the excess capacity methodology realizing there will be circumstances where judgement will need to be exercised where facilities are on more than a single shift.

As a result of using AEC, the Group discussed how to define a single shift which is a component of the AEC calculation. The subgroup developed 2008 test hours as a workyear standard. However, the Depot Maintenance JCSG uses 1615 hours and the Laboratory JCSG is using approximately 2080 hours. Discussion ensued on which might be the better figure to use. The Group agreed to use 2008 test hours as the workload standard because it more accurately reflects the workload based on facility capacity rather than the Depot's figure which is more of an personnel capacity measurement.

The Chairs then discussed the next actions the subgroup needed to pursue. These are to define the objective functions that would be required by this Group to incorporate or ensure are already incorporated in the optimization model and the development of an action plan that ties together the excess capacity, functional value, and optimization model methodologies. These will need to be completed by the next meeting for JCSG approval in order to brief the Steering Group Chairman at meeting to be determined shortly after June 24th.

The Chairs also expressed their strong desire to obtain a copy of the optimization model so the subgroup can familiarize themselves with the model. Money is not to be an obstacle. Mr. Boyles stated he would take the lead on this.

OLD BUSINESS:

One issue raised from last meeting dealing with the rewrite of the Action Plan was examined by the subgroup. It was determined that references to what the T&E Board of Directors will do for the Group were general enough that it does not require alteration.

The Army provided a list of their membership to the JCSG and subgroups. Still pending are Air Force, Navy and Defense Agencies. (Open)

There being no other items for discussion, the meeting adjourned at 1056.

Approved: Lee Frame, Co-Chairman

John Burt, Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test & Evaluation

June 14, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Burt, Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
LTG (Ret) Howard Leaf, Air Force
Mr. Parker Horner, Air Force
Mr. Doug Nation, Air Force
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Mr. Irv Boyles, OSD T&E
Mr. Jim Thomas, OSD OT&E
MAJ Robin Pope, OSD DR&E
Mr. Jim Churchill, OSD DR&E
Mr. Dave Vincent, DoD IG

BRAC 95
T&E Joint Cross-Service Group Meeting
0900, Tuesday, 14 June 1994
Conference Room, 1C730, Pentagon

Agenda

- Opening Remarks
- Steering Group Meeting Report / Discussion of Near Term Requirements
- Working Group Status Report
- Open Issues
- Action Items / Wrap Up

Cross-Service Analyses

Agreements Reached

- Military Departments will jointly conduct analyses
  - ✦ Based on instructions from Joint Cross-Service Groups
  - ✦ Tri-Department teams from Military Department BRAC offices will conduct analyses
  - ✦ Military Departments propose using an optimization model (linear solver) as a tool to help JCSGs
- Optimization Model would be run at least twice
  - ✦ Unconstrained based on JCSG functional data
  - ✦ Constrained based on Military Department installation military value
- Optimization model runs would be in September
- JCSG additional alternatives for Military Department consideration would be finalized in October

Cross-Service Analyses

* Bob Bayer said he really considers these resolved in favor of the second alternative in each case.

Issues Unresolved

- **What role should installation military value play in model**
  - ✦ Use when running constrained model, or
  - ✦ Not needed as they are not comparable
- **How many objective functions model would solve**
  - ✦ One - i.e. maximize reduction in excess capacity, or
  - ✦ Multiple - i.e. minimize sites, maximize values, etc.
- **Model output to include sensitivity analysis?**
  - ✦ Not required, or
  - ✦ Yes, will aid JCSG's in developing alternatives
- **Use of model**
  - ✦ Optional for each JCSG, or
  - ✦ Mandatory

Cross-Service Analyses

Next Steps

- Hammer out issues
- Conduct training for JCSG's on how model works - run model on notional data
- JCSG's develop methodologies for inputs to model
  - Excess Capacity
  - Functional value
  - Methodology for decisionmaking (rules for model)
- Steering Group team reviews methodologies with JCSG's
- Steering Group approves methodologies
- JCSG's receive data inputs from Military Departments

T&E JOINT WORKING GROUP STATUS
14 June 1994

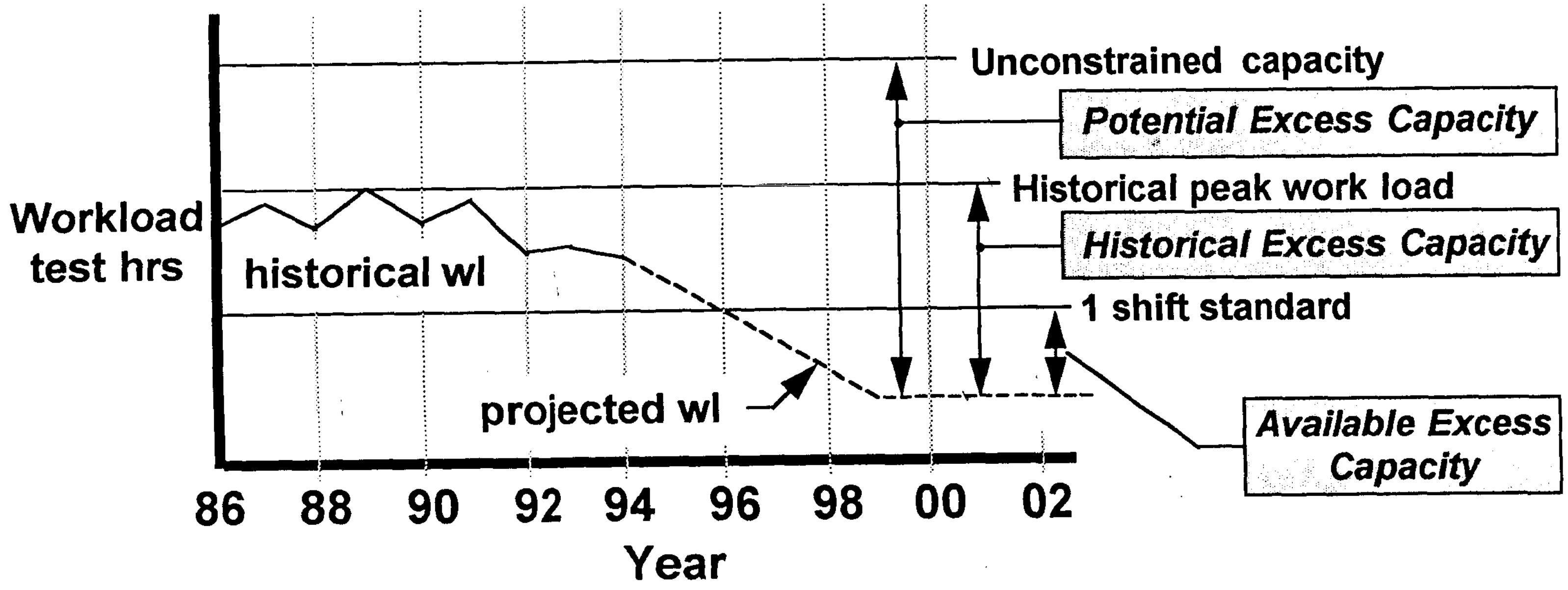
- T&E JWG Briefing Agenda

  -Capacity

  -Workload Projection

  -Functional Value

Capacity Analysis



Definitions

Potential Excess Cap (surge) = UC - Projected WL
Available Excess Cap = 1 shift standard - Projected WL
Historical Excess Cap = Peak Workload year - Projected WL
Max Throughput = Unconstrained capacity

T&E JWG STATUS
Capacity

- **DEFINITIONS**

UC - Unconstrained Capacity: Line defined by the Unconstrained capacity calculation. UC represents the theoretical maximum capacity of a facility given its existing infrastructure assuming that manpower and consumable supplies are unlimited

SS - Single Shift: Line defined by multiplying the total workload per facility hour (sum of col. #7 of UC worksheet) by 2008 hours. SS represents an estimated single shift operation for the facility based on its response to the UC worksheets.

T&E JWG STATUS
Capacity

- **DEFINITIONS (CONT)**

HW - Historical Workload: Curve defined by the historical workload as reported by each facility. Represents the workload that the facility actually achieved in each year.

HP - Historical Peak: Line defined by the maximum single year workload achieved by the facility as shown on the HW curve. Represents the maximum demonstrated capacity of that facility for the resource constraints existing within the time period reported.

T&E JWG STATUS
Capacity

- **DEFINITIONS (CONT)**

PWL - Projected Workload: Workload requirements projected to FY-2001

HEC - Historical Excess Capacity: HP-PWL

AEC - Available Excess Capacity: SS-PWL

PEC - Potential Excess Capacity: UC- PWL

SC - Surge Capacity: UC - {HP or SS}

T&E JWG STATUS
Capacity

- **Excess Capacity is defined by either:**

Historical Excess Capacity = Historical Peak - Project Workload

or

Available Excess Capacity = Single Shift standard - Proj. WL

T&E JWG STATUS
Capacity (Cont.)

- **HISTORICAL EXCESS CAPACITY**

PRO'S

1. HEC provides excess capacity based on demonstrated performance, not estimated performance.

2. By using historical workload, HP presents an achievable capacity that may not require infrastructure enhancements

CON'S

1. HP is a measure of workload completed and does not necessarily capture or reflect facility capacity.

2. The infrastructure that achieved HP may not reflect current infrastructure. It does not reflect programmed infrastructure.

3. Although HP represents a full years operation, it may not be sustainable for multiple successive years

T&E JWG STATUS
Capacity (cont.)

- **HISTORICAL EXCESS CAPACITY (CONT.)**

PRO'S

3. In utilizing historical (test hours) workyear data, HEC is consistent with the approach being utilized by the Lab. JWG.

4. HEC ensures retention of a surge capability during mobilization contingencies.

5. HEC compares facilities based on whatever shift scheme has been utilized.

CON'S

4. HEC does not normalize facility capacity across all three military departments.

T&E JWG STATUS
Capacity (cont.)

- **AVAILABLE EXCESS CAPACITY**

PRO'S

1. AEC provides an estimate of excess capacity and will not require infrastructure enhancements since based on existing infrastructure.
2. AEC normalizes excess capacity data across all military departments
3. AEC is consistent with DoD single shift standards which is used by the Depot JWG (Depot group specifically asked for single shift data)
4. AEC ensures retention of a surge capability during contingencies.

CON'S

1. SS is an estimate versus demonstrated data.
2. AEC assumes downtime can be accommodated outside of the single shift standard.
3. Some facilities may not be optimized by a single shift standard.
4. AEC does not reflect programmed infrastructure changes.

T&E JWG STATUS
Capacity (cont.)

- JWG UNABLE TO REACH CONSENSUS ON WHICH EXCESS CAPACITY TO USE

-Historical vs Available

- **JWG REQUESTS JCSG TO DECIDE AND PROVIDE GUIDANCE**

T&E JWG STATUS
Planned Activities

- **Planned Activities 14-21 June 94**
  - Complete Workload Projection Methodology
  - Formulate Target Reduction Methodology
  - Strawman for Functional Value

T&E JWG STATUS
Capacity (cont.)

Single Shift Standard

Workyear standard (test hours)

T&E - 2008 hrs, 8 hrs, 5 day, 52 weeks, less 10 holidays

Depot- 1615 hrs (DoD Standard), same as above - vacations

HISTORICAL WORKLOAD

Facility/Capability Title: ____________________

T&E FUNCTIONAL AREA		FISCAL YEAR 86	87	88	89	90	91	92	93
AIR VEHICLES	DIRECT LABOR								
	TEST HOURS								
	MISSIONS								
EC	DIRECT LABOR								
	TEST HOURS								
	MISSIONS								
ARMAMENT/WEAPONS	DIRECT LABOR								
	TEST HOURS								
	MISSIONS								
OTHER T&E	DIRECT LABOR								
	TEST HOURS								
	MISSIONS								
OTHER	DIRECT LABOR								
	TEST HOURS								
	MISSIONS								

DETERMINATION OF UNCONSTRAINED CAPACITY

FACILITY/CAPABILITY TITLE: ______________________

ANNUAL HOURS OF DOWNTIME	1 ______
AVERAGE DOWNTIME PER DAY (LINE 1 ÷ 365)	2 ______
AVERAGE HOURS AVAILABLE PER DAY (24-LINE 2)	3 ______

TEST TYPES	TESTS AT ONE TIME	WORKLOAD PER TEST PER FACILITY HOUR	WORKLOAD PER FACILITY HOUR	UNCONSTRAINED CAPACITY PER DAY (LINE 3 x TOTAL Σ)
4	5	6	7	8 ______
______	______	______	______	
______	______	______	______	
______	______	______	______	ANNUAL UNCONSTRAINED CAPACITY
______	______	______	______	9 ______
______	______	______	______	
"TYPICAL" ______	______	______	______	
		TOTAL Σ	______	

DEPARTMENT OF THE ARMY
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C. 20310-0102
7 June 1994

SAUS-OR

MEMORANDUM THRU DACS-TABS

FOR DIRECTOR, TEST AND EVALUATION

SUBJECT: Army T&E Joint Cross-Service Group

The services have identified principals for the T&E JCSG membership. The JCSG members have support teams to jointly work issues associated with BRAC T&E inputs. My T&E JCSG support team members are:

MAJ Essex Fowlks	Mr. John Gehrig	Mr. Raymond Wagner
Mr. Tom Roller	Mr. Gary Holloway	

The T&E JCSG workload projection and excess capacity sub-working group members are:

Mr. Gary Holloway	MAJ Essex Fowlks	Mr. Tom Roller

As needed, technical experts will be called in to provide specific requirements in support of the BRAC process.

Request you endorse these individuals as members of the Army BRAC team.

Point of contact for this action is MAJ Essex Fowlks, 695-8995.

for
Walter W. Hollis
Deputy Under Secretary of the Army
(Operations Research)

CF:
DOT&E

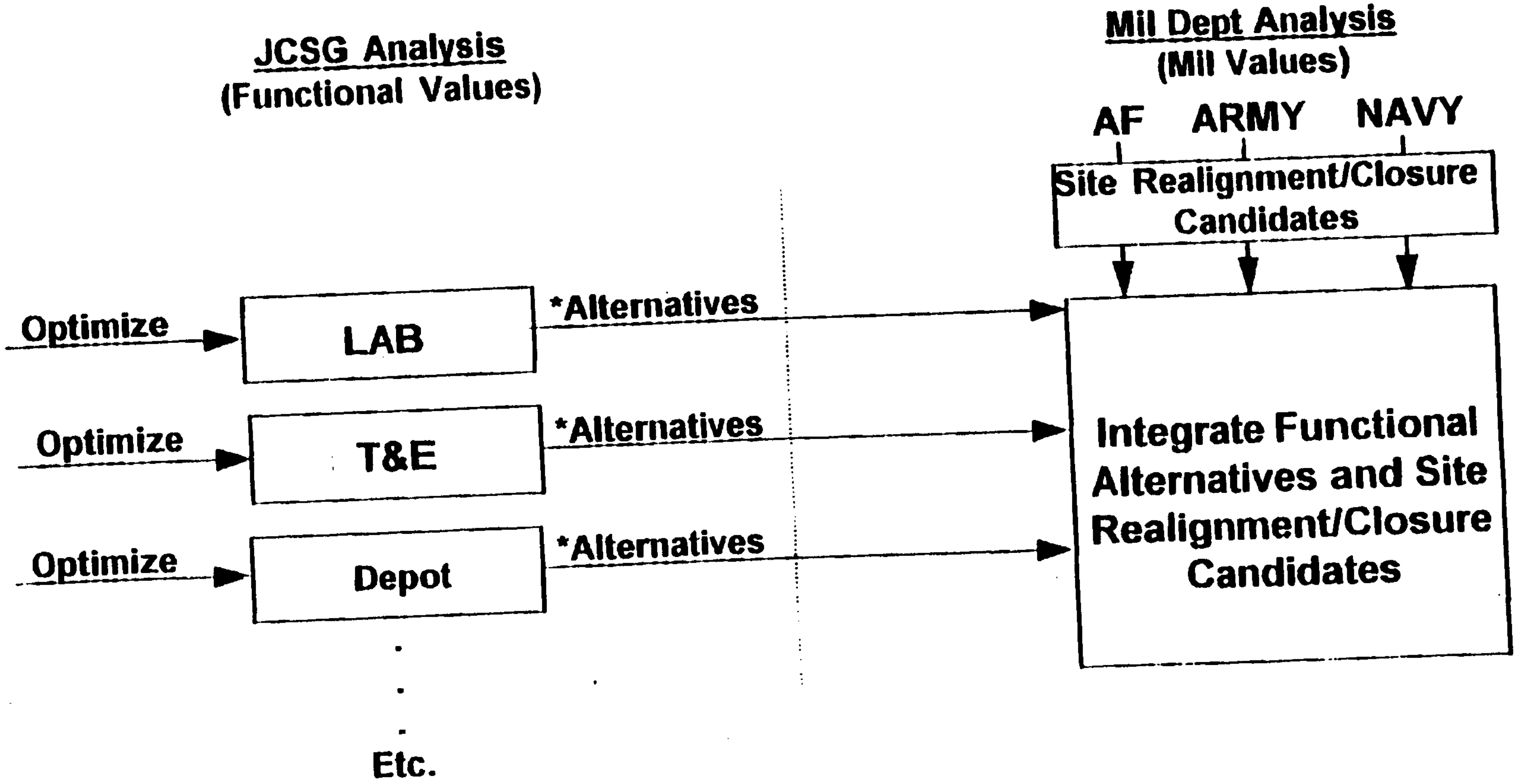
DEP SECDEF JSCG TASKING (7 JAN 94)

- **ANALYZE CROSS-SERVICE TRADEOFFS**

- **DEVELOP ALTERNATIVES AND EXCESS CAPACITY TARGETS FOR <u>CONSIDERATION</u> BY THE SERVICES IN THEIR MILITARY DEPARTMENT ANALYSES**

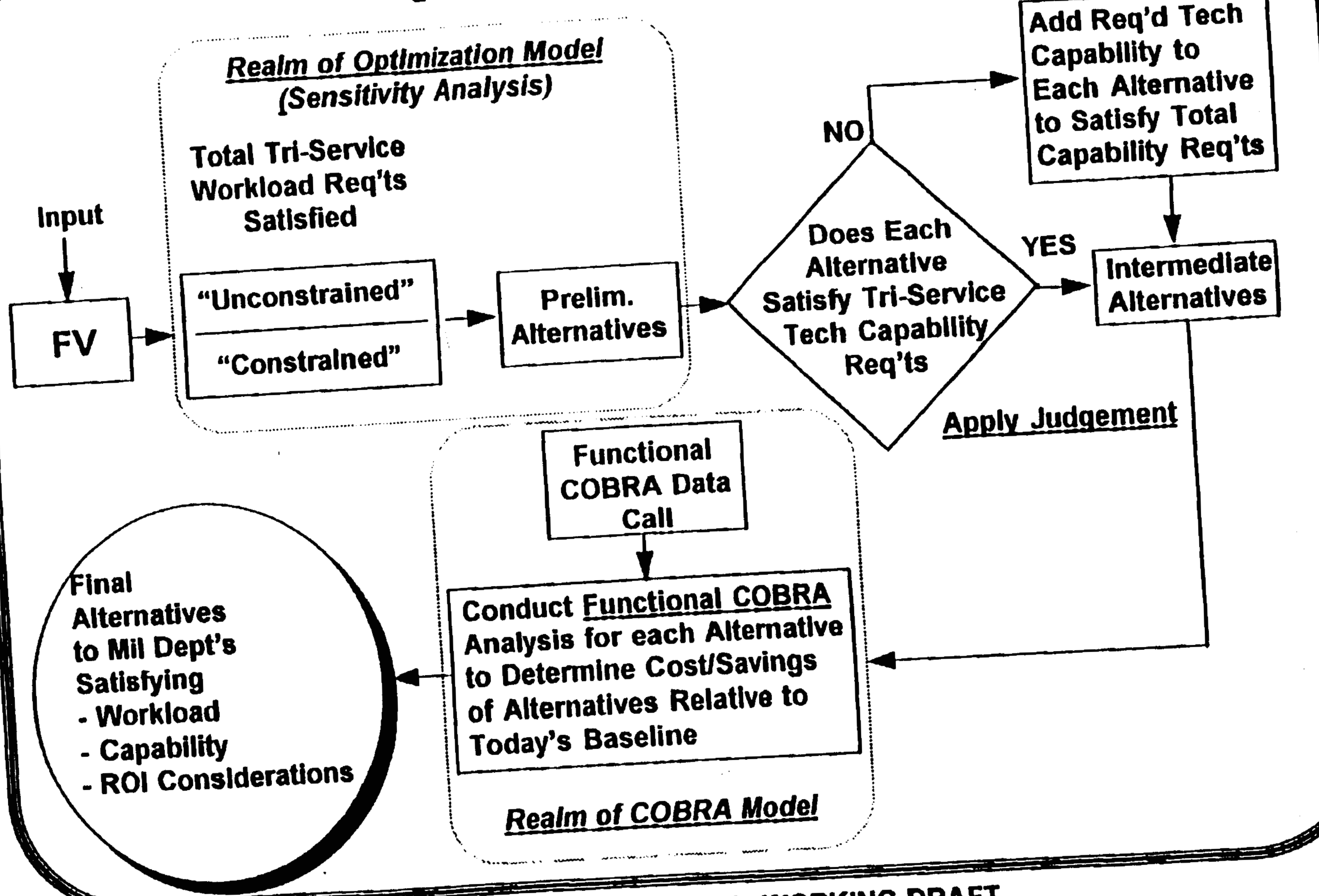
- **USE TRI-SERVICE TEAM TO CONDUCT ANALYSIS**

TRI-DEPT BRAC ANALYSIS PROCESS

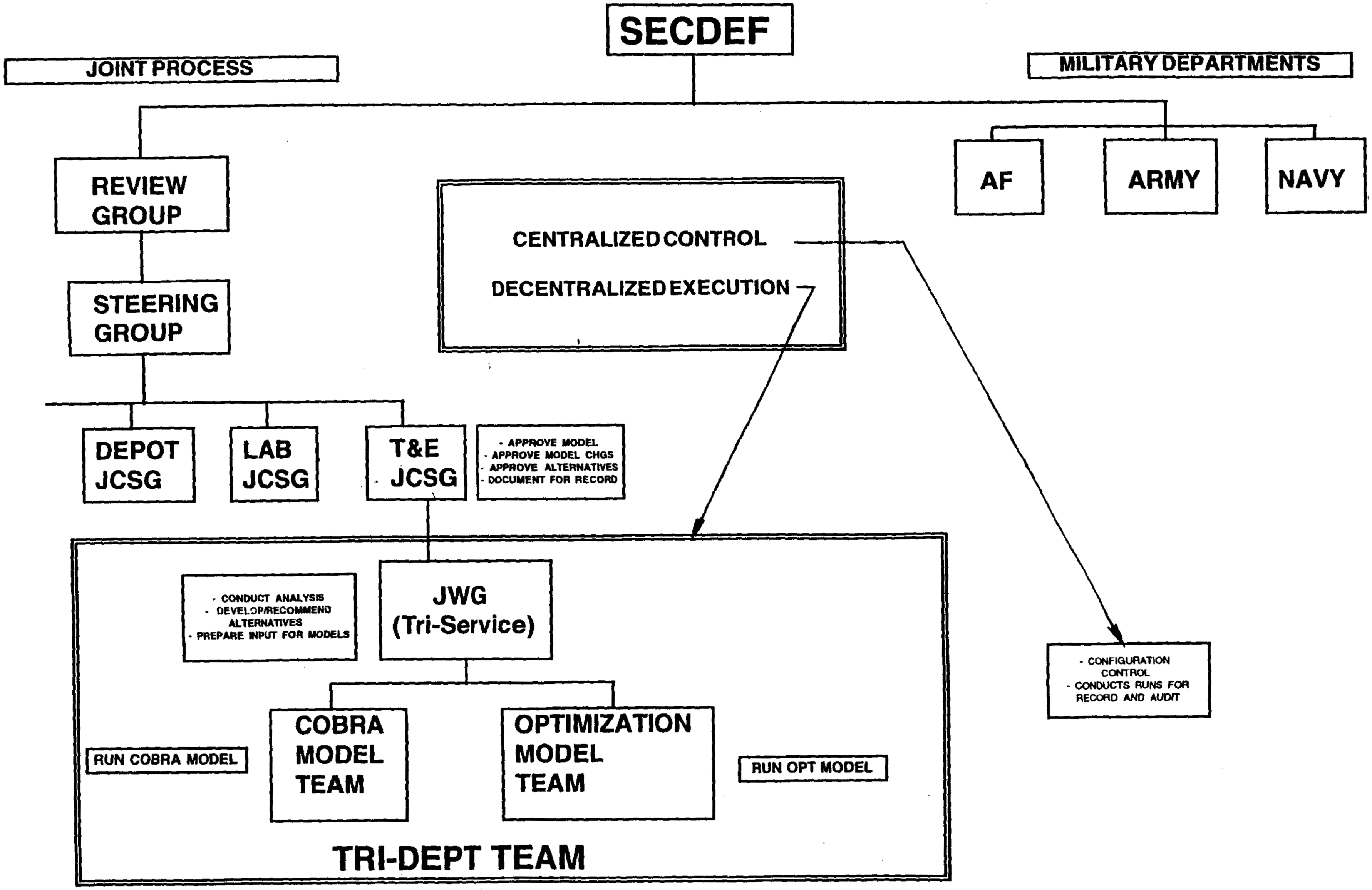


* For Each Alternative
- Satisfy Excess Capacity Targets
- Satisfy Tri-Service Technical Capability Requirements
- Reduce Functional Cost for Accomplishing Tri-Service Req'ts (Workload & Technical Capability) Relative to Today's Cost

JCSG ANALYSIS PROCESS



PROPOSED ANALYSIS TEAM STRUCTURE



BRAC 95

Joint Cross-Service Group on Test & Evaluation

Tuesday, June 21, 1994

Minutes

The sixteenth meeting of the BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. John Burt chaired the meeting. The agenda, a list of attendees, and handouts are attached.

NEW BUSINESS:

The meeting began with a review of documentation that outlines the tasks to be completed by the Joint Cross Service Group (JCSG). There was considerable discussion on what constitutes analysis and what role the JCSG will play in the analysis. Specifically, the January 7, 1994, kick-off memo under the heading <u>BRAC 95 Joint Cross-Service Groups</u> states that the JCSGs will "analyze cross-service tradeoffs." After spirited discussion on what constituted analysis, the Group understood the Military Departments will conduct the analyses as defined by the Group in their guidance to the Military Departments. Furthermore, it was explained that the Tri-Department BRAC Group that will run the optimization model for the JCSGs will be appointed by the Military Departments and will receive inputs for running the model from the JCSGs. The Tri-Department BRAC Group will then return the output of the runs to the Group where it will be reviewed as part of developing alternatives for further analysis.

The subgroup then provided a status of their work on workload projection methodology. Three alternatives for calculating future workload were discussed. They are: Individual PE Method, Weighted TOA Method, and Total TOA Method. After defining each methodology, discussion ensued on the advantages and disadvantages of each method. The Group agreed to use the Total TOA Method to determine future workload. The Chairmen asked the subgroup to perform a sensitivity analysis on this method to ensure it will provide realistic workload levels.

The subgroup then discussed their progress on functional value analysis. The subgroup stated that they are working toward a method that incorporates modeling tools currently used by the Military Departments into a consolidated methodology for determining functional value. The subgroup estimated that they will complete the functional value framework by July 12. Discussion ensued about deadlines on the milestone charts after July 1. There was concern that deadlines after July 1, the established time for Services to release data to the JCSGs, would take valuable analytical time away from JCSGs. The Group agreed that all July 12 deadlines need to be accelerated to July 5 and asked the subgroup to rework the schedule to make this happen. On June 28, the Chairmen will be briefing the Assistant Secretary of Defense (Economic Security) on how the Group anticipates using the optimization model. Therefore, the Chairmen decided the deadline for the functional value framework will be due at the next meeting (June 28).

The subgroup then briefed the Group on the excess capacity reduction target methodology. Mr. Burt was concerned that in some cases there will be instances where a facility will show a negative excess capacity because of the nature of the testing. He wanted to ensure there is some way to capture these anomalies into our Action Plan so that we don't end up making a decision to increasing a facility that shows a negative capacity when as it normally operates. The Group decided to accept the reduction target constraints proposed by the subgroup and add a fourth reflecting Mr. Burt's concerns.

Discussion then turned to the testing of the optimization model. Some concerns arose that the objective functions are not performing as they should. The meeting on June 28th with Mr. Gotbaum, the ASD(ES), is supposed to highlight these type of problems with the optimization model. However, everyone was cautioned that before these problems are elevated they need to be run through Mr. Ron Nickel of Navy BSAT to ensure the model is being correctly utilized. The Chairmen reiterated the need for a crisp assessment of the model and encouraged the Laboratory JCSG be brought on-line in this assessment since the June 28th meeting will discuss the potential for joint optimization runs.

The final discussion centered on the use of IDA office space to house the T&E subgroup during the analytical phase. A proposed floor plan was introduced along with a request for minor construction (knock down some walls, put up security walls, etc.). The Chairmen agreed to the plan and funding and a requirements listing for construction will be handed to Mr. Bolino as soon as possible. The subgroup was reminded that the more construction asked for will delay the subgroup from going in and working. They were asked to keep the construction to the absolute minimum. Depending on manning of the office space, there may be room to house the Laboratory subgroup for joint analysis. This will be determined later once a final floor plan is worked out and members to the T&E subgroup are named.

OLD BUSINESS:

The Navy provided a list of their membership to the JCSG and subgroups. Still pending are listings from the Air Force and Defense Agencies. (Open)

There being no other items for discussion, the meeting adjourned at 1111.

Approved:

Lee Frame
Co-Chairman

John Burt
Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test & Evaluation

June 21, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Burt, Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
Mr. John Bolino, Co-Study Team Leader
LTG (Ret) Howard Leaf, Air Force
Mr. Parker Horner, Air Force
Mr. Dan Stewart, Air Force
Mr. Joe Dowden, Air Force
Mr. Doug Nation, Air Force
Lt Col George London, Air Force
Mr. Walt Hollis, Army
Mr. Gary Holloway, Army
MAJ Essex Fowlks, Army
MAJ Jack Marriott, Army
Mr. Gerald Schiefer, Navy
CAPT Dave Rose, Navy
Mr. Don DeYoung, Navy
CDR Mark Samuels, Navy
Mr. Mike McAndrew, ODASD(ER&BRAC) BCU
Mr. Mark Flohr, OSD DNA
Mr. Jim Thomas, OSD OT&E
Mr. Dave Vincent, DoD IG
Ms. Jeanne Karstens, OSD Comptroller

DDR&E [redacted] TEL: 703-695-7042 Dec 23,93 16:0 No.006 P.02

Schiefer

ECONOMIC SECURITY

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3300 DEFENSE PENTAGON
WASHINGTON, DC 20301-3300

EXECUTIVE SUMMARY

MEMORANDUM FOR DEPUTY SECRETARY OF DEFENSE

THROUGH: UNDER SECRETARY OF DEFENSE (ACQUISITION AND TECHNOLOGY)
PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION AND TECHNOLOGY)
PRINCIPAL DEPUTY ASSISTANT SECRETARY OF DEFENSE (ECONOMIC SECURITY)

FROM: DEPUTY ASSISTANT SECRETARY OF DEFENSE (ECONOMIC REINVESTMENT AND BASE REALIGNMENT AND CLOSURE)
Prepared by: Doug Hansen/BCU/x45356/931212

SUBJECT: BRAC 95 "Kick-Off" Memorandum

PURPOSE: ACTION--To provide guidance and direction necessary to start the BRAC 95 process.

DISCUSSION: The memorandum at TAB A formally begins the BRAC 95 process by supplying policy and procedural guidance and direction. The kick-off memorandum incorporates recommendations for a new way of analyzing depot maintenance, laboratories, test and evaluation, graduate medical education and undergraduate pilot training which should increase opportunities for base closures and realignments resulting from cross-servicing. This new process was agreed to by the Secretaries of the Army and Air Force, Under Secretary of the Navy and key OSD leaders in a recent BRAC 95 principal's meeting chaired by the USD(A&T) on November 30. The new process would direct (1) joint groups to develop policy for analyses; (2) Military Departments to collect and analyze data; (3) Military Departments to make recommendations to SecDef; (4) a BRAC 95 review group chaired by the USD(A) to review the overall process. Your November 10, 1993, Program Decision Memorandum directed that the BRAC 95 kick-off memorandum be issued by December 15, 1993.

decis

COORDINATION: The memorandum has been fully coordinated. Comments received have been incorporated as appropriate (TAB B).

RECOMMENDATION

That you sign the memorandum at TAB A beginning the BRAC 95 process.

since the relevant commission recommendation was made. Documentation for such changes must involve clear military value or significant savings, and be based on the final criteria, the force structure plan and the policy guidance for the BRAC 95 process.

Authorities

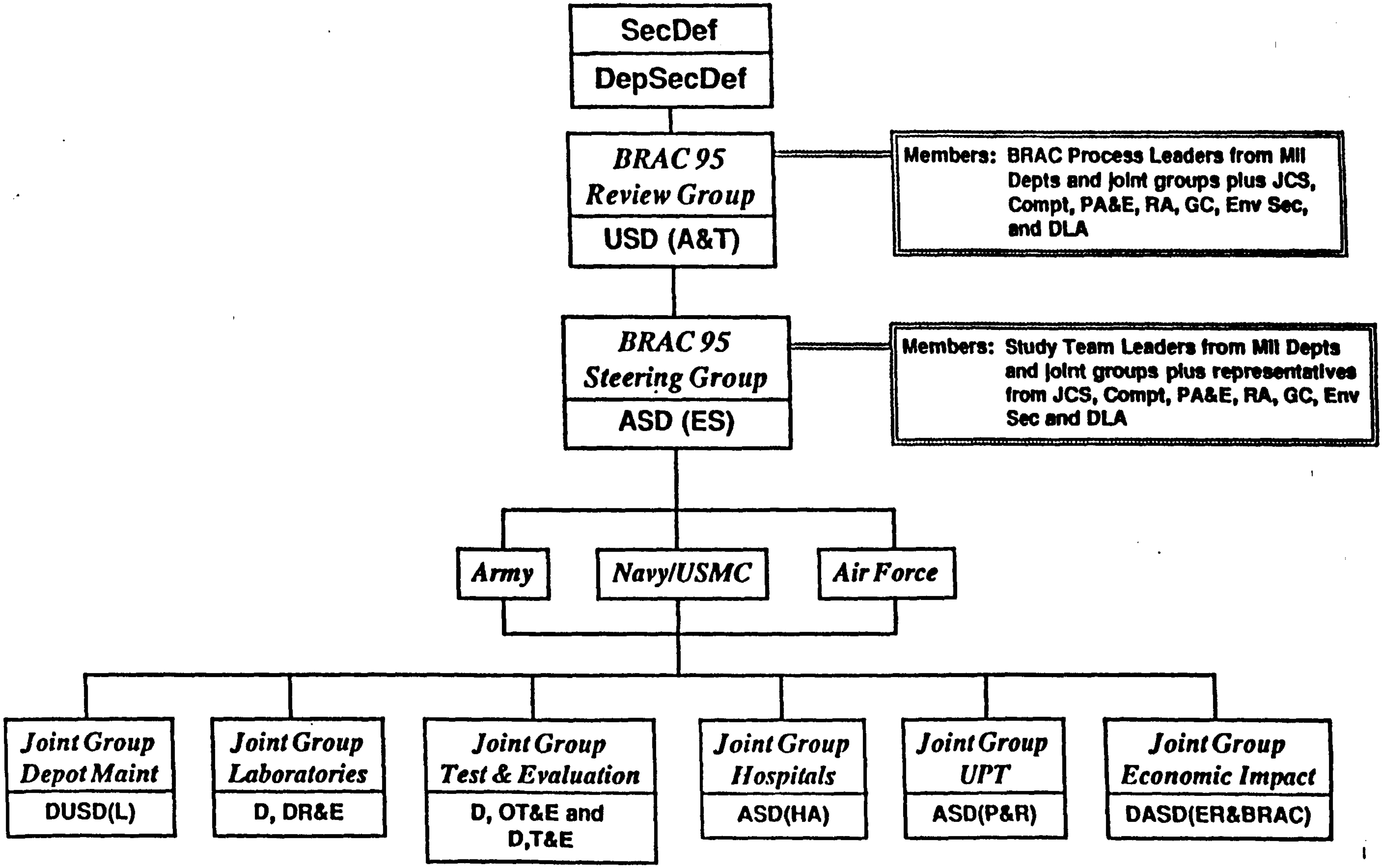
The BRAC 95 process must enhance opportunities for consideration of cross-service tradeoffs and multi-service use of the remaining infrastructure. Since BRAC 95 is the last round of closures authorized under Public Law 101-510, these efforts are critical to balancing the DoD base and force structures and to preserving readiness through the elimination of unnecessary infrastructure. Sharing authority among the Military Departments, Defense Agencies and the Office of the Secretary of Defense is essential to sound decision making and taking advantage of available cross-service asset sharing opportunities. The authorities of the DoD Components and the joint groups established by this policy guidance follow and are depicted in Appendix A.

Sec Deps vs JWG chart

BRAC 95 Review Group

The Under Secretary of Defense for Acquisition and Technology (USD(A&T)) will chair a senior level BRAC 95 Review Group to oversee the entire BRAC 95 process. The members of the BRAC 95 Review Group will be: a senior level representative from each Military Department; the chairperson of the BRAC 95 Steering Group; the chairperson(s) of each BRAC 95 Joint Cross-Service Group; senior representatives from the Joint Staff, DoD Comptroller (COMP), Program Analysis and Evaluation (PA&E), Reserve Affairs (RA), General Counsel (GC), Environmental Security and the Defense Logistics Agency (DLA); and such other members as the USD(A&T) considers appropriate. The BRAC 95 Review Group authorities include, but are not limited to: reviewing BRAC 95 analysis policies and procedures; reviewing excess capacity analyses; establishing closure or realignment alternatives and numerical excess capacity reduction targets for consideration by the DoD Components; reviewing BRAC 95 work products of the DoD Components and BRAC 95 Joint Cross-Service Groups; and making recommendations to the Secretary of Defense, including cross-service tradeoff recommendations and recommendations on submission of below-threshold actions to the 1995 Commission.

BRAC 95 Organization for Analysis



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BRAC 95 Steering Group

The Assistant Secretary of Defense for Economic Security (ASD(ES)) will chair a BRAC 95 Steering Group of study team leaders from: the Military Departments; DLA; each Joint Cross-Service Group; representatives from the Joint Staff, COMP, PA&E, RA, GC and Environmental Security; and such other members as the ASD(ES) considers appropriate. The purpose of the BRAC 95 Steering Group is to assist the BRAC 95 Review Group in exercising its authorities and to review DoD Component supplementary BRAC 95 guidance.

BRAC 95 Joint Cross-Service Groups

BRAC 95 Joint Cross-Service Groups are hereby established in six areas with significant potential for cross-service impacts in BRAC 95.

The purpose of the five functional area joint cross-service groups is: to determine the common support functions and bases to be addressed by each cross-service group; to establish the guidelines, standards, assumptions, measures of merit, data elements and milestone schedules for DoD Component conduct of cross-service analyses of common support functions; to oversee DoD Component cross-service analyses of these common support functions; to identify necessary outsourcing policies and make recommendations regarding those policies; to review excess capacity analyses; to develop closure or realignment alternatives and numerical excess capacity reduction targets for consideration in such analyses; and to analyze cross-service tradeoffs.

what JWG do

The purpose of the economic impact joint cross-service group is: to establish the guidelines for measuring economic impact and, if practicable, cumulative economic impact; to analyze DoD Component recommendations under those guidelines; and to develop a process for analyzing alternative closures or realignments necessitated by cumulative economic impact considerations, if necessary.

BRAC 95 Joint Cross-Service Groups shall complete the analytical design tasks above and issue guidance to the DoD Components, after review by the BRAC 95 Review Group, no later than March 31, 1994. The six BRAC 95 Joint Cross-Service Groups are:

o Depot Maintenance: The group will be chaired by the Deputy Under Secretary Defense for Logistics (DUSD(L)) with members from each Military Department, the Joint Staff and DLA, and other offices as considered appropriate by the DUSD(L). The DASD(ER&BRAC) and the Deputy Assistant Secretary of Defense for Production Resources will also serve as members.

o Test and Evaluation: The group will be jointly chaired by the Director, Test and Evaluation (D,T&E) and the Director, Operational Test and Evaluation (D,OT&E) with members from each Military Department, Defense Research and Engineering (DR&E), and other offices as considered appropriate by the chairpersons. The DASD(ER&BRAC) will also serve as a member.

o Laboratories: The group will be chaired by the Director, Defense Research and Engineering (D,DR&E) with members from each Military Department, T&E, OT&E and other offices as considered appropriate by the D,DR&E. The DASD(ER&BRAC) will also serve as a member.

o Military Treatment Facilities including Graduate Medical Education: The group will be chaired by the Assistant Secretary of Defense for Health Affairs (ASD(HA)) with members from each Military Department and other offices as considered appropriate by ASD(HA). The DASD(ER&BRAC) will also serve as a member.

o Undergraduate Pilot Training: The group will be chaired by the Assistant Secretary of Defense for Personnel and Readiness (ASD(P&R)) with members from each Military Department and others as considered appropriate by the ASD(P&R). The DASD(ER&BRAC) will also serve as a member.

o Economic Impact: The group will be chaired by Deputy Assistant Secretary of Defense for Economic Reinvestment and BRAC (DASD(ER&BRAC)) with members from each Military Department, the Office of Economic Adjustment (OEA) and other offices as considered appropriate by the DASD(ER&BRAC).

DoD Components

What MILDEPs do

The Secretaries of the Military Departments, the Directors of the Defense Agencies, and the Heads of other DoD Components shall (without delegation) submit their recommendations for base realignments or closures under Public Law 101-510, as amended, to the Secretary of Defense. Recommendations and supporting documentation shall be delivered to the Assistant Secretary of Defense for Economic Security for appropriate processing and forwarding to the Secretary of Defense.

Heads of DoD Components will designate the individuals to serve on the joint groups as described above.

Component and BRAC 95 Joint Cross-Service Group responsibility. DoD Components and BRAC 95 Joint Cross-Service Groups should avoid over-categorization in order to maximize opportunities for cross-service or intra-service tradeoffs.

Reserve Component Impacts

Considerable overall DoD savings can be realized through maximizing the use of Reserve component enclaves and through joint use of facilities by the Reserve components. However, these overall DoD savings may not be identified during the BRAC 95 process. Consequently, DoD Components should look for opportunities to consolidate or relocate Reserve components onto active bases to be retained in the base structure and onto closing or realigning bases.

DoD Components must complete Reserve component recruiting demographic studies required by DoD Directive 1225.7 to ensure that the impact on the Reserve components of specific closures and realignments are considered.

Cost of Base Realignment Actions (COBRA) Cost Model

Cobra

DoD Components must use the COBRA cost model to calculate the costs, savings and return on investment of proposed closures and realignments. The Army is executive agent for COBRA and model improvements are underway.

Community Preference

DoD Components must document the receipt of valid requests received from communities expressing a preference for the closure of a military installation under Section 2924 of Public Law 101-510. DoD components will also document the steps taken to give these requests special consideration. Such documentation is subject to review by the General Accounting Office, the Commission and the Congress.

Release of Information

Data and analyses used by the DoD Components to evaluate military installations for closure and realignment will not be released until the Secretary's recommendations have been forwarded to the 1995 Commission on March 1, 1995, unless specifically required by law. The 1995 Commission is required to hold public hearings on the recommendations.

The General Accounting Office (GAO), however, has a special role in assisting the Commission in its review and analysis of the Secretary's recommendations and must also prepare a report detailing the Department of Defense's selection process. As

Internal Control Plan for Managing the Identification of DoD Cross-Service Opportunities as Part of the DoD 1995 Base Realignment and Closure Process (BRAC-95)

Background

With certain exceptions, the exclusive procedures by which the Secretary of Defense (SECDEF) may pursue realignment or closure of military installations inside the United States are contained in Part A, Title XXIX of Public Law 101-510, the Defense Base Closure and Realignment Act of 1990; as amended by Public Law 102-190 and Public Law 103-160; hereafter referred to as the Base Closure Act. The Base Closure Act also includes a provision for the President to appoint independent Base Closure and Realignment Commissions to review the Secretary of Defense's recommendations in calendar years 1991, 1993, and 1995.

The Deputy Secretary of Defense (DEPSECDEF), in a memorandum dated 7 January 1994, set forth guidance, policy, procedures, authorities and responsibilities for recommending bases for realignment or closure for submission to the 1995 Defense Base Closure and Realignment Commission. The DEPSECDEF guidance included a requirement for the establishment of BRAC-95 Joint Cross-Service Groups in six areas with significant potential for cross-service impacts in BRAC-95.

Five of the Joint Cross-Service Groups are functional areas encompassing Depot Maintenance, Test and Evaluation, Laboratories, Military Treatment Facilities including Graduate Medical Education, and Undergraduate Pilot Training. These functional groups should, where operationally and cost effective, strive to: retain in only one Service militarily unique capabilities used by two or more Services; consolidate workload across the Services to reduce capacity; and assign operational units from more than one Service to a single base. A sixth Joint Cross-Service Group was formed as a Joint Economic Impact Group to establish guidelines for measuring economic impacts. The five functional area joint cross-service groups have been tasked by the DEPSECDEF to:

- determine the common support functions and bases to be addressed by each cross-service group:
- establish the guidelines, standards, assumptions, measures of merit, data elements and milestone schedules for DoD Component conduct of cross-service analyses of common support functions;
- oversee DoD Component cross-service analyses of these common support functions;
- identify necessary outsourcing policies and make recommendations regarding those policies;

- review excess capacity analyses;

- develop closure or realignment alternatives and numerical excess reduction targets for consideration in such analyses; and

- analyze cross-service tradeoffs.

The economic impact joint cross-service group has been tasked by the DEPSECDEF to:

- establish the guidelines for measuring economic impact and, if practicable, cumulative economic impact; to analyze DoD Component recommendations under those guidelines; and

- develop a process for analyzing alternative closures or realignments necessitated by cumulative economic impact considerations, if necessary.

The DEPSECDEF directed the BRAC-95 Joint Cross-Service Groups to complete the above analytical design tasks and issue guidance to the DoD Components, after review by the BRAC-95 Review Group, no later than 31 March 1994. The BRAC-95 Review Group reviewed and approved the guidance on March 30, 1994.

Purpose

The primary purpose of this Internal Control Plan is to provide a consistent set of management controls for all Joint Cross-Service Groups and to meet the requirements established by the DEPSECDEF regarding the DoD Component cross-service analyses of all assets within each category, as annunciated in his Memorandum of 7 January 1994. More specifically, the DEPSECDEF directed the Joint Cross-Service Groups to develop and implement an Internal Control Plan to ensure the accuracy of data collection for conducting base realignment or closure assessments. At a minimum this Internal Control Plan includes:

- Uniform guidance defining data and information requirements and sources;

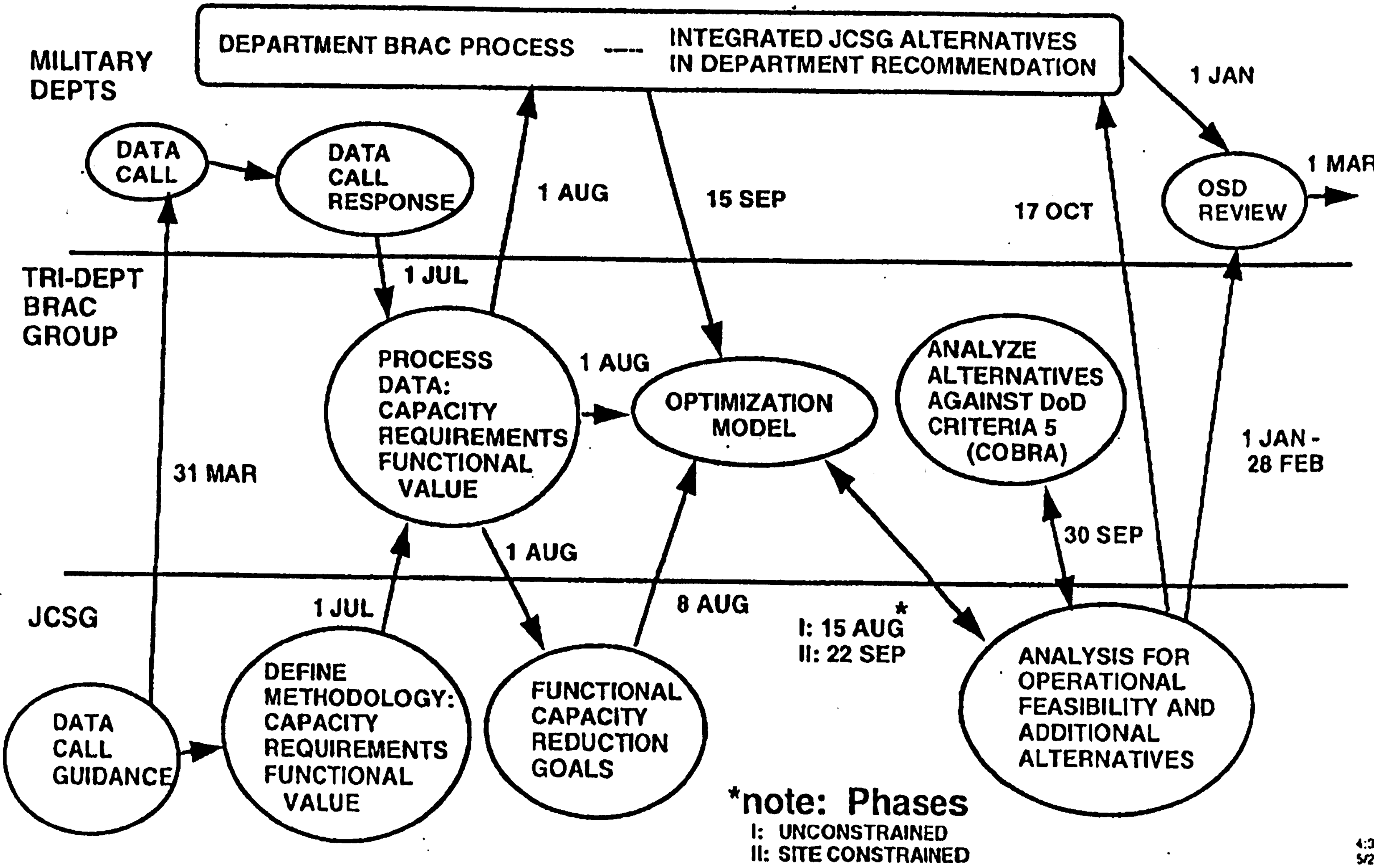
- Systems for verifying the accuracy of data and information at all levels of command;

- Documentation justifying changes made to data received from subordinate commands;

- Procedures to check the accuracy of the analyses made from the data and information; and

- Assessment by auditors of the adequacy of this Internal Control Plan.

JOINT ANALYSIS PROCESS



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WES

BRAC SELECTION CRITERIA

MILITARY VALUE

1-CURRENT MISSION REQUIREMENTS
-FUTURE MISSION REQUIREMENTS
-IMPACT ON OPERATIONAL READINESS OF DOD TOTAL FORCE

2-AVAILABILITY AND CONDITION OF LAND
-AVAILABILITY AND CONDITION OF FACILITIES
-AVAILABILITY AND CONDITION OF ASSOCIATED AIRSPACE

3-ABILITY TO ACCOMMODATE CONTINGENCY
-ABILITY TO ACCOMMODATE MOBILIZATION
-ABILITY TO ACCOMODATE FUTURE TOTAL FORCE REQUIREMENTS

4-COST IMPLICATIONS
-MANPOWER IMPLICATIONS

RETURN ON INVESTMENT

5-EXTENT OF POTENTIAL COSTS AND SAVINGS
-TIMING OF POTENTIAL COSTS AND SAVINGS
-NUMBER OF YEARS FOR SAVINGS TO EXCEED THE COSTS

IMPACTS

6-THE ECONOMIC IMPACT ON COMMUNITIES

7-ABILITY OF COMMUNITIES INFRASTRUCTURE TO SUPPORT FORCES, MISSIONS AND PERSONNEL.

8- THE ENVIRONMENTAL IMPACT.

BRAC-95 Review Group. The BRAC-95 Review Group is empowered to develop recommendations to the SECDEF regarding cross-service tradeoffs and asset sharing opportunities. Only the BRAC-95 Review Group, the Secretaries of the Military Departments, and the Heads of Defense Agencies are empowered to make specific closure or realignment recommendations to the SECDEF. The BRAC-95 Review Group is responsible for ensuring that fair and complete cross-service analyses were conducted and considered for every recommendation made to the SECDEF involving cross-service tradeoffs or asset sharing. This includes overseeing the work of the Steering Group and making decisions regarding definitions, assumptions, measures of merit, excess capacity, military value, return on investment, and other impacts deemed appropriate.

BRAC-95 Steering Group. The BRAC-95 Steering Group is a subordinate organization to the BRAC-95 Review Group. It will oversee the actions of the Joint Cross-Service Groups. The results of such direction and evaluations will be periodically reported to the BRAC-95 Review Group. The BRAC-95 Steering Group will rely on the Joint Cross-Service Groups to review cross-service analyses and potential cross-service tradeoffs, cross-service asset sharing and closure or realignment opportunities. The use of private sector contractors, or any other private or public organization, to conduct such analyses will not be permitted unless specifically authorized by the Chairman of the BRAC-95 Steering Group. Private contractors and outside groups will not be used to perform any independent analysis relating to capacity analysis, military value, return on investment, and other impacts that may eventually be provided to the BRAC-95 Review Group.

BRAC-95 Joint Cross-Service Groups. The basic purpose of the Joint Cross-Service Groups is to oversee and guide the Military Departments and the Defense Agencies in conducting fair cross-service analyses and in developing recommended alternatives for consideration by the DoD Components. The Joint Cross-Service Groups have been established to identify cross-service tradeoff opportunities that will maximize the military value and cost effectiveness of operating the entire DoD infrastructure of specified functional areas. The Joint Cross-Service Group are subordinate to the direction and guidance of the BRAC-95 Steering Group. Other OSD elements, Military Departments, or Defense Agencies will not direct any particular data collection or analysis effort for a Joint Cross-Service Group unless such direction has been authorized by a Group. The Joint Cross-Service Groups may employ any internal organization or subgroup to accomplish their tasks, but such subgroups shall comply with the terms of this Internal Control Plan. The membership of any internal organizations or subgroups employed shall be documented in the official records of the Joint Cross-Service Groups. The Joint Cross-Service Groups are responsible for protecting the integrity of the BRAC-95 by preventing either the improper dissemination or collection of BRAC-95 data and information.

Inspector General, DoD. The Inspector General, DoD will advise the BRAC-95 Steering Group and the Joint Cross-Service Groups on the implementation of this Internal Control Plan. As such, auditors from the Office of the Inspector General, DoD will be available to review the activities of the Joint Cross-Service Groups to ensure such activities comply with the requirements of the Internal Control Plan.

Access to BRAC-95 Files

To protect the integrity of the DoD BRAC-95 process, all files, data and materials relating to that process are deemed sensitive and internal to DoD. Any dissemination of such data or other materials outside of the established BRAC 95 organizational framework shall be made only upon the express authorization of the Chairman of the BRAC-95 Steering Group. Pending forwarding to the Defense Base Closure and Realignment Commission by SECDEF of his recommendations for closure or realignment of military installations, requests under the Freedom of Information Act for release of DoD BRAC-95 data and materials should be denied on the basis that both are predecisional and are internal government memoranda. This does not apply to basic policy memoranda, such as the Deputy Secretary's January 7, 1994, "Kickoff" memorandum and the 1995 Base Realignment and Closure Policy Memorandum One.

The members of the Joint Cross-Service Groups are entrusted to have access to BRAC-95 information and data that originated from either the Military Departments or the Defense Agencies. Consistent with the organization controls set forth in this Internal Control Plan, access will not be granted to any individuals, to include technical experts, without first informing the BRAC-95 Steering Group. Such access carries a responsibility for ensuring that BRAC-95 information and data is treated as sensitive and predecisional. Not only is access restricted to those individuals officially approved to take part in the BRAC-95 Process, care must also be taken to avoid inadvertent dissemination of sensitive BRAC information through either facsimile "FAX" transmissions or electronic "E" mail. Any dissemination of information that is not discussed in this Internal Control Plan will only be made with the approval of the Chairman of the BRAC-95 Steering Group. The members of the Joint Cross-Service Groups are also required to protect the BRAC-95 process from either improper or unofficial disclosures.

Audit Access to Records.

The Base Closure Act includes a requirement that the SECDEF make available to the Comptroller General of the United States, the agency head of the General Accounting Office (GAO), all information and materials used by DoD in making recommendations for closure and realignment. To meet these requirements, the GAO is being provided full and open access to all official BRAC-95 records and documentation. In addition to the full and open access granted to the GAO, such access will be granted to the DoD Inspector General regarding records, data, information and other materials either collected or retained by the Joint Cross-Service Groups. Information requests forwarded by the Joint Cross-Service Groups to the Military Components and Defense Agencies for processing will be subjected to review by the audit agencies cognizant to the Military Components and the Defense Agencies. The audit agencies of the Military Departments, the DoD Inspector General, and the Defense Agencies will coordinate their efforts in a way to avoid audit duplication of the same information, data, and other materials.

WASHINGTON, D.C. 20301

3 1 MAR 1994

MEMORANDUM FOR SECRETARY OF THE ARMY
SECRETARY OF THE NAVY
SECRETARY OF THE AIR FORCE
DIRECTOR, DEFENSE NUCLEAR AGENCY
DIRECTOR, DEFENSE INFORMATION SYSTEMS AGENCY

SUBJECT: 1995 Base Realignment and Closure (BRAC) Test and Evaluation (T&E) Joint Cross-Service Group Guidance

In accordance with the Deputy Secretary of Defense memorandum dated January 7, 1994, officially initiating the BRAC '95 process to address cross-service utilization of common support assets, the T&E Joint Cross-Service Group was established. Attached is guidance for data collection and cross-service analysis for the purpose of identifying alternative opportunities for closure or realignment of facilities on military installations that perform test or evaluation. These opportunities for T&E facility closure or realignment will then be available for consideration by the DoD Military Departments in their analyses for installation closure or realignment. This memo complies with the Deputy Secretary of Defense tasking to complete analytical design tasks and issue guidance to the DoD components by March 31, 1994.

JSWG Co-Lead Tasking

We request that addressees collect and certify the data requested from all facilities at any CONUS DoD installation that meets the criteria and definitions as a T&E facility/ capability provided in the attached guidance package. These facilities/ capabilities are those that have performed and are still capable of performing or support test and evaluation of air vehicles, electronic combat, and armaments/weapons. We also request the sharing of data and participation in performing cross-service analyses to determine opportunities for T&E facility/capability closure or realignment. Service analyses should also consider opportunities for consolidating T&E, lab, depot maintenance test, and training facilities/ capabilities when common assets are available.

ROBERT E. BAYER
Deputy Assistant Secretary of Defense for
Economic Reinvestment and
Base Realignment and Closure

June 1, 1994

Memo For: Mike Walker
Robin Pirie
Jim Boatright

I appreciate the effort that each service is putting into reaching an agreement on a joint BRAC analysis scheme. I'm hoping that your experts can help educate the joint groups on the uses and limits of the proposed computer model. In my meeting with the joint groups, they were particularly concerned about the integrity of the BRAC process, and strongly suggested that the Services develop base military value calculations independently and concurrently with the joint groups developing their functional values. I realize that this presents some scheduling challenges, but it also would create a perception that neither the Services nor the joint groups were "gaming" one another.

I'd be happy to discuss this further.

Bo Bayer

POST
JCSG
MTG

3300 DEFENSE PENTAGON
WASHINGTON, DC 20301-3300

NOMIC SECURITY

1 JUN 1994

MEMORANDUM FOR CHAIRPERSONS, BRAC 95 JOINT CROSS SERVICE-GROUPS

SUBJECT: BRAC 95 Joint Cross-Service Analyses

I wanted to follow up on our meeting of last week on cross-service analyses. I have re-done the general briefing charts used at our meeting to incorporate your concerns (attached). I have also begun discussions with the Military Departments on your proposed changes.

I have scheduled two meetings for Monday, June 6, 1994. The first with the Military Departments, alone, is Monday morning. If you have any further thoughts on exactly how we should conduct these joint cross-service analyses, please call me direct on (703) 697-1771 by close of business Friday.

The second meeting, scheduled for Monday June 6, 1994 at 4:00 p.m. in my office (3E813), is to reconvene all the chairpersons of the BRAC 95 Joint Cross-Service Groups to go over what happened at my morning meeting with the Military Departments.

Both of these Monday meetings are preparatory to the Wednesday BRAC 95 Steering Group meeting where we hope to wrap up this issue. Mr. Gotbaum will chair this meeting which will be at 10 a.m. in room 3D1019.

Lastly, I suggest each group begin familiarizing themselves with the proposed model. It would be helpful if each of your groups gains some perspective on the strengths and weaknesses of the model before the Wednesday Steering Group Meeting. Mr. Pete Potochney of my staff will help you arrange familiarization meetings. He can be reached on (703) 697-8048.

Robert E. Bayer
Robert E. Bayer
Chairman, Special BRAC 95 Task Force
on Joint Cross-Service Analyses

cc:
Military Departments
Defense Logistics Agency

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3300 DEFENSE PENTAGON
WASHINGTON, DC 20301-3300

ECONOMIC SECURITY

14 JUN 1994

MEMORANDUM FOR BRAC 95 JOINT CROSS-SERVICE GROUP CHAIRPERSONS

SUBJECT: Joint Cross Service Optimization Model

At the June 8, 1994, BRAC 95 Steering Group Meeting, we agreed that a team of Service and OSD representatives would evaluate and adapt the proposed optimization model by making it more flexible and therefore of more use as a common tool for each Joint Cross-Service Group. Each Joint Cross-Service Group would then individually evaluate the model, develop the necessary inputs to the model (functional capacity, functional value, policy imperatives) and report on its utility and how it would be employed to the Steering Group.

The Service/OSD team has completed its evaluation and incorporated Air Force improvements into the model that have resulted in a more flexible and useful tool. I ask that each Joint Cross Service Group perform its own evaluation of the resulting "Joint Cross Service Analysis Tool" (documentation attached) in order to determine how it will be employed and what specifications and assumptions will be needed for its operation. This evaluation can include "dry-runs" using notional data.

Dr. Ron Nickel is the Navy representative to the Tri-Department Team that will run the model on behalf of each Joint Cross-Service Group, based on direction of the group. Ron is standing by to work with each group. He can be reached at 681-0494. Please contact him to make arrangements to begin your evaluations. Due to security concerns, we have arranged for the model to be available for your evaluations only at the Center for Naval Analysis building in Arlington.

Finally, my staff will be in contact with your Study Team Leaders to arrange individual meetings to discuss the results of your evaluations. As further agreed to at the Steering Group meeting, I expect these meetings to be conducted late during the week of June 20-24.

Douglas B. Hansen
Executive Secretary
BRAC 95 Steering Group

Attachment

cc: Army, Navy & AF

LA
'C
Gu

INPUTS - Dave Hanse for GE Brief 1 MILDEP & Chair JCSG

JOINT CROSS-SERVICE PROCESS OVERVIEW

- CONCURRENT EFFORTS
  - MILDEP PERFORM SITE ANALYSIS WHILE:
  - JCSG LOOK AT FUNCTION / FACILITY FUNCTIONAL VALUE AND EXCESS CAPACITY REDUCTION GOALS
- THE OPTIMIZATION MODEL IS A FRAMEWORK:
  - EACH JCSG MUST ADAPT IT TO ITS FUNCTIONAL AREA AND DATA CALL (INCLUDING ANY SPECIFIC POLICY IMPERATIVE)
  - DETAILS ARE PROVIDED IN "JOINT CROSS-SERVICE ANALYSIS PROPOSAL"
- TRI-DEPT BRAC GROUP WILL CALCULATE CAPACITY, REQUIREMENTS, AND FUNCTIONAL VALUE FOR EACH FUNCTION/FACILITY
- JCSG PROVIDE FUNCTIONAL VALUE OF COMPARATIVE FUNCTION / FACILITY TO MILDEPS

JOINT CROSS-SERVICE PROCESS OVERVIEW (CONT)

- MILDEP PROVIDE JCSG THEIR CLOSURE / REALIGN ALTERNATIVES UNDER CONSIDERATION AND THE ATTENDANT SITE MILVAL
- TRI DEPT BRAC WILL RUN OPTIMIZATION MODEL
- JCSG CHECK CLOSURE / REALIGN ALTERNATIVES UNDER CONSIDERATION WITH FUNCTIONAL VALUES LOOKING FOR ANOMALIES
- JCSG ASK MILDEP'S TO LOOK AT ALTERNATIVES TO RESOLVE ANOMALIES
- TRI-DEPT BRAC WILL CONDUCT FUNCTIONAL COBRA ANALYSIS TO DETERMINE COST IMPLICATIONS OF JCSG ALTERNATIVES
- MILDEP RESPONSIBLE FOR SITE COBRA, ECONOMIC, COMMUNITY INFRASTRUCTURE, AND ENVIRONMENTAL IMPACT ANALYSIS (CRITERIA 6,7,8)

6:53 PM
5/25/94
2

TOTAL P.05
P.005

Cross-Service Analysis Steps

What	Who	When
Issue Data Call Guidance	JCSG	April
Issue Data Call	Mil Deps	April
Determine 1) How to calculate excess capacity 2) Weights for functional measures of merit	JCSG	June
Develop Methodology for Inputs to Optimization Model 1) Excess capacity 2) Functional military value 3) Rules for model	JCSG	July
Approve Methodology for Inputs to Optimization Model	Steering Group	July
Provide Data to JCSG	Mil Deps	July

Note: Revised per input from JCSG Chairs

As of: 8/31/94

Cross-Service Analysis Steps

What	Who	When
Provide Installation/Site Potential Closure/Military Value Info to JCSG	Mil Deps	August
Develop Inputs to Model	JCSG	August
Run Unconstrained Model	Tri Dept BRAC Gp	September
Analyze Results	JCSG	September
Run Constrained Model	Tri Dept BRAC Gp	September
Analyze Results	JCSG	October
Determine Alternatives for Mil Dep Consideration	JCSG	October
Analyze Alternatives	Mil Deps	Nov - Dec

Note: Revised per Input from JCSG Chairs

As of : 8/31/94

31 Mar 1994 Data Call forwarding memo to MILDEPs

Attached is the guidance for the purpose of identifying alternative opportunities for closure or realignment of facilities on military installations that perform test or evaluation. These opportunities for T&E facility closure or realignment will then be available for consideration by the DOD Military Departments in their analyses for installation closure or realignments.

7 Jan 1994 SECDEF memo policy guidance to MILDEPS

Studies must have as their basis the Force Structure Plan required by Section 2903 of Public Law 101-510;

Studies must be based on the final criteria for selecting bases for closure and realignment required by Section 2903;

Studies must be based on analyses of the base structure by like categories of bases using; objective measures for the selection criteria, where possible; the force structure plan; programmed workload over the FYDP; and military judgement.

The authorities of the DOD Components and the joint groups established by this policy guidance follow and are depicted in Appendix A. (See Attached.)

The purpose of the five functional area joint cross-service groups is: to determine the common support function and bases to be addressed by each cross-service group; to establish the guidlines, standards, assumption, measures or merit, data elements and milestone schedules for DOD Component conduct of cross-sèrvice analyses of common support functions; to oversee DOD Component cross-service analyses of these common support functions; to identify necessary outsourcing policies and make recommendations regarding those policies; to review excess capacity analyses; To develop closure or realignment alternatives and numerical excess capacity reduction targets for consideration in such analyses; and to analyze cross-service tradeoffs.

The secretaries of the Military Departments, shall (without delegation) submit their recommendations for base realignments or closures under Public Law 101-510

DOD Components must use the COBRA cost model to calculate the costs, savings and return on investment of proposed closures and realignments.

Concurred by Mike McAndrew - Transon Office

GIVENS

Mr. Bayer and his special task force has not finalized the common analysis framework for all of the Joint Service Working Groups.

Mr. Bayer and his group have determined that the Cobra analysis and the optimization analysis for functional alternatives will be performed only by present BRAC personnel and not by functional groups, subgroups or extensions of the BRAC.

Early decisions were made by the review group that the Joint Working Groups were subordinate to the Department Secretaries and that the Department Secretaries would send individual reports to the Secretary of Defense.

Joint Working Groups only propose additional alternatives for the Military Departments to consider in their Departments Processes.

Direction given by the T&E JSWG co-leaders in the Data Call letter to the Department Secretaries was "guidance for data collection and cross-service analysis for the purpose of identifying alternative opportunities for closure or realignment of facilities on military installations that perform test and evaluation.. These opportunities for T&E facility closure or realignment will then be available for consideration by the DOD Military Departments in their analyses for installation closure or alignment."

The functional groups, who are subordinate to the Joint Working Groups, can do the capacity data processing and suggest facility/functions comparative values. BRAC representives from each service will assure law compliance.

Present tasking for the subgroup is:

-Determine questions and methodology for determining capacity and excess capacity.
-Determine questions for function/facilities evaluation
-Suggest comparative weights for each question

Dumeter/Rose request Feb 94

DRAFT RECOMMENDATIONS ON MEASURES OF MERIT, GUIDELINES AND ASSUMPTIONS FOR CROSS-SERVICE ANALYSIS

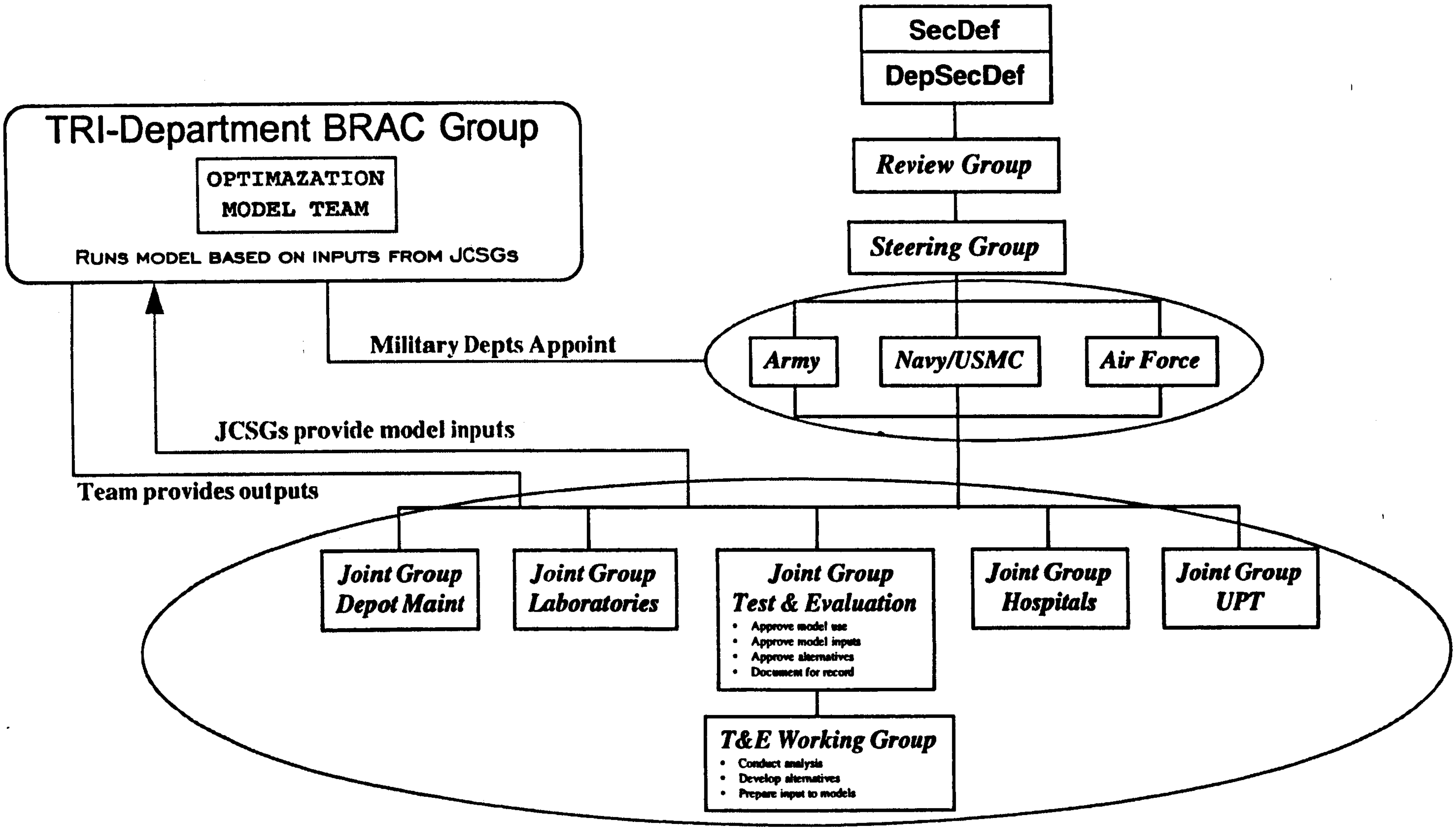
The first step the T&E Working Group must take is to define a process that must be carried out to be in accordance with the BRAC law. This process must be submitted, in summary, with the Secretary of Defense report to the Base Closure and Realignment Commission. The process must be auditable and defensible. The Commission has responsibility to cite any deviation from the BRAC law and the processes defined under it. This is the only way the commission can change any recommendations by the Department so this is the area of greatest scrutiny. The T&E Working Group process must be directed by an Internal Control Plan. It must specifically detail the responsibilities of the T&E Working Group members and the procedures under which the Working Group will interface with the three Departments' internal BRAC processes. The three Department Secretaries have ultimate responsibility to submit individual reports to the Secretary of Defense. Therefore, measures of merit, guidelines and assumptions prepared by the Working Group must interlace with the ongoing BRAC processes being executed by the three departments. All processes must define how only BRAC certified data will be used and that any analysis will be based on the Force Structure Plan and the approved Criteria. Further, the process should delineate that only the DoD mandated COBRA algorithms are used in the scenarios for comparative cost analysis. The process must ensure that all installations in like categories are treated equally and that capacity analysis, military value computations and comparative scenarios done by the three departments incorporate a cross-service consideration. Detailed minutes of all meetings are required by the process, and no effort should be initiated until the process plan is approved and in place. Since the Base Closure and Realignment Act requires that all facilities be assessed fairly and equally and that BRAC analysis be based on certified data, it implies that all recommendations shall be based on original BRAC analyses, absent of any influence or data from previous non-BRAC analyses or studies, such as the T&E Board of Directors study.

The Navy requests that a joint meeting be held among the T&E Working Group, the T&E Board of Directors and representatives of General Counsel experienced with the BRAC law, process and litigation pitfalls to clarify what actions are legal and what processes are appropriate under the BRAC law. This action should be accomplished as soon as possible before any additional actions are taken regarding T&E facilities.

Once the process is in place, the interface between other OSD BRAC working groups and the three Department processes are understood and the internal control plan is established, the T&E Working Group can proceed with the generation of the imperatives directed by the Deputy Secretary of Defense.

In this instance, adherence to the BRAC law is much more critical than schedule. If the law is breached, the ensuing litigation and pressures will stop the Department from completing the streamlining it must do to survive future budgets.

JCSG ANALYSIS PROCESS



BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 21 JUNE 1994
CONFERENCE ROOM, 1C730, PENTAGON

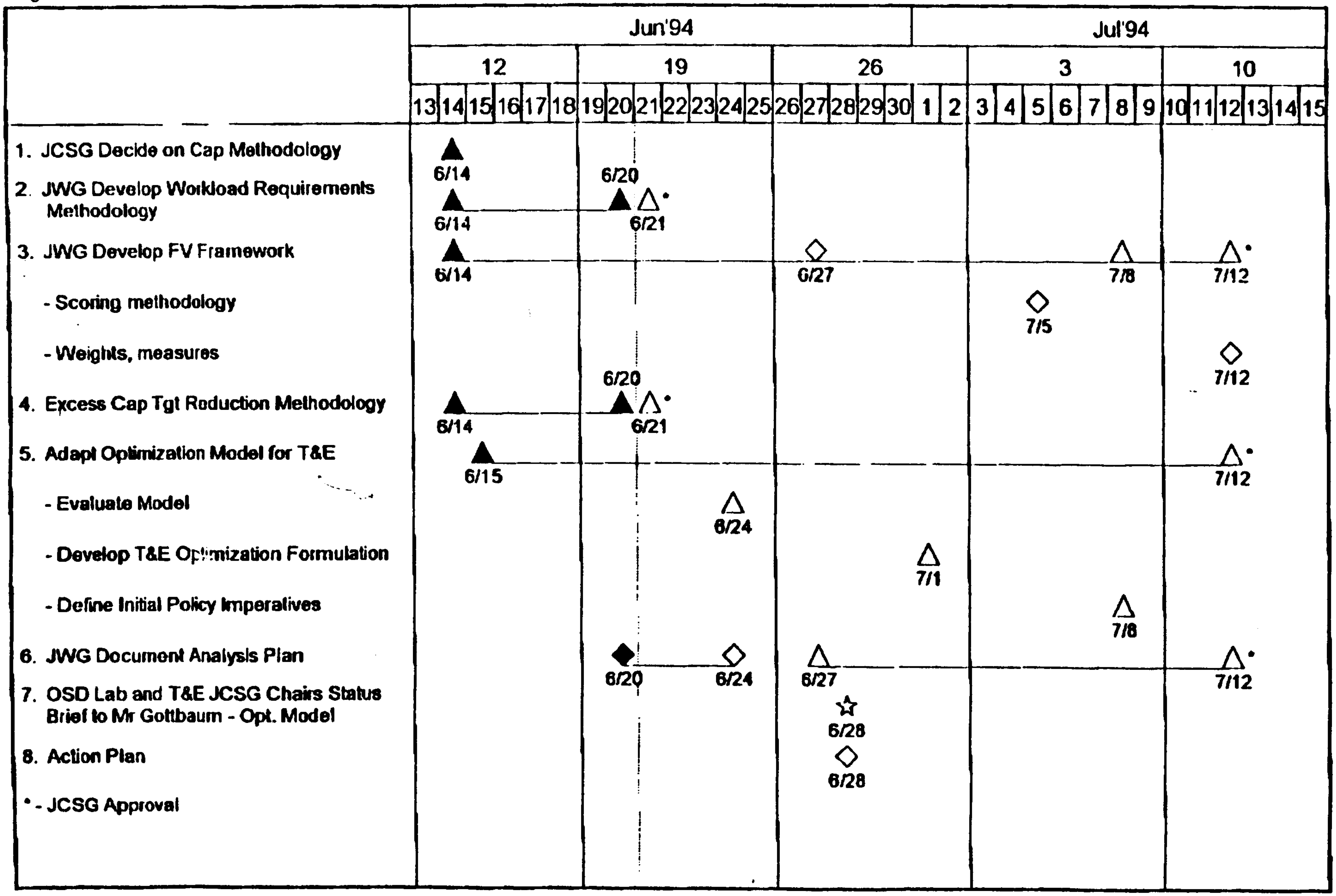
AGENDA

- Opening Remarks
- Comments on 14 June 1994 minutes
- Working Group Status Report
  - Schedule
  - Workload Projection
  - Functional Value
  - Excess Capacity Target Methodology
  - Optimization Model Evaluation
  - JCSGWG Document Analysis Plan
  - Action Plan
  - JCSGWG Facility
- Issues/Recommendations
- Action Items/Wrap Up

T&E JWG Schedule

For Official Use Only - Working Draft

6/20/1994



WORKLOAD PROJECTION METHODOLOGY

21 JUNE 1994

Gary L. Holloway

T&E WORKLOAD PROJECTION METHODOLOGY

1. INTRODUCTION: Inherent to the determination of excess capacity is the development of a future T&E workload projection for each of the functional areas being examined as part of the T&E joint cross service analysis. This document

a. describes three alternative techniques for projecting future T&E workload requirements,

b. discusses their relative advantages and disadvantages, and

c. recommends an alternative for use in the T&E joint cross-service analysis.

The underlying premise for all alternatives is that future T&E workload will increase/decrease in direct proportion to increases/decreases in the Services' budgets. The three alternatives differ principally in the degree of funding aggregation done within the alternative.

2. OBJECTIVE: To develop a workload projection methodology that provides a quantitative, consistent, and defensible basis for estimating future T&E workload requirements.

3. ASSUMPTIONS:

a. The amount of workload generated by a fixed dollar amount is constant over the period FY92 - FY01.

b. The percentage of total workload for a given functional area that must be accomplished by each of the six test resource categories remains constant over the period FY92 - FY01.

c. The T&E JCSG analysis will include minimization of excess capacity as one of its goals; therefore, workload projections must be done at the test resource category level.

d. Outlay rates for FY94 are representative of those for FY89 - FY99.

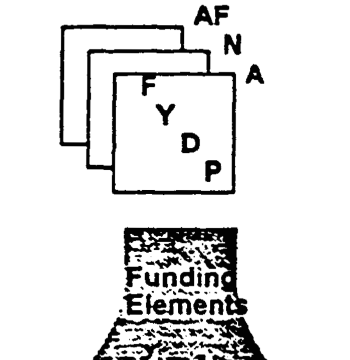
4. SCOPE: The methodology projects T&E workload throughout the POM period and utilizes the workload measures specified in the JCSG T&E data call. The methodology draws upon historical workload information contained within the data call and funding data contained in individual Services' FYDPs. Generation of T&E workload projections will be the responsibility of the T&E JCSG.

5. METHODOLOGY:

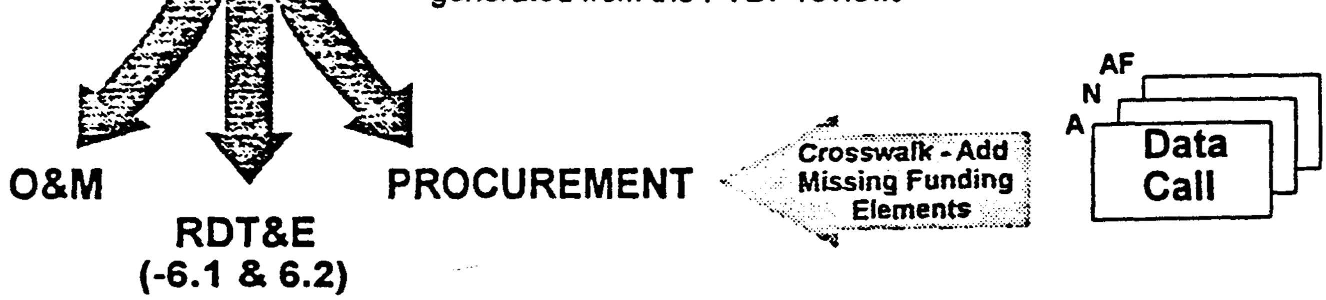
5.1 Individual PE Method. The end product of this method is a single T&E workload projection index for each functional area for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. Select a functional area (FA_i; i = 1, 2, 3).

b. Review each Services' FYDP and identify those funding elements and associated dollars, for FYs 90-99, that have been or are expected to be a T&E workload driver for this functional area.



Sort funding elements and associated dollars into the following Operations and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement. Exclude 6.1 and 6.2 RDT&E funding elements as they are not significant T&E workload drivers. Crosswalk these funding elements with those identified in the T&E JCSG Data Calls to ensure all workload drivers are identified; add the funding elements and associated dollars generated from the FYDP review.



Assume funding totals for FY00 and FY01 are equal to those for FY99 within each of these three funding categories. When a funding element drives workload in more than one functional area, total program funding will be applied to the total for each functional area.

c. Compute funding totals by fiscal year for each funding category and convert into constant FY93 dollars by deflating/inflating totals with inflation indices provided by the DoD Comptroller.

where FOM_{xi} = total O&M dollars for fiscal year x and functional area i which were identified as T&E workload drivers expressed in constant FY93 dollars.

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FR_{xi} = total RDT&E dollars minus 6.1 and 6.2 dollars for fiscal year x and functional area i which were identified as T&E workload drivers expressed in constant FY93 dollars.

FP_{xi} = total Procurement dollars for fiscal year x and functional area i which were identified as T&E workload drivers expressed in constant FY93 dollars.

FUNCTIONAL AREA (FA_i)

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	FOM_{90i}	FOM_{91i}	FOM_{92i}	FOM_{93i}	....	....	FOM_{00i}	FOM_{01i}
RDT&E	FR_{90i}	FR_{91i}	FR_{92i}	FR_{93i}	....	....	FR_{00i}	FR_{01i}
Procurement	FP_{90i}	FP_{91i}	FP_{92i}	FP_{93i}	....	....	FP_{00i}	FP_{01i}

d. Based on historical experience across the three Services, determine what fraction of total workload within this functional area is driven by each of the three funding categories.

WOM_i = fraction driven by O&M funding
WR_i = fraction driven by RDT&E funding
WP_i = fraction driven by Procurement funding

e. Multiply the constant dollar amounts from step c by the weighting functions (i.e., fractions) from step d and sum.

$$FT_{xi} = FOM_{xi} \times WOM_i + FR_{xi} \times WR_i + FP_{(x-2)i} \times WP_i$$

where a two-year workload lag is built-in for procurement funding. (If desired, outlay rates could be incorporated to provide a better estimate of the workload lag.)

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f. Compute average funding total baseline (FTB) for FY92 and FY93.

$$FTB_i = \frac{FT_{92i} + FT_{93i}}{2}$$

g. Divide funding total for fiscal year x from step e by the funding baseline from step f for fiscal years FY95 - FY01 to get the workload projection index for functional area i.

$$I_{xi} = \frac{FT_{xi}}{FTB_i} \qquad x = FY95, FY96, \ldots\ldots\ldots, FY01$$

h. Select test resource category (TRC_j; j = 1, 2, ..., 6).

i. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

j. Multiply total workload baseline from step i by the workload projection index from step g to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_{xi} \times WTB_{ij}$$

k. Repeat steps h through j for each test resource category.

l. Repeat steps a through k for each functional area.

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TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

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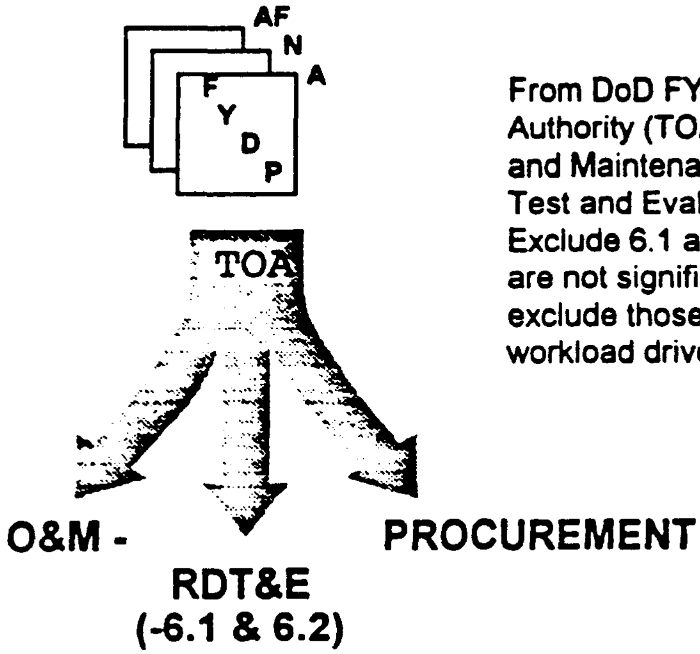
5.2 Weighted TOA Method. The end product of this method is a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. Compute Total Obligation Authority (TOA) by funding category.



From DoD FYDP compute the Total Obligation Authority (TOA) by funding category (i.e., Operations and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement). Exclude 6.1 and 6.2 RDT&E funding because they are not significant T&E workload drivers; also exclude those O&M elements that are not T&E workload drivers.

Assume funding totals for FY00 and FY01 are equal to those for FY99 within each of these three funding categories.

b. Compute funding totals by fiscal year for each funding category and convert into constant FY93 dollars by deflating/inflating totals with inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M TOA for fiscal year x expressed in constant FY93 dollars.

TR_x = total RDT&E TOA minus 6.1 and 6.2 funding for fiscal year x expressed in constant FY93 dollars.

TP_x = total Procurement TOA for fiscal year x expressed in constant FY93 dollars.

TOTAL OBLIGATION AUTHORITY (TOA)

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Based on historical experience across the three Services, determine what fraction of total T&E workload driven by each of the three funding categories.

WOM = fraction driven by O&M funding
WR = fraction driven by RDT&E funding
WP = fraction driven by Procurement funding

d. Multiply the constant dollar amounts from step b by the weighting functions (i.e., fractions) from step c and sum.

$$FT_x = TOM_x \times WOM + TR_x \times WR + TP_{(x-2)} \times WP$$

where a two-year workload lag is built-in for procurement funding. (If desired, outlay rates could be incorporated to provide a better estimate of the workload lag.)

e. Compute average funding total baseline (FTB) for FY92 and FY93.

$$FTB = \frac{FT_{92} + FT_{93}}{2}$$

f. Divide funding total for fiscal year x from step d by the funding baseline from step e for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{FT_x}{FTB} \qquad x = FY95, FY96, ..., FY01$$

g. Select test resource category (TRC_j; $j = 1, 2, ..., 6$) and functional area (FA_i; $i = 1, 2, 3$)

h. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

i. Multiply total workload baseline from step h by the workload projection index from step f to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_x \times WTB_{ij}$$

j. Repeat steps g through i for each test resource category and each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

5.3 Total TOA Method. The end product of this method is a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. From the DoD FYDP compute the Total Obligation Authority (TOA) by summing Operations and Maintenance (O&M); Research, Development, Test and evaluation (RDT&E); and Procurement funding. Assume TOA for FY00 and FY01 is equal to that for FY99.

b. Convert into constant FY93 dollars by deflating/inflating totals with inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M TOA for fiscal year x expressed in constant FY93 dollars.

TR_x = total RDT&E TOA for fiscal year x expressed in constant FY93 dollars.

TP_x = total Procurement TOA for fiscal year x expressed in constant FY93 dollars.

TOTAL OBLIGATION AUTHORITY (TOA)

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Compute TOA for fiscal year x using certified outlay rates provided by the DoD Comptroller.

$$TOA_x = \sum_{k=1}^{6} (TOM_{x+1-k} \times OMOR_k + TR_{x+1-k} \times ROR_k + TP_{x+1-k} \times POR_k)$$

where $OMOR_k$ = outlay rate for O&M funding for kth year of the appropriation.
ROR_k = outlay rate for RDT&E funding for kth year of the appropriation.
POR_k = outlay rate for Procurement funding for kth year of the appropriation.

d. Compute average TOA baseline (TOAB) for FY92 and FY93.

$$TOAB = \frac{TOA_{92} + TOA_{93}}{2}$$

e. Divide TOA for fiscal year x from step c by the funding baseline from step d for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{TOA_x}{TOAB} \qquad x = FY95, FY96, \ldots\ldots\ldots, FY01$$

g. Select test resource category (TRC_j; j = 1, 2, ..., 6) and functional area (FA_i ; i = 1, 2, 3).

h. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

i. Multiply total workload baseline from step h by the workload projection index from step f to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_x \times WTB_{ij}$$

j. Repeat steps g through i for each test resource category and each functional area.

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TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
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EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

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Total TOA Method

ADVANTAGES	DISADVANTAGES
1. Simplest approach and more easily understood by BRAC Commission and affected sites.	1. Does not reflect funding trend within individual functional areas; under- or over-estimates workload in a functional area.
2. Workload projection index can be computed independent of data call.	2. Assumes Other workload increases/ decreases in proportion to Services' budgets.
3. Projects total test resource category workload without modification.	3. Does not capture degree to which workload for individual facility is driven by individual Service funding.
4. Requires least effort to generate workload projections.	

7. RECOMMENDATION: Adopt the Total TOA Method for projecting future workload requirements for T&E joint cross-service analysis.

6. ADVANTAGES/DISADVANTAGES:

Individual PE Method

ADVANTAGES

1. Reflects funding trends within each functional area; stronger correlation with T&E sites than TOA.

2. Basic approach verified by historical Army experience.

DISADVANTAGES

1. Higher level of detail; may be open to more challenge by BRAC commission and affected sites.

2. Requires modification/assumptions to project workload for the Other T&E and Other categories from data call.

3. Most effort required to generate workload projections.

4. Does not capture degree to which workload for individual facility is driven by individual Service funding.

5. Predictions more uncertain for those functional areas where workload is driven by a small number of PEs.

Weighted TOA Method

ADVANTAGES

1. Simpler approach and more easily understood by BRAC Commission and affected sites.

2. Workload projection index can be computed independent of data call.

3. Projects total test resource category workload without modification.

4. Requires less effort than Individual PE Method to generate workload projections

DISADVANTAGES

1. Does not reflect funding trend within individual functional areas; under- or over-estimates workload in a functional area.

2.. Assumes Other workload increases/ decreases in proportion to Services' budgets.

3. Does not capture degree to which workload for individual facility is driven by individual Service funding.

FUNCTIONAL VALUE

- This is a preliminary report on what the working group is considering. The working group will make a formal recommendation to the principals after further consideration.
- The Air Force has proposed a model f or assessing T&E functional value based upon the site's capability to satisfy the DoD's total T&E requirements in three stated T&E functional areas.
- The DoD T&E requirements can be grouped into three main areas:
  - Natural Resources
  - Technical Resources
  - Maximum Throughput
- The Army presented a briefing on Decision Pad; a commercial tool that the group may consider using for developing weighted values.

TEST AND EVALUATION FUNCTIONAL VALUE MODEL

An objective assessment of the functional value of each site which supports T&E of Air Vehicles, Electronic Combat, or Armaments/Weapons is required as part of the BRAC cross-servicing process. This value, taken together with excess capacity data and recurring and non-recurring costs, provides the basis for the development of alternatives for consolidating/realigning the T&E infrastructure. A model for assessing T&E functional value is proposed which is based on a site's capability to satisfy the DoD's total T&E requirements in the three stated T&E functional areas. The linkage between the model and the T&E data call are shown.

The DoD's T&E requirements can be grouped into three main areas: natural resources, technical resources, and maximum throughput. The natural resources at a site determine its capability in terms of critical air, land, and sea space to conduct open-air test operations and to support evaluations of the performance of the system under test in real-world environments under realistic operational conditions. The technical resources at a site determine its capability in terms of capital assets to test and evaluate current and future weapons systems. The maximum throughput at a site determines its capability to handle the DoD's total workload requirements.

The required attributes (measures) against which a given site's capabilities in each T&E functional area will be evaluated can be stated based on an aggregation of each Service's current and programmed capabilities through the FYDP. The functional experts on the T&E JWG will develop these standards. The relative importance of each attribute (weights) will be developed by the T&E JWG and approved by the T&E JCSG before access to the Tri-Service data call responses has been granted. The weights and measures may be unique to each functional area.

Evaluation of a site's capabilities in each T&E functional area will be performed by members of the T&E JWG. Actual attributes at a site, as documented in data call responses for all facilities which fall into the T&E functional area being evaluated, will be compared to the required attributes, generally at the T&E facility category level. A score for each attribute will be assigned based on the extent to which the DoD's total requirements are satisfied. Using the weights for each attribute, these scores will be aggregated to arrive at a T&E functional value for each T&E functional area at a site. These values can be further aggregated to arrive at a T&E functional value overall for each site.

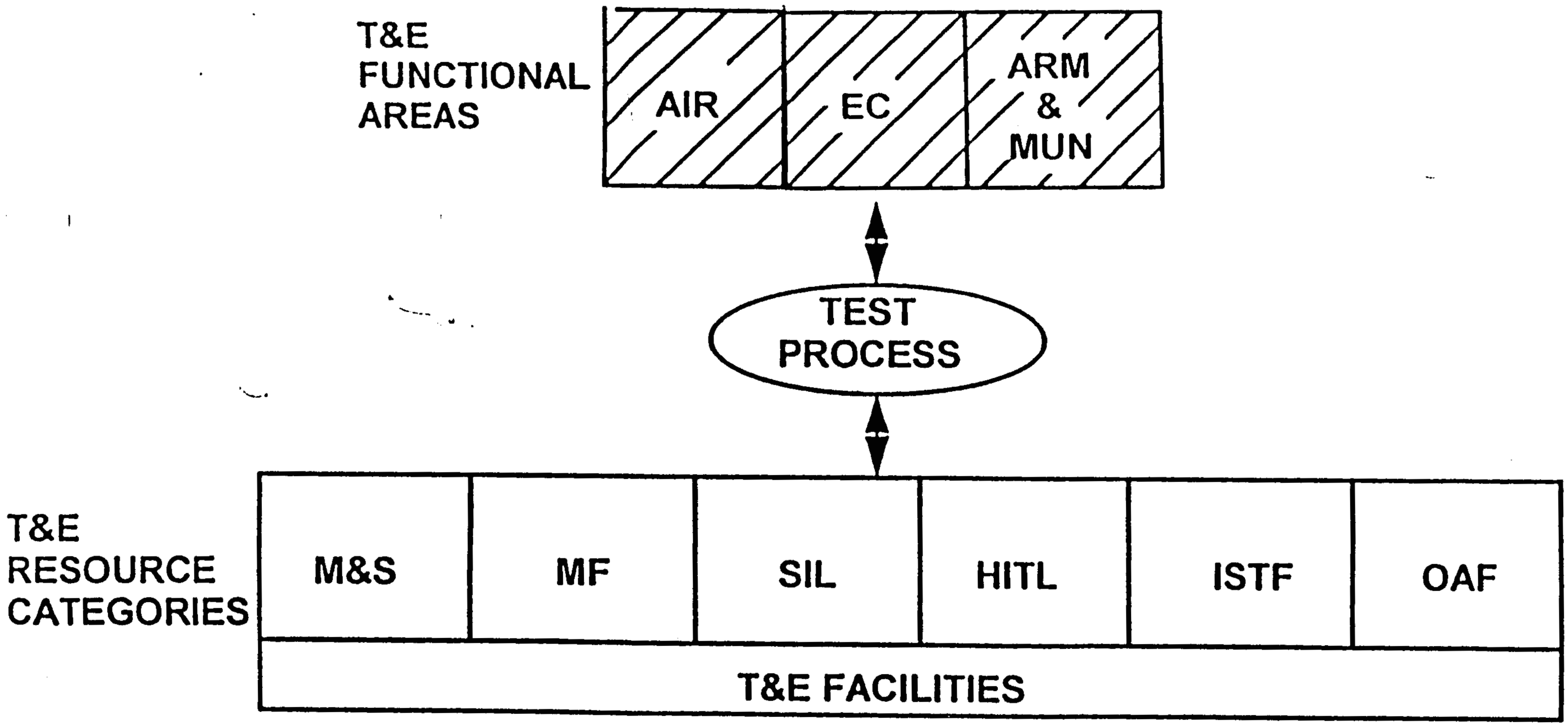
The briefing attached provides details of the approach and representative examples of required attributes and linkage to the T&E data call.

ANALYSIS APPROACH FOR FUNCTIONAL VALUE

D. Nation
2 June 1994

T&E FACILITY TAXONOMY

FUNCTIONAL AREAS & RESOURCE CATEGORIES



- WORKING DRAFT

ROLL-UP HIERARCHY FOR T&E FUNCTIONAL VALUE DETERMINATION

T&E FUNCTIONAL AREA AT A SITE (3)

↑

TEST FACILITY CATEGORY (6)

↑

FACILITY

FUNCTION VALUE FORMULA

$$FV \equiv W_{NC} \times FV(NC) + W_{TC} \times FV(TC) + W_{TPC} \times FV(TPC)$$

- **FV(NC) ≡ Extent to which a site's natural attributes satisfies Tri-Service req'mnts to test current and future weapon systems**
- **FV(TC) ≡ Extent to which a site's technical capabilities, comprised of its facilities, instrumentation and supporting test infrastructure satisfies Tri-Service req'mnts through the FYDP**
- **FV(TPC) ≡ Extent to which a site's throughput capability, as defined by its unconstrained capacity, can satisfy the Tri-Service workload req'mnts through the FYDP**
- **W_{NC}, W_{TC}, W_{TPC} ≡ The weight assigned to Natural Capacity, Technical Capability, and Throughput Capability**

Note: Weight will be determined by the JCSG

Functional Value Formula

$$FV_{\text{Site, T\&E functional area}} = W_{NC} * FV(NC) + W_{TC} * FV(TC) + W_{TPC} * FV(TPC)$$

$W_{NC} * FV(NC)$	$W_{TC} * FV(TC)$	$W_{TPC} * FV(TPC)$
•Critical Air /Land/Sea Space •Topography •Climate •Future viability •Encroachment •Environment	•Technical Capabilities •Support Infrastructure Capabilities	•Throughput/capacity
$FV(NC) = \sum_{i=1}^{n} w_i MOM_i(NC)$	$FV(TC) = \sum_{i=1}^{6} w_i MOM_i(TC)$	$FV(TPC) = \sum_{i=1}^{6} w_i MOM_i(TPC)$

ANALYSIS PROCESS
OVERALL APPROACH

DEFINE THE MEASURE OF MERIT (MOM) FOR EACH ATTRIBUTE

COMPILE ACTUAL ATTRIBUTES FOR EACH SITE/FACILITY

DEFINE REQUIRED ATTRIBUTES BASED ON TRI-SERVICE REQUIREMENTS

COMPARE SITE/FACILITY ATTRIBUTES WITH THE REQUIRED ATTRIBUTES

SITE ASSESSMENT FOR EACH T&E FUNCTIONAL AREA

TRI-SERVICE TECHNICAL CAPABILITY REQUIREMENTS

- DEFINED AS THE MINIMUM TECHNICAL CAPABILITY NEEDED TO SATISFY ALL THREE SERVICES T&E REQUIREMENTS THROUGH THE FYDP
  - OBTAINED BY AGGREGATING TODAY'S CAPABILITIES IN FY94 ACROSS ALL 3 SERVICES WITH IMPROVEMENTS/UPGRADES FUNDED IN THE FYDP
- TO BE DEVELOPED BY TRI-SERVICE TEAM OF EXPERTS FOR EACH T&E FUNCTIONAL AREA
  - SEPARATE FROM SERVICE DATA CALL
- TO BE DEVELOPED FOR EACH T&E RESOURCE CATEGORY AT A HIGH LEVEL OF TECHNICAL SPECIFICATION
  - ADEQUATE TO ASSESS THE CAPABILITY OF A FACILITY OR SUPPORTING INFRASTRUCTURE AT A SITE TO SATISFY TRI-SERVICE REQUIREMENTS

- WORKING DRAFT

EXAMPLE
NATURAL ATTRIBUTES
CRITICAL SPACE

TYPE WEAPON SYSTEM	TESTING CAPABILITY	REQUIRED ATTRIBUTES
ARMAMENT & WEAPONS	• AIR-TO-AIR (LAND & SEA)	• 50X150 NM WITH FTS • 250X350 NM W/O FTS • SURFACE TO 100K FT ALT
	• AIR-TO-SURFACE (LAND & SEA)	• 10X100 NM WITH FTS • 100X100 NM W/O FTS • SURFACE TO 100K FT ALT
	• SURFACE-TO-AIR (LAND & SEA)	• 100X250 NM WITH FTS • 250X250 NM W/O FTS • SURFACE TO 100K FT ALT
	• SURFACE-TO-SURFACE (LAND & SEA)	• 200X200 NM WITH FTS • 300X300 NM W/O FTS • SURFACE TO 100K FT ALT
	• CRUISE MISSILES (LAND/ SEA)	• 10X1000 NM WITH FTS • SURFACE TO 100K FT ALT
	• THEATRE MISSILE DEFENSE	• 50X150 NM (LAND/SEA) SHORT • 100X400 NM (SEA) MEDIUM • 300X700 NM (SEA) LONG
	• GUNS	• 5X50 NM (LAND) • 15X100 NM (SEA) • SURFACE TO 100K FT ALT

APPROACH

❶ Define Measures of Merit (MOM) for each Element of FV (ie., NC, TC, TPC)
- MOM is based on comparing the req'd attributes with the actual attributes of a site's capabilities

❷ Compare the Tri-Service Required Attributes to Projected Workload and Capability to Test Current & Future Weapon Systems
- Consistent with T&E data call

❸ Align Facilities from Data Call with T&E Resource Category for each Functional Area
- Consistent with T&E Data Call

❹ Compare Actual Attributes with Req'd Attributes and Assign Rating
- T&E resource category level for TC and TPC
- Site level for NC

❺ Aggregate TC & TPC to Site Level
- Combine with NC and weights to provide rating for each T&E functional level (AV, Mun, EC)

D-PAD MODEL DESCRIPTION

D-PAD MODEL:

- WEIGHTED MULTI-CRITERIA DECISION SUPPORT MODEL.
- USES SIMPLE ADDITIVE WEIGHTING TO RANK UP TO 250 ALTERNATIVES.

D-PAD MODEL STRENGTHS

- COMMERCIAL SOFTWARE:
  - DOCUMENTED, USER'S MANUAL
  - HELP-LINE AVAILABLE
  - TECH SUPPORT AVAILABLE
- TRIED AND TESTED IN BRAC 91 AND BRAC 93
- USES SIMPLE MATHEMATICAL PRINCIPALS
- AGGREGATES SIMPLE DATA TO REACH COMPLEX RELATIONSHIPS
- PROVIDES SENSITIVITY ANALYSIS
- USES VERY LITTLE HARD DISK SPACE, RUNS FAST

D-PAD MODEL WEAKNESSES

- DOES NOT PROVIDE THE WHOLE DATA CALL TO THE USER

EXCESS CAPACITY REDUCTION TARGET METHODOLOGY

- TASKING- Each JCSG tasked to
  - Review excess capacity analyses, and
  - Develop numerical excess capacity reduction targets
- PROPOSED TARGET
  - Reduce all excess capacity as defined below, where cost effective
- EXCESS CAPACITY DEFINITION
  - Delta between single-shift capacity and projected workload
- REDUCTION TARGET CONSTRAINTS
  - Separate for each T&E functional area
  - Separate for each test facility category within each T&E functional area
  - Exclude excess capacity associated with unique, one-of-a-kind facilities
  - Reduction targets will consider those facilities that are required by the nature of test to operate on more than a single shift basis.
- COST EFFECTIVENESS
  - Based pm total costs, to include non-T&E and customer costs

<u>AGREEMENTS</u>

- JCSGs have the flexibility to define their own:
  - Optimization Formulations
  - Workload Allocation Methodology

- Model is a "tool" vice "core" of the analytical process.

- Policy and Process statements in <u>this</u> document are not binding.

- Military values, if used, will be those provided by the Military Departments.

DEPARTMENT OF THE ARMY
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C. 20310-0102

6 June 1994

SAUS-OR

MEMORANDUM FOR CO-CHAIRS, BRAC 95 T&E JOINT CROSS SERVICE GROUP

SUBJECT: Joint Cross Service Analysis Approach

References:

a. 2 June 1994 Briefing to T&E Joint Cross Service Group representatives; SAB.
b. Draft Joint Cross-Service Analysis Approach Proposal dated 2 June 1994.

During the reference 1.a. briefing, Dr. Ronald Nickel presented an overview of a linear optimization model proposed for use as part of the BRAC 95 joint cross service analyses. This model is one element of the overall analysis proposal described in reference 1.b; this overall analysis proposal was not discussed during the reference 1.a briefing.

The draft proposal (reference 1.b) must be viewed simply as an initial point of departure towards the development of a common framework for joint cross service analysis. I believe the current draft is unacceptable. My major concerns are as follows:

a. The "DoD BRAC Goals" are incorrectly stated; they are more correctly stated as:

The goal of the DoD BRAC process is to achieve maximum feasible cost savings through:

- elimination of DoD excess capacity while
- maintaining a high quality infrastructure, and
- ensuring that critical air/land/sea space and required capabilities are retained

b. The definition of "activity" is incorrect. It should be: "An activity refers to a component of the site such as a depot or test organization residing on the site."

c. Membership of the Tri-Department BRAC Team must include functional area experts from the individual joint cross service groups.

d. Since the Services' versions of the COBRA model are not the same, the COBRA model runs should be made using a common model vice being run separately by the individual Military Departments.

e. The linear optimization model is acceptable for use as one of the tools in the cross service analysis. **It must not be used as the decision maker.** Development of cross service alternatives and the subsequent decision process must allow for military judgements.

f. A common optimization formulation will not work for all joint cross service groups. The proposed optimization formulation on page 8 of reference 1.b will not work for the T&E cross service analysis because it assumes excess capacity for any resource category (e.g., open-air range) can accommodate workload from any other resource category (e.g., measurement laboratory). **Each Joint Service Group must have the flexibility to develop its own optimization formulation.**

g. The Primary Formulation paragraph on page 8 states either site or activity can be used in the optimization formulation. This is incorrect because an activity can have components at multiple sites; the optimization formulation must be based on sites.

h. Military values used in the cross service analyses must be supplied by the Military Departments. The proposal to determine Value within a functional area by banding only those sites under consideration in that functional area is unacceptable.

i. The linear optimization model assumes reduction of excess capacity will result in cost savings; this is not true in all cases. It is also true that in some alternatives, the most cost effective alternative is achieved by investing in additional capacity at a given site. The linear optimization model will not generate such alternatives for consideration.

Since this draft proposal only recently came to my attention, I wanted to make sure you understood my concerns prior to the follow-on discussions of this draft proposal scheduled for later this week. I have asked Mr. John Gehrig and his support team to be prepared to work with you and other members of the T&E Joint Cross Service Analysis Team to develop a workable cross service analysis approach.

for Walter W. Hollis MAJ GS
Deputy Under Secretary of the Army
(Operations Research)

ACTION PLAN AND MILESTONES

Test and Evaluation Joint Cross-Service Group

Phase 2: Cross Service Analyses and Recommendations

June 1994

John A. Burt
Director
Test and Evaluation

Lee H. Frame
Acting Director
Operational Test and Evaluation

I. INTRODUCTION

In previous Base Realignment and Closures (BRAC) cycles, the analyses and development of recommendations for closures and realignments have been conducted within the DoD Components. As a result, it has been difficult for alternatives that involve "cross service" actions to receive full assessment. As part of the process for the BRAC 95 cycle, the DEPSECDEF has directed that strong attention be focused on examining the cross-service utilization of common support assets. Throughout the BRAC 95 analysis process, the DoD Components are to look for cross-service or intra-service opportunities to share assets and for opportunities to rely on a single Military Service for support in selected support areas.

The DEPSECDEF has also directed the formation of a number of Joint Cross-Service Groups (JCSGs), led by OSD representatives, to design the cross-service analysis approach in selected functional areas and to oversee the conduct of these analyses by the DoD Components. Test and evaluation (T&E) has been identified as one of the five functional areas that will be examined in the BRAC 95 cross-service analyses.

An earlier action plandated January 1994, described the actions and milestones for the BRAC 95 T&E Joint Cross-Service Group and included schedule milestones through the issuance of guidance to the services. This plan focuses on the activities associated with conducting cross service analyses, formulating recommendations for consideration by the service BRAC teams, and oversight of the process by T&E JCSG; culminating in presentation by the services to the Secretary of Defense of their recommendations for closures and realignments, and the reallocation of workload and missions necessary to implement the closures and realignments. Section II describes the membership of the group, the group's objectives, and the actions that are planned. Section III contains tables with the milestones for the T&E group's activities.

II. PLAN OF ACTION

MEMBERSHIP

The BRAC 95 T&E Joint Cross-Service Group will be jointly chaired by the Director, Test and Evaluation (D,T&E) and the Director, Operational Test and Evaluation (D,OT&E). Members will be representatives from:

Army,
Navy,
Air Force,
Ballistic Missile Defense Organization,
Defense Nuclear Agency,
Joint Interoperability and Engineering Organization,
Director, Defense Research and Engineering,
Deputy Assistance Secretary of Defense for Economic Reinvestment and BRAC, and
Director (PA&E).

Other offices will be included as considered appropriate by the chairpersons. The Heads of DoD Components will designate the individuals to serve as their representatives on the T&E Joint Group.

PURPOSE

The T&E Joint Cross-Service Group was established by the Deputy Secretary of Defense to:

- Determine the common support functions and bases to be addressed by the T&E cross-service analyses;

- Establish the guidelines, standards, assumptions, measures of merit, data elements, and milestone schedules for DoD Component conduct of cross-service analyses of the T&E function;

- Establish a consistent analytic methodology for, and conduct analyses to formulate recommendations for consideration by the DoD Components BRAC teams;

- Oversee DoD Component cross-service analyses of T&E functions;

- Identify necessary outsourcing policies and make recommendations regarding those policies;

- Review excess capacity analyses;

- Develop closure or realignment alternatives and excess capacity targets for consideration in such analyses;

- Recommend workload and mission reallocations necessary to facilitate the recommended closures and recommendations,and

- Analyze cross-service tradeoffs.

The DoD Components will conduct analyses in accordance with the guidelines provided by the T&E Joint Cross-Service Group.

ACTIONS

The T&E Joint Cross Service Group will perform actions that directly relate to the purpose described above as identified in DEPSECDEF memorandum: "1995 Base Realignments and Closures (BRAC 95)," dated 7 January 1994. It is anticipated that the T&E Joint Group will consider a broad range of factors which include structural changes, organizational changes, and operational changes. The following paragraphs summarize the actions that the group will undertake during the BRAC 95 activity.

ACTION 1: Determine the common support functions and bases to be addressed by the T&E Cross-Service Group. The T&E Joint Group will define the scope of functions and bases to be addressed by the T&E cross-service activity. The T&E Joint Group will develop a preliminary listing of all DoD facilities determined to support T&E. Within this listing, consideration will be given to those T&E facilities that are located at bases outside the Major Range and Test Facility Base (MRTFB), including laboratory and depot maintenance facilities. The current efforts from T&E Project Reliance will provide a baseline from which to proceed. From this set of facilities supporting T&E, the T&E Group will develop a functional list of subsets that will be considered for BRAC 95.

ACTION 2: Establish the guidelines, standards, assumptions, measures of merit, data elements and milestone schedules for DoD Component conduct of cross-service analyses of the common support functions. The T&E Joint Group will develop analyses criteria and issue guidance to the DoD Components. The guidance will include the following topics:

Guidelines:

- General statement of the objectives of analyses in the T&E support area.
- Criteria and process to be used to group bases, facilities, and installations into categories of bases and into T&E mission areas, to include laboratory and depot maintenance facilities as appropriate to performing the T&E mission..
- Guidelines for the conduct of the analyses.

Standards:

- Standards for the designation of a facility as a "T&E facility" for consideration in analyses.

Assumptions:

- Bases and facilities closed under previous BRAC actions will not be considered.
- Budget, technology, and threat trends that drive workload.

Measures of Merit:

- Measures of merit will be developed by the T&E Joint Group. Additional measures of merit may be determined in the course of the Component analyses in conjunction with the Components' BRAC teams. The measures of merit will address common measures to be applied to each DoD component's facilities.

Data elements:

- Data elements needed to support the analyses by the Components will be developed by the T&E Joint Group.

- Where feasible, common data elements with laboratory and depot maintenance group will be sought.

Milestone schedule:

- Milestone schedule for the Component analyses and reports to the T&E Joint Group is incorporated in the schedule shown in Section III. Actions by the T&E Join Group to be accomplished between promulgation of guidance to the DoD Components on 31 March 1994 and the presentation of Component recommendations to the Secretary of Defense in February 1995 are included.

ACTION 3: Identify necessary outsourcing policies and make recommendations regarding those policies. The T&E Joint Group will develop strategies or guidlines that will place a limit on the analyses of outsourcing alternatives to be examined. The T&E Joint Group will address the issue of government development/ownership of new or improved T&E facilities as compared to contractor development/ownership. A key consideration will be the role of the government versus the private sector in the conduct of T&E. Conversion of existing government owned and operated facilities to government owned contractor operated (GOCO) will also be investigated to determine potential for advantages to the government.

ACTION 4: Define a Consistent Methodology.

-- Select an optimization model for allocation of workload to facilities capable of performing the workload.
-- Develop methodologies for assigning functional values to the various functional capabilities.
-- Develop Workload Projection Methodology
-- Develop Target Reduction Methodology
-- Develop methodology for translating the Component field data, provided in response to the data call, into inputs suiitable for use in the optimization model.
-- Develop metyhodology for assigning military value and applying it to the optimization model.
-- Test the model for validity.

ACTION 5: Develop and Maintain a Capability, Capacity, and Workload Data Base

-- Define a data base consistent with the data elements requested from field activities. Where possible, use definitions common with those used by other JCSGs, particularly laboratories and maintenance depots.
-- Host the data base in a fashion that enhances accessibility to those involved in the BRAC analytic process, and populate it with field data.

-- Attempt to automate the interface between the optimization model and the data base.

ACTION 6: Conduct Analyses

-- Conduct optimization runs on notional data to familiarize the JCSG members with its behavior.
-- Conduct optimization runs without regard to military value.
-- Conduct Optimization runs with military value assigned.
-- Conduct cross-functional optimizations among the "best" lab and T&E alternatives.
-- Conduct COBRA analyses on all appropriate optimization scenarios.

ACTION 7: Provide Recommendations to the Components for analysis by their BRAC teams.

-- Formulate recommendations for closure and realignemnts of functional T&E (or T&E and lab) capabilities, and identify the expected financial and technical implications.
-- Identify changes to (the allocation of) workload and/or mission assignments necessary to implement the closures and realignments
-- Identify special features or aspects of each recommendation for which special analyses are desired -- such as contracting out, converting to go-co.
-- Provide to the Components the analytic basis for the JCSG recommendation.

ACTION 8: Oversee DoD Component cross-service analyses of these common support functions. From the analysis guidance provided by the T&E Cross-Service Group, the DoD Components will conduct the analyses of the T&E facilities and bases under the auspices of the T&E Executive Agent Board of Directors. During this analysis period, the T&E Joint Group will periodically review the DoD Component activity and progress. Following the completion of the Component analyses, the results will be presented to the T&E Joint Cross-Service Group for their review and evaluation.

ACTION 9: Develop closure or realignment alternatives. The T&E Joint Group will propose a list of potential closure or realignment alternatives, to include consideration of recommendations of the T&E Executive Board of Directors. The group will assess excess capacity, and will consider generic capabilities, capacity, and workload at the various T&E facilities and bases. Consideration will be given in each of the T&E mission areas.

COORDINATION

In pursuing their BRAC 95 work, all of the joint groups and the DoD Components will coordinate with each other and should take into account other analyses or studies external to the BRAC process which may impact their deliberations. The T&E Joint Cross-Service Group will closely coordinate its activity with the Joint Cross-Service Group for Laboratories, and the Group for Depot Maintenance. The T&E Joint Group will also consider inputs from the Test and Evaluation Executive Agent Board of Directors and coordinate its activities with the Board of Directors.

It has been agreed that JCSG analysis teams for T&E and Laboratrories will be collocated, and that analyses will be performed to evaluate the benefits potentially available from joint recommendations.

RECORD KEEPING

The chairs of the T&E Joint Group shall establish from members of their own staffs, a secretariat for the group. The secretariat shall be led by the Deputy Director, Test Facilities and Resources, (D,T&E), with close coordination with the Deputy Director, Resources and Administration, (D,OT&E). From the date of receipt of the DEPSECDEF BRAC 95 memorandum, the secretariat will develop procedures and methods to maintain the records required by the DEPSECDEF guidance. The secretariat will develop, as directed by the T&E Joint Cross-Service Group, and keep:

- Minutes of meetings will be kept by the respresentative from the DASD(Economic Reinvestment and BRAC), and will not be circulated. Coordination by DT&E and DOT&E will be required as a minimum.

- Descriptions of how base realignment and closure policies, guidance, analyses and recommendations were made, including minutes of all deliberative meetings;

- All policy, data, information, and analyses considered in making base realignment and closure recommendations;

- Descriptions of how DoD Components recommendations met the final selection criteria and were based on the final force structure plan; and

- Documentation that addresses each recommendation to the Secretary of Defense to realign or close a military installation under the law.

The secretariat will all develop strawman material for use by the group as directed by the co-Chairs of the Group.

INTERNAL CONTROLS

The T&E Joint Cross-Service Group must develop and implement an internal control plan for base realignment, closure or consolidation studies to ensure the accuracy of data collection and analyses.

At a minimum, this internal control plan will include:

- Uniform guidance defining data requirements and sources;

- Systems for verifying the accuracy of data at all levels of command;

- Documentation justifying changes made to data received from subordinate commands;

- Procedures for safeguarding and handling data, including its configuration control;

- Procedures to check the accuracy of the analyses made from the data; and

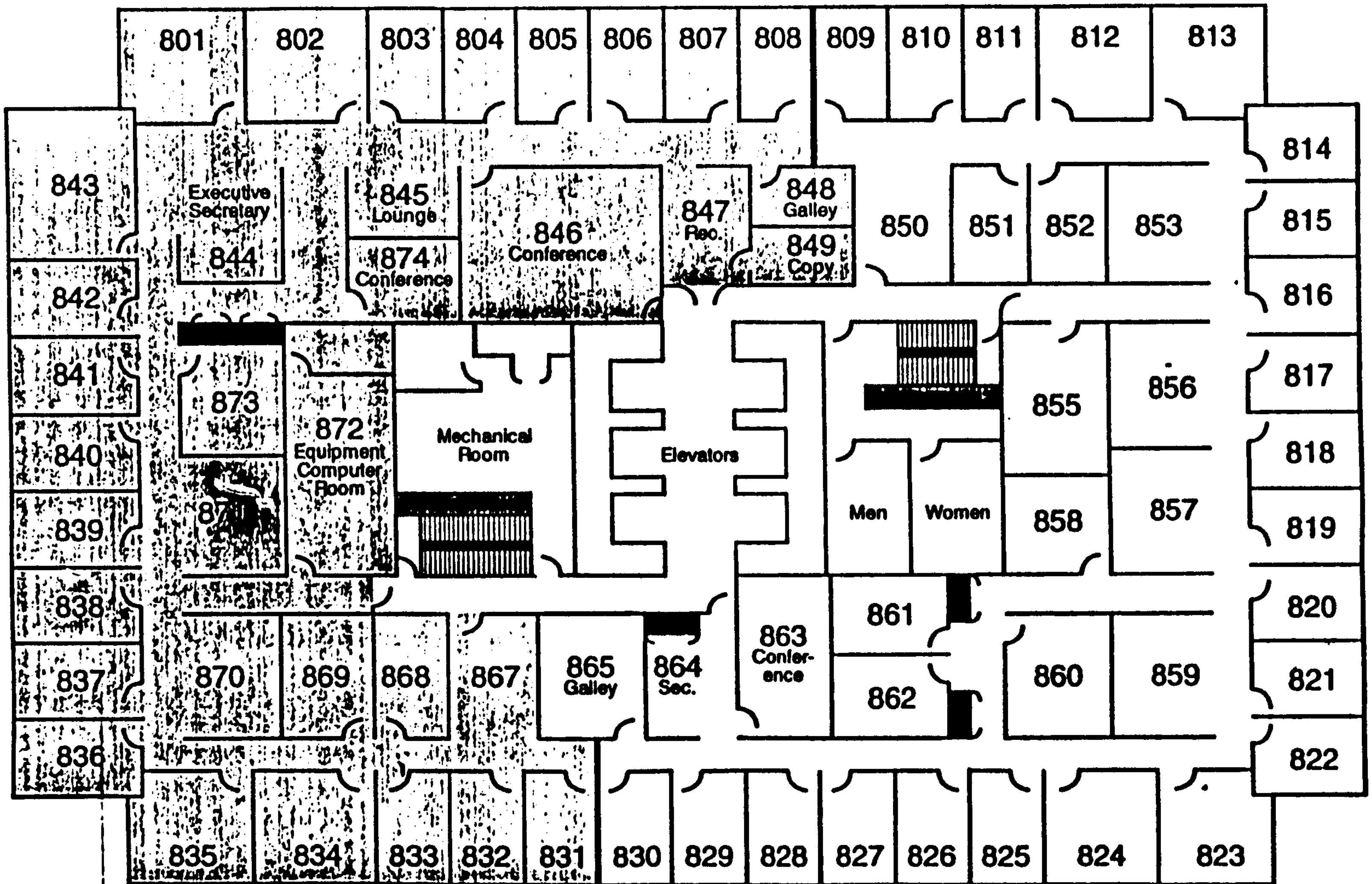
- An assessment by auditors of the adequacy of each internal control plan.

MILESTONES

Table III-1 - MILESTONES (TO FEBRUARY 1995)

MILESTONE	DUE DATE	ACTUAL DATE
Data Call released to Services	31 March 94	
JCSG reaches agreement on Analysis Approach	1 June	
JCSG approves: Workload Projection Methodology Target Reduction Methodology Functional Value Algorithm	15 July	
Tri-Service BRAC Team completes design of database for field data	31 July	
JCSG approves analysis methodology and model	31 July	
Tri-Service BRAC Team completes population of database	31 August	
Steering Group reviews and approves JCSG methodologies	15 August	
Tri-Service BRAC Team complete Preliminary Analysis	15 September	
Services provide site military values	1 September	
Tri-Service BRAC Team complete Primary Analysis (Optimization Model Runs)	30 September	
JCSG recommends alternatives To Services	30 October	
Determine Cross-Service Receiving Capabilities	Nov-Dec	
Service Recommendations To SECDEF	Jan-Feb 95	

THE TEC
TEST & EVALUATION CENTER



WALCOFF

Walcoff & Associates, Inc.

2001 North Beauregard Street, Suite 800, Alexandria, VA 22311 ▪ Phone (703) 578-8222 ▪ Fax (703) 578-0527

DRAFT
171000JUN94

BRAC 95 JOINT CROSS-SERVICE GROUP MANAGEMENT CONTROL PLAN JOINT ANALYTICAL PROCESS

I. BACKGROUND:

The exclusive procedures by which the Secretary of Defense (SECDEF) may pursue realignment or closure of military installations inside the United States are contained in Part A, Title XXIX of Public Law 101-510, entitled the Defense Base Closure and Realignment Act of 1990; as amended by Public Law 102-190 and 103-160; hereafter referred to as the Base Closure Act. The Base Closure Act includes a provision for the President to appoint an independent Base Closure and Realignment (BRAC) Commission to review the SECDEF recommendations in calendar years 1991, 1993, and 1995.

The Deputy Secretary of Defense (DEPSECDEF), in a memorandum dated 7 January 1994, set forth guidance, policy, procedures, authorities and responsibilities for selecting bases for realignment or closure and subsequent submission to the BRAC 1995 Commission. The DEPSECDEF guidance includes a requirement for the establishment of Joint Cross-Service Groups (JCSG) in six areas with significant potential for cross-service impacts in BRAC-95.

Five of these groups are functional in nature and the sixth was established to examine economic impacts. The five functional cross-service groups are Laboratories, Test and Evaluation, Maintenance Depots, Undergraduate Pilot Training, and Medical Treatment Facilities including Graduate Medical Education.

II. PURPOSE:

The primary purpose of this Management Control Plan (MCP) is to provide a set of management controls for the process that the five functional BRAC-95 Joint Cross-Service Groups, and (sub working teams), will use to meet the requirements established by the DEPSECDEF. This MCP, with its associated joint analysis process, provides the necessary checks and balances between the JCSG's and the Military Departments to ensure all possible alternatives are considered and auditable.

III. RESPONSIBILITIES:

a. Review Group: The Review Group is the approving and reviewing authority for all procedures, capacity analysis, definition of alternatives, all joint group products, and making recommendations to the SECDEF and Military Department.

b. Steering Group: The Steering Group is responsible for assisting the Review Group in exercising its authority and reviewing any supplementary guidance issues to the Military Department with regard to these Joint Cross-Service Groups. In addition, the Steering Group acts as an integrator across functional areas.

c. Military Departments: The Military Departments are responsible for assisting the JCSG and must consider all recommendations of the JCSG that have been approved by the Review Group in the Military Department BRAC submission to the SECDEF.

d. Joint Cross-Service Groups: The joint groups are responsible for establishing guidelines, standards, assumptions, measures of merit, data elements, and milestones for their cross-service functional areas. They will provide the functional oversight to the Military Departments in support of the analysis of common support functions, capacity analysis, alternative and scenario development/analysis, and cross-service trade-off analysis. They are responsible for conducting in-depth functional reviews of all analytical analysis to ensure that all alternatives and scenarios are operationally feasible and meet the "common sense" test. This group must review all work conducted by any associated working group and used by the JCSG.

e. Working Groups: This group is a sub-group to the Joint Cross-Service Group that conducts detailed work prior to review by the Joint Cross-Service Group members. This group is not an official group within the Authorized structure described above in section I, therefore, is not subject to the same record keeping requirements. Additionally, the group can not eliminate any action, alternative, or scenario from consideration. Instead, it must document the pros and cons of the action for the Cross-Service Group decision.

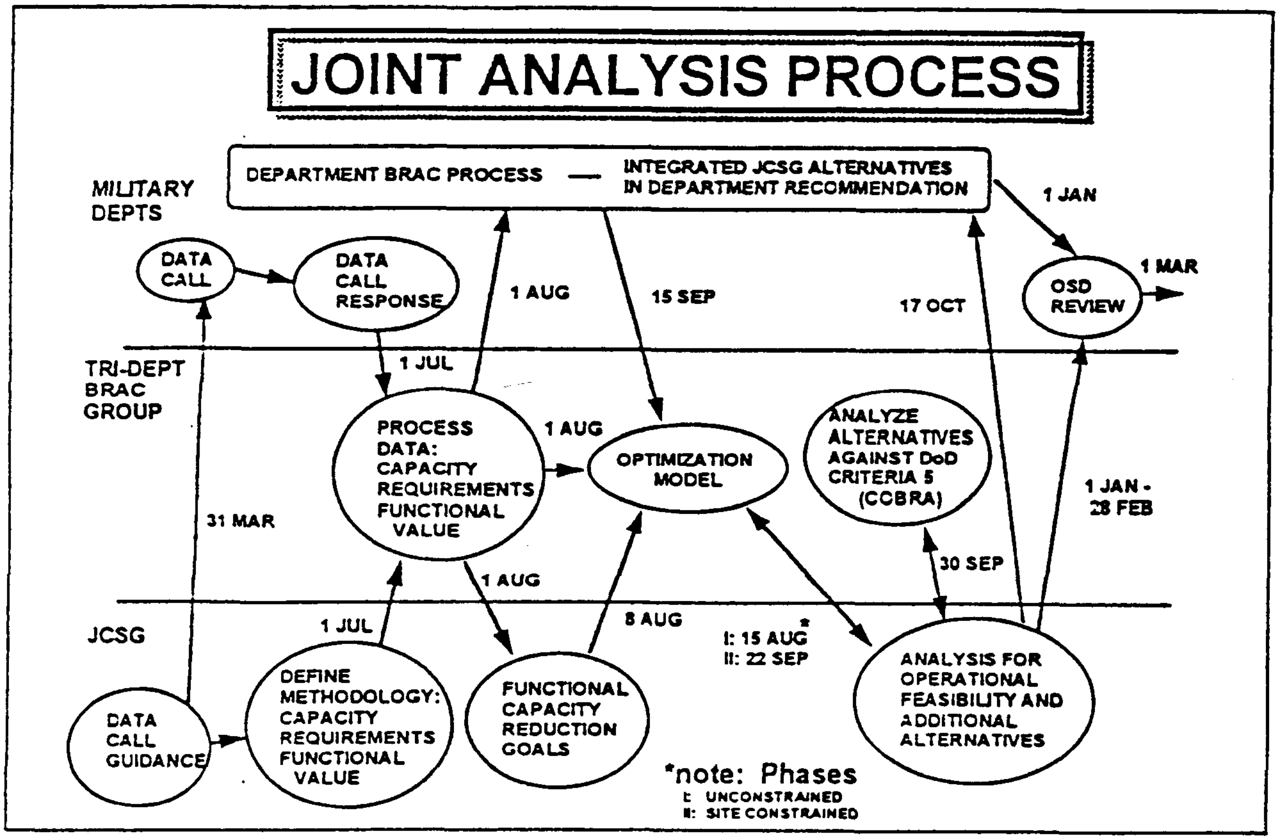
f. Tri-Department BRAC Group: This group is responsible for calculating capacity, requirements, and activity functional value as prescribed by each JCSG. They will run the optimization and COBRA models for each of the JCSGs. The Tri-Department BRAC Group will be composed of members or appointed member of the Military Department BRAC planning offices, as the designated independent BRAC office. This group will have the primary function to ensure auditability to the process.

IV. INTERNAL CONTROLS:

The Internal Control Plan (ICP), 13 April 1994, was approved by the BRAC-95 Cross-Service Steering Group and provides the management controls for the BRAC-95 Joint Cross-Service Groups. This document provides the controls for development, acquisition, certification, and verification of data. The ICP describes the procedures for development, approval and dissemination of measures of merit, processes, policies and guidance as it refers to activities, or facilities.

V. JOINT ANALYSIS PROCESS:

This joint analysis process will be used by the Joint Cross-Service Groups, it includes the process steps described below. The integrity and the auditability of the BRAC process will be enhanced by this common analytical framework. The process provides a set of standard tools (spreadsheet, cost analysis, and linear programming)to assist the JCSGs to focus their functional reviews and allows them to achieve their goals as stated in the DEPSECDEF memorandum. A flow diagram with milestones in the figure below illustrates the interactions of events and provides a time-sequence of events.



1. Taxonomy: The JCSG will define the taxonomy needed to expand the functional JCSG area. The process to define these common support functions (CSF) will begin by the Services defining their specific view points and then reconcile across the Military Departments to develop a joint list.

2. Hierarchial Structure: The JCSG will identify the hierarchial structure that will be used throughout their analysis, to include the activity that relates to each of the CSF's described in step 1. In addition, each service will identify for each CSF Sub-group whether that area is either a core function for that service and must be retained, a candidate for out-sourcing, a candidate for cross-service consolidation, or possibly an area that could be divested completely. This will be a Service view with consideration to other Services or non-DoD needs. The Military Department should consider the resource requirement to be a smart buyer even if the area is out-sourced.

3. Functional Value: The JCSG will then develop the measures of merit. These measures will examine the capability of the activity, the needs of the Services, the facility infrastructure required to maintain the activity, the ability of the industrial base to support this business area, and the agreement between the Services on measuring the Cost of Base Realignment Actions Model (COBRA) input values for the cost analysis. The joint group must agree on the weights/importance of these attributes to gain a common basis for comparison across the Department of Defense. These weights and attributes will describe the Functional Value of each activity.

4. Capacity and Requirements: The JCSG will develop the method to calculate capacity and requirements for each CSF.

5. JCSG Guidance Document: These four requirements, stated above, will be transmitted to the Military Departments as a BRAC data call to be released to their Military Department.

6. Excess Capacity Goals: The JCSG will then review their functional areas for excess capacity. From this review, the group will develop excess capacity goals for each CSF. In addition, the JCSG will develop the methodology to be used with the optimization model described in step 8. This will include which combinations objective functions and policy imperatives to be considered initially by the JCSG.

7. Process Data: The Tri-Department BRAC Group will conduct an initial analysis, using the measures of merit in step 3, and return this analysis to the joint group and the Military Departments.

8. Optimization Model: The Tri-Department BRAC Group will produce a family of alternatives by using the Jointly approved

optimization model (documented separably). The inputs to this model are the functional values of activities, military value of sites (installations), activity capacity, and requirement goals that were determined in earlier steps. A family of alternatives, and a brief analysis and interpretation of the results, will be turned over to the JCSG for their detailed functional review. This step will be conducted in two phases, unconstrained and constrained. The unconstrained will be conducted first to provide the JCSG's with a pure functional view and comparison of their functional area. The second run will be the constrained version with site (installation) military value bands that will be provided by the Military Departments. This family of alternatives will provide alternatives that will be influenced by the Military Department determination of the sites that have low military value to that Department and thus is under consideration for closure by the Military Department.

9. Functional Review: The JCSG's will conduct a detailed review of these sets of outputs for operational feasibility and apply a "common sense" test to each alternative. This is a key step in the process to ensure a workable solution set of alternatives. The JCSG must document all review findings as to why an alternative was not acceptable. Each JCSG has the authority to establish additional alternative sets for consideration. The result of this review will be a set of operational feasible alternatives to be analyzed by DoD Criteria 5, return on investment (COBRA).

10. Functional COBRA: The Tri-Department BRAC Group will conduct functional COBRA analysis on each of the alternative scenarios to determine which scenario, if any, is cost effective. This step will be repeated until all feasible alternatives have been explored and endorsed by the Joint Cross-Service Group or recommended for elimination from consideration.

11. JCSG/Military Department Coordination: Each JCSG alternative will then be submitted through the Steering Group to the Review Group for approval, with all supporting analysis. Once the Review Group approves the recommendation, the Military Department must consider this proposal in their submission to SECDEF. Implicit in this approach is the concept that DoD and the gaining Military Department must appropriate sufficient TOA to support all customers with their Executive Service or Agent status.

12. Review of Alternatives: The final step will be the review of the Military Department BRAC 95 Recommendation to OSD. This review will include the JCSG's ensuring that their alternatives were incorporated or at least considered but not incorporated due to other consideration.

VI. DOCUMENTATION:

Each CSF determined to have cross-service value for consolidation will be documented, addressing the following areas.

a. The activities across DoD that support the CSF.

b. The justification of the consolidated excess capacity analysis for each CSF.

c. All policies that could affect the analysis.

d. The measures of merit, weights and functional value methodology that will be used to evaluate possible alternatives.

e. The list of all scenarios associated with each alternative.

f. Rational why any alternative was eliminated or excluded from further review.

g. The analysis of each scenario to include the cost analysis.

h. The recommendation to the Steering group, and Review Group for exclusion or incorporation into the Services recommendations.

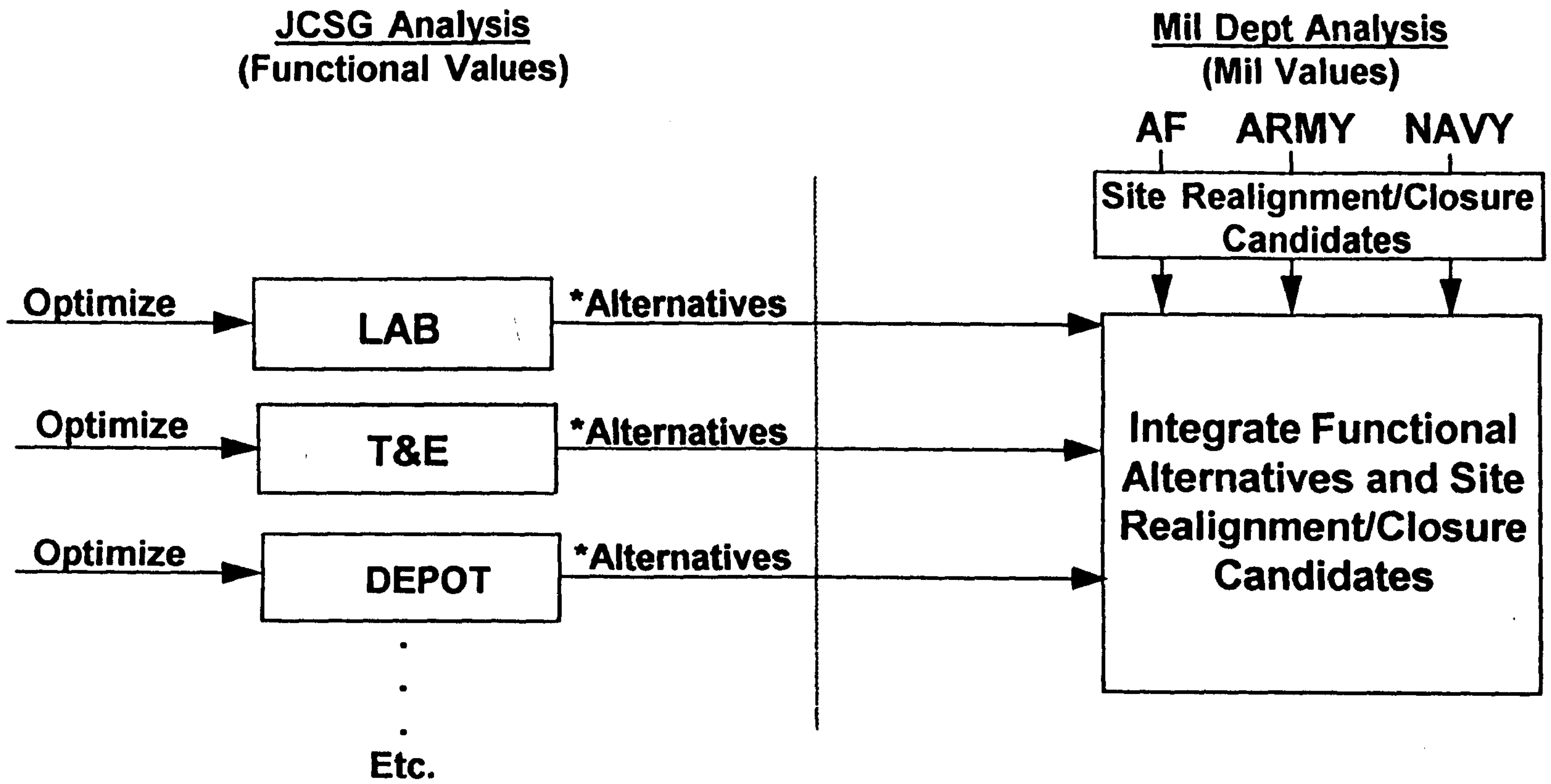
ISSUES

- WHAT ARE THE PRODUCTS OF THE JCSG ?
- WHAT CONSTITUTES AN ALTERNATIVE ?
- AT WHAT POINT IS AN ALTERNATIVE FORWARDED TO THE MILITARY DEPARTMENTS ?
- WHO DOES THE ANALYSIS ?

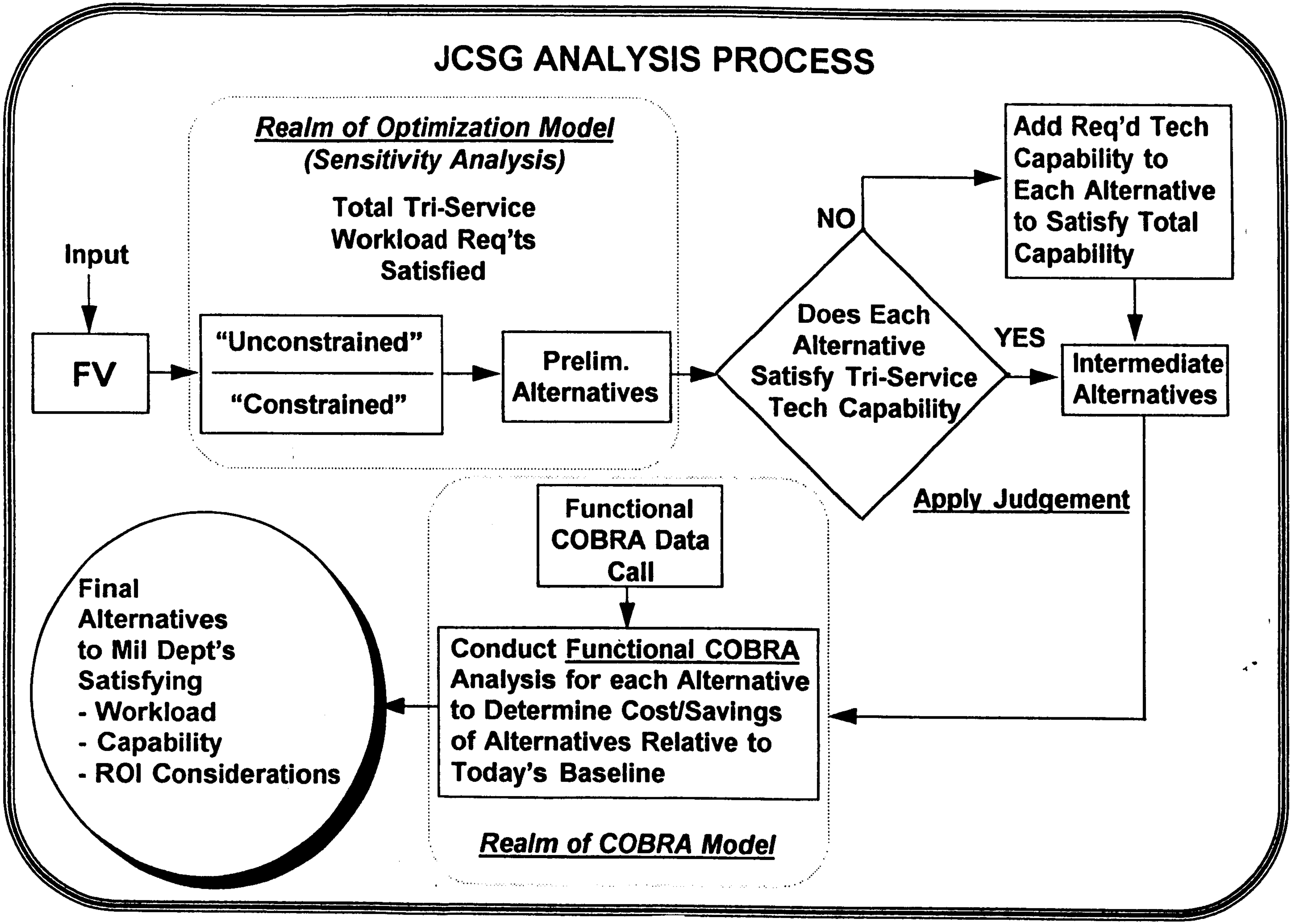
RECOMMENDATIONS

- DEFINE THE PRODUCTS OF THE JCSG
- DEFINE AN ALTERNATIVE
- DETERMINE WHEN FORWARD AN ALTERNATIVE TO THE MILITARY DEPARTMENTS
- DETERMINE WHO WILL DO THE ANALYSIS

TRI-DEPT BRAC ANALYSIS PROCESS

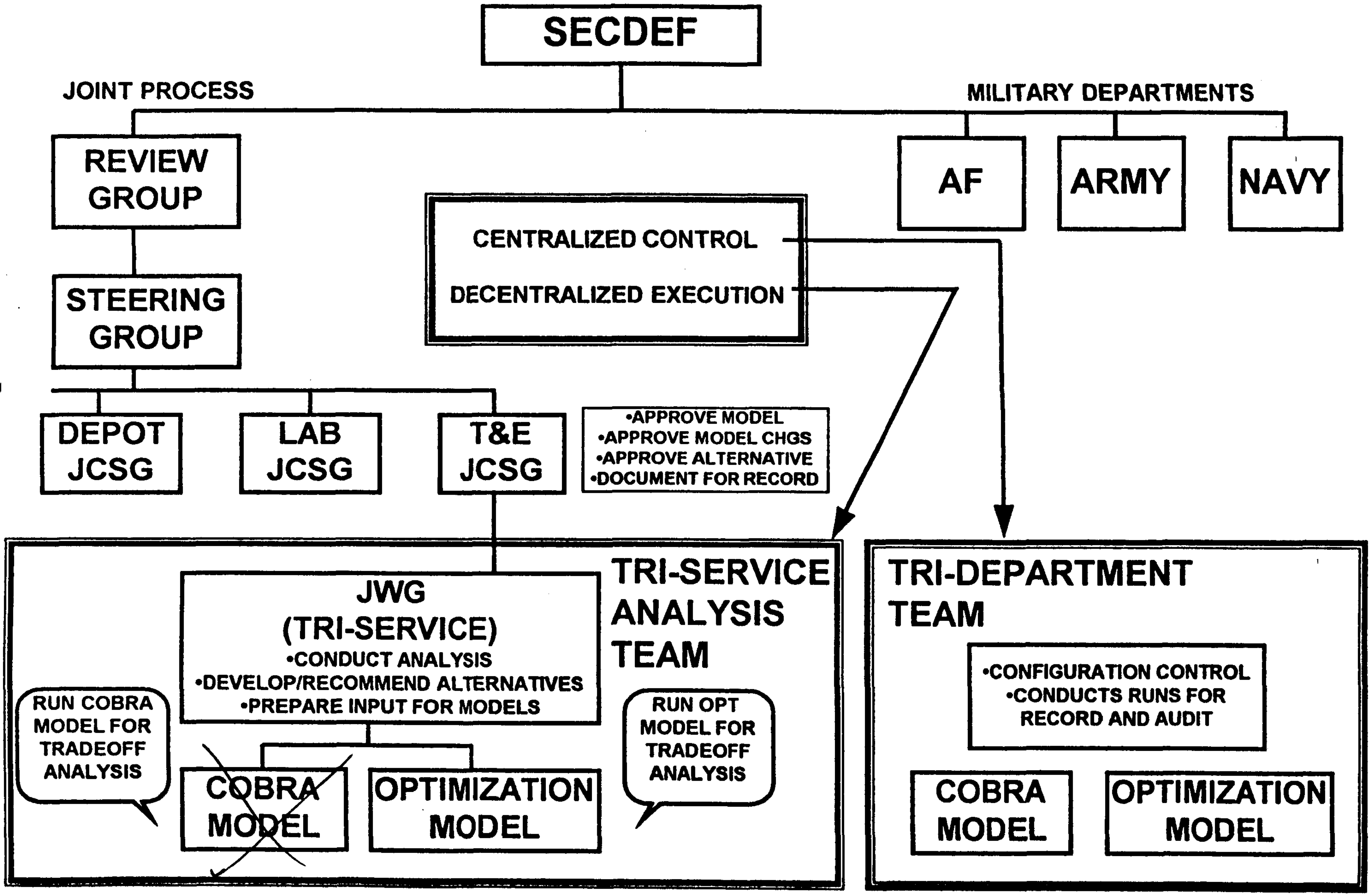


* For Each Alternative
- Satisfy Excess Capacity Targets
- Satisfy Tri-Service Technical Capability
- Reduce Functional Cost for Accomplishing Tri-Service Workload & Technical Capability Relative to Today's Cost


JCSG ANALYSIS PROCESS
Realm of Optimization Model
(Sensitivity Analysis)
Total Tri-Service Workload Req'ts Satisfied
Input
FV
"Unconstrained"
"Constrained"
Prelim. Alternatives
Does Each Alternative Satisfy Tri-Service Tech Capability
NO
YES
Add Req'd Tech Capability to Each Alternative to Satisfy Total Capability
Intermediate Alternatives
Apply Judgement
Functional COBRA Data Call
Conduct Functional COBRA Analysis for each Alternative to Determine Cost/Savings of Alternatives Relative to Today's Baseline
Realm of COBRA Model
Final Alternatives to Mil Dept's Satisfying
- Workload
- Capability
- ROI Considerations

. USE ONLY

PROPOSED ANALYSIS TEAM STRUCTURE



BRAC 95

Joint Cross-Service Group on Test & Evaluation

Tuesday, June 28, 1994

Minutes

The BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. John Burt chaired the meeting. The agenda, a list of attendees, and handouts are attached.

NEW BUSINESS:

The meeting began a briefing on the sensitivity analysis performed on the Total Budget Authority Method (formerly named Total TOA Method), which was approved for use by the Group at the last meeting. The three assumptions used in the sensitivity analysis are 1) the change in workload from FYs 1993-2001 will be the same as the projected change in workload from FYs 1993-1999 in the FY 1995 President's Budget; 2) the total change in workload for the RDT&E, Procurement, and O&M titles roughly equates to the total change in workload at the T&E activities; and, 3) the change in workload or workload mix at any single activity will be offset by changes at other activities to result in a rough correlation to the total workload mix. After a brief discussion, the Group agreed that the change in total outlays for the three titles from FY 1993 to FY 1999 is very similar to the change in only the RDT&E title and that various notional workload mix assumptions for the T&E activities does not result in a significantly different change than that resulting from the total change in outlays. A detailed writeup is attached for more information.

The discussion then turned to the schedule. The subgroup asked if it would be possible to reschedule the July 5th meeting to July 6th because of the July 4th holiday. The Group agreed and the schedule reflects the latest action due date of July 6. Additionally, the database requirement/selection was added since last meeting. The Group ratified its addition and further commented that it should be modified to reflect a July 6 suspense also.

The next discussion pertained to excess capacity reduction target methodology. It was noted the bullet pertaining to cost effectiveness was modified to ensure that all costs are captured in COBRA scenario data calls. Concern arose on the issue of institutional funding and whether it can be fully captured. The discussion ended with the Group stating that they should remain aware of potential institutional funding problems associated with COBRA and the excess capacity reduction target methodology, as written, is agreed upon.

The next part of the briefing was on the optimization model. The subgroup related to the Group the model's flexibility, projected use, and limitations. One such limitation is that technical differences at facilities cannot be captured in the model's objective functions. The Group discussed possible solutions to this including the use of military judgement on the model's outputs. Issues raised on the use of the model include: 1) the flexibility to use whatever objective functions the Groups need; 2) the model only addresses one part of the overall analysis - capacity - and does not address capability or cost effectiveness; 3) the model cannot be used to optimize across JCSG functional areas; and, 4) it restricts JCSG tradeoffs to functional value and it leaves military value tradeoffs to the Military Departments. Other issues discussed pertained to JCSG products, what is the overall Tri-Service Analysis Process, and who does what in each team (Tri-Service Analysis Team and Tri-Department BRAC Team). A detailed discussion ensued on these issues. A step by step description of who (JCSG/Tri-Dept BRAC Team/Military Department) will perform what actions was detailed using a previous meetings diagram. After it was completed, the Group agreed it should be formally drawn up and presented at the next meeting. The Group further agreed that the diagram should include a written description of each block or responsibility to explain the relationships between each group. A companion diagram was also modified from the last meeting which highlights responsibilities between the Group and subgroup and the Tri-Department BRAC Team. This diagram will also be ratified at the next meeting. A discussion on functional COBRA runs arose. It was relayed to the Group that this has been discussed at the Steering Group level and there is a desire for functional COBRAs to be run, but at this time who in the Military Departments and the timing of these runs has not been agreed to yet. This Group agreed to recognize a need to address functional cost analysis and technical feasibility issues once the action plan has been completed and approved by the Group.

After the lengthy discussion on the process responsibilities, the Group resolved those issues pertaining to JCSG products, what the overall Tri-Service Analysis Process is,. and who does what (Tri-Service Analysis Team/Tri-Department BRAC Team). One issue that was left unresolved was optimization across JCSGs. Because the Laboratory and Test & Evaluation JCSGs use different measures of capacity the subgroup couldn't determine how to run joint optimization model. The Chairs tasked the subgroup to get with the Laboratory Group and modelers to see if data could be normalized for cross-JCSG runs of the model are possible. They also tasked the subgroup with determining a methodology for cross-service function integration if the model could not be adapted. On a final note, the Chairs agreed they would bring this issue up to the Assistant Secretary of Defense for Economic Security (ASD(ES)) as a problem the two JCSGs are wrestling with.

The next discussion centered on the functional value framework. There was a proposal by the subgroup during this briefing whether throughput value, which was defined as the capacity of a site to do work, should be included in the calculation of functional value. It was pointed out that the Air Force requested this inclusion to the functional value so that they can use it in their determination of installation military value. The subgroup then presented pro's and con's of including the throughput value. A main theme presented was that capacity analysis will capture throughput, but not place a functional value on it, and throughput considerations can be addressed in the weighting of the technical and physical values of the methodology. An additional consideration shared was that if the Air Force was requiring this value in our functional value analysis were all JCSGs being asked to include it in theirs for consistency. If one group were not to add it the installation military value would be suspect if there were to be cross-JCSG functions located at the installation. Three options were then introduced that could address some of the con's. These options are: accept additional weighting for some objective functions, modify objective functions to eliminate additional weighting, and include throughput value in JCSG functional values delivered to the Services, but exclude it when doing optimization. Their was no Group agreement on how to resolve this so the Chairs decided to bring this up to the ASD(ES) for discussion with respect to total inclusion/exclusion.

A review of the draft briefing to the ASD(ES) then took place. The Group agreed to the briefing as written with the two issues mentioned above added to the Issues chart. The Group also asked the status of how classified facilities are to be handled. The Group was informed that the Steering Group addressed this issue and the C3I representative would facilitate the analysis of classified facilities. The Chairs agreed that this was important enough to add as an issue during their briefing.

OLD BUSINESS:

The Air Force and Defense Agencies still need to provide a list of their membership to the JCSG and subgroups. (Open)

There being no other items for discussion, the meeting adjourned at 1200.

Approved: G/H Frame
Lee Frame
Co-Chairman

John Burt
Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test & Evaluation

June 28, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Burt, Co-Chair
Mr. John Bolino, Co-Study Team Leader
LTG (Ret) Howard Leaf, Air Force
Mr. Parker Horner, Air Force
Mr. Dan Stewart, Air Force
Mr. Joe Dowden, Air Force
Mr. Doug Nation, Air Force
Lt Col George London, Air Force
Mr. Walt Hollis, Army
Mr. John Gehrig, Army
Mr. Gary Holloway, Army
MAJ Essex Fowlks, Army
Mr. Tom Roller, Army
MAJ Jack Marriott, Army
Mr. Gerald Schiefer, Navy
CAPT Dave Rose, Navy
Mr. Don DeYoung, Navy
CDR Mark Samuels, Navy
Mr. Ron Nickel, Navy
Mr. Mike McAndrew, ODASD(ER&BRAC) BCU
Mr. Joe Moore, OSD DOT&E
Mr. Irv Boyles, OSD DT&E
Ms. Kathleen Ruemmele, BMDO
Mr. Frank Lewis, OSD PA&E
MAJ Robin Pope, OSD DR&E
Mr. Mark Flohr, OSD DNA
Mr. Jim Thomas, OSD OT&E
Mr. Dave Vincent, DoD IG
Ms. Jeanne Karstens, OSD Comptroller

Office of DoD Comptroller
Program/Budget, Investment Directorate

June 29, 1994

MEMORANDUM FOR: CO-CHAIRMEN, T&E JOINT CROSS-SERVICE WORKING GROUP

SUBJECT: Workload Methodology Assessment

Attached is a summary of my analysis of the sensitivity of appropriation weighting in the projection of workload for the T&E activities. Based on my concern that the methodology for projecting workload that was approved at the June 21 meeting of the Joint Cross-Service Working Group may not provide the best projection, I performed an analysis of various workload methodologies using official outlay projections and notional workload alternatives.

As discussed at the June 21 meeting, the sub-group had reviewed three alternatives for projecting workload at the T&E activities using data in the Future Years Defense Program supporting the FY 1995 President's budget. Alternative 1 projected workload based on total funding from FYs 1992/93 to FY 1999 in a defined set of program elements (specifically those that are identified as workload drivers). Alternative 3, the approved alternative, would project workload based on the total change in outlays for the Operation and Maintenance (O&M), Procurement, and Research, Development, Test and Evaluation (RDT&E) titles between FYs 1992/93 and FY 1999. Alternative 2 was a refinement of alternative 3 which provided a weight to each of the three titles based on historical experience.

Since O&M accounts for roughly half of the total of these three titles it contributes heavily to the change over the FYDP. And since O&M is not the driver for workload at the T&E activities, my concern was that the change in total outlays may not equate to the anticipated change in total outlays at the T&E activities. The analysis that I performed indicated, however, that the change in total outlays for the three titles from FY 1993 to FY 1999 is very similar to the change in only the RDT&E title (Attachment A). And, further, that various notional workload mix assumptions for the T&E activities does not result in a significantly different change than that resulting from the total change in outlays (Attachment B).

Attachment C provides the data used in the calculation. This data was provided by the Plans and Systems Directorate of the Office of the DoD Comptroller and supports the FY 1995 President's Budget. Attachment D provides an unofficial estimate of the outlays that could be expected for each budget activity of the RDT&E total title (by applying the average RDT&E outlay rate to each budget activity). These amounts were used in page 2 of Attachment A to determine the impact of excluding

6.1 and 6.2 programs for the calculation. There is some variance in the total workload that would be projected by excluding 6.1 and 6.2 or by including only 6.3B, 6.4 and Operations Systems Development programs in the total. However, given the other uncertainties inherent in the future funding available and the amount of T&E that will be required, the difference was not considered significant.

Attachment E reflects the assumptions inherent in this methodology.

Jeanne Karstens

Jeanne Karstens

FY 1995–99 FYDP

	% Change BA	% Change Outlays
RDT&EA	–47.4%	–46.4%
RDT&EN	–33.8%	–32.2%
RDT&EAF	–34.2%	–29.8%
RDT&EDW	–22.0%	–17.2%
DT&E	–0.6%	–0.9%
OT&E	–5.5%	–51.8%
RDT&E Total	–32.8%	–29.9%
PROCUREMENT		
APA	–35.1%	–53.1%
MPA	–5.8%	–67.4%
PWTCVA	60.2%	–43.6%
PAA	–44.4%	–58.0%
OPA	–34.0%	–45.5%
APN	46.6%	–7.5%
WPN	–38.6%	–56.0%
SCN	29.9%	–37.5%
OPN	–30.0%	–52.2%
PMC	16.6%	–57.1%
[illegible]PAF	–13.5%	–42.9%
WPAF	32.6%	–9.9%
OPAF	–13.8%	–21.0%
PDA	17.4%	11.8%
DPA		–61.4%
NGRE	–100.0%	–93.7%
CAM	6.2%	46.2%
Proc Total	–4.5%	–36.3%
O&M Total	–13.2%	–18.6%
Grand Total	–14.8%	–26.9%

FY 1995–99 FYDP

	% Change BA	% Change Outlays
RDT&E		
6.1 Total	–12.1%	–8.6%
6.2 Total	–18.9%	–15.6%
6.3A Total	–34.9%	–32.3%
6.3B Total	–23.9%	–20.8%
6.4 Total	–41.0%	–38.7%
6.5 Total	–16.7%	–13.4%
OSD Total	–40.1%	–37.6%
RDT&E Total	–32.6%	–29.9%
Less 6.1 & 6.2	–34.9%	–32.2%
6.3B/6.4/OSD	–37.5%	–35.0%

FY 1995–99 FYDP

	% Change Outlays	Workload Mix A	Outlays	Workload Mix B	Outlays	Workload Mix C	Outlays	Workload Mix D	Outlays	Workload Mix E	Outlays	Workload Mix F	Outlays
RDT&E													
RDT&EA	–46.4%												
RDT&EN	–32.2%												
RDT&EAF	–29.8%												
RDT&EDW	–17.2%												
DT&E	–0.9%												
OT&E	–51.8%												
RDT&E Total	–29.9%	70%	–21%	60%	–18%	55%	–16%	60%	–18%	65%	–19%	65% (6.3B/6.4/OSD)	–23%
PROCUREMENT													
APA	–53.1%			5%	–3%								
MPA	–67.4%					8%	–5%						
PWTCVA	–43.6%												
PAA	–58.0%					7%	–4%						
OPA	–45.5%												
APN	–7.5%			10%	–1%								
WPN	–56.0%					6%	–3%						
SCN	–37.5%												
OPN	–52.2%			5%	–3%								
PMC	–57.1%												
APAF	–42.9%			10%	–4%	3%	–1%						
WPAF	–9.9%					11%	–1%						
OPAF	–21.0%			5%	–1%								
PDA	11.8%												
DPA	–61.4%												
NGRE	–93.7%												
CAM	46.2%												
Proc Total	–36.3%	20%	–7%	35%	–13%	35%	–13%	10%	–4%	15%	–5%	15% (LESS SCN)	–5.4%
O&M Total	–18.6%	5%	–1%	5%	–1%	10%	–2%	15%	–3%	10%	–2%	10%	–2%
Grand Total	–26.9%	95%	–29%	100%	–32%	100%	–31%	85%	–24%	90%	–27%	90%	–30%

FY 1995–99 FYDP

	Budget Authority				Budgeted Outlays			
	TY$		95$		TY$		95$	
	FY 93	FY 99	FY 93	FY 99	FY 93	FY 99	FY 93	FY 99
RDT&E								
RDT&EA	6,057,072	3,746,141	6,375,147	3,356,792	6,218,192	3,908,237	6,530,950	3,502,219
RDT&EN	8,913,836	6,965,928	9,388,835	6,218,718	8,944,299	7,134,017	9,402,102	6,370,842
RDT&EAF	12,978,924	10,126,084	13,698,289	9,009,690	12,338,220	10,247,846	12,989,161	9,122,674
RDT&EDW	9,752,650	9,033,305	10,298,785	8,033,648	9,204,125	9,019,984	9,695,828	8,025,998
DT&E	259,021	306,501	273,932	272,386	240,077	282,025	252,969	250,819
OT&E	12,333	13,873	13,047	12,327	22,795	13,027	24,019	11,586
RDT&E Total	37,973,836	30,191,832	40,048,035	26,903,561	36,967,708	30,605,136	38,895,029	27,284,138
PROCUREMENT			1					
APA	1,420,784	1,099,263	1,504,015	976,780	1,674,573	930,886	1,764,497	827,884
MPA	1,000,537	1,123,710	1,059,654	998,457	2,186,823	845,950	2,304,255	752,346
PWTCVA	905,631	1,729,461	959,181	1,536,632	2,112,716	1,412,193	2,226,168	1,255,935
PAA	1,060,273	701,668	1,121,221	623,660	1,383,301	688,711	1,457,584	612,506
OPA	3,058,651	2,405,727	3,239,022	2,137,647	3,913,428	2,526,570	4,123,578	2,247,006
APN	5,616,017	9,810,717	5,945,543	8,717,778	7,245,510	7,937,936	7,634,592	7,059,608
WPN	3,556,380	2,602,706	3,765,672	2,312,678	4,742,181	2,472,688	4,996,835	2,199,086
SCN	4,425,310	6,859,468	4,690,745	6,094,824	10,135,552	7,499,974	10,679,828	6,670,106
OPN	5,271,205	4,396,105	5,582,863	3,906,270	6,400,569	3,624,641	6,744,278	3,223,577
PMC	829,607	1,152,854	878,409	1,024,443	1,458,174	741,476	1,536,478	659,432
APAF	10,013,006	10,329,304	10,608,762	9,177,826	11,438,378	7,745,335	12,052,615	6,888,318
WPAF	4,229,873	6,688,240	4,481,538	5,942,741	5,423,847	5,790,559	5,715,106	5,149,837
OPAF	7,560,457	7,743,835	7,988,936	6,883,329	8,052,669	7,540,267	8,485,095	6,705,941
PDA	1,983,314	2,768,862	2,095,960	2,460,937	1,733,175	2,295,053	1,826,246	2,041,107
DPA			0	0	21,868	10,000	23,043	8,894
NGRE	1,339,243		1,418,687	0	1,662,195	123,188	1,751,454	109,557
CAM	518,600	654,469	548,040	581,718	350,908	608,012	369,752	540,736
Proc Total	52,788,888	60,066,389	55,888,248	53,375,720	69,935,867	52,793,439	73,691,404	46,951,876
			1					
O&M Total	89,172,254	90,576,275	93,251,056	80,920,339	94,121,051	89,629,012	98,380,230	80,096,505
Grand Total	179,934,978	180,834,496	189,187,339	161,199,620	201,024,626	173,027,587	210,966,663	154,332,519

Att[illegible] C

FY 1995–99 FYDP

	Budget Authority				Budgeted Outlays			
	TY$		95$		TY$		95$	
	FY 93	FY 99	FY 93	FY 99	FY 93	FY 99	FY 93	FY 99
RDT&E			1.0546	0.89110	0.9773	1.0137	0.9750	1.0141
6.1 Total	1,314,079	1,366,363	1,385,828	1,217,566	1,284,207	1,385,067	1,351,160	1,234,773
6.2 Total	3,549,022	3,407,019	3,742,799	3,035,995	3,468,346	3,453,658	3,649,169	3,078,900
6.3A Total	6,282,318	4,840,414	6,625,333	4,313,293	6,139,508	4,906,674	6,459,594	4,374,248
6.3B Total	4,211,722	3,793,505	4,441,682	3,380,392	4,115,981	3,845,434	4,330,569	3,428,164
6.4 Total	8,486,601	5,923,888	8,949,969	5,278,777	8,293,684	6,004,980	8,726,077	5,353,377
6.5 Total	3,397,818	3,349,616	3,583,339	2,984,843	3,320,579	3,395,469	3,493,698	3,027,025
OSD Total	10,586,038	7,511,027	11,164,036	6,693,076	10,345,396	7,613,845	10,884,756	6,787,663
RDT&E Total	37,827,598	30,191,832	39,892,986	26,903,942	36,967,708	30,605,136	38,895,029	27,284,138
					(7)	(9)	(6)	12
Less 6.1 & 6.2	32,964,497	25,418,450	34,764,359	22,650,381	32,215,148	25,766,402	33,894,694	22,970,477
6.3B/6.4/OSD	23,284,361	17,228,420	24,555,687	15,352,245	22,755,061	17,464,259	23,941,402	15,569,204

T&E Workload Projection Assumptions

Total Budget Authority Methodology
(RDT&E, Procurement and O&M Titles only)

- The change in workload (expressed as outlays) from FYs 1993-2001 will be the same as the projected change in workload from FYs 1993-1999 in the FY 1995 President's Budget.

- The total change in workload for the RDT&E, Procurement and O&M titles roughly equates to the total change in workload at the T&E activities.

- The change in workload or workload mix at any single activity will be offset by changes at other activities to result in a rough correlation to the total workload mix.

OPTIMIZATION MODEL - ISSUES

- **JCSG Must have Flexibility to Use Whatever Objective Functions They Need to Conduct Tradeoffs and Define the Best Possible Alternatives**
  - Do Not Restrict to "Preliminary" and "Primary" Formulations in Current Model
- **Model Only Addresses One Part of Overall Analysis Process - i.e., Capacity**
  - Does Not Address "Capability" or "Cost Effectiveness" of JCSG Alternatives
- **Model Cannot be Used to Optimize Across JCSG Functional Areas**
  - Different Measures of Capacity (eg, Test Hrs vs Manyears)
  - Different Capabilities Cannot be Interchanged within a Functional Area, Much Less Across Functional Areas
- **Restrict JCSG Tradeoffs to Functional Value, and Leave Mil Value Tradeoffs to Mil Departments**
  - Equal Banding of Mil Value for Functional Sites Could Lead to Retention of the Least Desirable Functional Capability

ISSUES REMAINING

- What are the JCSG Products?
- What is Overall Tri-Service Analysis Process?
- Who does What?

JCSG (Tri-Service Analysis Team)

Tri-Department Team

Reference the three charts presented at the last two JCSG meetings

R

DRAFT

BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 28 JUNE 1994
CONFERENCE ROOM 1C730, PENTAGON

AGENDA

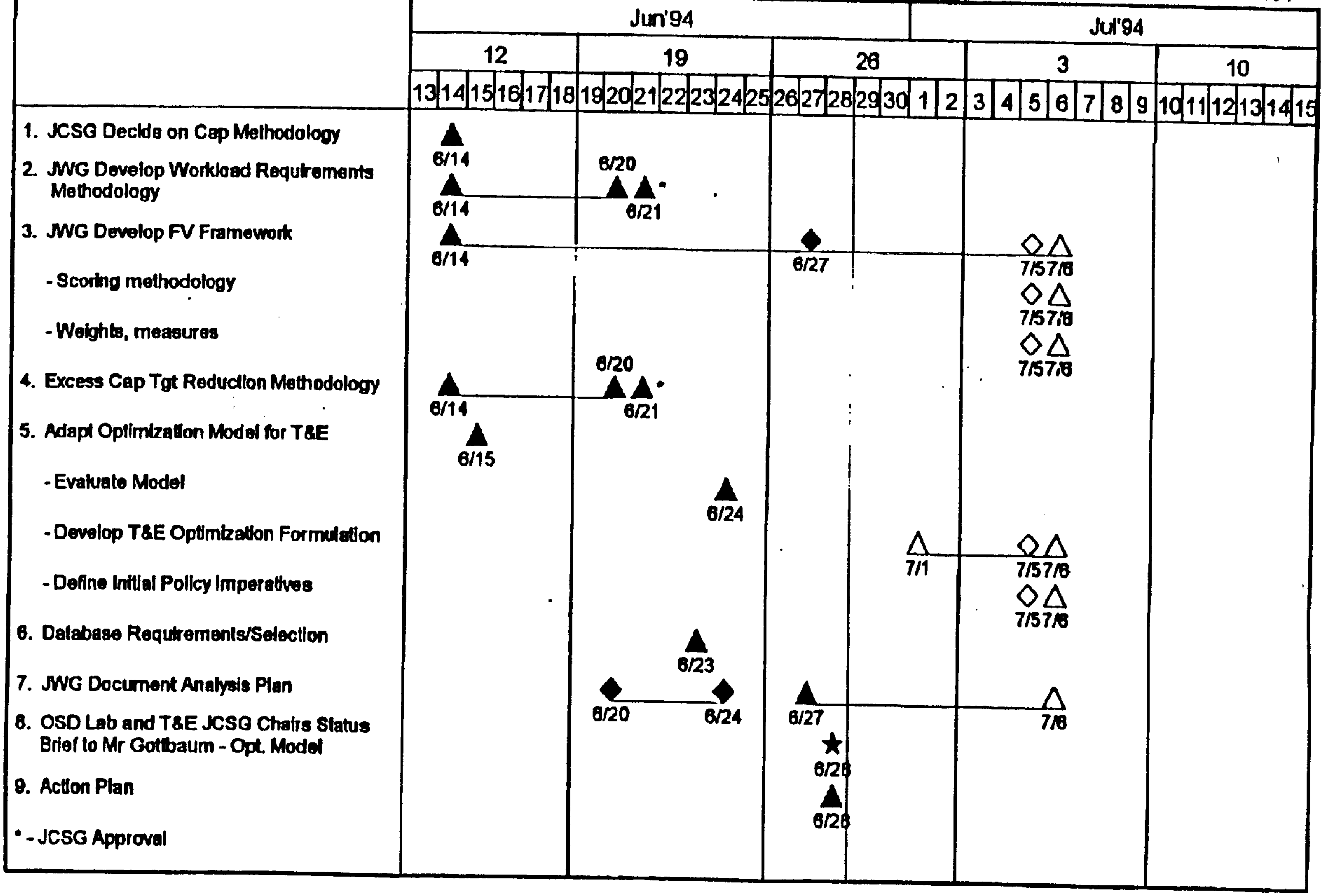
- OPENING REMARKS
- COMMENTS ON 21 JUNE 1994 MINUTES
- WORKING GROUP STATUS REPORT
    - SCHEDULE
    - WORKLOAD PROJECTION
    - EXCESS CAPACITY TARGET METHODOLOGY
    - OPTIMIZATION MODEL EVALUATION
    - FUNCTIONAL VALUE FRAME WORK STATUS
    - PROPOSED BRIEFING FOR ASD, ECONOMIC SECURITY MR. GOTTBAUM
    - ACTION PLAN ADDENDUM
    - JCSGWG FACILITY
    - JCSGWG DOCUMENT ANALYSIS PLAN
- ISSUES/RECOMMENDATIONS
- ACTION ITEMS/WRAP UP

DRAFT

T&E JWG Schedule

For Official Use Only - Working Draft

6/28/1994



WORKLOAD PROJECTION METHODOLOGY

- EXAMINED SENSITIVITY OF WORKLOAD PROJECTION INDEX

- PAPER DOCUMENTING METHODS COORDINATED WITH WORKING GROUP AND COMMENTS INCORPORATED

- RECOMMEND TOTAL BUDGET AUTHORITY METHOD BE ADOPTED FOR T&E JOINT CROSS-SERVICE ANALYSIS

28 June 1994

T&E WORKLOAD PROJECTION METHODOLOGY

1. INTRODUCTION: Inherent to the determination of excess capacity is the development of a future T&E workload projection for each of the functional areas being examined as part of the T&E joint cross service analysis. This document

a. describes three methods for projecting future T&E workload requirements,

b. discusses their relative advantages and disadvantages, and

c. recommends a method for use in the T&E joint cross-service analysis.

The underlying premise for all methods is that future T&E workload will increase/ decrease in direct proportion to funding increases/decreases in the DoD budget. The methods differ principally in the degree of funding refinement of DoD budget authority included in each method.

2. OBJECTIVE: To develop a workload projection methodology that provides a quantitative, consistent, and defensible basis for estimating future T&E workload.

3. ASSUMPTIONS:

a. The amount of workload generated by a fixed dollar amount is constant over the period FY92 - FY01.

b. The percentage of total workload for a given functional area that must be accomplished by each of the six test resource categories remains constant over the period FY92 - FY01.

c. The T&E JCSG analysis will include minimization of excess capacity as one of its goals; therefore, workload projections must be done at the test resource category level.

d. Outlay rates used in support of the FY95 President's Budget can be used for FYs93 - 99.

e . Workload for FY00 and FY01 equals that for FY99.

4. SCOPE: The methodology projects T&E workload throughout the FY95 - FY01 period and utilizes the workload measures specified in the JCSG T&E data call. The methodology draws upon historical workload information contained within the data call and funding data contained in the FY95 - 99 FYDP. Generation of T&E workload projections will be the responsibility of the T&E JCSG.

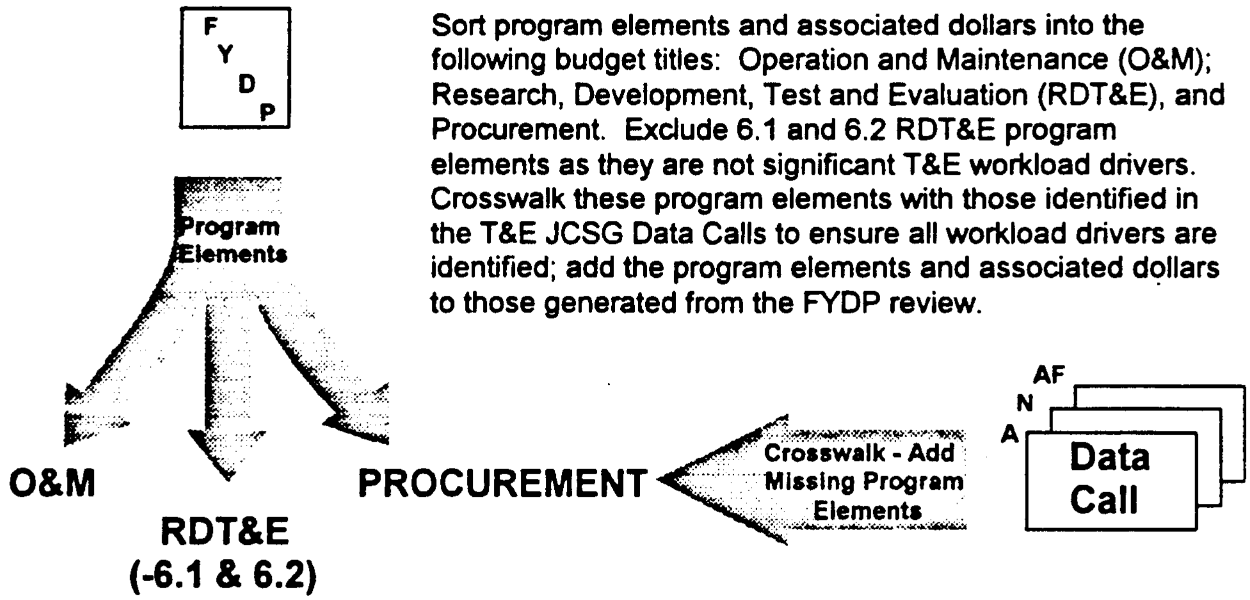
5. METHODOLOGY:

5.1 Individual PE Method. The end product of this method is a single T&E workload projection index for each functional area for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. Select a functional area (FA_i; i = 1, 2, 3).

b. Review the FYDP and identify, by fiscal year, those program elements and associated dollars that have been or are expected to be a T&E workload driver for this functional area.

Sort program elements and associated dollars into the following budget titles: Operation and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E), and Procurement. Exclude 6.1 and 6.2 RDT&E program elements as they are not significant T&E workload drivers. Crosswalk these program elements with those identified in the T&E JCSG Data Calls to ensure all workload drivers are identified; add the program elements and associated dollars to those generated from the FYDP review.



When a program element drives workload in more than one functional area, total program funding will be applied to the total for each functional area.

c. Compute funding totals by fiscal year for each budget title and convert into constant FY95 dollars by deflating/inflating totals with certified inflation indices provided by the DoD Comptroller.

where FOM_{xi} = total O&M dollars for fiscal year x and functional area i which were identified as T&E workload drivers expressed in constant FY95 dollars.

FR_{xi} = total RDT&E dollars minus 6.1 and 6.2 dollars for fiscal year x and functional area i which were identified as T&E workload drivers expressed in constant FY95 dollars.

FP_{xi} = total Procurement dollars for fiscal year x and functional area i which were identified as T&E workload drivers expressed in constant FY95 dollars.

FUNCTIONAL AREA (FA_i)

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	FOM_{90i}	FOM_{91i}	FOM_{92i}	FOM_{93i}	....	....	FOM_{00i}	FOM_{01i}
RDT&E	FR_{90i}	FR_{91i}	FR_{92i}	FR_{93i}	....	....	FR_{00i}	FR_{01i}
Procurement	FP_{90i}	FP_{91i}	FP_{92i}	FP_{93i}	....	....	FP_{00i}	FP_{01i}

d. Based on historical experience across the three Services, determine what fraction of total workload within this functional area was driven by each of the three budget titles.

WOM_i = fraction driven by O&M funding
WR_i = fraction driven by RDT&E funding
WP_i = fraction driven by Procurement funding

e. Multiply the constant dollar amounts from step c by the weighting functions (i.e., fractions) from step d and sum.

$$FT_{xi} = FOM_{xi} \times WOM_i + FR_{xi} \times WR_i + FP_{(x-2)i} \times WP_i$$

where a two-year workload lag is built-in for procurement funding. (If desired, outlay rates could be incorporated to provide a better estimate of the workload lag.)

f. Compute average funding total baseline (FTB) for FY92 and FY93.

$$FTB_i = \frac{FT_{92i} + FT_{93i}}{2}$$

g. Divide funding total for fiscal year x from step e by the funding baseline from step f for fiscal years FY95 - FY01 to get the workload projection index for functional area i.

$$I_{xi} = \frac{FT_{xi}}{FTB_i} \qquad x = FY95, FY96, \ldots\ldots\ldots, FY01$$

h. Select test resource category (TRC_j; j = 1, 2, ..., 6).

i. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

j. Multiply total workload baseline from step i by the workload projection index from step g to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_{xi} \times WTB_{ij}$$

k. Repeat steps h through j for each test resource category.

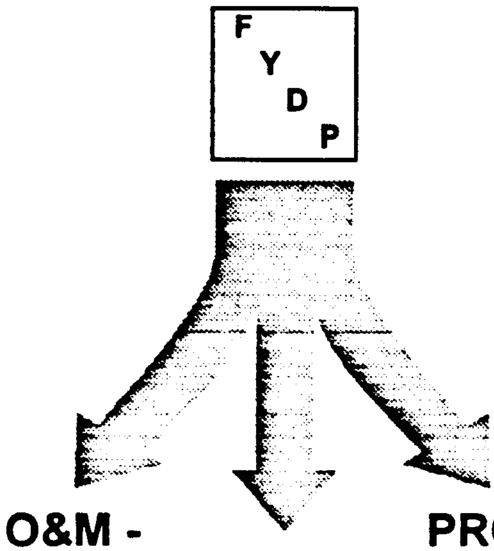
l. Repeat steps a through k for each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

5.2 Weighted Budget Authority Method. The end product of this method is a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. Compute Budget Authority (BA) by budget title:



From FYDP compute the Budget authority by budget title (i.e., Operation and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement). Exclude 6.1 and 6.2 RDT&E funding because they are not significant T&E workload drivers; also exclude those O&M activity groups that are not T&E workload drivers.

b. Compute funding totals by fiscal year for each budget title and convert into constant FY95 dollars by deflating/inflating totals with certified inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M BA minus those activity groups that are not T&E workload drivers for fiscal year x expressed in constant FY95 dollars.

TR_x = total RDT&E BA minus 6.1 and 6.2 funding for fiscal year x expressed in constant FY95 dollars.

TP_x = total Procurement BA for fiscal year x expressed in constant FY95 dollars.

TOTAL BUDGET AUTHORITY

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Based on historical experience across the three Services, determine what fraction of total T&E workload was driven by each of the three budget titles.

WOM = fraction driven by O&M funding
WR = fraction driven by RDT&E funding
WP = fraction driven by Procurement funding

d. Multiply the constant dollar amounts from step b by the weighting functions (i.e., fractions) from step c and sum.

$$FT_x = TOM_x \times WOM + TR_x \times WR + TP_{(x-2)} \times WP$$

where a two-year workload lag is built-in for procurement funding. (If desired, outlay rates could be incorporated to provide a better estimate of the workload lag.)

e. Compute average funding total baseline (FTB) for FY92 and FY93.

$$FTB = \frac{FT_{92} + FT_{93}}{2}$$

f. Divide funding total for fiscal year x from step d by the funding baseline from step e for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{FT_x}{FTB} \qquad x = \text{FY95, FY96, ..., FY01}$$

g. Select test resource category (TRC_j; $j = 1, 2, \ldots, 6$) and functional area (FA_i ; $i = 1, 2, 3$)

h. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

i. Multiply total workload baseline from step h by the workload projection index from step f to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_x \times WTB_{ij}$$

j. Repeat steps g through i for each test resource category and each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

5.3 Total Budget Authority Method. The end product of this method is a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. From the FYDP compute the total Budget Authority (BA) for Operation and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement funding.

b. Convert into constant FY95 dollars by deflating/inflating totals with certified inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M BA for fiscal year x expressed in constant FY95 dollars.

TR_x = total RDT&E BA for fiscal year x expressed in constant FY95 dollars.

TP_x = total Procurement BA for fiscal year x expressed in constant FY95 dollars.

TOTAL BUDGET AUTHORITY

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Compute total outlays for fiscal year x using certified outlay rates provided by the DoD Comptroller.

$$TBA_x = \sum_{k=1}^{7} (TOM_{x+1-k} \times OMOR_k + TR_{x+1-k} \times ROR_k + TP_{x+1-k} \times POR_k)$$

where $OMOR_k$ = outlay rate for O&M funding for kth year of the appropriation.
ROR_k = outlay rate for RDT&E funding for kth year of the appropriation.
POR_k = outlay rate for Procurement funding for kth year of the appropriation.

d. Compute average outlay baseline (AOB) for FY92 and FY93.

$$AOB = \frac{TBA_{92} + TBA_{93}}{2}$$

e. Divide total outlay baseline for fiscal year x from step c by the average outlay baseline from step d for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{TBA_x}{AOB} \qquad x = FY95, FY96, \ldots\ldots\ldots, FY01$$

f. Select test resource category (TRC_j; $j = 1, 2, \ldots\ldots, 6$) and functional area ($FA_i$; $i = 1, 2, 3$).

g. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

h. Multiply total workload baseline from step g by the workload projection index from step e to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_x \times WTB_{ij}$$

i. Repeat steps f through h for each test resource category and each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

6. ADVANTAGES/DISADVANTAGES:

Individual PE Method

ADVANTAGES	DISADVANTAGES
1. Reflects funding trends within each functional area; stronger correlation with T&E sites than BA.	1. Higher level of detail requiring more assumptions; may be open to more challenge.
2. Basic approach verified by historical Army experience.	2. Requires modification/assumptions to project workload for the Other T&E and Other categories from data call.
	3. Does not capture degree to which workload for individual facility is driven by individual Service funding.
	4. Predictions more uncertain for those functional areas where workload is driven by a small number of PEs.

Weighted BA Method

ADVANTAGES	DISADVANTAGES
1. Simpler approach and more easily understood.	1. Does not reflect funding trend within individual functional areas; under- or over-estimates workload in a functional area.
2. Workload projection index can be computed independent of data call.	2.. Assumes Other workload increases/ decreases in proportion to Services' budgets.
3. Projects total test resource category workload without modification.	3. Does not capture degree to which workload for individual facility is driven by individual Service funding.

Total BA Method

ADVANTAGES	DISADVANTAGES
1. Simplest approach and most easily understood.	1. Does not reflect funding trend within individual functional areas; under- or over-estimates workload in a functional area.
2. Workload projection index can be computed independent of data call.	2. Assumes Other workload increases/ decreases in proportion to Services' budgets.
3. Projects total test resource category workload without modification.	3. Does not capture degree to which workload for individual facility is driven by individual Service funding.

7. RECOMMENDATION: Adopt the Total Budget Authority Method for projecting future workload requirements for T&E joint cross-service analysis.

EXCESS CAPACITY REDUCTION TARGET METHODOLOGY

- TASKING- Each JCSG tasked to
  - Review excess capacity analyses, and
  - Develop numerical excess capacity reduction targets
- PROPOSED TARGET
  - Reduce all excess capacity as defined below, where cost effective
- EXCESS CAPACITY DEFINITION
  - Delta between single-shift capacity and projected workload
- REDUCTION TARGET CONSTRAINTS
  - Separate for each T&E functional area
  - Separate for each test facility category within each T&E functional area
  - Exclude excess capacity associated with unique, one-of-a-kind facilities
  - Reduction targets will consider those facilities that are required by the nature of test to operate on more than a single shift basis.
- COST EFFECTIVENESS
  - Based on total costs, to include non-T&E and customer costs

LINEAR OPTIMIZATION MODEL

- PROVIDES ACCEPTABLE FRAMEWORK WHICH MUST BE ADAPTED TO T&E JCSG EFFORTS THROUGH ADDITIONAL OPTIMIZATION FORMULATIONS, UNITS NORMALIZATION, AND POLICY IMPERATIVES

- NOTIONAL DATA RUNS BEING MADE TO DEVELOP POLICY IMPERATIVES, OPTIMIZATION FORMULATIONS, DATA ANALYSIS PROCEDURES, AND DATA PRESENTATION FORMATS

- MULTIPLE OPTIMIZATION FORMULATIONS TO BE RUN; ALTERNATIVES TO FOCUS ON AREAS OF LEAST COMMONALITY AMONG SOLUTION SETS

- ABSOLUTE MAGNITUDE OF EXCESS CAPACITY REDUCTION NOT CONSIDERED IN OPTIMIZATION

Other Optimization Functions & Constraints

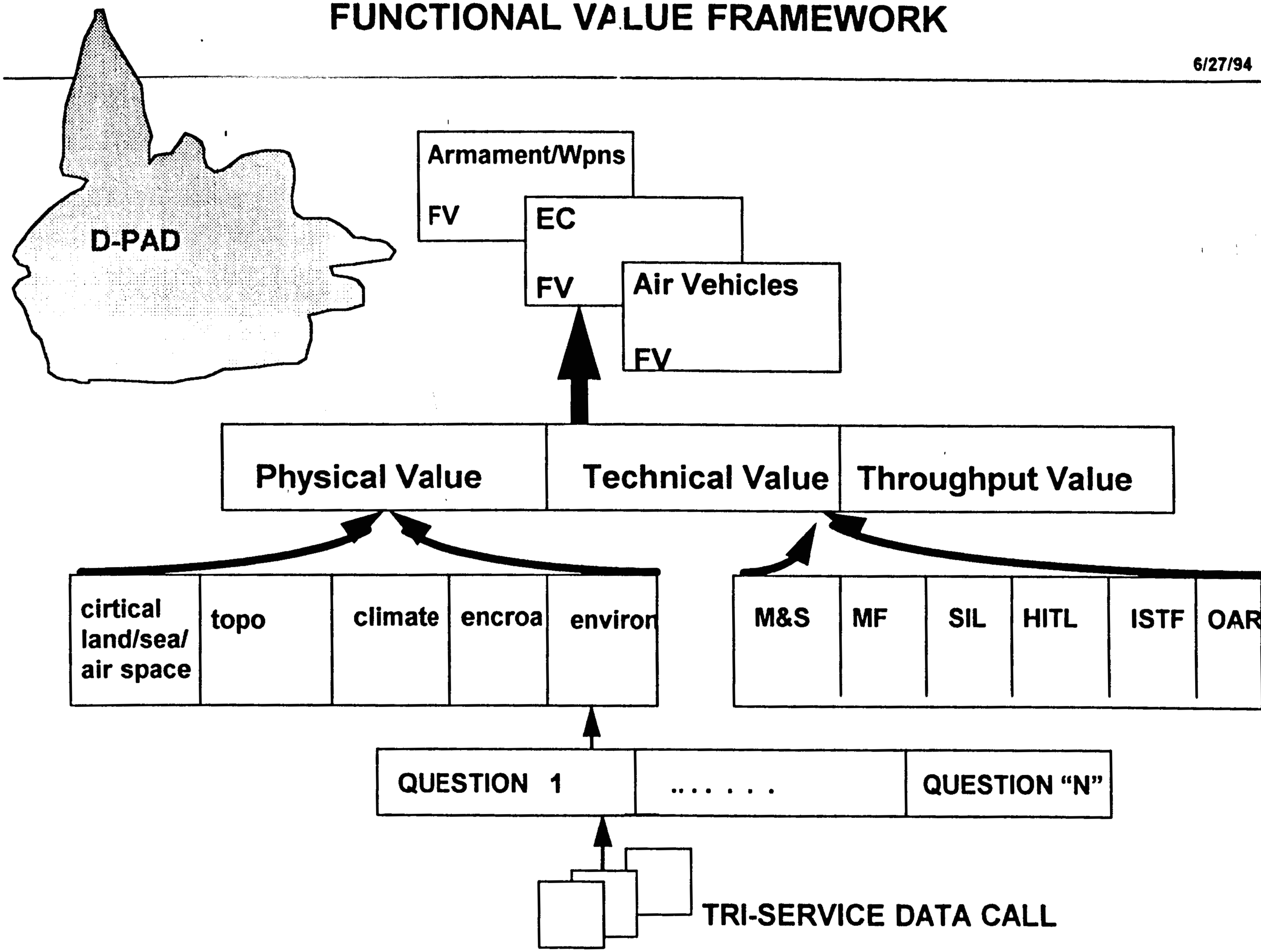
- MINXCAP - Minimize ExCap with iterative runs that vary # of open sites.
- MAXSFV - Maximize sum of FV for all open sites, with iterative runs that vary # of open sites.
- MINSITES - Minimize the number of open sites.

OPTIMIZATION SOLUTION SETS

	Functional Value	Excess Capacity	Number of Sites	Military Value
Functional Value	MAXSFV	MINXCAP	MINSITES	MINNMV
Excess Capacity		MINXCAP with weight set to 0	MINXCAP as function of N	Not Required
Number of Sites			MINSITES with weight set to 0	MINNMV as function of N
Military Value				MINNMV with weight set to 0

FUNCTIONAL VALUE FRAMEWORK

6/27/94



T&E FUNCTIONAL VALUE

ISSUE: SHOULD THROUGHPUT VALUE (TPV) BE INCLUDED WITH PHYSICAL VALUE (PV) AND TECHNICAL VALUE (TV) IN DEFINITION/CALCULATION OF FV, WHERE:

$$FV = W_{PV} \times PV + W_{TV} \times TV + W_{TPV} \times TPV$$

W = RELATIVE WEIGHTS

$$TPV = \frac{\text{TOTAL SS CAPACITY}}{\text{TOTAL DoD PROJ WORKLOAD}}$$

RELATED ISSUE: IF TPV INCLUDED IN FV, ADDITIONAL WEIGHT MAY BE GIVEN TO CAPACITY DURING OPTIMIZATION FOR CURRENT OBJECTIVE FUNCTION IN OPT MODEL

- but not for other objective functions

CONSIDERATIONS

- AF DEPENDENT ON JCSG RANKING OF FV FOR AV, MUNITION, EC FOR EACH DoD SITE TO DETERMINE OVERALL MILITARY VALUE (MV) OF SITE

    -FV WITHOUT TPV INCOMPLETE
    -AF WILL NOT CHANGE JCSG FV'S TO BE USED IN CALCULATING OVERALL MV

- SAME ARGUMENT CAN BE USED FOR BOTH FV AND MV IN OPTIMIZATION MODEL

    -BOTH INCLUDE CAPABILITY CONSIDERATIONS

ISSUE: SHOULD TPV BE INCLUDED IN FV?

PRO'S	CON'S
MEASURE OF SITE CAPABILITY TO HANDLE TOTAL WORKLOAD - THE MORE WORKOAD A SITE CAN HANDLE, THE LESS SITES NEEDED AND THUS LESS INFRASTRUCTURE/COST	ADDITIONAL WEIGHTING BECAUSE SOME OF OPTIMIZATION MODEL'S OBJECTIVE FUNCTIONS INCLUDE PRODUCT OF WORKLOAD (CAPACITY) AND FV

OPTIONS: IF TPV INCLUDED IN FV

I. ACCEPT ADDITIONAL WEIGHTING FOR SOME OBJECTIVE FUNCTIONS

II. MODIFY OBJECTIVE FUNCTIONS TO ELIMINATE ADDITIONAL WEIGHTING

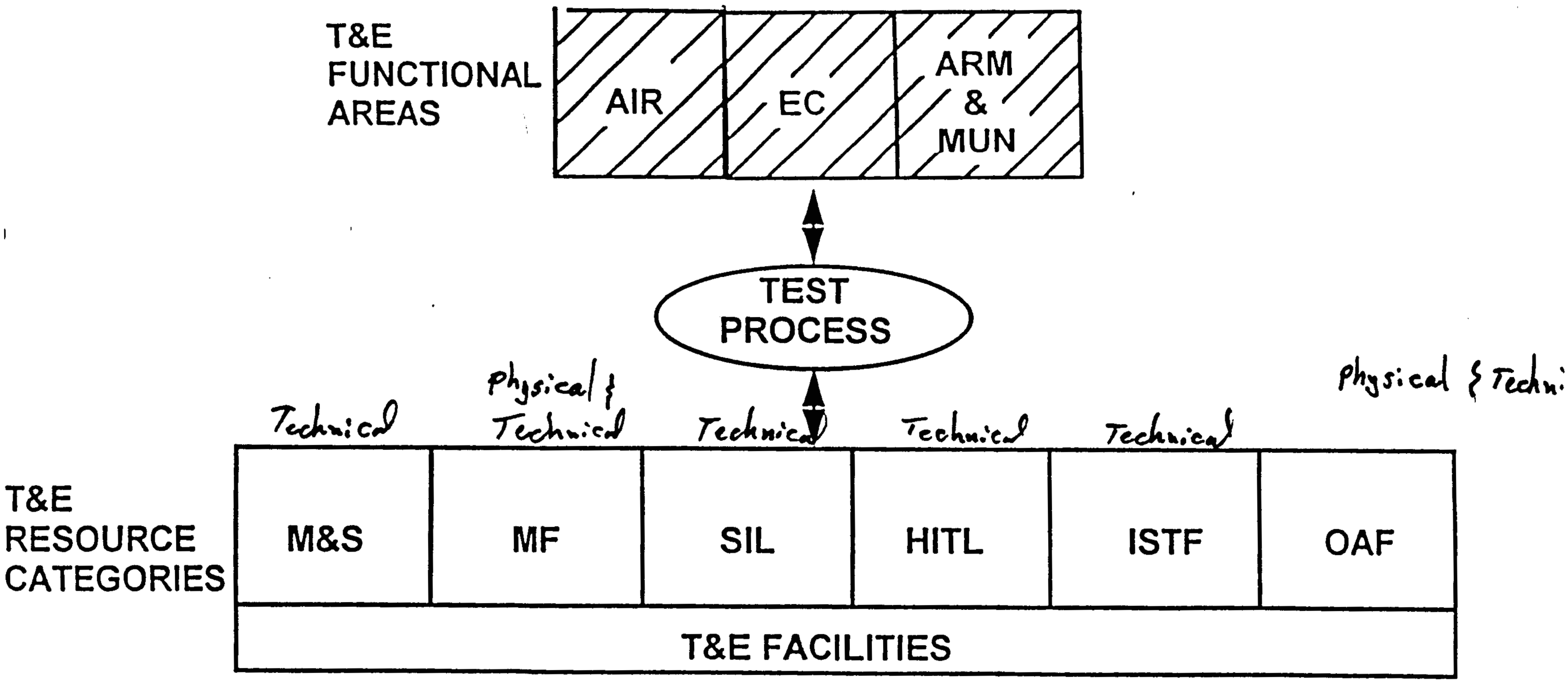
III. INCLUDE TPV IN JCSG FV'S DELIVERED TO SERVICES, BUT EXCLUDE IT WHEN DOING OPTIMIZATION

COMPARISON OF OPTIONS

OPTIONS	PRO'S	CON'S
I.	RETAINS MACRO-MEASURE OF THROUGHPUT/PRODUCTIVITY IN FV	MAY GIVE ADDITIONAL WEIGHT TO CAPACITY IN OPTIMIZATION
II.	RETAINS MACRO-MEASURE OF THROUGHPUT/PRODUCTIVITY IN FV	REQUIRES MODIFYING OBJECTIVE FUNCTION IN CURRENT NAVY MODEL
III.	RETAINS MACRO-MEASURE OF THROUGHPUT/PRODUCTIVITY IN FV REQUIRES NO CHANGES TO CURRENT OBJECTIVE FUNCTION IN NAVY MODEL RETAINS CONSISTENT DEFINITION/ METHOD FOR AF AND JCSG CALCULATION OF FV	DIFFERENT FV'S FOR AF AND JCSG

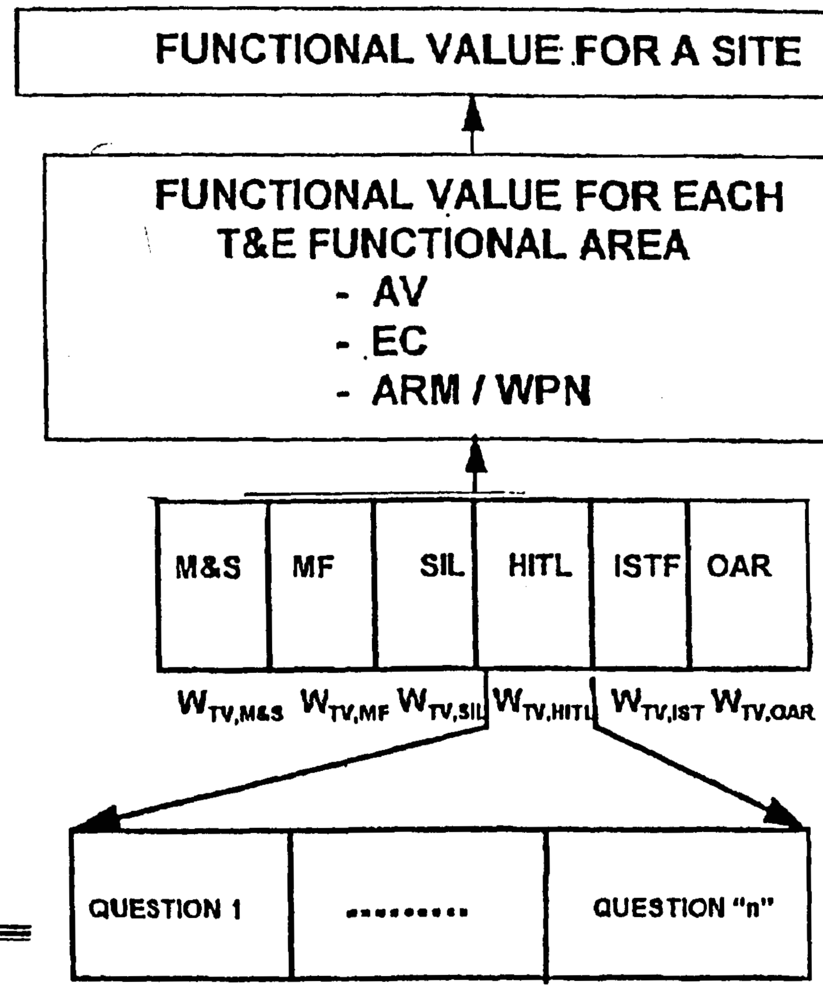
T&E FACILITY TAXONOMY

FUNCTIONAL AREAS & RESOURCE CATEGORIES



- WORKING DRAFT

FUNCTIONAL VALUE HIERARCHY



PRESENTATION TO MR. GOTBAUM

ON THE

TEST AND EVALUATION

JOINT CROSS SERVICE ANALYSIS

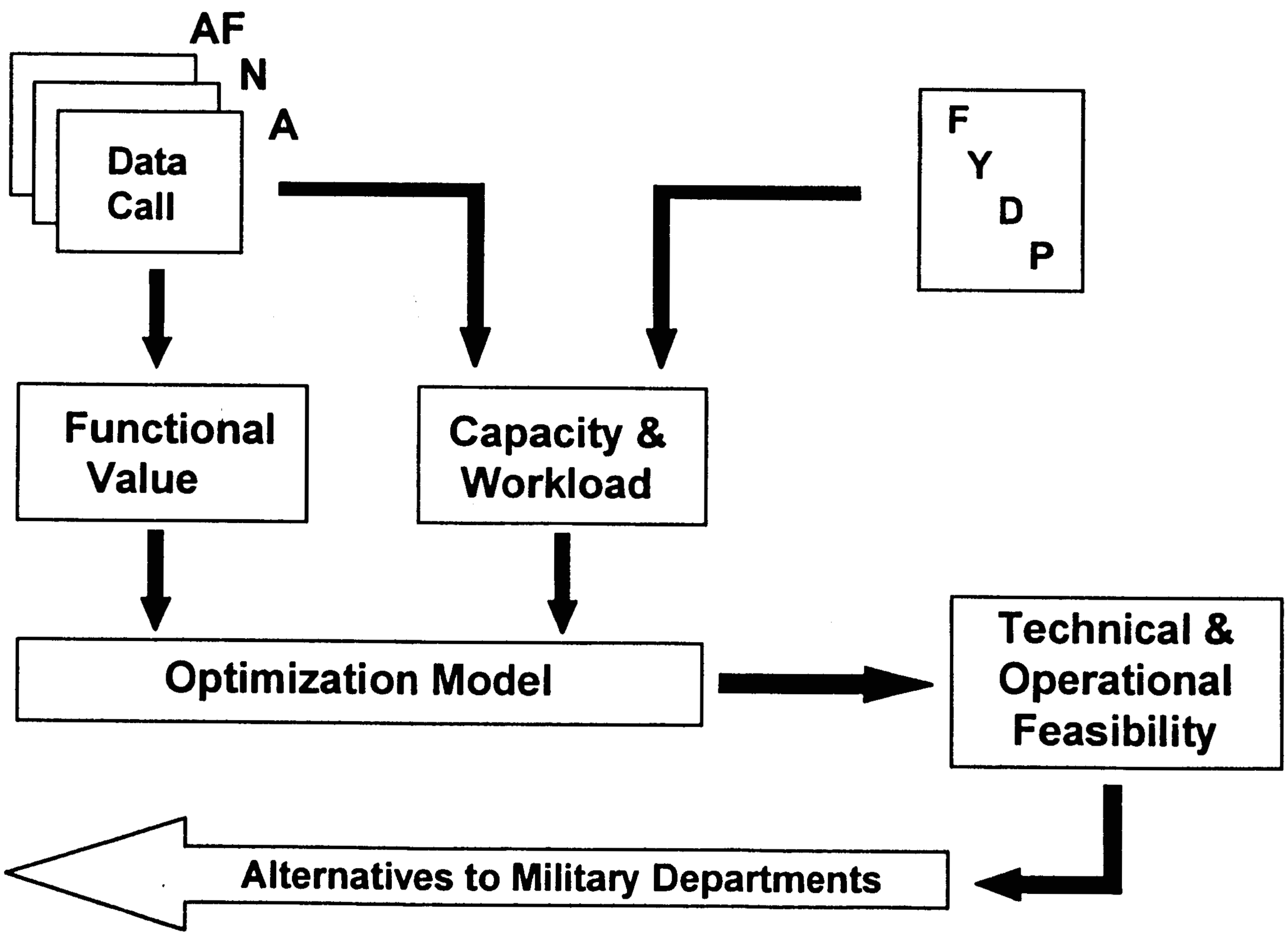
28 JUNE 1994

PURPOSE

- TO PROVIDE OVERVIEW AND STATUS UPDATE FOR TEST AND EVALUATION (T&E) JOINT CROSS SERVICE GROUP (JCSG) EFFORTS

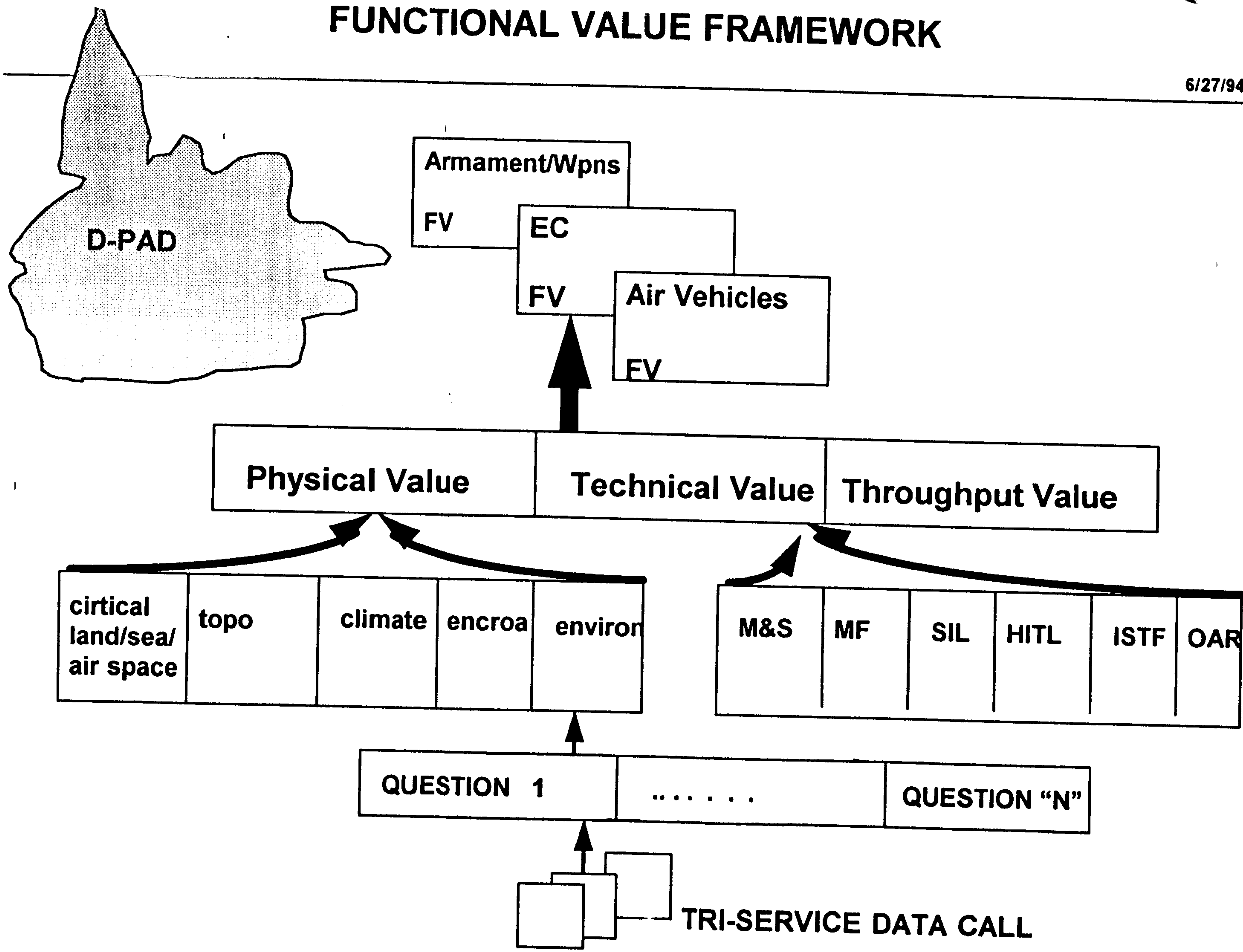
  - ANALYSIS FRAMEWORK
  - FUNCTIONAL VALUE
  - EXCESS CAPACITY
  - LINEAR OPTIMIZATION MODEL
  - SCHEDULE
  - ISSUES

ANALYSIS FRAMEWORK



FUNCTIONAL VALUE FRAMEWORK

6/27/94



EXCESS CAPACITY

- **DEFINED AS:**

  SINGLE SHIFT CAPACITY - PROJECTED WORKLOAD

- **SINGLE SHIFT CAPACITY COMPUTED FROM DATA CALL**

- **PROJECTED WORKLOAD (W) COMPUTED FROM FYDP AND DATA CALL AS:**

$$W(FY\ X) = W((FY92 + FY93)/2) \times \frac{\text{BUDGET OUTLAYS } (FY\ X)}{\text{BUDGET OUTLAYS } ((FY92 + FY93)/2)}$$

TARGET IS TO REDUCE ALL EXCESS CAPACITY EXCEPT THAT FOR UNIQUE CAPABILITIES

LINEAR OPTIMIZATION MODEL

- PROVIDES ACCEPTABLE FRAMEWORK WHICH MUST BE ADAPTED TO T&E JCSG EFFORTS THROUGH ADDITIONAL OPTIMIZATION FORMULATIONS, UNITS NORMALIZATION, AND POLICY IMPERATIVES

- NOTIONAL DATA RUNS BEING MADE TO DEVELOP POLICY IMPERATIVES, OPTIMIZATION FORMULATIONS, DATA ANALYSIS PROCEDURES, AND DATA PRESENTATION FORMATS

- MULTIPLE OPTIMIZATION FORMULATIONS TO BE RUN; ALTERNATIVES TO FOCUS ON AREAS OF LEAST COMMONALITY AMONG SOLUTION SETS

- ABSOLUTE MAGNITUDE OF EXCESS CAPACITY REDUCTION NOT CONSIDERED IN OPTIMIZATION

T&E JWG Schedule

For Official Use Only - Working Draft

6/28/1994

Task	Jun'94 (weeks of 12, 19, 26) / Jul'94 (weeks of 3, 10) milestones
1. JCSG Decide on Cap Methodology	6/14
2. JWG Develop Workload Requirements Methodology	6/14, 6/20, 6/21*
3. JWG Develop FV Framework	6/14, 6/27, 7/5 7/6
- Scoring methodology	7/5 7/6
- Weights, measures	7/5 7/6
4. Excess Cap Tgt Reduction Methodology	6/14, 6/20, 6/21*
5. Adapt Optimization Model for T&E	6/15
- Evaluate Model	6/24
- Develop T&E Optimization Formulation	7/1, 7/5 7/6
- Define Initial Policy Imperatives	7/5 7/6
6. Database Requirements/Selection	6/23
7. JWG Document Analysis Plan	6/20, 6/24, 6/27, 7/6
8. OSD Lab and T&E JCSG Chairs Status Brief to Mr Gottbaum - Opt. Model	6/28
9. Action Plan	6/28

* - JCSG Approval

ISSUES

?

SUMMARY

- ANALYSIS EFFORTS ON TRACK FOR 6 JULY COMPLETION
  - ANALYSIS FRAMEWORK IN PLACE
  - AGREEMENT ON MAJOR ELEMENTS OF FRAMEWORK
  - LINEAR OPTIMIZATION MODEL ADAPTED FOR T&E
  - DETAILS BEING WORKED

T&E JCSG Action Plan
Addendum June 94

ACTION 1: Develop an Overall Analysis Methodology that provides capacity, future workload requirements, excess capacity reduction targets and functional values for Air Vehicle, Electronic Combat, and Armament/Munitions T&E.

1.1 Develop an analysis framework that uses the FYDP and certified information provided in response to the T&E JCSG data call and that leads to the identification of opportunities for realigning/consolidating the T&E infrastructure.

1.2 Develop methodologies for:

- Projecting future workload requirements
- Computing excess capacity within each functional area
- Establishing excess capacity reduction targets
- Computing functional value (FV) for each T&E functional area

1.3 Adapt a linear optimization model to support the development of T&E cross-service realignment/consolidation alternatives

T&E JCSG Action Plan (cont.)

ACTION 2: Conduct Analyses Using Notional Data

2.1 Compute functional value using notional data to finalize questions and weights.

2.2 Conduct optimization runs using notional data to develop policy imperatives, optimization formulations, data analysis procedures, and data presentation formats.

T&E JCSG Action Plan (Cont.)

ACTION 4: Analyze Outputs from Tri-Department BRAC Team

4.1 Review inputs of model runs for accuracy.

4.2 Analyze outputs and develop initial set of realignment/consolidation alternatives.

4.3 Assess technical and operational feasibility of each alternative, modify, revise, or delete alternative as required.

4.4 Provide revised set of alternatives to Tri-Department BRAC Team for additional optimization and functional COBRA runs.

T&E JCSG Action Plan (Cont.)

ACTION 5: Finalize Alternatives and provide to the Military Departments

5.1 Review inputs of model runs for accuracy.

5.2 Analyze final outputs from <u>Tri-Department BRAC team.</u>

5.3 Review each alternative to ensure it is technically and operationally feasible, <u>retains the capability to satisfy future T&E requirements within each functional area, and is economically affordable.</u>

5.4 Forward approved alternatives along with supporting rationale and documentation to the Military Departments.

T&E JCSG Action Plan
ISSUES

- Tri-Department BRAC Team ---- who are they?

- Functional COBRA Runs -- JWG Runs or MIL DEPs?

- JCSG reviews each alternative to ensure it is technically and operationally feasible, retains the capability to satisfy future T&E requirements within each functional area and is economically affordable.

  - MIL DEP's to accomplish whether T&E capability retained is satisfactory and affordable, NOT JCSG

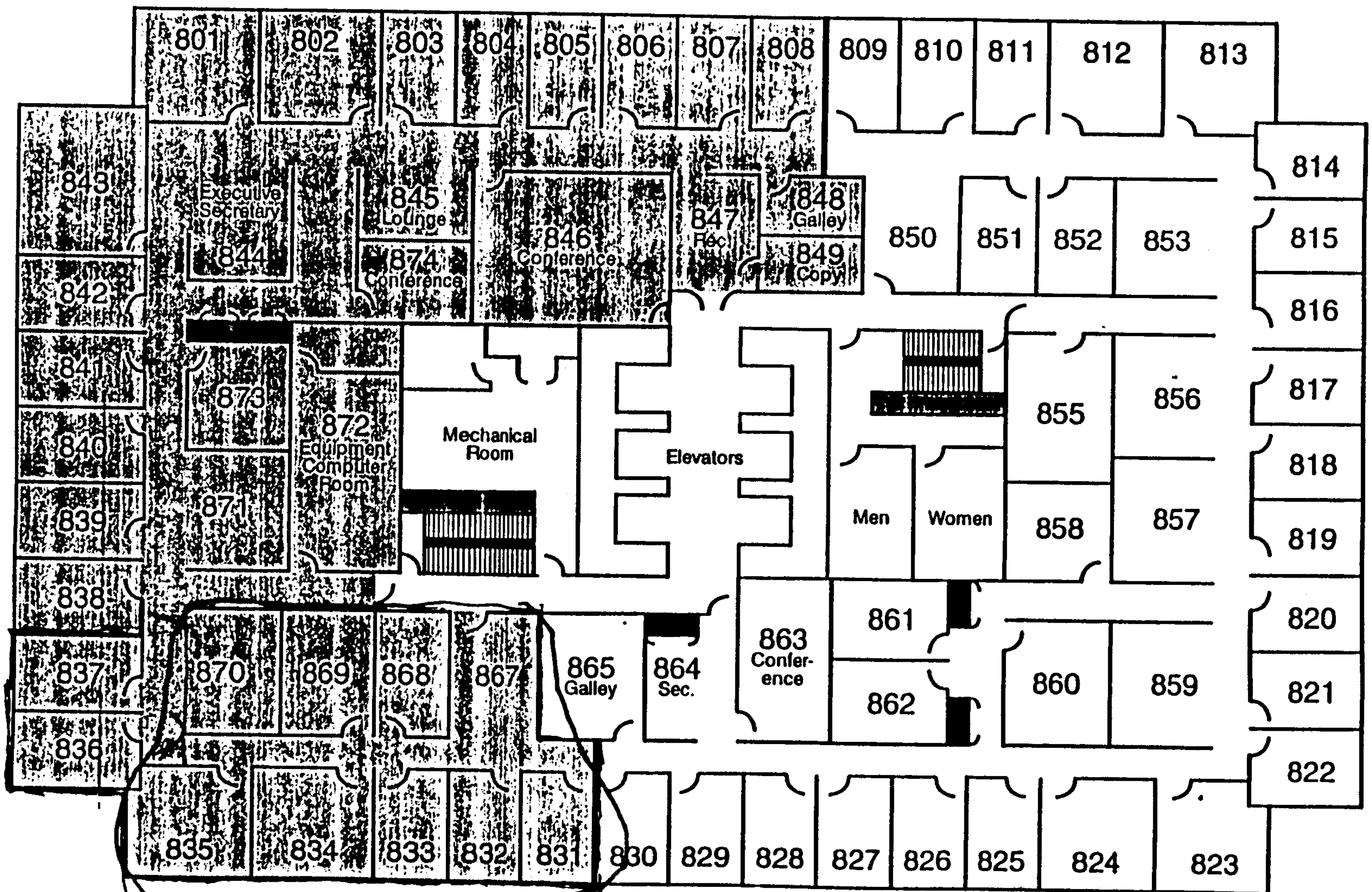
MILESTONES FOR CROSS SERVICE ANALYSIS

TABLE I

MILESTONE	Due Date	Actual Date
Data Call released to Services	31 Mar 94	31 Mar 94
ACTION 1 Overall Analysis Framework JCSG Approves: Capacity Calculation Future Workload Projection Methodology Functional Value Target Reduction Methodology	6 July 94	
ACTION 2 Optimization Notional Data Analyses Completed	15 July 94	
ACTION 3 Generate inputs for Tri-Department BRAC Team Functional Values Capacity/Requirements policy imperatives	15 Aug. 94	
ACTION 4 Analyze Outputs from Tri-Department BRAC Team	1 Oct.	
ACTION 5 Finalize Alternatives and provide to Mil Departments unconstrained constrained	17 Oct.	

3rd Whittenberg 15 Nov '94
578-8222
Manager
The Center

THE TEC
TEST & EVALUATION CENTER



Walcoff & Associates, Inc.

WALCOFF

2001 North Beauregard Street, Suite 800, Alexandria, VA 22311 ▪ Phone (703) 578-8222 ▪ Fax (703) 578-0527

BRAC 95
Joint Cross-Service Group on Test & Evaluation

Wednesday, 6 July 1994

Minutes

The eighteenth meeting of the BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. John Burt chaired the meeting. The agenda, the list of attendees, and the handouts are attached.

NEW BUSINESS

Minutes

It was announced by the co-chairs that the minutes of the meeting of 28 June have not yet been made available by the BRAC office.

The co-chairs reiterated the policy of reflecting amendments to meeting minutes amendments in subsequent meeting minutes.

Meeting with Mr. Gotbaum

Mr. Burt discussed the meeting on 28 June with Mr. Gotbaum. Mr. Gotbaum wants the T&E Joint Cross-Service Group (JCSG) to show facility workload capacity using both single shift and other-than-single-shift. That is, the T&E JCSG is to include alternatives other than a single shift. Also Mr. Gotbaum said the optimization model is not intended to produce hard answers; we are allowed to vary the weighing factors. Mr. Gotbaum also said that functional value does not include throughput value. Mr. Burt also said that there is not much push from higher levels that the analysis has to be the same in each Joint Group. They have confidence in our ability to tailor the analytic model. That is, they are allowing flexibility.

Mr. Burt also said that Mr. Gotbaum said each JCSG needs to run its own optimization model within its own group before looking across groups. That is because there are bound to be differences between the groups, variances in methodology, so it is better to run the model just for your single group first.

Mr. Burt said he suggested, at the meeting with Mr. Gotbaum, that the Labs and T&E Groups get together and try to do a common run of the optimization model.

Mr. Burt reported that it was also mentioned at the meeting with Mr. Gotbaum that no response had yet been received from C3I on the handling of data from classified facilities. Mr. Toomer and Mr. Bolino are going to get with Mr. Cavallini of C3I on the matter.

It was announced that, despite some impression to the contrary, there is no Steering Group meeting scheduled on 8 July. However, we should expect a meeting with the OSD BRAC organization soon, possibly the next week. Several items have been due to the BRAC office by July 8th: weighing factors, optimization formulations, scoring criteria, etc. But now it looks like the date those are due has slipped later.

One of the chairs asked the question if all of the data was in. The Services each stated where they stood. Army and Navy indicated they had their data. Air Force indicated they still had a piece due in.

Schedule

The T&E JCSG schedule chart (attached) was shown on a slide, showing actions accomplished and actions remaining.

It was agreed to incorporate in Action 5, "Finalize Alternatives", an action to look at data from other Cross-Service groups.

Discussion arose on what is the baseline of DoD T&E capabilities needed in order to compare against it the alternatives that are proposed. We do not have a list of needed capabilities. It was pointed out, however, that this may well slow down the process. Air Force recommended building such a list. It was generally agreed that a list of baseline capabilities would be developed.

It was also pointed out that we need to use the functional COBRA outputs to determine whether each particular alternative satisfies DoD T&E requirements. It was agreed to change the Action Plan to accommodate this.

Action Plan Addendum

The Action Plan Addendum was briefed on the latest changes.

It was suggested that we need to insert another action, to validate the data, among the milestones. It was generally agreed to do it in parallel with Action 3, "Generate Inputs for Analysis". It was agreed that 1 August would be the due date for validation of the data.

Briefing on the JCSG Analysis Plan

The chairs stated that it is our understanding that the Steering Group will approve the Analysis Plan.

It was agreed to delete paragraph 3.6 of the draft JCSG Analysis Plan and to delete the word "only" in paragraph 3.5.

Discussion arose regarding a 17 October deadline vs. the 1 November deadline. It was decided that each Service will go back and determine if 17 October is acceptable.

Joint Analysis Process Chart

The Joint Analysis Process Chart was presented on the screen and reviewed by Dr. Stewart. It was agreed to by the three Services and approved for incorporation into the Action Plan.

It was mentioned by one of the chairs that, as the process accelerates, we may need to meet more frequently than once a week.

It was agreed that after the functional COBRA runs, the results go back to the JCSGs.

The question was raised by one of the chairs--is it envisioned that a limited COBRA analysis will be done on every alternative that is proposed. The military services all indicated agreement--yes. All agreed.

The issue arose again of making a list of T&E capabilities that need to be maintained. A "T&E requirements" list.

Functional Value

A briefing was given on the current status of determining Functional Value. It was stated that the weighing of individual questions has now been taken out of the plan. Weighing will only take place at higher levels.

An example of Functional Value was briefed, including notional weights and scores. The issue was brought up of the need to identify exactly who in the Services can look at the data. One of the chairs said that the lists of names has come in from the Services and a consolidated list will be sent back to the three Services so they can see the names.

The question was raised as to whether Throughput Value will be included as a part of Functional Value. The decision was "No".

The question was raised as to whether every question in the data call must be considered or only those that, at this point, have some significance. The decision was made that we should use common sense and that questions can be thrown out or not considered if they are judged to be no longer important. But, one of the chairs pointed out, we must be careful as to the amount of the data we throw out.

A slide showed some preliminary weights that have been drafted up. It was agreed that, generally, these weights are within the comfort zone. However, one of the chairs said a few of the weights looked questionable and advised that those weights be re-looked at.

Optimization Formulation

A slide was shown indicating that the schedule calls for completing evaluation of alternative optimization formulations by 15 July 94. The question was raised of when will there be forthcoming a revised writeup by Dr. Ron Nickel of Navy BSAT of the formulation we are going to use in the analysis model. Also, whether it will include everything. It was decided that Ron is going to tailor the model to each JCSG. He can tailor it exactly. When we submit our plan, we will show exactly how we are going to use the model. We are going to give that to Ron. There was agreement in the Group on that point.

Joint T&E Analysis Facility

A slide showed the room arrangements for the Joint T&E Analysis Facility. It was announced that the facility would be ready for occupancy by 20 July. It was agreed that, right after this meeting, representatives from the three Services would meet briefly regarding the layout.

JCSG Database

As of now, the database is in hard copies. It was agreed that the Tri-Service BRAC Group will get the master. One of the chairs said he strongly advised keeping the data in electronic format as long as possible. It was agreed that each of the Services will send a hard copy and a disk to the repository (of the Tri-Service BRAC Group).

The issue was raised that, in the definition of Functional Value, it doesn't appear that we have allowed for the infrastructure support such as roads, electric and water lines, etc. It was pointed out that this is generally assumed--that the needed infrastructure support exists for any particular T&E facility. One of the chairs said, "We need to be sure we capture it, cranking it in."

The question was raised as to whether we need to allow for the quality of the people. It was mentioned that the Lab Group considered quality of people at a facility right from the start. Also, that we haven't asked that in the data call--we have asked only the number of people. It was decided that, no, we don't need to allow for quality of people, that quality of the people is less a consideration for T&E than it is for Labs.

One of the chairs pointed out that the critical path right now is finishing the Functional Value framework. Functional values must be determined for each functional area.

OLD BUSINESS:

None

There being no other items for discussion, the meeting adjourned at 1133 hours.

Approved: Lee Frame
Co-Chairman

John Burt
Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test and Evaluation

July 6, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Burt, Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
Mr. John Bolino, Co-Study Team leader
LTG(Ret) Howard Leaf, Air Force
Mr. Parker Horner, Air Force
Mr. Dan Stewart, Air Force
Mr. Joe Dowden, Air Force
Mr. Doug Nation, Air Force
LtCol George London, Air Force
Mr. Michael Wallace, Air Force
Mr. Gary Holloway, Army
Mr. Thomas Roller, Army
Mr. Gerald Schiefer, Navy
CAPT Dave Rose, Navy
Mr. Don DeYoung, Navy
Mr. Dave Vincent, DoDIG
Mr. Tom Glenn, BMDO
Mr. Frank Lewis, OSD PA&E
Mr. Irv Boyles, DT&E, OUSD(A&T)
Mr. Joe Moore, DOT&E

BRAC 95
T&E Joint Cross-Service Group Meeting
0900, Wednesday, 6 July 1994
Conference Room, 1C730, Pentagon

Agenda

- Opening Remarks
- Comments on 28 June 1994 Minutes
- Mr. Gotbaum Meeting Feedback
- Working Group Status Report

  Schedule....................LTC London
  Action Plan Addendum......Mr. Dowden
  JCSG Analysis Plan........Dr. Stewart
  Functional Value
     Framework Status.......Mr. Nation
  Optimization..............Mr. Holloway
  JCSG (JWG) Facility.......Mr. Dowden
  Data Base.................LTC London

- Issues / Recommendations
- Action Items / Wrap Up

TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

ACTION PLAN AND MILESTONES

FOR

BASE REALIGNMENT AND CLOSURE (BRAC) 95 CROSS SERVICE ANALYSES

Addendum, July 1994

John A. Burt
Director
Test and Evaluation

Lee H. Frame
Acting Director
Operational Test and Evaluation

I. PURPOSE and SCOPE

This addendum updates the Actions and Milestone schedule necessary to support identification of opportunities for consolidating/realigning the T&E infrastructure associated with Air Vehicle, Electronic Combat and Armament/Weapons testing as part of the FY95 Base Realignment and Closure (BRAC) joint cross-service analyses.

This addendum focuses on the activities associated with conducting the T&E cross- service analyses, formulating alternatives for consideration by the Military Department's BRAC offices, and oversight of the process by T&E Joint Cross-Service Group (JCSG).

II. ACTIONS

The major actions required for conduct of the T&E joint cross-service analyses are:

ACTION 1: Develop an Overall Analysis Methodology that provides capacity, future workload requirements, excess capacity reduction targets and functional values for Air Vehicle, Electronic Combat, and Armament/Munitions T&E.

1.1 Develop an analysis framework that uses the FYDP and certified information provided in response to the T&E JCSG data call and that leads to the identification of opportunities for realigning/consolidating the T&E infrastructure.

1.2 Develop methodologies for:
- Projecting future workload requirements
- Computing excess capacity within each functional area
- Establishing excess capacity reduction targets
- Computing functional value (FV) for each T&E functional area

1.3 Adapt a linear optimization model to support the development of T&E cross-service realignment/consolidation alternatives

ACTION 2: Conduct Analysis Using Notional Data

2.1 Compute functional value using notional data to finalize questions and weights.

2.2 Conduct optimization runs using notional data to develop initial policy imperatives, optimization formulations, data analysis procedures, and data presentation formats.

ACTION 3: Generate Inputs for Analysis

3.1 Provide questions, weights, and scoring criteria and compute functional value using Decision PAD software.

3.2 Compute future workload requirements and excess capacity for each functional area and test resource category.

3.3 Provide policy imperatives and other inputs required to run linear optimization and functional COBRA models.

3.4 Provide functional values (FV's) for each functional area for each site to the Military Departments.

ACTION 4: Conduct Analysis Using Real Data

4.1 Review inputs of model runs for accuracy.

4.2 Analyze outputs and develop initial set of realignment/consolidation alternatives.

4.3 Assess operational feasibility and cost effectiveness of each alternative; modify, revise, or delete alternatives as required. The assessment will include a determination as to whether the alternative retains the capability to satisfy DoD T&E requirements.

4.4 Provide revised set of alternatives to Tri-Department BRAC Group for additional optimization and functional COBRA runs.

ACTION 5: Finalize Alternatives to be provided to the Military Departments

5.1 Review inputs of model runs for accuracy.

5.2 Analyze final outputs from Tri-Department BRAC Group.

5.3 Review each alternative to ensure it is operationally feasible, retains the capability to satisfy DoD T&E requirements within each functional area, and is economically affordable.

5.4 Forward recommended alternatives along with supporting rationale and documentation to the Military Departments.

INTERNAL CONTROLS

The T&E Joint Cross-Service Group will adhere to the 13 April 1995 OSD BRAC95 internal control plan for base realignment, closure or consolidation studies to ensure the accuracy of data collection and analyses.

MILESTONES FOR CROSS SERVICE ANALYSIS

TABLE I

MILESTONE	Due Date
Data Call released to Services	31 Mar 94
ACTION 1 Overall Analysis Methodology JCSG Approves: Capacity Calculation Future Workload Projection Methodology Functional Value Target Reduction Methodology	6 Jul 94
ACTION 2 Conduct Analysis Using Notional Data JCSG Approves: Questions Weights Scoring Criteria Initial Policy Imperatives Optimization Formulations	15 Jul 94
ACTION 3 Generate Inputs for Analysis JCSG Approves: Functional Values Capacity/Requirements Policy imperatives	15 Aug 94
ACTION 4 Conduct Analysis using Real Data JCSG Provides: Inputs for Optimization/Cobra Models Functional Values (FV's) for Mil Dept's	15 Oct 94
ACTION 5 Finalize Alternatives Finalize Alternatives and provide to Mil Departments JCSG Approves: Alternatives Provide to Mil Dept's	1 Nov 94

T&E JCSG Action Plan
Addendum July 94

ACTION 1: Develop an Overall Analysis Methodology that provides capacity, future workload requirements, excess capacity reduction targets and functional values Air Vehicle, Electronic Combat, and Armament/Munitions T&E.

1.1 Develop an analysis framework that uses the FYDP and certified information provided in response to the T&E JCSG data call and that leads to the identification of feasible opportunities for realigning/consolidating the T&E infrastructure.

1.2 Develop methodologies for:
- Projecting future workload requirements
- Computing excess capacity within each functional area
- Establishing excess capacity value for each functional area and each test facility category at each individual site

1.3 Adapt a linear optimization model to support the development of T&E cross-service realignment/consolidation alternatives

T&E JCSG Action Plan (cont.)

ACTION 2: Conduct Analyses Using Notional Data

2.1 Compute functional value using notional data to finalize questions and weights.

2.2 Conduct optimization runs using notional data to finalize initial policy imperative, optimization formulations, data analysis procedures, data presentation format, and weighting functions.

T&E JCSG Action Plan (cont.)

ACTION 3: Generate Inputs for Analysis

3.1 Provide questions, weights, and scoring criteria for computation of functional value using Decision PAD software.

3.2 Compute future workload requirements and excess capacity for each functional area and test resource category.

3.3 Provide policy imperatives and other inputs required to run linear optimization model.

T&E JCSG Action Plan (Cont.)

ACTION 4: Conduct Analysis Using Real Data

4.1 Review inputs of model runs for accuracy.

4.2 Analyze outputs and develop initial set of realignment/consolidation alternatives.

4.3 Assess operational feasibility and cost effectiveness of each alternative; modify, revise, or delete alternatives as required. The assessment will include a determination as to whether the alternative retains the capability to satisfy DoD T&E requirements.

4.4 Provide revised set of alternatives to Tri-Department BRAC Group for additional optimization runs and functional COBRA runs.

T&E JCSG Action Plan (Cont.)

ACTION 5: Finalize Alternatives to be provided to the Military Departments

5.1 Review inputs of model runs for accuracy.

5.2 Analyze final outputs from Tri-Department BRAC Group.

5.3 Review each alternative to ensure it is operationally feasible, retains the capability to satisfy DoD T&E requirements within each functional area, and is economically affordable.

5.4 Forward recommended alternatives along with supporting rationale and documentation to the Military Departments.

MILESTONES FOR CROSS SERVICE ANALYSIS

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TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

DRAFT ANALYSIS PLAN

FOR

BASE REALIGNMENT AND CLOSURE (BRAC 95)

JOINT ANALYSIS

JULY 1994

John A. Burt
Director
Test and Evaluation

Lee H. Frame
Director
Operational Test and Evaluation

T&E JOINT CROSS-SERVICE GROUP ANALYSIS PLAN

1.0 BACKGROUND

1.1 In a 7 Jan 94 memorandum entitled "1995 Base Realignment and Closures (BRAC 95)", the DEPSECDEF established Joint Cross Service Groups (JCSGs) in six areas with significant potential for cross-service impacts in BRAC 95. Each JCSG was tasked to accomplish the following:

- To determine the common support functions and bases
- To establish the guidelines, standards, assumptions, measures of merit, data elements, and milestone schedules for DoD Component conduct of cross-service analysis of these common support functions.
- To oversee DoD Component analyses of the common support functions
- To review excess capacity analyses
- To develop closure and realignment alternatives and numerical excess capacity reduction targets for consideration in such analysis
- To analyze cross-service tradeoffs

1.2. The purpose of this plan is to outline how the analysis tasks will be accomplished and to describe the methodologies to be used in completing these tasks.

2.0 JOINT TEAM STRUCTURE

2.1 Attachment 1 summarizes the joint team structure and responsibilities for accomplishing the DEPSECDEF analysis tasks. Overall responsibilities of the Steering Group, Review Group, Military Departments, and Joint Cross Service Groups in the BRAC cross-servicing process are documented in the 7 Jan 94 DEPSECDEF Memorandum.

2.2 The Joint Working Group (JWG) is comprised of DoD Component members and reports directly to the T&E JCSG. It's principal role is to support the T&E JCSG in the development and conduct of the analysis, subject to the approval of the T&E JCSG. The T&E JCSG will also document all results and decisions for the record.

2.3 The Tri-Department BRAC Group is comprised of BRAC members from each Military Department who report directly to their Military Department. They are responsible for controlling data and running the optimization and functional COBRA models for each JCSG. T&E inputs for the model will be provided by the T&E JCSG. Model outputs will be provided to the T&E JCSG for review and analysis by the JWG.

3.0 JOINT ANALYSIS PROCESS

3.1 Steps in the joint analysis process are summarized in Attachment 2.

3.2 The T&E JCSG will develop guidance for joint T&E data calls to support the joint analysis process. The Military Departments will conduct the data calls and provide the responses to the Joint Cross Service Group through the Tri-Department BRAC Group for control.

3.3 The T&E JCSG will use the methodologies presented in Appendices A-C to compute T&E Functional Value (FV), Excess Capacity, and Projected Workload (PWL) based on information from the joint data call and the Future Years Defense Plan. They will also develop optimization formulations and policy imperatives to support optimization model runs (see Appendix D).

3.4 Notional data will be used to develop the optimization formulations and initial policy imperatives. Unconstrained runs using real data will then be conducted using inputs from the T&E JCSG to develop alternatives satisfying workload requirements. Additional runs ~~constrained by~~ *using* site military values provided by the Military Departments will also be run.

3.5 Collocation of T&E resources needed to support the test process in a T&E functional area (i.e., Air Vehicle, Armament/Weapons, or Electronic Combat) will be accomplished to the maximum extent possible in each alternative. *Resources will be retained at other sites only when geographically constrained, needed to satisfy workload, economically prohibitive to move, or for other operational reasons.*

3.6 The impact of proposed consolidation/realignment alternatives on customers and stakeholders will be taken into consideration to preclude the suboptimization of the T&E functions and overall DoD costs/savings. Costs will include non-T&E, customer and program costs, to the extent possible, in addition to T&E infrastructure costs.

3.7 An operational feasibility assessment will be conducted by the T&E JCSG to ensure the capability to satisfy DoD T&E requirements is retained.

Shortfalls in capability will be identified and necessary solutions developed to retain viable alternatives. *A top-level concept of operations (CONOPS) will be generated for each alternative and will address MILCON, personnel movement and termination, equipment relocation, customer and stakeholder impacts, etc. The CONOPS* ~~This~~ will provide the basis for a Functional COBRA data call to determine if an alternative is cost effective.

3.8 Alternatives that satisfy the DoD T&E workload and capability requirements and provide an acceptable return-on-investment from a T&E perspective will be recommended to the Military Departments for their consideration and integration into their closure/realignment candidates and alternatives from the other JCSGs.

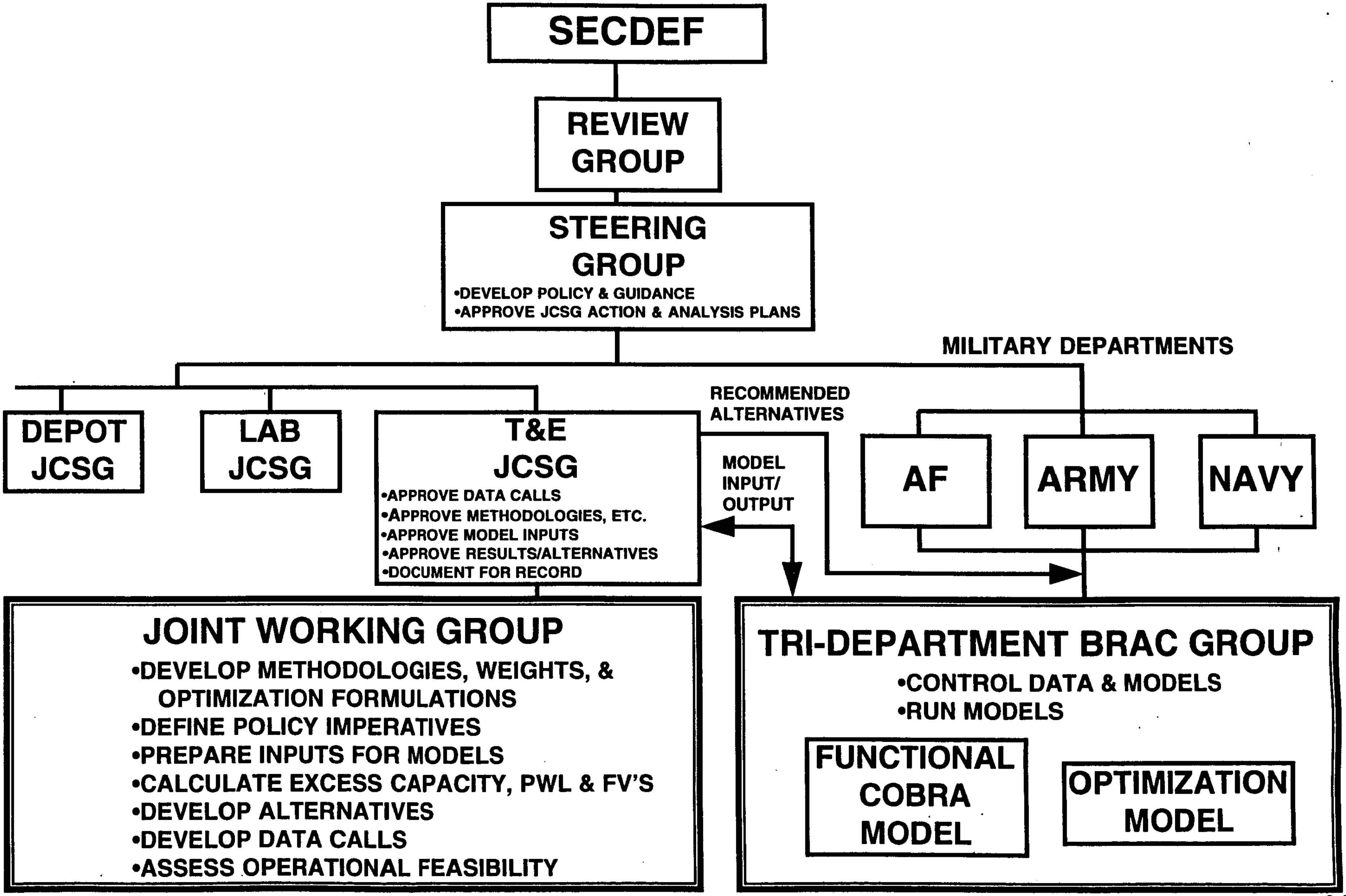
4.0 Schedule

4.1 Key milestones are shown in Attachment 3.

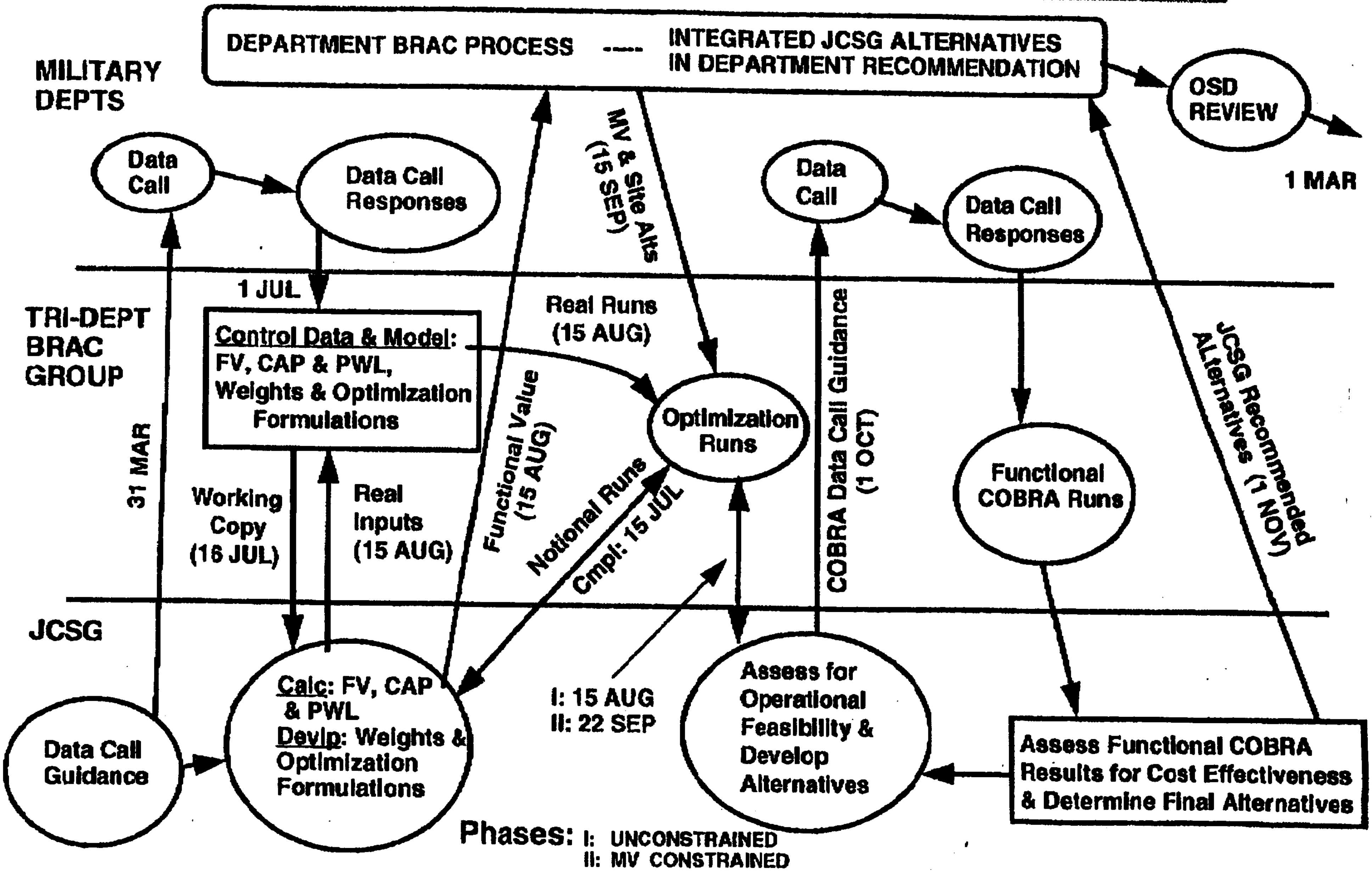
APPENDICES

A - T&E Functional Value Methodology
B - T&E Workload Projection Methodology
C - T&E Excess Capacity and Target Reduction Methodology
D - T&E Optimization Formulations

JOINT ANALYSIS TEAM STRUCTURE



JOINT ANALYSIS PROCESS



MILESTONES FOR CROSS SERVICE ANALYSIS

TABLE I

MILESTONE	Due Date
Data Call released to Services	31 Mar 94
ACTION 1 Overall Analysis Methodology JCSG Approves: Capacity Calculation Future Workload Projection Methodology Functional Value Target Reduction Methodology	6 Jul 94
ACTION 2 Conduct Analysis Using Notional Data JCSG Approves: Questions Weights Scoring Criteria Initial Policy Imperatives Optimization Formulations	15 Jul 94
ACTION 3 Generate Inputs for Analysis JCSG Approves: Functional Values Capacity/Requirements Policy imperatives	15 Aug 94
ACTION 4 Conduct Analysis using Real Data JCSG Provides: Inputs for Optimization/Cobra Models Functional Values (FV's) for Mil Dept's	15 Oct 94
ACTION 5 Finalize Alternatives Finalize Alternatives and provide to Mil Departments JCSG Approves: Alternatives Provide to Mil Dept's	1 Nov 94

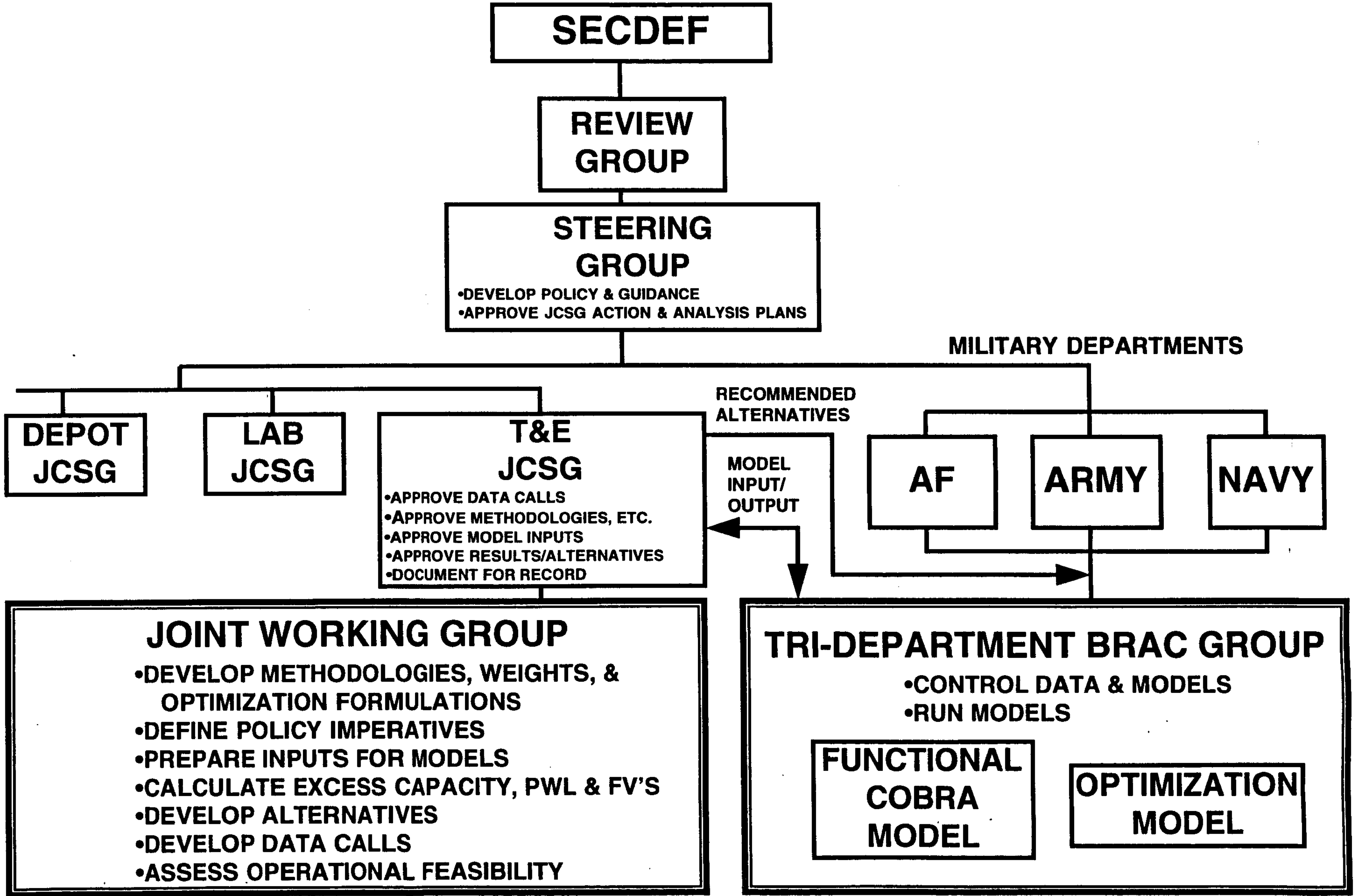
Atch 3

T&E JCSG ANALYSIS PLAN
PURPOSE

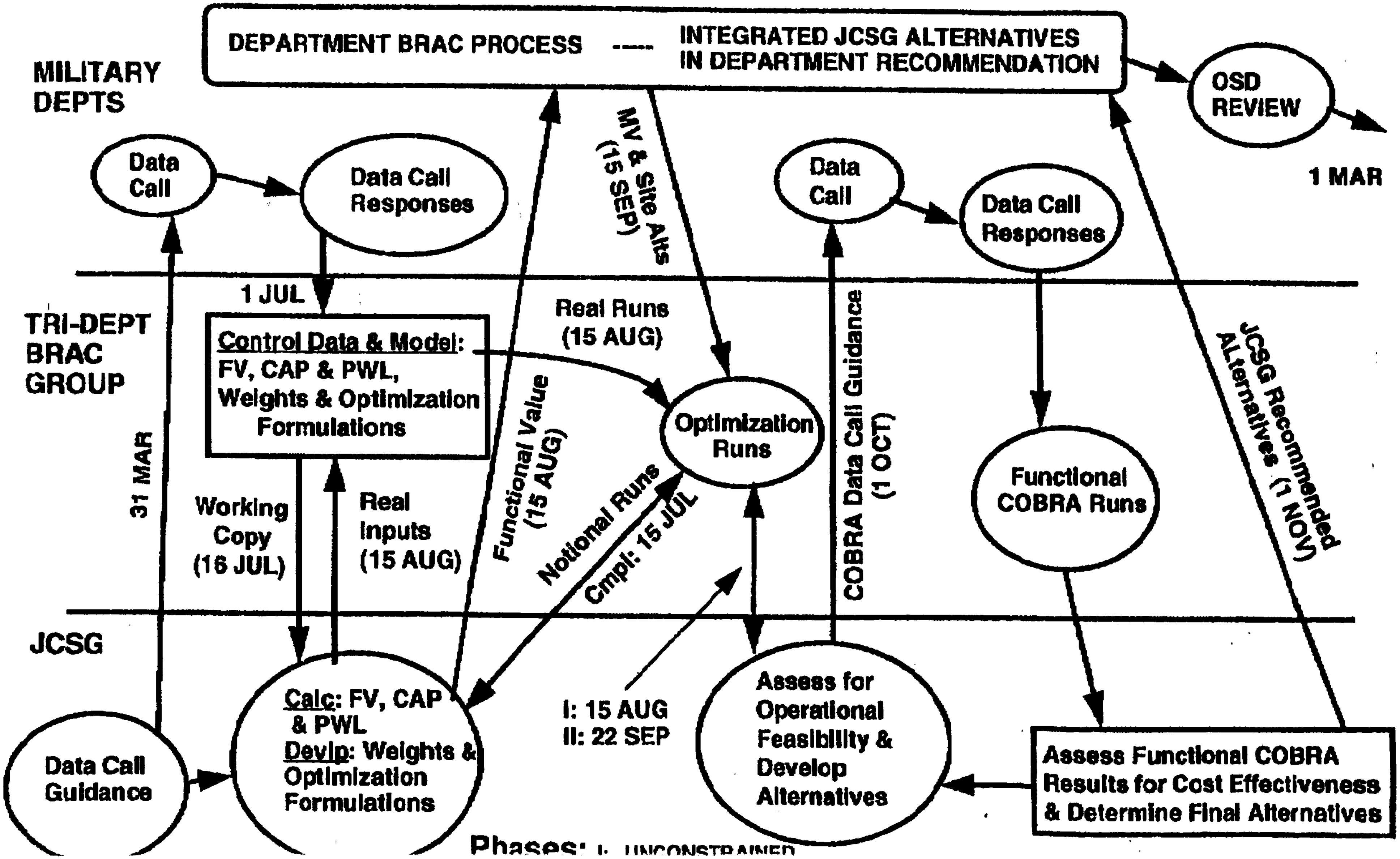
- **OUTLINE HOW ANALYSIS WILL BE ACCOMPLISHED**
  - IN RESPONSE TO 7 JAN 94 DepSecDef TASKING
- **DESCRIBE METHODOLOGIES TO BE USED TO COMPLETE TASKS**
  - APPENDIX A: T&E FUNCTIONAL VALUE
  - APPENDIX B: T&E WORKLOAD PROJECTION
  - APPENDIX C: T&E EXCESS CAPACITY AND TARGET REDUCTION
  - APPENDIX D: T&E OPTIMIZATION FORMULATIONS

FOR OFFICIAL USE ONLY - WORKING DRAFT

JOINT ANALYSIS TEAM STRUCTURE



JOINT ANALYSIS PROCESS



Phases: I. UNCONSTRAINED

JOINT ANALYSIS PROCESS
KEY POINTS

- COLLOCATION OF T&E RESOURCES NEEDED TO SUPPORT THE TEST PROCESS IN A T&E FUNCTIONAL AREA (AV, ARM/WPNS, OR EC) TO MAXIMUM EXTENT POSSIBLE
  - RETAIN AT OTHER SITES ONLY WHEN GEOGRAPHICALLY CONSTRAINED, NEEDED TO SATISFY WORKLOAD, ECONOMICALLY PROHIBITIVE TO MOVE, OR FOR OTHER OPERATIONAL REASONS
- ADDRESS IMPACT OF PROPOSED ALTERNATIVES ON CUSTOMERS AND STAKEHOLDERS
  - PRECLUDE SUBOPTIMIZATION OF OVERALL DoD COST/SAVINGS AND T&E FUNCTIONS

JOINT ANALYSIS PROCESS
KEY POINTS (CONT'D)

- OPERATIONAL FEASIBILITY ASSESSMENT
  - ENSURE CAPABILITY TO SATISFY DoD T&E REQUIREMENTS RETAINED
    - » IDENTIFY CAPABILITY SHORTFALLS/SOLUTIONS
  - BASIS FOR FUNCTIONAL COBRA DATA CALL/MODEL RUNS TO ASSESS COST EFFECTIVENESS

- ALTERNATIVES PROVIDED TO MIL DEPTS MUST
  - SATISFY PROJECTED DoD T&E WORKLOAD <u>(CAPACITY)</u>
  - SATISFY DoD T&E REQUIREMENTS <u>(CAPABILITY)</u>
  - PROVIDE ACCEPTABLE <u>RETURN-ON-INVESTMENT</u> FROM T&E FUNCTIONAL PERSPECTIVE

OPEN ISSUES

1. BASELINES TO SUPPORT FEASIBILITY ASSESSMENT OF ALTERNATIVES

   – DoD T&E CAPABILITY
   – FUNCTIONAL COST/SAVINGS

2. INTEGRATION ACROSS 3 T&E FUNCTIONAL AREAS AT A SITE (AV, ARM/WPNS, & EC)

3. ROLE OF MIL VALUE TRADEOFFS IN JOINT ANALYSIS PROCESS

Joint Analysis Facility Requirements

1.0 Purpose
The purpose of this facility is to accommodate members from all three service departments to engage in joint analysis on behalf of the Joint Cross Service Working Groups.

2.0 General
2.1 Total office space is needed to accommodate up to 15 individuals (core) and 2 transient.

Army	5
Navy	4
Air Force	6 + 2 transient
Administrative (IDA)	- (+2 IDA - they will have their own offices)
Total	15

2.2 A dedicated conference room for 18 people and access to a second conference room as needed.

3.0 Administrative Support
3.1. Dedicated copy machine
   3.1.1. Collating, stapling, enlargement/reduction
   3.1.2. Producing transparencies, single to double-side and double to double-side copying
3.2. Dedicated plain paper fax machine
   3.2.1. (equivalent in capability to the Canon Fax-L775)
3.3. One file cabinet (2-drawer) for approximately every three people.
   3.3.1. Should be lockable, with keys maintained by team members only.
3.4. Dedicated shredder
   3.4.1. both paper (6-8 sheets at a time) and transparencies.
3.5. Contractor should be able to supply routine office equipment items upon request
   3.5.1. e.g. staplers, pens, pencils, whiteboard markers, pads of paper, plastic notebooks
3.6. 1-2 IDA Administrative personnel to assist as necessary (tasks TBD).

4.0 Communication
4.1. Internal LAN is needed connecting all workstations and printers
   4.1.1. Server should have removable hard-drive for security purposes
4.2. Phone required for each person
   4.2.1. Commercial local and long distance access required
   4.2.2. DSN access is desired
   4.2.3. "Transfer" capability from one extension to another desired

5.0 Computer Hardware/Software (see attach. #1 for details)

5.1. One basic workstation per core person (no computers for transient)

5.1.1. 486-DX2/66MHz 3.5 and 5.25" disk drive, 16MB RAM 400 MB Hard Drive

5.2. One high-end workstations required

5.2.1. Pentium/90MHz, 3.5" and 5.25" disk drive, 16MB RAM 400 MB Hard Drive

5.3. Microsoft Office for each user

5.4. Wordperfect for 3 Navy users

5.5. D-PAD for 12 users

5.6. Some type of pass-wording S/W to secure computer access

5.7. Five laser printers (HP LaserJet 3Si or 4Si)

5.9 Other equipment as needed to implement the local area LAN (No external communications except one stand alone system)

6.0 Security Access

6.1. One locking cabinet large enough to hold the network server hard drive

6.1.1. Government is responsible for securing at end of day and booting each morning

6.2. Facility required to be open only to designated members and approved visitors

6.2.1. Government will provide the names of these personnel periodically

6.2.2. Designated team members will have access through cipher lock

6.2.3. Visitors will be escorted by a designated team member

6.3 Individual locks for each room.

7.0 Furniture/Office

7.1. Furniture placement should be for optimum space utilization

7.1.1. Personnel will be distributed as shown in Attachment 1, 2 people per room, except 3 in room # 835

7.1.2. Each room will require a 48" round table with three chairs

7.2. Offices should contain:

7.2.1. Desks/chairs for each individual, with desk drawers available for personal filing

7.2.2. A bookshelf or a filing drawer

7.2.3. A wastebasket

7.3. Each office should have a white board

7.4. Meeting room

7.4.1. Should have several white boards and at least one bulletin board

7.4.2. Should have an "electronic" white board

7.4.3. Should have an overhead projector and screen

7.4.4. Should have an electronic overhead projector, with dedicated basic workstation and associated software drivers

7.5 BRAC Certified Data Storage room with 5 ea., 6 ft high bookshelves (room # TBD). This area will be used as an controlled data storage area/depository for all certified data.

8.0 Parking

8.1. Free parking is needed for up to 10 vehicles daily

8.1.1. Occasional visitors will need free parking

9.0 Facility Layout (Atch 20)

9.1 Proposed layout to meet the above requirements is attached

9.1.1. Cost of both upgrading the facility and returning it to its original layout borne by the government

Contact Joe Dowden, @ 416 8482/3 for final layout configuration prior to installation

MANAGEMENT INFORMATION SYSTEM FOR T&E JCSG

Hardware and software required for a 15-user management information system:

Hardware:

- 14 PCs (486DX2/ 66 MHz, 3.5" & 5.25" Disk Drives, and with at least 16M RAM & 400M Hard Drive)
- 1 PC (Pentium, 90 MHz, 3.5" & 5.25" Disk Drives, and with at least 16M RAM & 400 M Hard Drive)
- 1 Fileserver (486DX2/66 MHz, with 24M RAM and 3G Hard Drive)
- 1 Synoptic 3000
- 1 Network Management Module
- 6 Fiber Optic Hosts (LattisNet 3304-ST Ethernet Fiber Hosts) for 20 users
- 1 Elgar UPS Model 2026E-1 2.4 KvA
- 16 Ethernet Cards (Intel Ether Express) - 1 Spare
- 15 Transceivers
- 30 25ft. jumpers (Drop cables)
- 5 Laser Printers (HP Laser Jet 3Si or 4Si)
- 5 Ethernet Cards for Printers
- 1 Tape Backup Unit
- 1 PC (486 w/8M RAM) for Internet connectivity (Using 14.4 KBS Modem or T1 line)

Software:

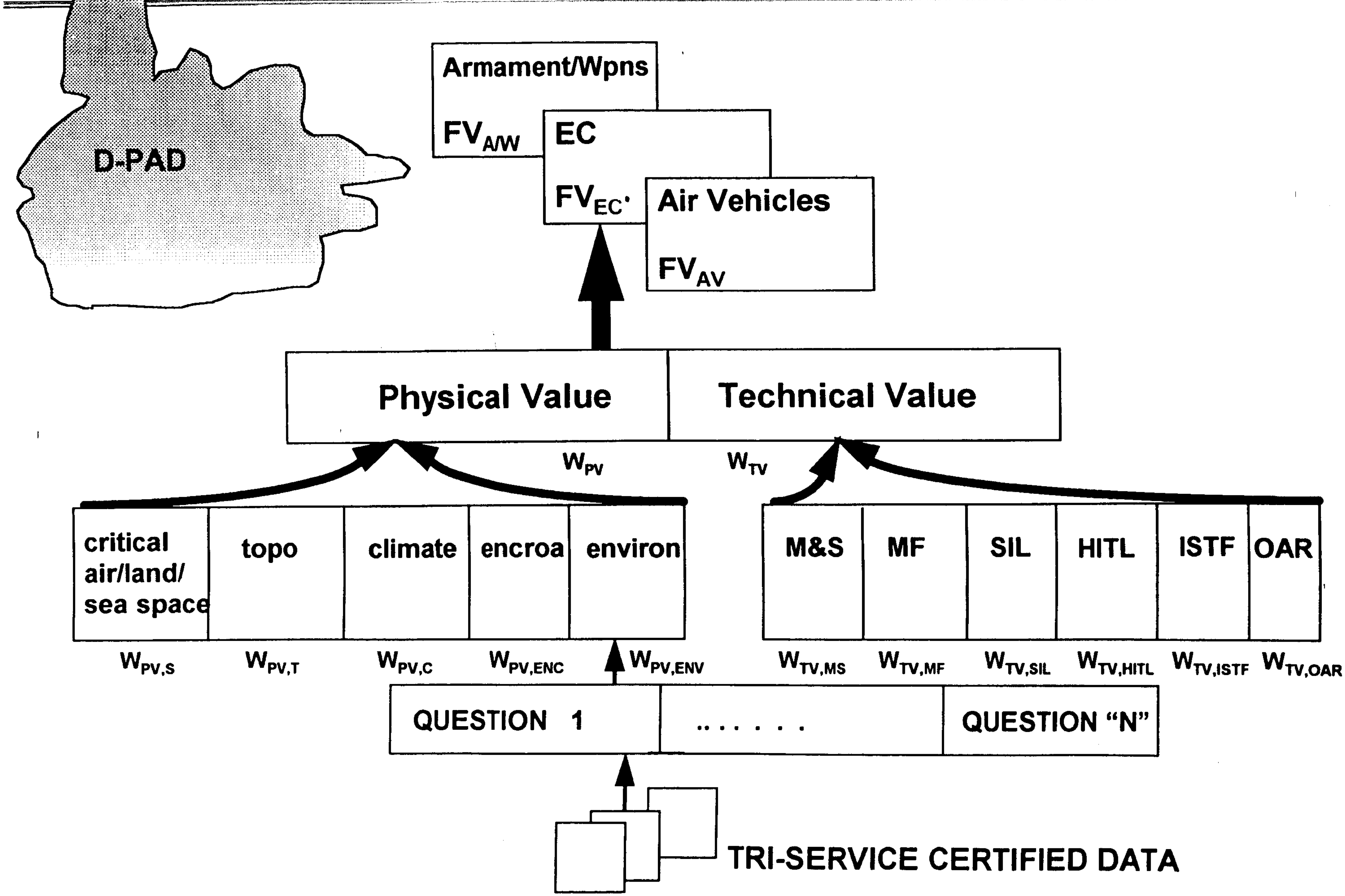
- Novell Site License for 15 users
- Microsoft Office for 15 users (Includes Powerpoint 4.0, Excel 5.0, and Word 6.0)
- Microsoft Project for 15 users
- Wordperfect 5.2 for 3 Navy users
- D-PAD for 12 users
- 1 PC Vugraph Projector Unit (SVGA color)

Security: The following is suggested to control non-classified data (other controls will be needed for classified data):

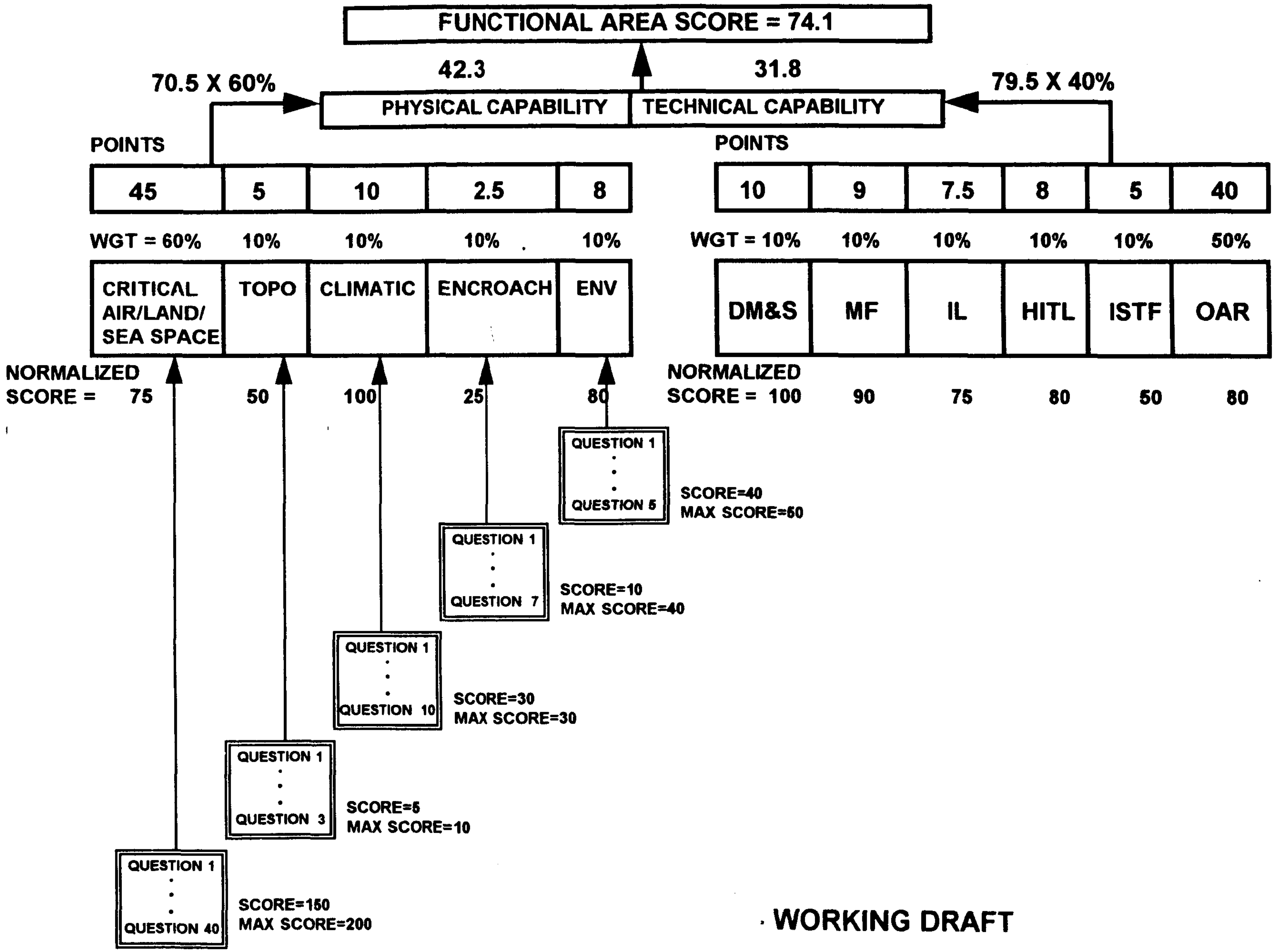
- Computer "Pass Wording" needs to be provided for all users
- Door locks
- Lockable 5-Drawer File Cabinets for each room

Atch 1

FUNCTIONAL VALUE FRAMEWORK

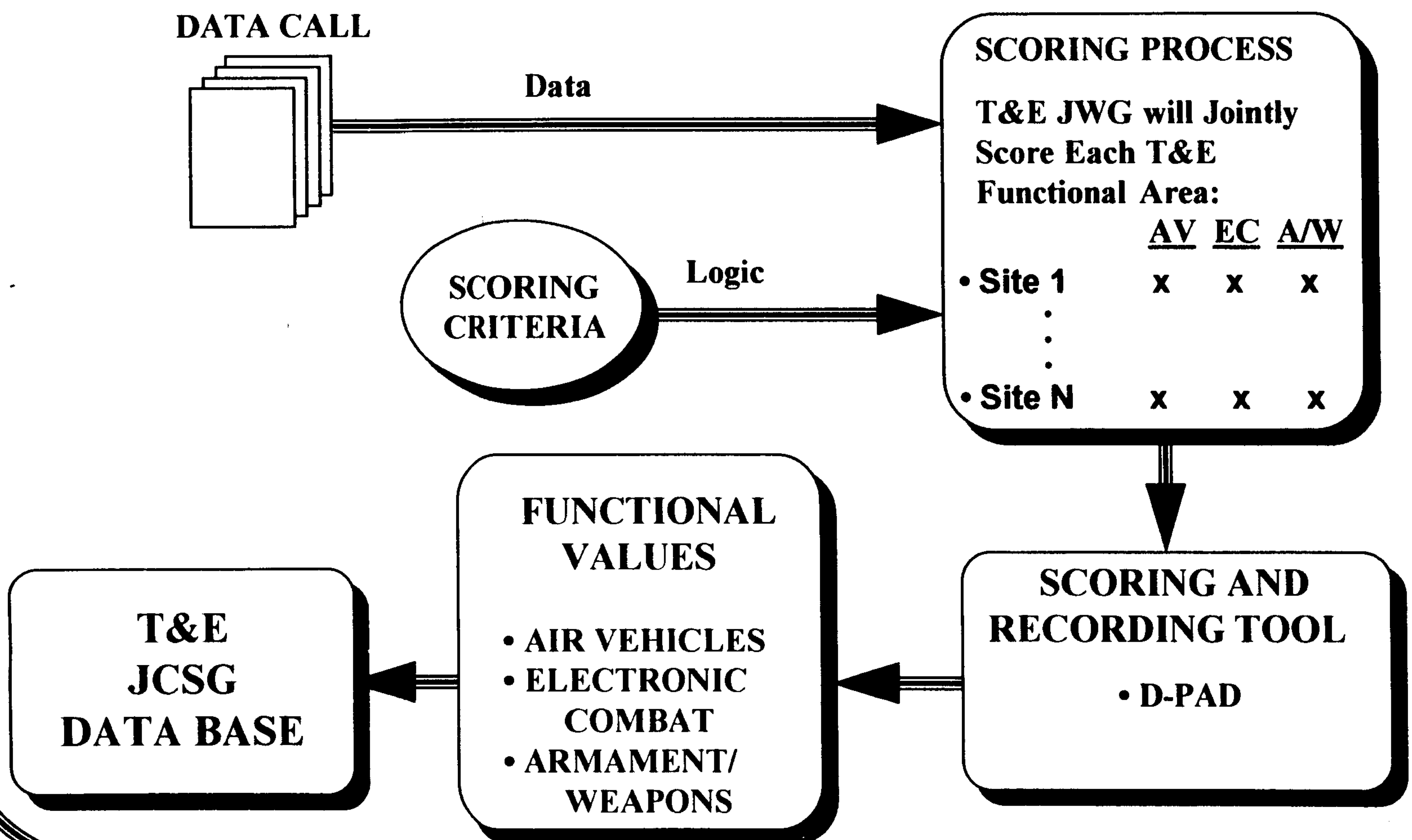


FUNCTIONAL VALUE EXAMPLE
NOTIONAL WEIGHTS AND SCORES



WORKING DRAFT

T&E JCSG FUNCTIONAL VALUE SCORING PROCESS



HARDWARE-IN-THE-LOOP FUNCTIONAL VALUE QUESTIONS

Question	Type
Site Provides Armament/Weapons RF HITL T&E Capabilities (3.2.B.1, Facility Forms)	Yes/No
Site Provides Armament/Weapons IR HITL T&E Capabilities	Yes/No
Site Provides Armament/Weapons Laser HITL T&E Capabilities	Yes/No
Site Provides Armament/Weapons MMW HITL T&E Capabilities	Yes/No
Site Provides Armament/Weapons EO/Visible HITL T&E Capabilities	Yes/No
Site Provides Armament/Weapons Midcourse Inertial/GPS HITL T&E Capabilities	Yes/No
Site Provides Armament/Weapons Multi-Mode HITL T&E Capabilities	Yes/No

THROUGHPUT VALUE IN FUNCTIONAL VALUE

- RAISED AS AN ISSUE IN 28 JUN T&E JCSG MEETING
- SUBSEQUENTLY ADDRESSED IN MEETING WITH MR. GOTBAUM
- DECISION?

ISSUES

- THROUGHPUT VALUE IN FUNCTIONAL VALUE

- SCORING METHODOLOGY
  - USE OF EVERY QUESTION IN DATA CALL
  - USE OF QUESTIONS NOT ASKED SPECIFICALLY IN DATA CALL

STATUS OF T&E OPTIMIZATION FORMULATIONS

- AGREE IN PRINCIPLE ON SET OF FORMULATIONS, INCLUDING OBJECTIVE FUNCTIONS AND CONSTRAINT EQUATIONS
- PLAN TO CONDUCT RUNS WITH NOTIONAL T&E DATA USING OPTIMIZATION PROGRAM **AMPL** TO CHARACTERIZE BEHAVIOR OF FORMULATION ALTERNATIVES
- SCHEDULE CALLS FOR COMPLETING EVALUATION OF ALTERNATIVE OPTIMIZATION FORMULATIONS BY 15 JUL 94

T&E OPTIMIZATION FORMULATIONS

OVERVIEW

- **MAXSFV**: MAXIMIZE FUNCTIONAL VALUE SUM FOR OPEN SITES
- **MINXCAP**: MINIMIZE EXCESS CAPACITY FOR OPEN SITES
- **MINSITE**: MINIMIZE THE NUMBER OF OPEN SITES
- **MINNMV**: MAXIMIZE MILITARY VALUE (MV) BY MINIMIZING ITS NEGATIVE PLUS 4 TO KEEP NMV POSITIVE

TABLE 6.
T&E COMMON-SITE ANALYSIS FOR ALTERNATIVE OPTIMIZATION FORMULATIONS (AN EXAMPLE WITH NOTIONAL DATA)

SITE	MAX SFV (ALL SITE)	MIN XCAP (ALL SITE)	MIN SITE	MIN SITE+E-6* LOAD*FV	MIN XCAP (SITES=9)	MAX FV (SITES = 9)	N SITES IN COMMON
A	1	1	1	1	1	1	6 *
B	1	1	0	0	0	0	2
C	1	1	1	1	1	1	6 *
D	1	1	1	0	1	0	4
E	1	1	1	1	1	1	6 *
F	1	1	1	1	1	1	6 *
G	1	0	0	1	0	1	3
H	1	1	0	0	0	0	2
I	1	1	1	1	1	1	6*
J	1	1	1	1	1	1	6*
K	1	1	0	0	0	0	2
L	1	0	0	0	0	0	1
M	1	0	0	0	0	0	1
N	1	1	1	1	1	1	6*
O	1	1	1	1	1	1	6*
NUMBER OF SITES OPEN	15	12	9	9	9	9	8 SITES IN COMMON (FLAGGED WITH *)
SUM OF FUNCTIONAL VALUES	1589	1358	1206	1358	1206	1359	
RATIO OF CAPACITY SUM TO REQUIREMENT	8.1	3	5.2	3	4.8	5.3	
SUM OF WORKLOAD-WEIGHTED FUNCTIONAL VALUE	1318	1112	1215	1112	1086	1181	

T&E NOTIONAL DATABASE

	SITES															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
							FUNCTIONAL VALUES									
AIR VEHICLE	80	70	90	10	45	80	85	5	40	65	5	0	0	0	0	
ARMAMENT/ MUNITIONS	91	40	25	8	54	44	16	10	50	19	12	0	0	0	0	
ELECTRONIC COMBAT	90	0	60	0	30	95	70	0	0	50	10	40	20	100	80	
							CAPACITIES									REQ'TS
AIR VEHICLE																
M&S	2500	0	2500	0	0	2500	4500	2000	0	2500	2000	0	0	0	0	5000
MF	4000	2000	2500	20000	1000	2000	2500	0	1000	2000	0	0	0	0	0	14000
SIL	2000	2000	4000	0	0	2000	4000	0	0	0	0	0	0	0	0	8000
HITL	4000	4000	4000	0	0	2000	6000	0	0	2000	0	0	0	0	0	4000
ISTF	2000	0	2000	0	0	0	2000	0	0	0	0	0	0	0	0	1500
OAR	5000	7000	10000	0	5000	8000	7500	0	5000	2500	0	0	0	0	0	12500
ARMAMENT/ MUNITIONS																
M&S	5000	0	1600	1600	3500	3500	1000	3500	1600	1600	1600	0	0	0	0	17150
MF	10000	1600	500	5000	12000	8000	500	2500	16000	3200	1600	0	0	0	0	42630
SIL	5000	3200	1000	0	6800	6800	500	1600	3200	1600	1600	0	0	0	0	21910
HITL	8500	0	0	0	8500	6800	0	0	0	0	0	0	0	0	0	16660
ISTF	1700	0	850	0	0	0	0	0	0	0	0	0	0	0	0	1785
OAR	17000	2000	200	0	5500	8000	200	400	12000	2000	700	0	0	0	0	33600
ELECTRONIC COMBAT																
M&S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF	0	0	0	0	0	8300	0	0	0	0	0	0	0	8200	8327	21000
SIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HITL	0	0	0	0	24760	0	0	0	0	0	6960	16776	7030	0	0	13208
ISTF	0	0	10311	0	0	0	27160	0	0	103200	0	0	0	0	0	31178
OAR	8694	0	0	0	0	8707	0	0	0	0	0	0	0	3480	0	6410

TABLE 1.

MAX SFV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ O_s,\ l_{sfr}}}{\text{Maximize}} \sum_s \sum_f \sum_r \left[w_1 \cdot o_s \cdot \text{fv}_{sf} + \frac{w_2 \cdot l_{sfr} \cdot \text{fv}_{sf}}{\text{req}_{fr}} \right],$$

where s is the site index,
f is the functional area index, and
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

o_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 2.

MIN XCAP OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ O_s,\ l_{sfr}}}{\text{Minimize}} \sum_{s} \sum_{f} \sum_{r} \left[\frac{w_1 \cdot O_s \cdot cap_{sfr} - w_2 \cdot l_{sfr} \cdot fv_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

O_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

cap_{sfr} is the capacity of site s for functional area f and test facility category r

TABLE 3.

MIN SITE OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to}\\ O_s,\, l_{sfr}}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[w_1 \cdot O_s - \frac{w_2 \cdot l_{sfr} \cdot fv_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

O_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 4.

MIN NMV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s,\, l_{sfr}}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[w_1 \cdot o_s \cdot \mathrm{nmv}_s - \frac{w_2 \cdot l_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

o_s is the open - site decision variable for each site s,

nmv_s is equal to $(4 - mv)$ for site s and mv is its military value (assigned as 1, 2, or 3),

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 5.

T& E CONSTRAINT EQUATIONS

$$\sum_{s} o_s \cdot cap_{sfr} \geq req_{fr}, \text{ for all } f, r$$

$$\sum_{s} l_{sfr} = req_{fr}, \text{ for all } f, r$$

$$0 \leq l_{sfr} \leq o_s \cdot cap_{sfr}, \text{ for all } s, f, r$$

$$o_s = \{\ 0 \text{ or } 1\ \}, \text{ for all s}$$

$$\sum_{f} \sum_{r} l_{sfr} \geq o_s, \text{ for all s}$$

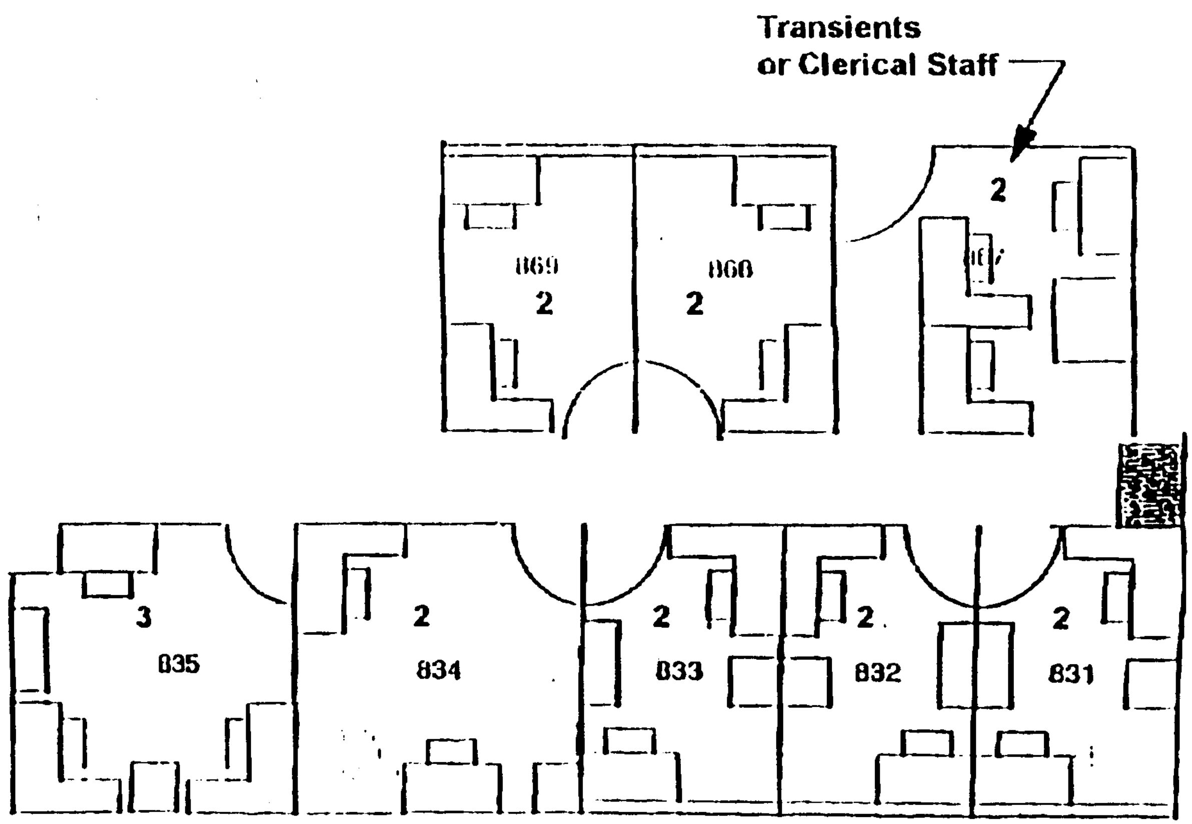
$$\sum_{s} o_s = n_{\text{limit}},$$

where n_{limit} is assigned as a run limit on the number of sites

JOINT T&E ANALYSIS FACILITY

(Include One Dedicated Conference Rm for 18 and Access to another Conference Rooms)

Occupancy: 17



T&E JSCG DATABASE

- JOINT WORKING GROUP CONTINUE TO DISCUSS/DETERMINE DATABASE REQUIREMENTS

- HARD COPIES OF QUESTIONNAIRE RESPONSES WILL BE THE PRIMARY DATABASE

- ELECTRONIC DATABASE IS OPTIONAL

- FINAL DATABASE REQUIREMENTS TO BE APPROVED BY THE JCSG

2 8 JUN 1994.

JOINT ANALYSIS FACILITY REQUIREMENTS

FOR

T&E CROSS-SERVICE ALTERNATIVE ANALYSIS

28 JUNE 94

SERVICE CONCURRENCE:

NAVY	AIR FORCE	ARMY
6/29/94	6/29/94	Gary L. Holloway 6/30/94

T&E Excess Capacity and Target Reduction Methodology

1. Introduction: Excess capacity is the arithmetic difference between Capacity and Projected Workload. Appendix B outlines the method for determining Projected Workload. This document describes the method selected for establishing T&E facility category Capacity within the three functional areas identified for cross-service analysis. Capacity will be calculated on an estimated single shift standard.

2. Assumptions:

a. A standard single shift workyear is 2008 hours, which does not include leave or administrative and training time.

b. Workload per facility hour remains constant over the period of FY93 through FY01

3. Scope: The methodology estimates the workload capacity of a T&E facility/capability by using the workload per facility hour of that facility/capability and extrapolating it over an annual single shift operation. This value is then allocated by T&E Functional Area and T&E Test Facility Category as indicated on the General Information Worksheet supporting that facility/capability. This capacity is then compared to the projected workload to determine the excess capacity.

4. Methodology:

a. CAPACITY: The method to be used generates a single estimated T&E capacity for each T&E Test Facility Category within each T&E Functional Area. The basic steps in this method are as follows:

(1) Total Facility/Capability Capacity (TFCC): Compute the TFCC by taking the "Total Σ" figure from Column 7 on the Determination of Unconstrained Capacity worksheet, and multiplying it by 2008.

(2) Total T&E Capacity (TEC): Compute the TEC by multiplying TFCC by the percent of T&E usage of the facility/capability as indicated in the General Information worksheet.

Appendix C

(3) Total T&E Capacity Allocated by Functional Area: Compute the total T&E capacity of the facility/capability to be allocated to each functional area (AVCAP for Air Vehicles, WEPCAP for Armanent/Weapons & ECCAP for Electronic Combat) by multiplying the TEC by the percentage indicated for each functional area in the General Information worksheet.

(4) Sum the above functional area capacities for all sites to generate the T&E Test Facility Category totals, within each functional area.

b. EXCESS CAPACITY: The method to be used generates a single T&E excess capacity for each T&E Test Facility Category within each T&E Functional Area. The basic step in this method is to subtract the projected workload for the appropriate T&E Test Facility Category within a T&E Functional Area from the total T&E capacity allocated to that same T&E Test Facility Category within the same T&E Functional Area.

c. TARGET REDUCTION: Targets for reducing excess capacity will be determined based on the methodology outlined in Attachment 1 to this Appendix. Special attention will be given to facilities/capabilities that show a negative excess capacity as a result of the nature of their operations.

5. Execution: The above algorithm will be incorporated into an MS Excel spreadsheet that will automatically calculate and prorate the capacities using the following inputs:

a. TOTSUM: Workload per facility hour. Taken from column 7 of the Determination of Unconstrained Capacity worksheet.

b. %T&E: Percentage of T&E usage of the facility/capability. Taken from the "PERCENTAGE USE:" row of the General Information worksheet.

c. %AV: Percentage of T&E usage for Air Vehicle T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

d. %WEP: Percentage of T&E usage for Armament/Weapons T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

e. %EC: Percentage of T&E usage for Electronic Combat T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the

General Information worksheet.

f. PWL: Projected workload for each intersection of T&E Test Facility Categories and T&E Functional Areas (a total of 18 inputs).

EXCESS CAPACITY REDUCTION TARGET METHODOLOGY

- **Tasking** - Each JCSG has been tasked to:
  - Review excess capacity analyses, and
  - Develop numerical excess capacity reduction targets

- **Proposed Target**
  - Reduce all excess capacity as defined below, where cost effective

- **Excess Capacity Definition**
  - Delta between single-shift capacity and projected workload

- **Reduction Target Constraints**
  - Separate for each T&E functional area
  - Separate for each test facility category within each T&E functional area
  - Exclude excess capacity associated with unique, one-of-a-kind facilities

- **Cost Effectiveness**
  - Based on total costs, to include non-T&E and customer costs

APPENDIX D

T&E OPTIMIZATION FORMULATIONS

OPTIMIZATION FORMULATIONS

The T&E JCSG will use a series of optimization formulations to assist in the development of alternatives for analysis and sensitivity studies. These optimization formulations are listed below:

1. **MAXSFV**. Maximize a weighted sum of **functional value multiplied by the open site decision variable** plus a weighted sum of **functional value multiplied by the workload assigned**, where the sums can be taken over all sites, functional areas, and test facility categories, subject to constraints on workload requirements, with iterative runs varying the number of open sites as a constraint. The workload assigned to each site for each test facility category in a functional area is **divided by the workload requirement** for each test facility category in the same functional area, so that differences in workload units will not affect the optimization across different test facility categories or across different functional areas. If the value of weight $\mathbf{w_1}$ is set equal to 0 and weight $\mathbf{w_2}$ is set equal to 1, then the objective function is equivalent to just maximizing the sum of **functional value multiplied by the workload assigned** (or conversely, set $\mathbf{w_1}$ equal to 1 and $\mathbf{w_2}$ equal to 0 and the objective function reduces to maximizing the sum of **functional value multiplied by the open site decision variable**). By varying the values of the two weights, parametric studies may be conducted for this optimization formulation. Table 1 contains the objective function for this optimization formulation and Table 5 contains the constraints.

2. **MINXCAP**. Minimize the weighted sum of **site capacity multiplied by the open site decision variable** minus a weighted sum **of functional value multiplied by the workload assigned**, where the sums can be taken over all sites, functional areas, and test facility categories, subject to constraints on workload requirements, with iterative runs varying the number of open sites as a constraint. The total capacity and the workload assigned to each site for each test facility category in a functional area are **divided by the workload requirement** for each test facility category in the same functional area, so that differences in units of capacity and workload will not affect the optimization across different test facility categories or across different functional areas. The relative weights can also be varied for the sum of site capacities and the sum of functional values multiplied by the workload assigned, similarly to the MAXFSV optimization formulation. Table 2 contains the objective function for this optimization formulation and Table 5 contains the constraints.

3. **MINSITE**. Minimize the **number of open sites** for each functional area (sum of open site decision variables) minus a weighted sum **of functional value multiplied by the workload assigned**, where the sums can be taken over all sites, functional areas, and test facility categories, subject to constraints on workload requirements. The workload assigned to each site for each test facility category in a functional area is **divided by the workload requirement** for each test facility category in the same functional area, so that differences in

workload units will not affect the optimization across different test facility categories or across different functional areas. The relative weights can also be varied for the number of open sites and the sum of functional values multiplied by the workload assigned, similarly to the MAXFSV optimization formulation. Table 3 contains the objective function for this optimization formulation and Table 5 contains the constraints.

4. **MINMV**. Minimize the weighted sum of **site military value multiplied by the open site decision variable** minus a weighted sum **of functional value multiplied by the workload assigned**, where the sums can be taken over all sites, functional areas, and test facility categories, subject to constraints on workload requirements, with iterative runs varying the number of open sites as a constraint. The workload assigned to each site for each test facility category in a functional area is **divided by the workload requirement** for each test facility category in the same functional area, so that differences in units of capacity and workload will not affect the optimization across different test facility categories or across different functional areas. The relative weights can also be varied for the sum of site military values and the sum of functional values multiplied by the workload assigned, similarly to the MAXFSV optimization formulation. Table 4 contains the objective function for this optimization formulation and Table 5 contains the constraints.

Functional values (see Appendix A) will be normalized to a maximum range of 100 points. This allows combination of functional values across different test facility categories in the same functional area in the optimization formulation. For all alternatives generated using the various optimization formulations, corresponding figures of merit for each alternative should be calculated **- the number (and set) of open sites, the ratio of the sum of open-site capacities to the requirements for each functional area (a measure of excess capacity), the sum of functional values for each set of open sites generated as a solution as well as the sum of functional values multiplied by workload assigned, and the sum of military values for each set of open sites.** Composite statistics such as mean and rms values, as well as graphical aids such as bar graphs, can be used to aid the analysis of the results.

The MINSITE model will generate one solution for a given set of requirements and capacities, although sensitivity studies can be performed by varying the requirements and capacities. The minimum number of sites from the MINSITE solution can then be used as a site limit (constraint equation) for subsequent runs using other optimization formulations. Analysis of these alternatives and their figures of merit (such as the ratio of open-site capacity to requirement and sums of functional value) will include identification of those sites that are consistently selected by the various formulations for workload assignment and those sites that are consistently not selected. More detailed analyses will be required to understand the reasons why a subset of the sites are selected for workload assignment for some alternatives and not others. In particular, analysis of the assignments of workload for different alternatives need to be cross-checked for feasibility and validity. An example of the results of such a comparison of several optimization formulations is given in Table 6.

The results of these analyses will be used to reduce the number of alternatives to a smaller set of promising options. Assessments on the feasibility of each option to satisfy total DOD T&E Needs will be conducted, followed by a functional COBRA analysis to assess cost effectiveness.

The actual optimization runs will include the assignment of relative priorities for one objective function over another and to use parametric variations in the weights to find "breakpoints" that cause transitions from one set of open site selections to another. Special constraints may be required to implement different "policy imperatives" that are identified as part of the BRAC process. Policy imperatives are classified as workload or site selection constraints that are imposed on an individual site or on a subset of the sites. Policy imperatives may include a requirement to maintain a minimum level of capability for a particular kind of test.

TABLE 1.

MAX SFV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ O_s,\ l_{sfr}}}{\text{Maximize}} \sum_s \sum_f \sum_r \left[w_1 \cdot o_s \cdot \mathrm{fv}_{sf} + \frac{w_2 \cdot l_{sfr} \cdot \mathrm{fv}_{sf}}{\mathrm{req}_{fr}} \right],$$

where s is the site index,
f is the functional area index, and
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

o_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 2.

MIN XCAP OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ O_s,\ l_{sfr}}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[\frac{w_1 \cdot o_s \cdot cap_{sfr} - w_2 \cdot l_{sfr} \cdot fv_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

o_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

cap_{sfr} is the capacity of site s for functional area f and test facility category r

TABLE 3.

MIN SITE OPTIMIZATION FORMULATION

$$\underset{\text{with respect to } o_s, l_{sfr}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[w_1 \cdot o_s - \frac{w_2 \cdot l_{sfr} \cdot fv_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

o_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 4.

MIN NMV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s, l_{sfr}}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[w_1 \cdot o_s \cdot \mathrm{nmv}_s - \frac{w_2 \cdot l_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index

w_1 and w_2 are weights assigned for each optimization run,

o_s is the open - site decision variable for each site s,

nmv_s is equal to (4 - mv) for site s and mv is its military value (assigned as 1, 2, or 3),

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 5.

T&E CONSTRAINT EQUATIONS

$$\sum_{s} o_s \cdot cap_{sfr} \geq req_{fr}, \text{ for all } f, r$$

$$\sum_{s} l_{sfr} = req_{fr}, \text{ for all } f, r$$

$$0 \leq l_{sfr} \leq o_s \cdot cap_{sfr}, \text{ for all } s, f, r$$

$$o_s = \{ 0 \text{ or } 1 \}, \text{ for all s}$$

$$\sum_{f} \sum_{r} l_{sfr} \geq o_s, \text{ for all s}$$

$$\sum_{s} o_s = n_{\text{limit}},$$

where n_{limit} is assigned as a run limit on the number of sites

TABLE 6.

T&E COMMON-SITE ANALYSIS FOR ALTERNATIVE OPTIMIZATION FORMULATIONS (AN EXAMPLE WITH NOTIONAL DATA)

SITE	MAX SFV (ALL SITE)	MIN XCAP (ALL SITE)	MIN SITE	MIN SITE+E-6* LOAD*FV	MIN XCAP (SITES=9)	MAX FV (SITES = 9)	N SITES IN COMMON
A	1	1	1	1	1	1	6*
B	1	1	0	0	0	0	2
C	1	1	1	1	1	1	6*
D	1	1	1	0	1	0	4
E	1	1	1	1	1	1	6*
F	1	1	1	1	1	1	6*
G	1	0	0	1	0	1	3
H	1	1	0	0	0	0	2
I	1	1	1	1	1	1	6*
J	1	1	1	1	1	1	6*
K	1	1	0	0	0	0	2
L	1	0	0	0	0	0	1
M	1	0	0	0	0	0	1
N	1	1	1	1	1	1	6*
O	1	1	1	1	1	1	6*
NUMBER OF SITES OPEN	15	12	9	9	9	9	8 SITES IN COMMON (FLAGGED WITH *)
SUM OF FUNCTIONAL VALUES	1589	1358	1206	1358	1206	1359	
RATIO OF CAPACITY SUM TO REQUIREMENT	8.1	3	5.2	3	4.8	5.3	
SUM OF WORKLOAD-WEIGHTED FUNCTIONAL VALUE	1318	1112	1215	1112	1086	1181	

BRAC 95

Joint Cross-Service Group on Test & Evaluation

Tuesday, July 12, 1994

Minutes

The BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. John Burt chaired the meeting. The agenda, a list of attendees, and handouts are attached.

The meeting began with a review of the action and analysis plan. The Group agreed to approve the action plan with a few minor modifications. The analysis plan was approved less the weights and measures portion. These will be added as an appendix when completed.

Discussion then ensued on the status of questions, weights and scoring processes. The Group agreed to optimize for test and evaluation in the three functional areas. Therefore the first bullet under AIM was removed from consideration.

Significant discussion then began on how the raw data will be handled. The area of concern is the final bullet under Scoring Process. Suggestions arose regarding individual safes versus a single safe for Services at the TEC Facility. The Group agreed that a single safe maintained by an OSD Administrator appointed by the Chairmen will suffice. Furthermore, Mr. Burt stated he forwarded the Service membership lists to Mr. Gotbaum and wanted this list entered into the minutes. The individuals listed will be the only ones with access to the T&E area in the TEC Facility. The letters of appointment are attached. Mr. Burt went on to say that a letter will be made outlining OSD participants that will have access to the TEC Facility. The Group agreed to remove the final bullet. Mr. Burt agreed to take the lead in determining a suitable person as the OSD Administrator of the T&E area in the TEC Facility.

A discussion of functional value questions then took place. There was concern by subgroup members that the level of detail the questions covered required the Group's guidance. The Group agreed to have the subgroup go back and derive questions using the data call questionnaires and the advice that a site will get credit for what they control or own and what they have available for use.

The subgroup then briefed the Group on the notional data run approach and schedule. The Chairs reminded the subgroup that they are testing the methodology and not testing for answers so the notional run need not reflect actual bases or facilities.

The next briefing given was on the database management. The Group agreed that this will be included as an appendix to the analysis plan. The Group further agreed to the appendix as presented.

The final discussion related to the schedule for subgroup actions. The subgroup requested that three actions be extended to July 19. Without a firm date for a Steering Group meeting, the Chairs agreed to extend the deadline for all actions to Monday, July 18. This would allow enough time for a briefing and approval if a Steering Group convened on July 19. The Group agreed to place a TBD in the database management process since it is not required to be done immediately.

The Chairs asked all members to review the July 7 version of the Joint Cross-Service Analysis Tool write-up to ensure the T&E optimization formulations were included and reflect what we as a group need them to do.

There being no other items for discussion, the meeting adjourned at 1045.

Approved: Lee Frame
Co-Chairman

John Burt
Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test & Evaluation

July 12, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Burt, Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
Mr. John Bolino, Co-Study Team Leader
LTG (Ret) Howard Leaf, Air Force
Mr. Dan Stewart, Air Force
Mr. Joe Dowden, Air Force
Mr. Doug Nation, Air Force
Lt Col George London, Air Force
Mr. Michael Wallace, Air Force
Mr. Walt Hollis, Army
Mr. Gary Holloway, Army
MAJ Essex Fowlks, Army
Mr. Tom Roller, Army
Mr. Gerald Schiefer, Navy
CAPT Dave Rose, Navy
Mr. Don DeYoung, Navy
CDR Mark Samuels, Navy
Mr. Ron Nickel, Navy
Mr. Mike McAndrew, ODASD(ER&BRAC) BCU
Mr. Joe Moore, OSD DOT&E
Mr. Irv Boyles, OSD DT&E
Ms. Kathleen Ruemmele, BMDO
Mr. Frank Lewis, OSD PA&E
Mr. Mark Flohr, OSD DNA
Mr. Dave Vincent, DoD IG
Ms. Jeanne Karstens, OSD Comptroller

BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 12 JUNE 1994
CONFERENCE ROOM, 1C730, PENTAGON

AGENDA

- Opening Remarks
- Comments on 28 June and 6 July Minutes
- Working Group Status Report
  - Schedule
  - Action Plan Addendum
  - JCSG Analysis Plan
    - » Functional Value Methodology
    - » Workload Projection Methodology (no change)
    - » Excess Capacity and Target Reduction Methodology (no change)
    - » Optimization Formulations
    - » Questions, Weights and Scoring Process
    - » Database Management Process

BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 12 JUNE 1994
CONFERENCE ROOM, 1C730, PENTAGON

AGENDA

- Other Activities
  - Notional Data Set
  - COBRA Model
  - Functional Value Weighting
- Issues/Recommendations
- Action Items/Wrap Up

T&E JWG Schedule

For Official Use Only - Working Draft

7/11/1994

	1994 June	1994 July
1. JCSG Decide on Cap Methodology	6/14	
2. JWG Develop Workload Requirements Methodology	6/14, 6/20, 6/21*	
3. JWG Develop FV Framework	6/14, 6/27	7/5, 7/19*
- Questions		7/5, 7/14
- Weights/Scoring Methodology		7/5, 7/19*
4. Excess Cap Tgt Red Methodology	6/14, 6/20, 6/21*	
5. Adapt Optimization Model for T&E	6/15	
- Evaluate Model	6/24	
- Develop T&E Optimization Formulation		7/1, 7/5, 7/15
- Define Initial Policy Imperatives		7/5, 7/19*
6. Database Management Process	6/23	7/5, 7/12*
7. JWG Document Analysis Plan	6/20, 6/24, 6/27	7/12*
8. OSD Lab and T&E JCSG Chairs Status Brief to Mr Gotbaum - Opt. Model	6/28	
9. Action Plan	6/28	7/12*

* - JCSG Approval

TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

ACTION PLAN AND MILESTONES

FOR

BASE REALIGNMENT AND CLOSURE (BRAC) 95 CROSS SERVICE ANALYSES

Addendum, July 1994

John A. Burt
~~Director~~
~~Test and Evaluation~~
Co-Chair
T&E JCSG

Lee H. Frame
~~Acting Director~~
~~Operational Test and Evaluation~~
Co-Chair
T&E JCSG

I. PURPOSE and SCOPE

This addendum updates the Actions and Milestone schedule necessary to support identification of opportunities for consolidating/realigning the T&E infrastructure associated with Air Vehicle, Electronic Combat and Armament/Weapons testing as part of the FY95 Base Realignment and Closure (BRAC) joint cross-service analyses.

This addendum focuses on the activities associated with conducting the T&E cross- service analyses, formulating alternatives for consideration by the Military Department's BRAC offices, and oversight of the process by T&E Joint Cross-Service Group (JCSG).

II. ACTIONS

The major actions required for conduct of the T&E joint cross-service analyses are:

ACTION 1: Develop an Overall Analysis Methodology that provides capacity, future workload requirements, excess capacity reduction targets and functional values for Air Vehicle, Electronic Combat, and Armament/Weapons T&E.

1.1 Develop an analysis framework that uses the FYDP and certified information provided in response to the T&E JCSG data call and that leads to the identification of opportunities for realigning/consolidating the T&E infrastructure.

1.2 Develop methodologies for:
- Projecting future workload requirements
- Computing excess capacity within each functional area
- Establishing excess capacity reduction targets
- Computing functional value (FV) for each T&E functional area

1.3 Adapt a linear optimization model to support the development of T&E cross-service realignment/consolidation alternatives.

ACTION 2: Conduct Analysis Using Notional Data

2.1 Compute functional value using notional data to finalize questions and weights.

2.2 Conduct optimization runs using notional data to develop initial policy imperatives, optimization formulations, data analysis procedures, and data presentation formats.

ACTION 3: Generate Inputs for Analysis

3.1 Review data call responses for completeness and site coverage. Request clarification for additional details from sites as necessary.

3.2 Provide questions, weights, and scoring criteria and compute functional value using Decision PAD software.

3.3 Compute future workload requirements and excess capacity for each functional area and test resource category.

3.4 Provide policy imperatives and other inputs required to run linear optimization and functional COBRA models to the Tri-Department BRAC Group.

3.5 Provide functional values (FV's) for each functional area for each site to the Military Departments.

ACTION 4: Conduct Analysis Using Real Data

4.1 Review inputs of model runs for accuracy.

4.2 Analyze outputs and develop initial set of realignment/consolidation alternatives and initiate coordination with other JCSGs.

4.3 Assess operational feasibility and cost effectiveness using functional COBRA model for each alternative; modify, revise, or delete alternatives as required. The assessment will include a determination as to whether the alternative retains the capability to satisfy DoD T&E requirements.

4.4 Provide revised set of alternatives to Tri-Department BRAC Group for additional optimization and functional COBRA runs.

ACTION 5: Finalize Alternatives to be provided to the Military Departments

5.1 Review inputs of model runs for accuracy.

5.2 Analyze final outputs from Tri-Department BRAC Group.

5.3 Review each alternative to ensure it is operationally feasible, retains the capability to satisfy DoD T&E requirements within each functional area, and is economically affordable. Coordinate alternatives with other Joint Cross-Service Groups.

5.4 Forward recommended alternatives along with supporting rationale and documentation to the Military Departments.

INTERNAL CONTROLS

The T&E Joint Cross-Service Group will adhere to the 13 April 1995 OSD BRAC95 internal control plan for base realignment, closure or consolidation studies to ensure the accuracy of data collection and analyses.

MILESTONES FOR CROSS SERVICE ANALYSIS

TABLE I

MILESTONE	Due Date
Data Call released to Services	31 Mar 94
ACTION 1 Overall Analysis Methodology JCSG Approves: Capacity Calculation Future Workload Projection Methodology Functional Value Target Reduction Methodology	6 Jul. 94
ACTION 2 Conduct Analysis Using Notional Data JCSG Approves: Questions Weights Scoring Criteria Initial Policy Imperatives Optimization Formulations	15 Jul. 94
ACTION 3 Generate Inputs for Analysis JCSG Approves: Functional Values Capacity/Requirements Policy imperatives	15 Aug. 94
ACTION 4 Conduct Analysis using Real Data JCSG: Assess Inputs for Optimization/Cobra Models Develop initial alternatives and coordinated with other JCSGs Assess operational feasibility and cost effectiveness of alternatives	8 Oct. 94
ACTION 5 Finalize Alternatives JCSG: Coordinate alternatives with other JCSGs Approves final alternatives Provide alternatives to Military Departments	17 Oct. 94

TEST AND EVALUATION (T&E)

JOINT CROSS-SERVICE GROUP

ANALYSIS PLAN

FOR

BASE REALIGNMENT AND CLOSURE (BRAC 95)

July 1994

JOHN A. BURT
~~Director~~
~~Test and Evaluation~~
Co-Chair
T&E JCSG

LEE H. FRAME
~~Director~~
~~Operational Test and~~ Evaluation
Co-Chair
T&E JCSG

T&E JOINT CROSS-SERVICE GROUP
ANALYSIS PLAN

1.0 BACKGROUND

1.1 In a 7 Jan 94 memorandum entitled "1995 Base Realignment and Closures (BRAC 95)", the DEPSECDEF established Joint Cross Service Groups (JCSGs) in six areas with significant potential for cross-service impacts in BRAC 95. Each JCSG was tasked to accomplish the following:

- To determine the common support functions and bases
- To establish the guidelines, standards, assumptions, measures of merit, data elements, and milestone schedules for DoD Component conduct of cross-service analysis of these common support functions
- To oversee DoD Component analyses of the common support functions
- To review excess capacity analyses
- To develop closure and realignment alternatives and numerical excess capacity reduction targets for consideration in such analysis
- To analyze cross-service tradeoffs

1.2 The purpose of this plan is to outline how the analysis tasks will be accomplished and to describe the methodologies to be used in completing these tasks.

2.0 JOINT TEAM STRUCTURE

2.1 Attachment 1 summarizes the joint team structure and responsibilities for accomplishing the DEPSECDEF analysis tasks. Overall responsibilities of the Steering Group, Review Group, Military Departments, and Joint Cross Service Groups in the BRAC cross-servicing process are documented in the 7 Jan 94 DEPSECDEF Memorandum.

2.2 The Joint Working Group (JWG) is comprised of DoD Component members and reports directly to the T&E JCSG. It's principal role is to support the T&E JCSG in the development and conduct of the analysis, subject to the approval of the T&E JCSG. The T&E JCSG will also document all results and decisions for the record.

2.3 The Tri-Department BRAC Group is comprised of BRAC members from each Military Department who report directly to their Military Department. They are responsible for controlling data and running the optimization and functional COBRA models for each JCSG. T&E inputs for the model will be provided by the T&E JCSG. Model outputs will be provided to the T&E JCSG for review and analysis by the JWG.

3.0 JOINT ANALYSIS PROCESS

3.1 Steps in the joint analysis process are summarized in Attachment 2.

3.2 The T&E JCSG will develop guidance for joint T&E data calls to support the joint analysis process. The Military Departments will conduct the data calls and provide the responses to the Joint Cross Service Group through the Tri-Department BRAC Group for control.

3.3 The T&E JCSG will use the methodologies presented in Appendices A-C to compute the T&E Functional Value (FV), Excess Capacity, and Projected Workload (PWL) based on information from the joint data call and the Future Years Defense Plan. They will also develop optimization formulations and policy imperatives to support optimization model runs (see Appendix D). Questions, weight, and scoring criteria presented in Appendix E will be used to calculate functional values. All data will be documented IAW Appendix F.

3.4 Notional data will be used to develop the optimization formulations and initial policy imperatives. Unconstrained runs using real data will then be conducted using inputs from the T&E JCSG to develop alternatives satisfying workload requirements. Additional runs using site military values provided by the Military Departments will also be run to refine alternatives.

Colocation
3.5 Collection of T&E resources needed to support the test process in a T&E functional area (i.e., Air Vehicle, Armament/Weapons, or Electronic Combat) will be accomplished to the maximum extent possible in each alternative. Resources will be retained at other sites when geographically constrained, needed to satisfy workload, economically prohibitive to move, or for other operational reasons.

3.6 Sensitivity analysis will be conducted throughout the process to identify risk areas.

3.7 An operational feasibility assessment will be conducted by the T&E JCSG to ensure the capability to satisfy DoD T&E requirements is retained. Shortfalls in capability will be identified and necessary solutions developed to retain viable alternatives. A top-level concept of operations (CONOPS) will be generated for each alternative and will address MILCON, personnel movement and termination, equipment relocation, customer and stakeholder impacts, etc. The CONOPS will provide the basis for a Functional COBRA data call to determine if an alternative is cost effective using the COBRA Model. The functional COBRA will consist of

COBRA runs using simplified input data sets and assumptions. These data sets and assumptions will be developed by the JWG and approved by the T&E JCSG. An approved version of COBRA will be used for these runs.

3.8 Alternatives that satisfy the DoD T&E workload and capability requirements and provide an acceptable return-on-investment from a T&E perspective will be recommended to the Military Departments for their consideration and integration into their closure/realignment candidates and alternatives from the other JCSGs.

4.0 SCHEDULE

4.1 Key milestones and schedules are shown in Attachment 2.

APPENDICES

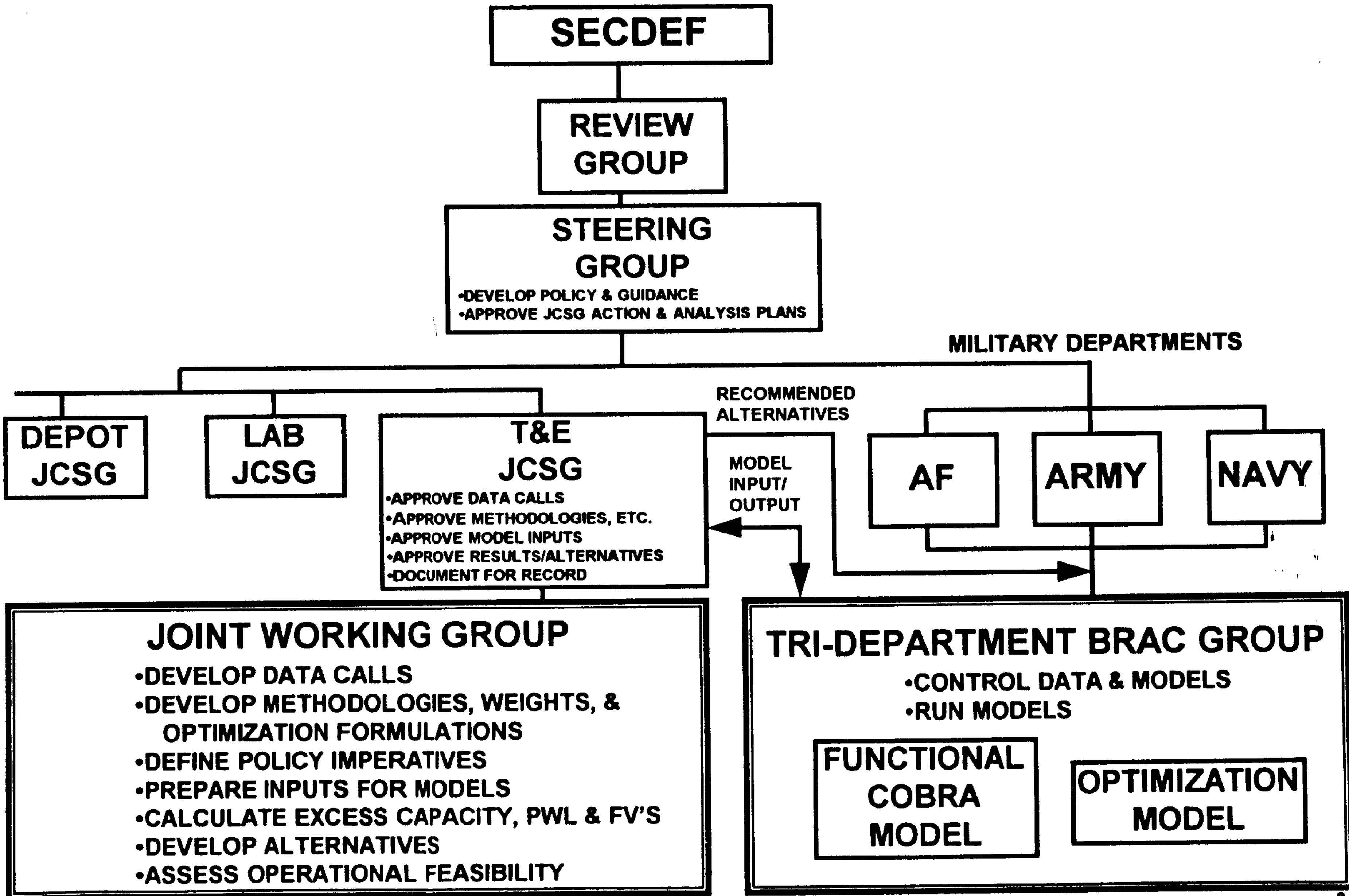
A - T&E Functional Value Methodology
B - T&E Workload Projection Methodology
C - T&E Excess Capacity and Target Reduction Methodology
D - T&E Optimization Formulations
E - Questions, Weights and Scoring Process (To Be Provided)
F - Data Base Management

ATTACHMENTS

(1) Joint Analysis Team Structure
(2) Joint Analysis Process

FOR OFFICIAL USE ONLY - WORKING DRAFT

JOINT ANALYSIS TEAM STRUCTURE



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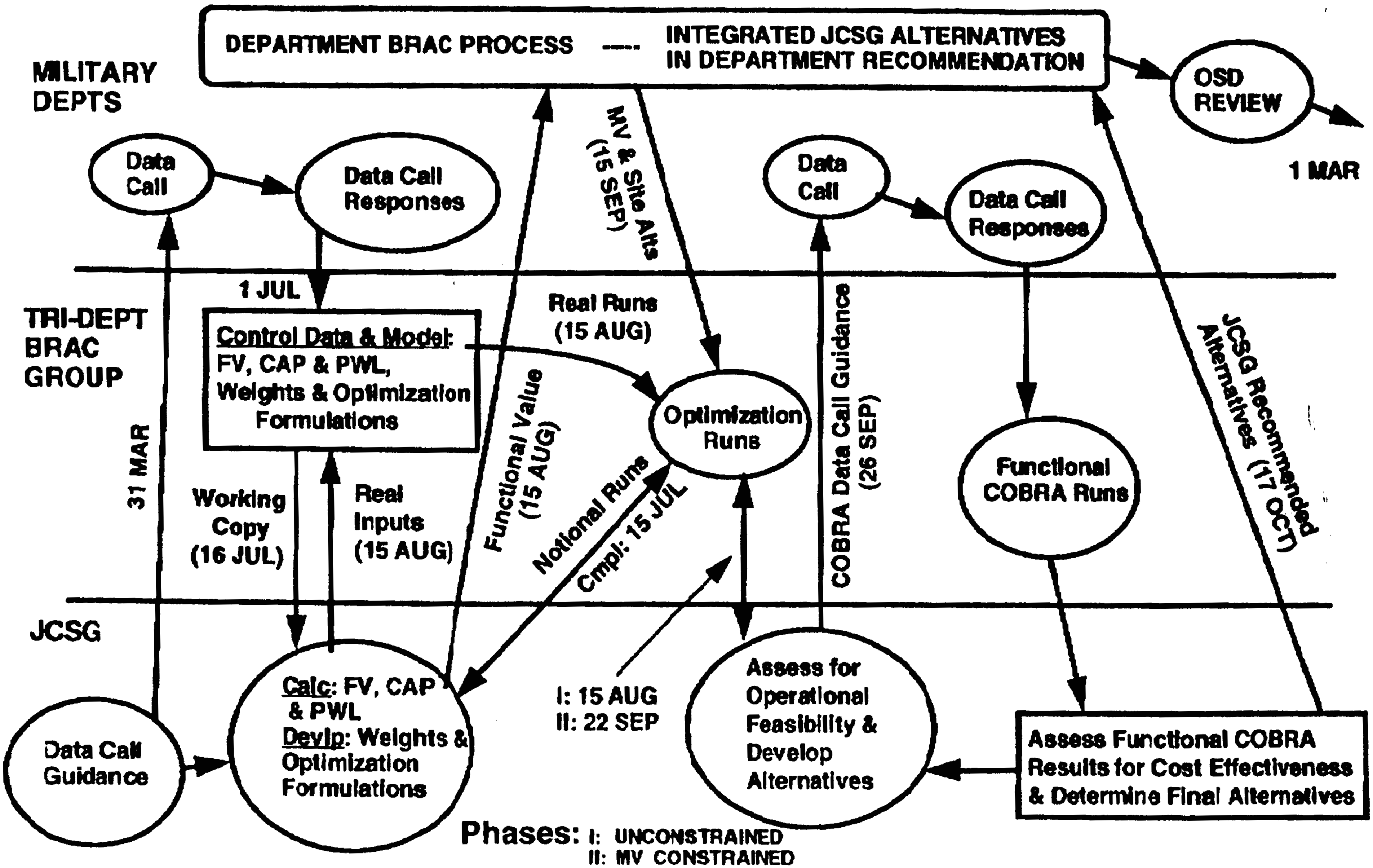
JOINT ANALYSIS PROCESS



APPENDIX A

T&E FUNCTIONAL VALUE METHODOLOGY

FUNCTIONAL VALUE

METHODOLOGY AND FRAMEWORK

1. INTRODUCTION:

An objective assessment of functional value for each site which supports T&E of air vehicles, electronic combat, or armament/weapons is required as part of the Base Realignment and Closure (BRAC) cross-service analysis process. This value will be used to support the development of alternatives for consolidating/realigning the T&E infrastructure.

2. DEFINITION: The standard dictionary definition of "value" is:

a. Worth in usefulness or importance to the possessor; and

b. A principle, standard or quality regarded as worthwhile or desirable.

Applying this standard definition, functional value for T&E joint cross-service analysis is defined as the value of performing T&E in one of the three functional areas (Air Vehicles, Electronic Combat, and Armament/Weapons) at a given site.

3. PURPOSE:

This document describes the methodology the T&E JCSG will use to arrive at functional values based on certified data from the Military Departments.

This methodology and framework provides a quantitative, consistent, and defensible basis for generating functional values for each site which performs Air Vehicles, Electronic Combat, and Armament/Weapons testing.

4. SCOPE:

The methodology generates functional values for each site and each functional area using certified data submitted in response to the T&E JCSG data call.

5. FRAMEWORK:

The framework for calculating functional value is based on a top down approach which captures the principal attributes required to support T&E within each functional area. The framework (see Figure 1) is comparable to a work breakdown structure (WBS). At the top level, two broad functional values (Physical and Technical) are required:

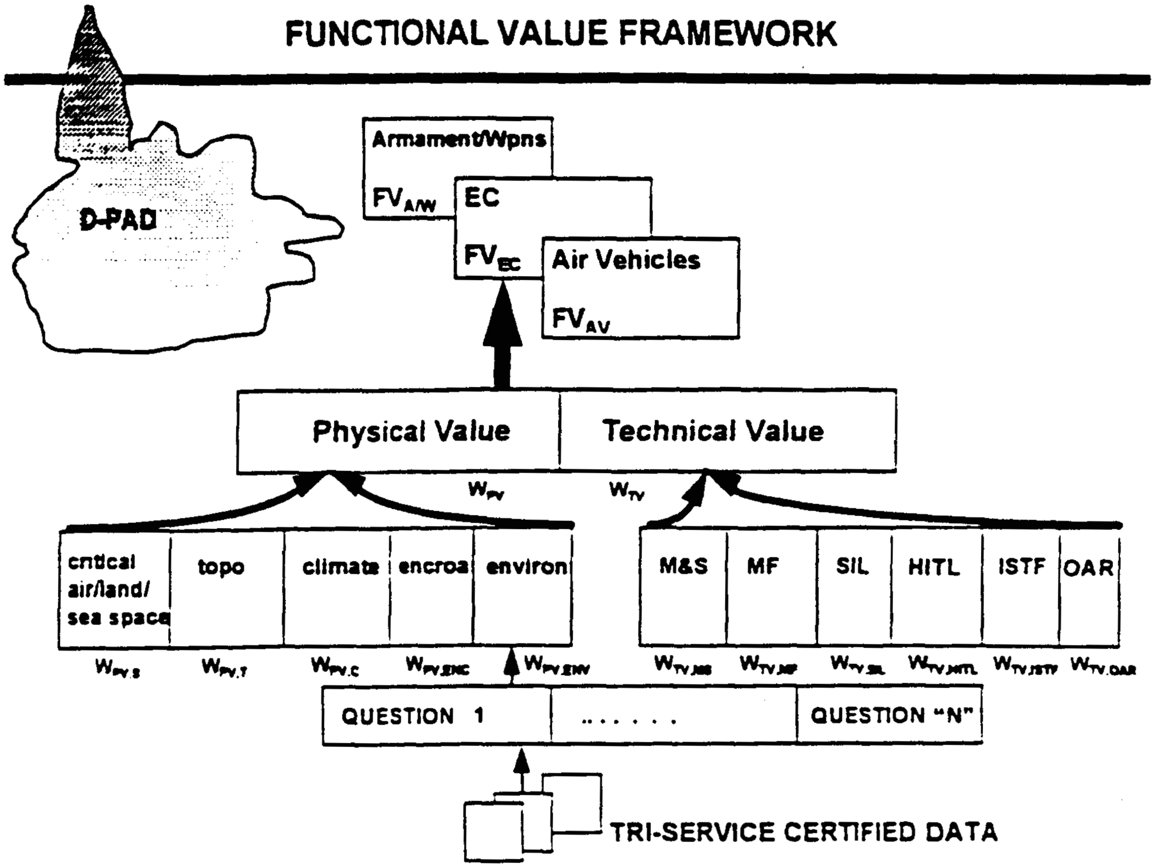


Figure 1

a. Physical Value. This category captures the intrinsic value of the air, land, and sea space as well as the varied topography and climates at a site as they relate to those required to support test and evaluation of system performance in real-world environments under realistic conditions. Encroachment and environmental categories attempt to capture to what extent future T&E operations might be affected by these factors.

b. Technical Value. This category captures the value of the man-made assets at each site in terms of their capability to support test and evaluation of current and future weapon systems.

These two top level categories (Physical and Technical) are further broken down into sub-categories. Physical value is based on a roll-up of critical air/land/sea space, topography, climate, encroachment, and environmental sub-categories. Technical value is based on a roll-up of six T&E test facility categories as defined in the T&E Data Call: (1) Modeling and Simulation (M&S), (2) Measurement Facilities (MF), (3) System Integration Laboratories (SIL), (4) Hardware-In-The-Loop (HITL), (5) Installed Systems Test Facilities (ISTF), and (6) Open Air Ranges (OAR).

Each of the sub-categories will be scored based on a set of questions unique to the functional area (air vehicles, electronic combat, and armament/weapons).

Included in the functional value framework is a set of weighting factors assigned in a top down process to the top two levels. The relative importance of each capability determines its weight. The weights will be the same for all three functional areas. At lower levels, questions and scoring criteria may be different within each functional area.

All questions, weights, and scoring criteria as approved by the T&E JCSG are contained in Appendix E. Notional data will be used to support the development of the questions, weights, and scoring criteria.

6. SCORING PROCESS:

The proposed T&E functional value scoring process is shown in Figure 2. Each site's data call responses will be scored by the T&E JWG using the scoring criteria given in Appendix E. Relevant data for a facility which conducts testing in more than one functional area will be scored in each area. Decision Pad (D-PAD) software will be used to facilitate scoring site responses and rolling up scores into functional values for each site.

T&E JCSG FUNCTIONAL VALUE SCORING PROCESS

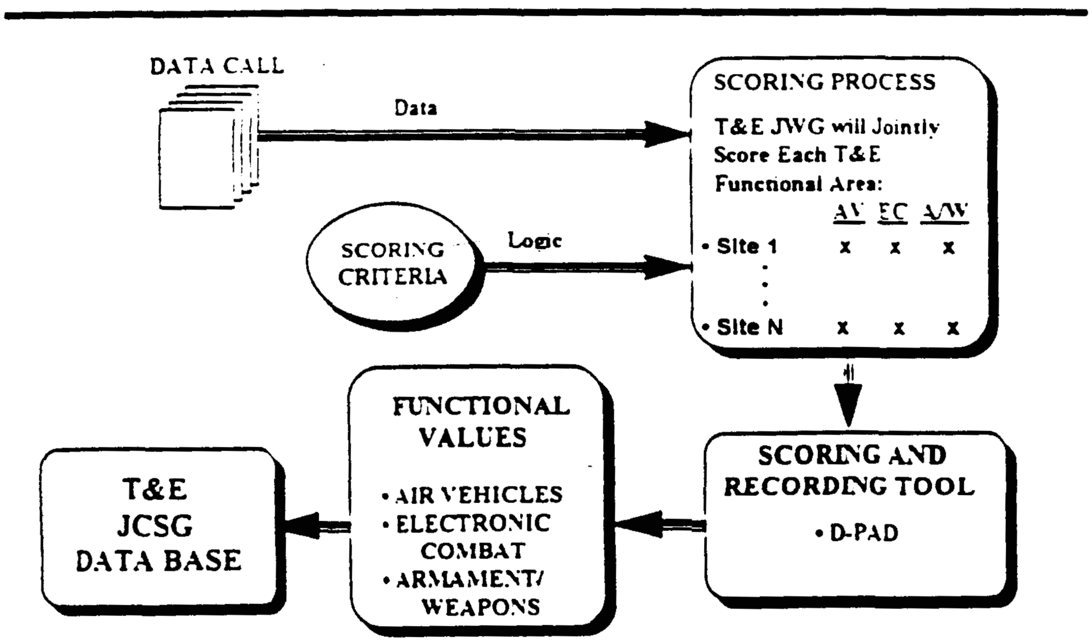


Figure 2

7. WEIGHTING NORMALIZED SCORES:

The mathematical formula for summing functional value scores is shown below. In addition, the framework consistently measures each site against the same set of questions, and the method is reproducible. All resulting functional values are between 0 and 100.

FUNCTIONAL VALUE WEIGHTING/SCORING

1. NORMALIZE ALL SCORES
2. EACH SCORE HAS AN ASSOCIATED WEIGHT
3. WEIGHTS ARE DECIMAL FRACTIONS LESS THAN ONE

$$\mathbf{FV} \equiv \sum_{i=1}^{2}\left[W_i\left(\sum_{j=1}^{m_i} W_{i,j}\left[100\left(\frac{\sum_{k=1}^{n_{i,j}} X_{i,j,k}}{\sum_{k=1}^{n_{i,j}} P_{i,j,k}}\right)\right]\right)\right]$$

$\sum_i W_i = 1.0$

$\sum_j W_{i,j} = 1.0$

- W_i = WEIGHT ASSOCIATED WITH CAPABILITY
- i = PV and TV
- $W_{i,j}$ = WEIGHT ASSOCIATED WITH CAPABILITY CATEGORY
- j = 1 THROUGH NUMBER OF CATEGORIES
- $X_{i,j,k}$ = SITE'S SCORE AGAINST QUESTION x
- $P_{i,j,k}$ = MAXIMUM SCORE FOR QUESTION x
- k = 1 THROUGH NUMBER OF QUESTIONS
- FV = FUNCTIONAL VALUE FOR A PARTICULAR FUNCTIONAL AREA SUCH AS AIR VEHICLE, ELECTRONIC COMBAT, OR ARMAMENT/WEAPONS

8. SUMMARY:

In summary, the functional value methodology and framework provides complete visibility into the relative importance, or weight, of each capability. Weights establish which capabilities are most critical to DoD. The site's functional values represent its inherent worth to DoD in three key functional areas: air vehicles, electronic combat, and armament/weapons.

APPENDIX B

T&E WORKLOAD PROJECTION METHODOLOGY

T&E WORKLOAD PROJECTION METHODOLOGY

1. INTRODUCTION: Inherent to the determination of excess capacity is the development of a future T&E workload projection for each of the functional areas being examined by the T&E Joint Cross-Service Group (JCSG). This document describes the method selected for projecting future workload requirements for the T&E joint cross-service analyses. The underlying premise for this method is that future T&E workload will increase/ decrease in direct proportion to funding increases/decreases in the DoD budget. This method was selected based on its ability to provide a quantitative, consistent, and defensible basis for estimating future T&E workload.

2. ASSUMPTIONS:

a. The amount of workload generated by a fixed dollar amount is constant over the period FY92 - FY01.

b. The percentage of total workload for a given functional area that must be accomplished by each of the six test resource categories remains constant over the period FY92 - FY01.

c. The T&E JCSG analysis will include minimization of excess capacity as one of its goals; therefore, workload projections must be done at the test resource category level.

d. Outlay rates used in support of the FY95 President's Budget can be used for FYs93 - 99.

e . Workload for FY00 and FY01 equals that for FY99.

3. SCOPE: The methodology projects T&E workload throughout the FY95 - FY01 period and utilizes the workload measures specified in the JCSG T&E data call. The methodology draws upon historical workload information contained within the data call and funding data contained in the FY95 - 99 FYDP. Generation of T&E workload projections is the responsibility of the T&E JCSG.

4. METHODOLOGY: The method to be used in the T&E joint cross-service analysis generates a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. From the FYDP compute the total Budget Authority (BA) for Operation and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement funding.

b. Convert into constant FY95 dollars by deflating/inflating totals with certified inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M BA for fiscal year x expressed in constant FY95 dollars.

TR_x = total RDT&E BA for fiscal year x expressed in constant FY95 dollars.

TP_x = total Procurement BA for fiscal year x expressed in constant FY95 dollars.

TOTAL BUDGET AUTHORITY

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Compute total outlays for fiscal year x using certified outlay rates provided by the DoD Comptroller.

$$TBA_x = \sum_{k=1}^{7} (TOM_{x+1-k} \times OMOR_k + TR_{x+1-k} \times ROR_k + TP_{x+1-k} \times POR_k)$$

where $OMOR_k$ = outlay rate for O&M funding for kth year of the appropriation.

ROR_k = outlay rate for RDT&E funding for kth year of the appropriation.

POR_k = outlay rate for Procurement funding for kth year of the appropriation.

d. Compute average outlay baseline (AOB) for FY92 and FY93.

$$AOB = \frac{TBA_{92} + TBA_{93}}{2}$$

e. Divide total outlay baseline for fiscal year x from step c by the average outlay baseline from step d for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{TBA_x}{AOB} \qquad x = FY95, FY96, \ldots\ldots\ldots, FY01$$

f. Select test resource category (TRC_j; j = 1, 2, ..., 6) and functional area (FA_i ; i = 1, 2, 3).

g. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

h. Multiply total workload baseline from step g by the workload projection index from step e to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_x \times WTB_{ij}$$

i. Repeat steps f through h for each test resource category and each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

APPENDIX C

EXCESS CAPACITY AND TARGET REDUCTION METHODOLOGY

T&E Excess Capacity and Target Reduction Methodology

1. Introduction: Excess capacity is the arithmetic difference between Capacity and Projected Workload. Appendix B outlines the method for determining Projected Workload. This document describes the method selected for establishing T&E facility category Capacity within the three functional areas identified for cross-service analysis. Capacity will be calculated on an estimated single shift standard.

2. Assumptions:

a. A standard single shift workyear is 2008 hours, which does not include leave or administrative and training time.

b. Workload per facility hour remains constant over the period of FY93 through FY01.

3. Scope: The methodology estimates the workload capacity of a T&E facility/capability by using the workload per facility hour of that facility/capability and extrapolating it over an annual single shift operation. This value is then allocated by T&E Functional Area and T&E Test Facility Category as indicated on the General Information Worksheet* supporting that facility/capability. This capacity is then compared to the projected workload to determine the excess capacity.

4. Methodology:

a. CAPACITY: The method to be used generates a single estimated T&E capacity for each T&E Test Facility Category within each T&E Functional Area. The basic steps in this method are as follows:

(1) <u>Total Facility/Capability Capacity (TFCC):</u> Compute the TFCC by taking the "Total Σ" figure from Column 7 on the Determination of Unconstrained Capacity worksheet*, and multiplying it by 2008.

(2) <u>Total T&E Capacity (TEC):</u> Compute the TEC by multiplying TFCC by

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* See T&E JCSG Data Call of 31 March 1994.

the percent of T&E usage of the facility/capability as indicated in the General Information worksheet.

(3) Total T&E Capacity Allocated by Functional Area: Compute the total T&E capacity of the facility/capability to be allocated to each functional area (AVCAP for Air Vehicles, WEPCAP for Armanent/Weapons & ECCAP for Electronic Combat) by multiplying the TEC by the percentage indicated for each functional area in the General Information worksheet.

(4) Sum the above functional area capacities for all sites to generate the T&E Test Facility Category totals, within each functional area.

b. EXCESS CAPACITY: The method to be used generates a single T&E excess capacity for each T&E Test Facility Category within each T&E Functional Area. The basic step in this method is to subtract the projected workload for the appropriate T&E Test Facility Category within a T&E Functional Area from the total T&E capacity allocated to that same T&E Test Facility Category within the same T&E Functional Area.

c. TARGET REDUCTION: Targets for reducing excess capacity will be determined based on the methodology outlined in Attachment 1 to this Appendix. Special attention will be given to facilities/capabilities that show a negative excess capacity as a result of the nature of their operations.

5. Execution: The above algorithm will be incorporated into an MS Excel spreadsheet that will automatically calculate and prorate the capacities using the following inputs:

a. TOTSUM: Workload per facility hour. Taken from column 7 of the Determination of Unconstrained Capacity worksheet.

b. %T&E: Percentage of T&E usage of the facility/capability. Taken from the "PERCENTAGE USE:" row of the General Information worksheet.

c. %AV: Percentage of T&E usage for Air Vehicle T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

d. %WEP: Percentage of T&E usage for Armament/Weapons T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

e. %EC: Percentage of T&E usage for Electronic Combat T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

f. PWL: Projected workload for each intersection of T&E Test Facility Categories and T&E Functional Areas (a total of 18 inputs).

EXCESS CAPACITY REDUCTION TARGET METHODOLOGY

- **Background** - Each JCSG has been tasked to:
    - Review excess capacity analyses, and
    - Develop numerical excess capacity reduction targets

- **Proposed Target**
    - Reduce all excess capacity as defined below, where cost effective

- **Excess Capacity Definition**
    - Delta between single-shift capacity and projected workload

- **Reduction Target Constraints**
    - Separate for each T&E functional area
    - Separate for each test facility category within each T&E functional area
    - Exclude excess capacity associated with unique, one-of-a-kind facilities

- **Cost Effectiveness**
    - Based on total costs, to include non-T&E and customer costs

APPENDIX D

OPTIMIZATION FORMULATIONS

APPENDIX D. T&E OPTIMIZATION FORMULATIONS

1. INTRODUCTION: To assist in the generation of cross-service functional alternatives for consideration by the Military Departments, a common analytical tool based on mixed integer, linear programming has been adopted by the Joint Cross-Service Groups (JCSGs). This document describes the specific adaptation of this common tool to support the T&E joint cross-service analysis process.

2. ASSUMPTIONS:

a. Policy imperatives agreed to by the T&E JCSG can be incorporated into the optimization formulations in the form of additional constraints.

b. The following data will be available for all of the sites and T&E functional areas:

Data Elements	Description
mv_s	Military value of site *s* expressed as 3 (high), 2 (medium), or 1 (low).
fv_{sf}	Functional value for performing function *f* at site *s* expressed as a number from 0 (low) to 100 (high).
cap_{sfr}	Capacity of site *s* to perform function *f* using test facility category *r*
req_{fr}	Total DoD requirement to perform function *f* using test facility category *r*

The military value of a site, mv_s, measures the overall value of the site to the department and will be provided by the Military Departments. The methods to be employed by the T&E JCSG to determine the functional value, capacity and workload requirements are described in other appendices.

3. SCOPE: Different optimization formulations (as described in the following section) have been selected to support the identification of cross-service alternatives and to provide a full understanding of the effect of individual parameters (*eg*, functional value, capacity, workload, *etc*) on the benefits/risks associated with each alternative.

Optimization model runs will be performed by the Tri-Department BRAC Group using AMPL and inputs as approved by the T&E JCSG. During the course of the analysis, modifications, revisions, and additions to the optimization formulations and policy imperatives may be required to support the identification and refinement of viable cross-service alternatives. All modifications, revisions, and additions will be approved by the T&E JCSG prior to implementation.

4. OPTIMIZATION FORMULATIONS: The four optimization formulations described below vary only in the specification of the objective function. Some of the objective functions involve summing terms across different types of test facilities and functional areas, where the terms including factors for the workload assigned or workload capacity are measured in units that reflect a different cost basis. These workload factors are always normalized in the objective functions by dividing by the corresponding workload requirements, so that the objective functions will only sum terms with consistent relative workload units. All four of the optimization formulations support a parametric variation in the relative weights (w and 1-w) applied to a pair of terms in each objective function. This allows the T&E JCSG to develop alternatives which evaluate the impact of composite objective functions; for example, minimizing the number of open sites as a primary objective while maximizing the functional value of the workload assignment as a subordinate objective. The weight w is constrained between the values of 0 and 1 to avoid any distortion of the scale or units for the components of the objective functions.

Objective Functions.

a. The **MAXSFV** formulation. This formulation maximizes the sum of the functional values for all of the retained sites. The objective function for this formulation is given in Table 1. If the number of sites to be retained is not included as a constraint, all of the sites will be retained in the solution because the objective function is maximized when o_s = 1 for all sites. Obtaining meaningful results with this formulation, therefore, requires a constraint on the number of sites retained. If w = 1, then this formulation reduces to maximizing the functional value sum over the open sites. If w = 0, then the objective function maximizes functional value weighted by the fraction of required workload assigned to the site.

b. The **MINNMV** formulation. This formulation will find a small number of sites having the highest military value that can accommodate the DoD required workload. In addition, it will assign the DoD requirement for each cross-service function to the retained sites (or activities) having the highest functional value for that function. The purpose of this formulation is to assign, to the extent possible, the cross-service functional requirements to sites or activities having high military value and high functional values.

The objective function for this formulation is given in Table 2. This formulation is referred to as **MINNMV** because it minimizes the sum of 4 - nmv_s for retained sites or activities. Sites or activities having a high military value (3) will have 1 as their value for nmv, while sites with low military values (1) will have 3 as their value for nmv.

If w = 1, then the objective function includes only military value as a term. If w = 0, then the objective function is identical to **MAXSFV** with its w = 0.

c. The **MINXCAP** formulation. If the parameter w is set to a large value (*eg*, w = 0.9), this problem formulation will find the set of retained sites having the smallest total functional capacity but still able to perform the DoD functional requirement. Depending on w, functional assignments are also optimized. The objective function for this formulation is given in Table 3.

If w = 0, this formulation - like the **MINMNV** formulation - is also equivalent to the **MAXSFV** formulation with its w = 0. If w is set to a large value, excess capacity is reduced as much as possible with minimal regard for functional value.

d. The **MINSITES** formulation. This formulation, depending on the value of *w*, will find the minimum-sized set of sites that can perform the DoD functional requirement. The objective function for this formulation is given in Table 4.

If *w* is set to a large value (*eg*, 0.9), the cross-service functional workload is assigned to the smallest number of sites, with minimal regard for functional values.

Constraints. The constraint equations common to all four optimization formulations are given in Table 5. The constraint on the number of sites will be deactivated for some optimization runs - in particular, for the **MINSITES** formulation which seeks the minimum number of sites to be retained as part of the solution.

TABLE 1.

MAXSFV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to}\\ O_s,\ l_{sfr}}}{\text{Maximize}} \sum_s \sum_f \sum_r \left[w \cdot o_s \cdot \mathrm{fv}_{sf} + \frac{(1-w) \cdot l_{sfr} \cdot \mathrm{fv}_{sf}}{\mathrm{req}_{fr}} \right],$$

where s is the site index,
f is the functional area index, and
r is the test facility category index,

w and $1-w$ are weights assigned for each optimization run ($0 \leq w \leq 1$),

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 2.

MINNMV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s,\, l_{sfr}}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[w \cdot o_s \cdot \mathrm{nmv}_s - \frac{(1-w) \cdot l_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index,

w and $1 - w$ are weights assigned for each optimization run ($0 \leq w \leq 1$),

o_s is the open-site decision variable for each site s,

nmv_s is equal to $(4 - mv)$ for site s and mv is its military value (assigned as 1, 2, or 3),

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 3.

MINXCAP OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ O_s,\, l_{sfr}}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[\frac{w \cdot o_s \cdot cap_{sfr} - (1-w) \cdot l_{sfr} \cdot fv_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index,

w and $1 - w$ are weights assigned for each optimization run $(0 \leq w \leq 1)$,

o_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

cap_{sfr} is the capacity of site s for functional area f and test facility category r

TABLE 4.

MINSITES OPTIMIZATION FORMULATION

$$\underset{\text{with respect to } o_s, l_{sfr}}{\text{Minimize}} \sum_s \sum_f \sum_r \left[w \cdot o_s - \frac{(1-w) \cdot l_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right],$$

where s is the site index,
f is the functional area index,
r is the test facility category index,

w and $1 - w$ are weights assigned for each optimization run ($0 \le w \le 1$),

o_s is the open - site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 5.

CONSTRAINT EQUATIONS

$$\sum_s o_s \cdot cap_{sfr} \geq req_{fr}, \text{ for all } f, r$$

$$\sum_s l_{sfr} = req_{fr}, \text{ for all } f, r$$

$$0 \leq l_{sfr} \leq o_s \cdot cap_{sfr}, \text{ for all } s, f, r$$

$$o_s = \{\ 0 \text{ or } 1\ \}, \text{ for all s}$$

$$\sum_f \sum_r l_{sfr} \geq o_s, \text{ for all s}$$

$$\sum_s o_s = n_{limit},$$

where n_{limit} is assigned as a run limit on the number of sites

APPENDIX E

QUESTIONS, WEIGHTS AND SCORING PROCESS

STATUS OF
QUESTIONS, WEIGHTS, & SCORING PROCESS

I. AIM

TO DERIVE FUNCTIONAL VALUES FOR EACH FACILITY RESOURCE CATEGORY WITHIN EACH FUNCTIONAL AREA.

OR,

TO DERIVE FUNCTIONAL VALUES FOR EACH FUNCTIONAL AREA FOR EACH SITE.

II. QUESTIONS

- PHYSICAL AND TECHNICAL VALUE QUESTIONS HAVE BEEN WRITTEN FOR AV, EC, A/W

- TECHNICAL INFORMATION FORM IS EXPECTED TO PROVIDE DATA FOR QUESTIONS THAT ARE NOT EXPLICITLY ASKED IN THE DATA CALL.

III. WEIGHTS

- RELATIVE WEIGHTING OF QUESTIONS (HIGH, MEDIUM, LOW) NOT YET DETERMINED.

  HOWEVER, NOTIONAL WEIGHTS HAVE BEEN DISCUSSED.

- POINTS VALUES NOT YET DETERMINED. (1-3, 1-5, ...)

- SCALING METHODS NOT YET DETERMINED (0-MAX. MIN-MAX....)

STATUS OF
QUESTIONS, WEIGHTS, & SCORING PROCESS

IV. SCORING PROCESS

- AGREEMENT TO USE 3 TEAMS (AV, EC, A/W) OF ONE OR TWO MEMBERS FROM EACH MILITARY DEPARTMENT.

- EACH TEAM MEMBER WILL SCORE INDEPENDENTLY, AFTER WHICH THE TEAM WILL JOINTLY REVIEW THE SCORING.

- SCORING TEAM WILL USE A CONSENSUS APPROACH, WITH DISAGREEMENTS RESOLVED BY THE THREE SESers IN THE WORKING GROUP.

- SCORING TO BE DONE AT IDA'S TEC USING COPIES OF TRI-SERVICE CERTIFIED DATA

~~[- EACH MILITARY DEPARTMENT WILL MAINTAIN ADMINISTRATIVE CONTROL OF ITS CERTIFIED DATA.]~~

V. QUESTIONS, WEIGHTS, AND SCORING PROCESS ARE BEING DOCUMENTED IN THE T&E ANALYSIS PLAN.

SAMPLE FUNCTIONAL VALUE (FV) QUESTIONS

* COMMON TO AIR VEHICLES, ELECTRONIC COMBAT, ARMAMENT / WEAPONS

(1) HOW MANY SQUARE MILES OF AIRSPACE ARE AVAILABLE TO SUPPORT TEST OPERATIONS? (#3.1.G.1) (RAMP)

(2) DOES DOD OWN OR CONTROL *ALL* OF THE LAND UNDER THE RESTRICTED AIRSPACE? (# 3.1.G.2) (Y/N - x POINTS)

DOES DOD OWN OR CONTROL *SOME* OF THE LAND UNDER THE RESTRICTED AIRSPACE? (# 3.1.G.2) (Y/N - y POINTS)

DOES DOD OWN OR CONTROL *NONE* OF THE LAND UNDER THE RESTRICTED AIRSPACE? (# 3.1.G.2) (Y/N - z POINT)

(3) WHAT IS THE MAXIMUM STRAIGHT LINE SEGMENT IN THE AIRSPACE IN NAUTICAL MILES? (# 3.1.G.5) (RAMP)

* AIR VEHICLES

(1) FACILITY TESTS FIXED WING AIRCRAFT?	(#3.2.C.1)	(Y/N - w POINTS)
FACILITY TESTS ROTARY WING AIRCRAFT?	(#3.2.C.1)	(Y/N - x POINTS)
FACILITY TESTS UNMANNED AIR VEHICLES?	(#3.2.C.1)	(Y/N - y POINTS)
FACILITY TESTS CRUISE MISSILES?	(#3.2.C.1)	(Y/N - z POINTS)
(2) FACILITY CONDUCTS AIRFRAME TESTING?	(#3.2.C.1)	(Y/N - x POINTS)
FACILITY CONDUCTS PROPULSION TESTING?	(#3.2.C.1)	(Y/N - y POINTS)
FACILITY CONDUCTS AVIONICS TESTING?	(#3.2.C.1)	(Y/N - z POINTS)

SOME ADDITIONAL QUESTIONS, OTHER THAN THOSE SPECIFIED IN DATA CALL, MAY BE ADDED.

SAMPLE FUNCTIONAL VALUE (FV) QUESTIONS

* ELECTRONIC COMBAT

(1) WHICH OF THE FOLLOWING SPECTRA ARE AVAILABLE TO TEST AGAINST: RF, EO, IR, MMW, UV, LASER? (#3.3.A.2, #.3.3.B.4) (RAMP or Y/N)

(2) WHAT IS THE MAXIMUM SIGNAL DENSITY THAT CAN BE PROVIDED? (#3.3.A.2) (RAMP)

(3) DOES THE FACILITY HAVE *CLOSED-LOOP* THREAT SIMULATORS? (#3.3.A.4) (Y/N - x POINTS)

DOES THE FACILITY HAVE *OPEN-LOOP* THREAT SIMULATORS? (#3.3.A.4) (Y/N - y POINTS)

DOES THE FACILITY HAVE *REACTIVE* OPEN-LOOP THREAT SIMULATORS? (#3.3.A.4) (Y/N - z POINTS)

SOME ADDITIONAL QUESTIONS, OTHER THAN THOSE SPECIFIED IN DATA CALL, MAY BE ADDED.

* ARMAMENTS/ WEAPONS

(1) 92/93 AVERAGE NUMBER OF TEST MISSIONS WITH SAFETY FOOTPRINTS COMPARABLE TO LIVE GUIDED WEAPON? (3.4.B.2.A) (RAMP)

(2) 92/93 AVERAGE NUMBER OF TEST MISSIONS WITH SAFETY FOOTPRINTS COMPARABLE TO LONG-RANGE MISSILE WHICH WERE CONDUCTED ABOVE 20,000 FT MSL. (3.4.B.2.A) (RAMP)

(3) MAXIMUM RANGE OVER LAND/SEA (IN NAUTICAL MILES) SITE CAN USE TO TEST AIR-TO-AIR MISSILES (#3.4.B.1.C) (RAMP)

SAMPLE FUNCTIONAL VALUE (FV) QUESTIONS

A/W QUESTIONS HAVE BEEN DEVELOPED THAT WERE NOT EXPLICITLY ASKED IN THE DATA CALL.

FOR EXAMPLE:

(1) SITE PROVIDES ARMAMENT/WEAPONS RF HITL T&E CAPABILITIES
(EXPECTED FROM FACILITY FORMS) (Y/N - x POINTS)

(2) SITE HAS THE CAPABILITY TO PERFORM CFD/3-D HYDROCODES IN SUPPORT OF ARMAMENTS/WEAPONS T&E.
(EXPECTED FROM FACILITY FORMS) (Y/N - x POINTS)

APPENDIX F

DATABASE MANAGEMENT PROCESS

APPENDIX F

T&E DATABASE MANAGEMENT PROCESS

1. Purpose:

This document describes the process to be used for the storage, retrieval, and disposition of the data/information used for T&E cross-service analysis.

2. Scope:

The database is the repository for all information used to conduct the T&E cross-service analysis and will consist of both hard and soft copy information, where all T&E data is stored and retrieved for use in the analysis. Specifically, the database will serve as repository for the T&E data call responses; FYDP information, computed functional values, capacity, excess capacity, and workload; functional COBRA inputs and outputs, and optimization model inputs and outputs (See Atch 1). In addition, the database will maintain an audit trail for all data and model runs by the Joint Working Group (JWG).

3. Approach:

3.1 Initial Database Inputs:

The initial database inputs are the responses from the data call and pertinent information from the FYDP (e.g., Program Elements). These data will be provided by the Tri-Department BRAC Group.

3.2 Database Outputs:

Data will be retrieved from the database to compute functional value, capacity, excess capacity, and workload. This computed information will also be stored in the database and provided to the Tri-Department BRAC Group as inputs to the optimization model.

3.3 Database Inputs:

The database will also contain the computed data and the results provided from the functional COBRA runs. The computed data as defined herein includes functional values, capacity, excess capacity, required workload, optimization model results, and the results of the functional COBRA runs.

3.4 Configuration Control:

The data will be kept in a locked storage area with limited access. A data administrator will be appointed by the JCSG to insure that data is properly controlled and maintained. The data administrator will keep track of revisions and maintain an audit trail on all changes to the database. The data administrator will serve as principal database interface with the Tri-Department BRAC Group and will maintain a log of control numbers for model runs.

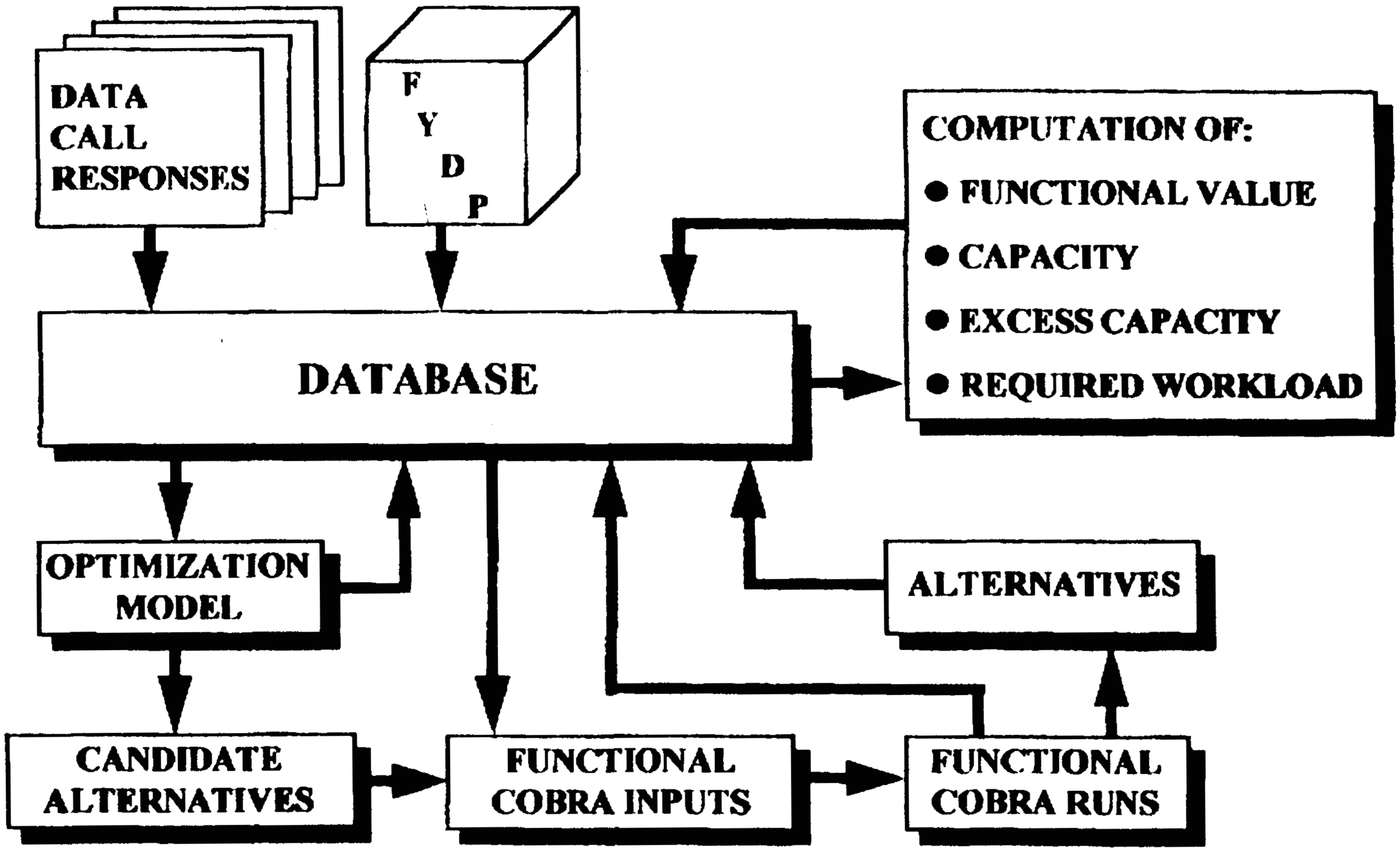
3.5 Management of T&E Database:

The working database will be managed by the JWG during the scoring, computation of required data, optimization and sensitivity analysis, functional COBRA analysis, and development of alternatives.

4.0 Database Disposition at End of Study:

The requisite database information, including alternatives, input and output data, and other pertinent information, will be submitted to the Tri-Department BRAC Group. All working copies of the database and its supporting documentation will be destroyed.

DATABASE MANAGEMENT PROCESS



BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 12 JUNE 1994
CONFERENCE ROOM, 1C730, PENTAGON

NOTIONAL DATA SET

- GOALS
  - Validate T&E optimization formulations
  - Verify model can handle complete data set
  - Refine data analysis procedures and presentations
  - Identify initial policy imperatives
- APPROACH
  - Each Service JWG rep provide notional data (FV, MV, capacity, and projected workload) for its sites
  - Tri-department BRAC group construct notional data set
- Tri-department BRAC group run T&E optimization formulations
- SCHEDULE
  - Inputs due to Tri-Service BRAC group by 13 Jul
  - Complete initial runs by 15 Jul

BRAC 95

T&E JOINT CROSS-SERVICE GROUP MEETING

0900, TUESDAY, 12 JUNE 1994

CONFERENCE ROOM, 1C730, PENTAGON

COBRA MODEL

- Army TABS office attempted to build ~~functional value~~ spread sheet, cumbersome nature of data precluded its completion
- TABS office suggested that a simplified version of COBRA Model be used in lieu of spreadsheet
- Use of COBRA Model would require JWG to make simplifing assumptions
- JWG would present simplifing assumptions to principals for approval

RECOMMENDATION:

Use COBRA with simplifing assumptions

BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 12 JUNE 1994
CONFERENCE ROOM, 1C730, PENTAGON

DATABASE MANAGEMENT

- Appendix F to Analysis Plan
- Central repository for T&E data
  - T&E data call responses
  - FYDP information
  - Functional values
  - Capacity
  - Excess Capacity
  - Projected Workload
  - Functional COBRA inputs
  - Alternatives
- Format
  - Hard copies
  - Spread sheets for computations

BRAC 95
T&E JOINT CROSS-SERVICE GROUP MEETING
0900, TUESDAY, 12 JUNE 1994
CONFERENCE ROOM, 1C730, PENTAGON

DATABASE MANAGEMENT

- Configuration Control
  - Data administrator appointed by JCSG
  - Locked storage area
- Disposition
  - Official database to Tri-Department BRAC Group
  - Working copies to be destroyed

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ACQUISITION AND TECHNOLOGY

MEMORANDUM FOR ASSISTANT SECRETARY OF DEFENSE (ECONOMIC SECURITY)

SUBJECT: Service Joint Cross-Service Representatives

Attached are the Army, Navy and Air Force representatives for the T&E Joint Cross Service Membership.

John A. Burt
Director
Test and Evaluation

Attachments
as stated

DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20350-1000

MM-0209-F4
BSAT/MS
9 June 1994

MEMORANDUM FOR THE CO-CHAIRMAN, T&E JOINT WORKING GROUP

Subj: NAVY REPRESENTATIVES FOR T&E CROSS-SERVICE EFFORTS

As requested in the 31 May 1994 T&E Cross-Service Working Group meeting, the following information is submitted to satisfy the DOD BRAC Internal Control Plan requirements to notify the OSD BRAC Steering Group of all Navy personnel working in the T&E Cross-Service area.

As specified in previous letters, all Navy personnel involved in the Joint Working Groups are members of the Navy BRAC team. The Navy BRAC team members were selected by the Under Secretary of the Navy, to encompass the expertise required to make the technical and operational recommendations for the BRAC process.

Mr. Gerald Schiefer continues to be the Navy's Principal to the T&E Joint Working Group. His Alternate is CAPT Dave Rose. In addition to these two personnel, CDR Mark Samuels, Mr. Don DeYoung, Mr. Dave Wennergren and Dr. Ron Nickel will provide support in sub-group activities, and other efforts as required.

CDR Samuels will be the Principal for Cross-Service Optimization Model and COBRA Model operation. Mr. DeYoung will be the Alternate. Dr. Nickel and Mr. Wennergren will provide technical oversight and assistance for these model operations as required and ensure coordination with all other Navy efforts associated with other Cross-Service Working Groups.

As was discussed during the Steering Group meeting of 8 June 1994, we share the OSD concern with the potential for predecisional public disclosures which open avenues for challenges as well as outside comment on what is an internal process before decisions are announced by the Secretary of Defense. Lack of controls over access to efforts and continually changing participants will greatly contribute to this problem.

C. P. NEMFAKOS
Vice Chairman,
Base Structure Evaluation Committee

DEPARTMENT OF THE AIR FORCE
WASHINGTON DC 20330-1000

OFFICE OF THE ASSISTANT SECRETARY

6/28/94

28 JUN 1994

MEMORANDUM FOR THE T&E JCSG CO-CHAIRMAN

FROM: SAF/MII

SUBJECT: T&E JCSG Air Force Representatvies

The services have identified principals for the T&E JSCG membership. Mr. Parker Horner is designated as Lt Gen Leaf's alternate on the T&E JCSG due to the retirement of Mr. Carroll Jones. The JCSG members have support teams to jointly work issues associated with BRAC T&E inputs. The approved T&E JCSG support team members have been briefed on BRAC policy and they are:

Dr. Dan Stewart	AFDTC, Eglin AFB
Col Wes Heidenreich	AFDTC
Lt Col George London	AF/TER, Pentagon
Mr. Doug Nation	AFDTC
Mr. Robert Lee	AFFTC, Edwards AFB
Mr. Joe Dowden	AFFTC
Mrs. Sharon Brooks	AFDTC
Mr. Carlos Tirres	AEDC, Arnold AFB

As needed, technical experts will be called in and identified to you to provide specific requirements in support of the BRAC process.

My point of contact for this action is Lt Col John Plummer, 695-6766.

JAMES F. BOATRIGHT
Deputy Assistant Secretary of the Air Force
(Installations)

cc:
AF/XOOR
AF/TE

Defense Nuclear Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

DFTD 22 June 1994

MEMORANDUM FOR DIRECTOR, OPERATIONAL TEST & EVALUATION

SUBJECT: Designation of DNA Personnel Assigned BRAC Duties

The following personnel have been involved with the '95 BRAC review process and will continue to carry out BRAC related duties for DNA. Dr. Don A. Linger, Director for Test, is the primary BRAC POC at DNA and Mr. Thomas E. Kennedy is his alternate. Dr. Linger has been primarily involved with the Joint Cross-Service Group for Test & Evaluation. Mr. Kennedy, Chief, Test Requirements Division (TDTR), has been primarily involved with the Joint Cross-Service Group for Laboratories. Mr. Mark D. Flohr, TDTR, has also served as an alternate for Dr. Linger as the DNA representative in the T&E Group and the T&E Working Group.

In summary the DNA BRAC personnel who will be involved at the BRAC Group and Working Group levels are:

Dr. Don A. Linger	-	Director for Test
Mr. Thomas E. Kennedy	-	Chief, Test Requirements Division
Mr. Mark D. Flohr	-	Assistant Chief, Test Requirements Division

Any questions concerning this assignment can be addressed to any one of these three. They can be reached by calling (703) 325-7694 or (703) 325-7775.

Don A. Linger

DON A. LINGER
Director for Test

DEPARTMENT OF THE ARMY
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C. 20310-0102
7 June 1994

6/7/94

SAUS-OR

MEMORANDUM THRU DACS-TABS

FOR DIRECTOR, TEST AND EVALUATION

SUBJECT: Army T&E Joint Cross-Service Group

The services have identified principals for the T&E JCSG membership. The JCSG members have support teams to jointly work issues associated with BRAC T&E inputs. My T&E JCSG support team members are:

MAJ Essex Fowlks	Mr. John Gehrig	Mr. Raymond Wagner
Mr. Tom Roller	Mr. Gary Holloway	

The T&E JCSG workload projection and excess capacity sub-working group members are:

Mr. Gary Holloway MAJ Essex Fowlks Mr. Tom Roller

As needed, technical experts will be called in to provide specific requirements in support of the BRAC process.

Request you endorse these individuals as members of the Army BRAC team.

Point of contact for this action is MAJ Essex Fowlks, 695-8995.

for Walter W. Hollis
Deputy Under Secretary of the Army
(Operations Research)

CF:
DOT&E

Joint Cross-Service Analysis Tool

Executive Summary

Background

The integrity of the BRAC process will be enhanced if each of the Joint Cross-Service Groups (JCSG) uses a common analytical approach to assist in the generation of cross-service functional alternatives for consideration by the Military Departments. Defending base closure and realignment recommendations before the BRAC Commission, Congress, and the affected communities requires an analytical approach that can be audited, that generates results that can be reproduced, and that ensures compatibility across multiple JCSGs. This document describes an analytical tool that will aid the JCSGs in meeting these criteria.

DoD BRAC Goals

Goals of the DoD BRAC process include:

- elimination of DoD excess capacity,
- maintaining a high-quality infrastructure,
- making sure that required capabilities are retained, and
- being in compliance with all BRAC legislation and directives.

While it is true that the JCSGs are to focus on common support functions, it is also true that BRAC is about the closure and realignment of bases and installations. An analytical approach that does not give consideration to opportunities to close bases and installations is not likely to lead to any significant reductions in infrastructure. The shuffling of functions from one site to another does not, in general, require the burden of the BRAC process. The formulations described here will provide families of solutions for consideration by the JCSGs. Each solution will correspond to a different cross-service functional workload assignment.

Role of the Joint Cross-Service Groups

The JCSGs have been given the following responsibilities by the Deputy Secretary:

- Establish common data elements for analysis of assigned cross-service functions,
- Establish excess capacity reduction targets for their assigned functions, and
- Develop cross-service functional alternatives for consideration by the Military Departments. The JCSGs do not recommend installation or site closures.

Role of the Military Departments

The Military Departments have a number of responsibilities to support the work of the JCSGs. These include:

- Participate as members of each JCSG,
- Provide data as directed by the JCSGs,
- Provide analytical support to the JCSG such as running the analytical tool described here,
- Provide the JCSGs with the military value of their installations or sites, and
- Analyze cross-service functional alternatives within their BRAC process as directed by the JCSGs.

Analytical Approach

A standard resource allocation tool comprises the core of the analytical approach described in detail in the main body of this document . A standard tool used to find optimal solutions to complex allocation problems is the mixed-integer, linear program (MILP). Allocation of common support functional requirements to military department sites and activities is a complex allocation problem.

The MILP formulation described in the main body of this document can be used to generate cross-service functional alternatives. The data elements required for this approach are derived from the certified data available to the JCSGs. Policy imperatives agreed to by the members of the JCSGs and any other JCSG-unique considerations can be incorporated into a formulation in the form of additional constraints. This will allow the tailoring of the formulations to accommodate the unique perspectives of each JCSG.

While each JCSG will develop their model formulations independently, the structure of the analytical approach would allow the functional data and constraints from each JCSG to be combined into a single formulation that models all of the functions from all of the JCSGs. Without a common formulation, it is possible that cross-service functional alternatives generated from individual JCSG formulations will be inconsistent, i.e., one will be moving functions into a site or activity while the other is moving them out. If the outputs from different JCSGs are inconsistent, a common formulation could be run to resolve the inconsistencies.

The objective function for a formulation can be varied to obtain families of solutions. A solution defines a set of functional allocations and identification of sites or activities where cross-service functional workload could be assigned. An objective function that combines military value of sites and activities with functional values is discussed in the main body of this document. This particular objective function will tend to consolidate common support functions into high military value sites or activities. At the same time, this objective function will assign common support functions to sites having high functional values. The weighting between these two goals can be parameterized to obtain families of solutions for further consideration by the JCSGs.

Other objective functions that the JCSGs may wish to consider in addition to the one mentioned above, include minimizing excess functional capacity, minimizing the total number of sites performing cross-service functions, and maximizing the sum of functional values. This tool will also allow the JCSGs to explore the sensitivity of the optimal solution for a given formulation to particular model inputs.

The JCSGs will use the MILP formulation described in the body of this document as the basic analytical tool to generate cross-service functional alternatives to be assessed by the military departments.

Document Organization

An overview of the analytical process proposed in this document is presented in the next section. That section describes the products of the process. The section also discusses terminology relating to what a *site or activity* is relative to a *function.*

The next section describes the basic data elements that are used in the process. This section discusses the data elements in terms of what these elements are meant to represent. This section also discusses who would be responsible for determining how to calculate the data elements.

The different optimization problem formulations that the JCSGs may choose to use to explore alternatives are discussed in the next section. These include finding a small set of high military value sites or activities that can perform the functional requirement, minimizing excess capacity, and minimizing the number of sites. All of these formulations are parameterized in such a way that the JCSGs can explore trade-offs between different factors, such as military value or excess capacity, and assignments of functional requirement based upon functional value. This section also discusses the incorporation of policy imperatives in the optimization problem formulations.

The next section uses an example to demonstrate the application of each of these formulations. The last section identifies the commercial software product used to find the optimal solutions to the optimization example problems. Input files for this package used to prepare the examples are included in the appendices.

Analytical Process Overview

The optimization formulations described in this document require a set of data elements as inputs. All of the formulations require a functional value and functional capacity for each site capable of performing that specific cross-service function. The DoD requirement for each cross-service function is required. Some of the formulations will also require the military values for each site as determined by the Military Departments.

A preliminary formulation that allocates cross-service functional requirements based upon functional capacities and functional value will be conducted. The objective function of this formulation will assign the DoD requirement for each cross-service function to sites or activities having the highest functional value for each function. These assignments will only be constrained by the functional capacities at each site. This analysis will not require the military values for the sites.

The primary formulations optimize the assignment of cross-service functions based upon military values of sites, functional values, and capacities. These formulations are very flexible in that multiple objective functions and policy imperatives modeled as constraints may be used to explore different solutions.

A standard resource allocation tool comprises the core of the analytical approach. A standard tool used to find optimal solutions to complex allocation problems is the mixed-integer, linear program (MILP). Allocation of common support functional requirements to military department sites and activities subject to constraints is a complex allocation problem.

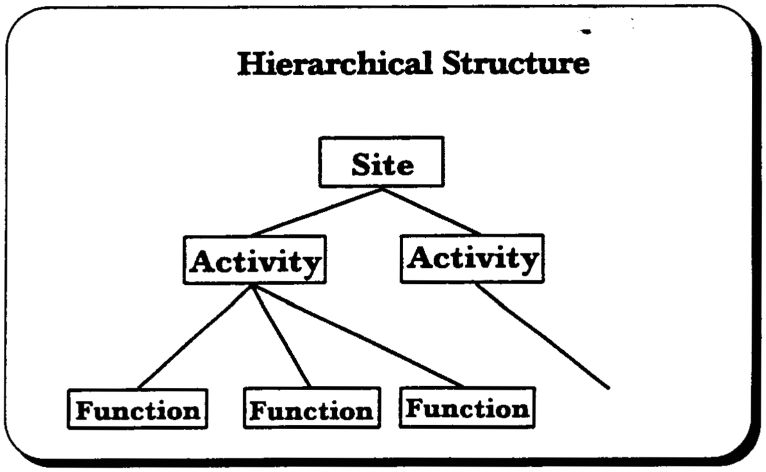
Process Products

The following table lists the various products of the analytical approach defined in this document.

Process products	Description
Capacity analyses	Develop methodology to measure the capacity of a site or activity to perform a function. Use data call responses to calculate capacities.
Requirements analyses	For each function, develop methodology to estimate the out-year DoD requirement to perform the function. Calculate the required capacity and identify excess capacity reduction goals.
Functional value (FV) assessments	Develop measures and weights for assessing the value of performing a function at a site or an activity based upon data call responses. Compute FV for all appropriate functions and site/activity combinations.
Optimize functional requirement allocations (preliminary formulation)	Find the best allocation of functional requirements to sites or activities based solely upon functional capacities and functional values.
Optimize allocations of functional requirements to high military value sites or activities (primary formulations)	Develop solutions based upon the first three products, above, and policy imperatives. Solutions will be developed using the optimization formulations described later in this document as a tool to explore alternatives.

Hierarchical Structure

The Office of the Secretary of Defense (OSD), the departments, and other groups all use different terms to describe the various components of infrastructure that are to be considered by the JCSGs. In this document a ***site*** refers to an installation, base, or station. An ***activity*** refers to a component of the site such as depot or test facility residing on the site. A site may have one or more activities. A ***function*** is the capability to perform a particular support action or produce a particular commodity. A common support function is a function. An activity includes a collection of functions. For example, a depot (an activity) may repair engines and airframes. These would be two functions performed at this activity. A function may be further broken down into subfunctions or facilities required to perform functions, but the approach described here does not consider the subfunctions or facilities. Subfunctions or facilities can be incorporated into the process described here if the appropriate data is available. The following diagram illustrates this hierarchical structure.



Data Elements

The analytical approach assumes that the following data will be available for all of the sites and functions under review by the JCSGs:

Data Elements	Description
mv_s	Military value of site s expressed as 3 (high), 2 (medium), or 1 (low).
fv_{sf}	Functional value for performing function f at site/activity s expressed as a number from 0 (low) to 100 (high).
cap_{sf}	Capacity of site/activity s to perform function f.
req_f	The total DoD requirement or goal to perform function f.

The military value of a site, mv_s, should measure the overall value of the site to the department in terms of the four DoD criteria: readiness, facilities, mobilization, and cost and manpower. Since sites that remain open after the BRAC process is complete will be the only resources available for many years into the future, it is imperative that this analytical process make the best use of those sites having the highest utility to the department. Each department should plan to band all of their sites under consideration by any joint cross-service group into three relatively equal-sized sets.

The JCSGs will develop methods to determine the functional value for performing functions at sites or activities. The methodologies must use data that is available in the joint data call responses. The Military Departments will provide the military value for each site.

The fv_{sf} functional value for performing function f at site (or activity) s should measure the capability and quality of performing work of type f at site (or activity) s. Since the formulations described below consider capacity in the allocation of cross-service functions to sites or activities, functional capacity should not be an element of functional value. Capacity to perform a specialized subfunction that is not one of the functions called out in the formulation can be considered in calculating functional value.

Optimization Formulations

The mixed integer linear programming (MILP) model formulations, that are described below, will serve as the basic analytical tools to be used by the JCSGs. The JCSGs may modify these formulations with the consent of all of the military departments. Modifications would include the incorporation of policy imperatives.[1]

Preliminary Formulation.

The preliminary formulation of the optimization problem will be solved once the initial data (fv_{sf}, cap_{sf}, req_f) are available. This formulation, called **MAXFV** will maximize the functional values weighted by the assigned workload and normalized by the functional requirement. No constraints other than the functional capacities at each site and the requirement to meet the DoD requirement for each cross-service function are included in this formulation. The output from this formulation will be provided to the JCSGs and the departments to be used at their discretion. This solution will serve as a baseline of what is possible if no other factors, such as military values of sites or costs, are considered.

For each function, this formulation will load as much of the functional DoD requirement as it can into the site or activity having the highest functional value for that function. If that site or activity does not have the capacity to accommodate the full requirement, the site or activity having the next highest functional value will be allocated any remaining requirement up to its capacity, and so on.

The mathematical description of this formulation follows:

$$\underset{l_{sf}}{Maximize}\ \Sigma_{s \in S} \Sigma_{f \in F}\, l_{sf} \times fv_{sf}/req_f$$

subject to :

$$\Sigma_{s \in S}\, l_{sf} = req_f : \text{for all functions } f \in F,$$

$$\Sigma_{f \in F}\, l_{sf} \leq o_s \times \Sigma_{g \in F}\, cap_{sf} : \text{for all sites } s \in S,$$

$$o_s \leq \Sigma_{f \in F}\, l_{sf} : \text{for all sites } s \in S,$$

$$0 \leq l_{sf} \leq cap_{sf} : \text{for all functions } f \in F \text{ and sites } s \in S;$$

$$0 \leq o_s \leq 1,\ integer : \text{for all sites } s \in S;$$

where

[1]A *policy imperative* is a statement that restricts the solutions that are acceptable and that can be modeled as a constraint in the formulation. An example of a policy imperative is included in one of the examples.

$S =$ The set of all sites under consideration by joint cross-service groups;

$F =$ The set of all functions under consideration by joint cross-service groups;

$o_s =$ 1 if any functional requirement is assigned to the site, and 0 otherwise;

Decision variable

$l_{sf} =$ amount of the DoD requirement for function f to be assigned to site s.

The o_s variables are included in this formulation only to keep count of the number of sites that actually have some functional requirement assigned to them. Their inclusion in the model does not affect the assignment of the functional requirement to sites or activities. The two constraints involving the o_s variables are used to ensure that these variables are set to the correct values.

Primary Formulations

These formulations will also be used by the JCSGs to explore potential cross-service functional alternatives. The basic formulation is shown below. Specification of the objective function, $f(o_s, l_{tg}, k_{uh})$, will create a different optimization problem.

$$\underset{o_s, l_{tg}, k_{uh}}{Minimize} \; f(o_s, l_{tg}, k_{uh})$$

subject to

$\Sigma_{s \in S}\, l_{sf} = req_f$: for all functions $f \in F$,

$\Sigma_{f \in F}\, l_{sf} \le o_s \times \Sigma_{g \in F}\, cap_{s,g}$: for all sites $s \in S$,

$o_s \le \Sigma_{f \in F}\, l_{sf}$: for all sites $s \in S$,

$0 \le l_{sf} \le k_{sf} \times cap_{sf}$: for all functions $f \in F$ and sites $s \in S$,

$0 \le o_s \le 1$, *integer* : for all sites $s \in S$,

$0 \le k_{sf} \le 1$, *integer* : for all sites $s \in S$ and functions $f \in F$,

where

$S =$ The set of all sites under consideration by joint cross-service groups;

$F =$ The set of all functions under consideration by joint cross-service groups;

Decision variables

$o_s =$ 1 if any cross-service functional requirements are assigned to the site or activity, 0 otherwise;

$l_{sf} =$ amount of the DoD requirement for function f to be assigned to site or activity s.

$k_{sf} =$ 1 if any DoD requirement for function f is to be assigned to site s, 0 otherwise.

Three different optimization formulations are discussed next that vary only in the specification of the objective function.

The MINNMV Formulation. This formulation will find a small number of sites having the highest military value that can accommodate the DoD required workload. In addition, it will assign the DoD requirement for each cross-service function to the retained sites (or activities) having the highest functional value for that function. The purpose of this formulation is to assign, to the extent possible, the cross-service functional requirements to sites or activities having high military value and high functional values. The rationale for this approach is that sites having high military value are the ones most likely to be retained by the military departments. The objective function for this formulation is as follows:

$$\underset{o_s, l_{tg}}{Minimize}\ f(o_s, l_{tg}, k_{uh}) = \left(\frac{w}{u_1}\right) \times \Sigma_{s\in S}\, o_s \times nmv_s - \left(\frac{100-w}{u_2}\right) \times \Sigma_{t\in S} \Sigma_{g\in F}\, l_{tg} \times fv_{tg}/req_g$$

where

$0 \le w \le 100$	Weight parameter used to vary the emphasis between military value and functional value,
$u_1 \ge 0, u_2 \ge 0$	$u_1 = \Sigma_{s\in S}(4 - mv_s),\ u_2 = \Sigma_{f\in F} \max_{s\in S} fv_{sf}$
$nmv_s =$	$4 - mv_s$.

This formulation will be referred to as the **MINNMV** model since it minimizes the sum of $4 - mv_s$ for retained sites or activities. Site or activities having a high military value (3) will have 1 as their value. Site or activities with low military value (1) will have 3 as their value.

The parameters u_1 and u_2 are used to scale the two components of the objective function. Scaling the components of the objective function enhances the ability of the solver to find a solution. Apart from the weight parameters, these scaling parameters will scale the components of the objective function to values near 1.0 .

The weight parameter, w, can be varied to change the emphasis the formulation gives to military value versus functional value. If $w = 0$, this formulation matches the preliminary formulation (**MAXFV**) as site military value would have zero weight. Conversely, if w is set to a large value ($w = 99$), functional value would have little weight. The **MAXFV** and **MINNMV** formulations are the same formulation, only differing in the parameter w . Varying w in the formulation allows the model to be used to create a family of solutions. These points are illustrated by an example in the next section.

The component of the objective function that addresses military value of sites, $\Sigma_{s\in S}\, o_s \times nmv_s = \Sigma_{s\in S}\, o_s \times (4 - mv_s)$, affects the optimal solution as follows. (For this discussion we will ignore the functional value component of the objective function, $-\Sigma_{t\in S} \Sigma_{g\in F}\, l_{tg} \times fv_{tg}/req_g$.) If there were no constraints in the formulation, i.e., satisfy the DoD requirement, the minimum value of the objective function would be achieved by setting $o_s = 0$ for all sites since $4 - mv_s \ge 1$ for all sites. Given that some sites have to be open, all else being equal, it is better to open a site with $mv_s = 3$ because it increases the objective function by the least amount.

The MINXCAP Formulation. If the parameter w is set to a large value ($w = 99$), this problem formulation will find the set of retained sites having the smallest total functional capacity but still able to perform the DoD functional requirement. Depending on w, functional assignments are also optimized. The objective function for this formulation is:

$$\underset{o_s,\, l_{tg},\, k_{uh}}{Minimize}\ f(o_s, l_{tg}, k_{uh}) = \left(\tfrac{w}{u_1}\right) \times \Sigma_{s\in S}\, o_s \times \left(\Sigma_{f\in F}\, cap_{sf}/req_f\right) - \left(\tfrac{100-w}{u_2}\right) \times \Sigma_{t\in S}\, \Sigma_{g\in F}\, l_{tg} \times fv_{tg}/req_g$$

If $w = 0$, this formulation, like the **MINNMV** formulation, is also equivalent to the **MAXFV** formulation. If w is set to a large value, excess capacity is reduced as much as possible without regard to functional values. As in the **MINNMV** formulation, u_1 and u_2 are used to scale the components of the objective function. For this formulation $u_1 = \Sigma_{s\in S}\, \Sigma_{f\in F}\, cap_{sf}/req_f$. The other scale parameter u_2 is set to the same value for all formulations.

The MINSITES Formulation. This formulation, depending on the value of w, will find the minimum-sized set of site or activities that can perform the DoD functional requirement. As in the previous formulations, if $w = 0$, this formulation is also equivalent to **MAXFV**. The objective function for this formulation is given by:

$$\underset{o_s,\, l_{tg},\, k_{uh}}{Minimize}\ f(o_s, l_{tg}, k_{uh}) = \left(\tfrac{w}{u_1}\right) \times \Sigma_{s\in S}\, o_s - \left(\tfrac{100-w}{u_2}\right) \times \Sigma_{t\in S}\, \Sigma_{g\in F}\, l_{tg} \times fv_{tg}/req_g$$

If w is set to a large value, the cross-service functional workload is assigned to the smallest possible number of sites regardless of functional values. For this formulation $u_1 = |S|$, the number of sites in the set S.

The MAXSFV formulation. This formulation maximizes the sum of the functional values for all of the retained sites. The objective function for this formulation is given by:

$$\underset{o_s,\, l_{tg},\, k_{uh}}{Maximize}\ f(o_s, l_{tg}, k_{uh}) = \left(\tfrac{w}{u_1}\right) \times \Sigma_{s\in S}(o_s \times \Sigma_{f\in F}\, fv_{sf}) + \left(\tfrac{100-w}{u_2}\right) \times \Sigma_{t\in S}\, \Sigma_{g\in F}\, l_{tg} \times fv_{tg}/req_g$$

For this formulation $u_1 = \Sigma_{f\in F}\, \Sigma_{s\in S}\, fv_{sf}$. If the number of sites to be retained is not constrained, all of the sites will be retained in the solution since the objective function is maximized when $o_s = 1$ for all sites. Obtaining meaningful results with this formulation, therefore, requires a constraint on the number of sites retained.

Policy Imperatives

A policy imperative is any statement that can be formulated as a constraint in the model. The model described here is very flexible in its capacity to handle imperatives. Examples of imperatives that can be modeled include:

- assigning functions in groups,
- increasing the average DoD military value of the sites assigned any cross-service functional workload,

- requiring the weighted functional value for a given common support function to be at least as great as some value,
- limiting the number of sites that have any cross-service functional workload assigned to them,
- requiring that each department's average military value is not allowed to go below some level,
- requiring a certain number of sites in a geographic area to remain open, and
- requiring the distribution of functional workload to follow a certain pattern, e.g., in one department, in one location, or on both coasts.

This is not an exhaustive list of the possibilities for policy imperatives. An example of a policy imperative added to the **MINNMV** formulation is given in the following section.

Consistent Alternatives

The functional data and constraints from all of the JCSGs may be combined into a single formulation since the functions of different JCSGs should be independent. In the event that two JCSGs obtain solutions that are inconsistent in that the solutions have a site or activity receiving cross-service functional workload in one and losing all of its cross-service functional workload in the other, this capability can be used to resolve the inconsistency.

Optimization Examples

The following examples use representative, notional data to demonstrate the formulations. Three different departments, X, Y, and Z, each have 5 sites (A, B, C, D, and E). Six functions are considered: air vehicles, munitions, electronic combat, fixed-wing avionics, conventional missiles and rockets, and satellites. Table 1 shows the basic data for these sites. Table 1 also shows the DoD requirement by function and the percent of excess capacity. Percent excess capacity is calculated as

$$100 \times \left(\frac{\sum_{s \in S} cap_{sf}}{req_f} - 1 \right).$$

Preliminary Formulation (MAXFV).

Results for the **MAXFV** formulation are shown in table 2. If there is no functional requirement assigned to a site, the capacity for that function is shown as zero at that site even if the site has requirements for other functions assigned. Notice that, for this solution, *all sites have some cross-service functional workload assigned.*

The column in table 2 labeled *Wgt FV* shows the weighted functional value for each function. Wgt FV for function $f \in F = \frac{\sum_{s \in S} fv_{sf} \times req_{sf}}{\sum_{s \in S} req_{sf}}$. Wgt FV is an indicator of the quality of the cross-service allocation of the functional requirement across all sites and activities. The average FV, the weighted average FV, and the weighted percent excess capacity are also shown in the table. These three numbers are gross measures of the quality of the solution.

Primary Formulation (MINNMV).

Table 3 shows the data for the optimal solution to the **MINNMV** formulation with $w = 99$. The number of sites having cross-service functional workload assigned has been reduced from 15 to six. Excess capacity is greatly reduced. The weighted percent excess capacity is only 31 percent compared to 60 for the **MAXFV** formulation. The DoD military value average is increased by 28.8 percent. The military value averages for the two departments with any sites retained have both been increased. The weighted functional value scores are not as good as the scores obtained from the **MAXFV** formulation. The average FV score is almost 14 points lower than for the **MAXFV** formulation.

Primary Formulation (MINNMV) with Policy Imperative

As an example of a policy imperative, consider the following. Suppose the JCSG responsible for the missile function determines that only two sites should perform the conventional missiles and rockets function. The optimal solution to the original **MINNMV** formulation assigned the missile function to four different sites. Modifying the **MINNMV** formulation such that only two sites are allowed to perform the missile function results in the solution shown in table 4. The optimal solution still requires only six sites to perform the cross-service functions, but the sites are different. Only four of the sites are common to both solutions. Since the model has an additional constraint, the average military value has decreased compared to the original **MINNMV** formulation.

Parameterization of the MINNMV Formulation

Table 5 summarizes the results of varying the parameter w in the **MINNMV** formulation over the values 0, 2, 3, 5, 10, 20, 30, 40, 60, and 99 . As is to be expected, the number of sites and activities with cross-service functional workload assigned and weighted functional value decrease as w increases. The average military value generally increases as w increases. Though these results pertain only to this particular example, they clearly illustrate qualitative differences between the **MAXFV** and **MINNMV** formulations. The optimal solutions to the formulation do not change as w varies over the range of 60 to 99.

This example illustrates how the parameter w can be used to generate a family of cross-service functional solutions. For instance, a JCSG with table 5 before it could decide that from this family of solutions, the solution obtained by setting $w = 20$ is worth exploring further since the weighted functional values are very close to the best values obtained in the **MAXFV** formulation and the weighted average percent excess capacity has been reduced from 60 to 17 percent. Table 6 displays the full output from this formulation.

Figure 1 displays this information in graphical form. The figure shows the sharp decrease in the average functional value for conventional missiles and rockets when w is changed from 20 to 30. The figure also displays the increase in average military value that is achieved by using the **MINNMV** formulation.

Primary Formulation (MINXCAP)

Table 7 shows the output of the **MINXCAP** formulation with $w = 99$. As would be expected, this formulation produces a solution that greatly reduces excess capacity, but the weighted functional values have suffered. The weighted average percent excess capacity has been reduced to almost 6 percent.

Primary Formulation (MINSITES)

The results of using the **MINSITES** formulation with $w = 99$ are given in table 8. The optimal solution retains only six sites. The sites are different than the sites retained in the **MINNMV** solution.

Primary Formulation (MAXSFV)

The results of using the MAXSFV formulation with the number of retained sites constrained to be no more than six are displayed in table 9.

Summary of Formulation Results

The following table summarizes the basic statistics for the five formulations.

Statistics	MAXFV	MINNMV	MINXCAP	MINSITES	MAXSFV
Sites retained	15	6	7	6	6
Weighted avg. percent excess capacity	60.37	31.39	6.11	12.14	24.1
Weighted average FV	84.7	73.9	74.2	76.5	62.9
Average military value	2.2	2.83	2	2.67	2.67

Optimization Software

The solutions to these optimization problems were obtained using the commercially-available, IBM Optimization Subroutine Library (OSL)[2] interfaced with AMPL[3]. The text file describing these formulations in the AMPL format is contained in appendix A. Note that all of the different objective functions are defined in this single text file. The AMPL-format data file

[2] *Optimization with OSL* by Ming S. Hung, Walter O. Rom, and Allan D. Waren, published by The Scientific Press.

[3] *AMPL: A Modeling Language for Mathematical Programming* by Robert Fourer, David M. Gay, and Brian Kernighan, published by The Scientific Press, 1993.

for the example is given in appendix B. These files are processed by the AMPL/OSL package to produce the outputs discussed in the examples section of this document.

Table 1. Joint Cross-Service Groups Analysis Examples
Basic Data

Function	Department															Totals
	X					Y					Z					
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	
Capacities																
Air vehicles	450	7000	2500	0	0	5000	500	0	0	0	3000	1200	0	2857	0	22,507
Munitions	850	200	4500	0	0	300	0	2000	0	0	1000	0	1000	0	0	9,850
Electronic combat	3000	0	0	0	0	1000	0	0	0	0	2000	0	0	1543	20	7,563
Fixed-wing avionics	0	0	250	3500	0	0	0	400	3500	0	1000	4000	0	2000	500	15,150
Conv. missiles/rockets	0	0	200	0	3000	0	0	200	100	2000	3000	700	200	300	200	9,900
Satelites	0	0	300	4000	0	0	0	500	0	0	250	50	0	300	2200	7,600
Function FV Scores																
Air vehicles	50	70	68	0	0	57	72	0	0	0	81	92	0	86	0	
Munitions	88	71	58	0	0	54	0	88	0	0	72	0	75	0	0	
Electronic combat	67	0	0	0	0	91	0	0	0	0	52	0	0	78	77	
Fixed-wing avionics	0	0	92	94	0	0	0	78	69	0	72	93	0	66	71	
Conv. missiles/rockets	0	0	62	0	89	0	0	59	93	92	56	59	50	65	91	
Satelites	0	0	71	58	0	0	0	64	0	0	85	61	0	73	93	
Department Military Value	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1	

Function	DoD req.	Pct. excess
Air vehicles	9,463	137.8
Munitions	5,503	79.0
Electronic combat	3,234	133.9
Fixed-wing avionics	3,775	301.3
Conv. missiles/rockets	3,743	164.5
Satelites	2,480	206.5

Table 2. MAXFV Model Output

Function	X					Y					Z					Retained totals	
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E		
Retain=1, Close=0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		Percent excess
Capacities																	
Air vehicles	0	7000	0	0	0	0	500	0	0	0	3000	1200	0	2857	0	14557	53.8
Munitions	850	200	4500	0	0	0	0	2000	0	0	1000	0	1000	0	0	9550	73.5
Electronic combat	3000	0	0	0	0	1000	0	0	0	0	0	0	0	1543	20	5563	72.0
Fixed-wing avionics	0	0	0	3500	0	0	0	0	0	0	0	4000	0	0	0	7500	98.7
Conv. missiles/rockets	0	0	0	0	3000	0	0	0	100	2000	0	0	0	0	200	5300	41.6
Satelites	0	0	0	0	0	0	0	0	0	0	250	0	0	300	2200	2750	10.9
																Wgt. avg.	**60.37**
Workload assigned																**Totals**	
Air vehicles	0	1906	0	0	0	0	500	0	0	0	3000	1200	0	2857	0	9463	
Munitions	850	200	453	0	0	0	0	2000	0	0	1000	0	1000	0	0	5503	
Electronic combat	671	0	0	0	0	1000	0	0	0	0	0	0	0	1543	20	3234	
Fixed-wing avionics	0	0	0	3500	0	0	0	0	0	0	0	275	0	0	0	3775	
Conv. missiles/rockets	0	0	0	0	1443	0	0	0	100	2000	0	0	0	0	200	3743	
Satelites	0	0	0	0	0	0	0	0	0	0	250	0	0	30	2200	2480	
Department avg. MV			2.4					1.8					2.4				
Percent change			-0.0					0.0					-0.0				
DoD average MV								2.20									
Percent change								0.0									

DoD weighted FVs	
Function	**Wgt FV**
Air vehicles	81.2
Munitions	79.6
Electronic combat	79.7
Fixed-wing avionics	93.9
Conv. missiles/rockets	90.8
Satelites	92.0
Average FV	**86.2**
Weighted avg. FV	**84.7**

Table 3. MINNMV Model Output

Function	X A	X B	X C	X D	X E	Y A	Y B	Y C	Y D	Y E	Z A	Z B	Z C	Z D	Z E	Retained totals	Percent excess
Retain=1, Close=0	1	0	1	1	0	0	0	0	0	0	1	1	0	1	0	6	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	
Air vehicles	0	0	2500	0	0	0	0	0	0	0	3000	1200	0	2857	0	9557	1.0
Munitions	850	0	4500	0	0	0	0	0	0	0	1000	0	0	0	0	6350	15.4
Electronic combat	3000	0	0	0	0	0	0	0	0	0	0	0	0	1543	0	4543	40.5
Fixed-wing avionics	0	0	0	3500	0	0	0	0	0	0	0	4000	0	0	0	7500	98.7
Conv. missiles/rockets	0	0	200	0	0	0	0	0	0	0	3000	700	0	300	0	4200	12.2
Satelites	0	0	300	4000	0	0	0	0	0	0	250	50	0	300	0	4900	97.6
																Wgt. avg.	**31.39**
Workload assigned																**Totals**	
Air vehicles	0	0	2406	0	0	0	0	0	0	0	3000	1200	0	2857	0	9463	
Munitions	850	0	3653	0	0	0	0	0	0	0	1000	0	0	0	0	5503	
Electronic combat	1691	0	0	0	0	0	0	0	0	0	0	0	0	1543	0	3234	
Fixed-wing avionics	0	0	0	3500	0	0	0	0	0	0	0	275	0	0	0	3775	
Conv. missiles/rockets	0	0	200	0	0	0	0	0	0	0	2543	700	0	300	0	3743	
Satelites	0	0	300	1580	0	0	0	0	0	0	250	50	0	300	0	2480	
Department avg. MV			2.7					0.0					3.0				
Percent change			11.1					-100.0					25.0				

DoD average MV 2.83
Percent change 28.8

DoD weighted FVs	
Function	**Wgt FV**
Air vehicles	80.6
Munitions	65.2
Electronic combat	72.2
Fixed-wing avionics	93.9
Conv. missiles/rockets	57.6
Satelites	64.2
Average FV	**72.3**
Weighted avg. FV	**73.9**

Table 4. MINNMV Model with Policy Imerative Output

Function	Department X A	X B	X C	X D	X E	Y A	Y B	Y C	Y D	Y E	Z A	Z B	Z C	Z D	Z E	Retained totals	Percent excess
Retain=1, Close=0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	6	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	
Air vehicles	0	7000	0	0	0	0	0	0	0	0	3000	0	0	2857	0	12857	35.9
Munitions	0	200	4500	0	0	0	0	0	0	0	1000	0	0	0	0	5700	3.6
Electronic combat	0	0	0	0	0	0	0	0	0	0	2000	0	0	1543	0	3543	9.6
Fixed-wing avionics	0	0	250	3500	0	0	0	0	0	0	1000	0	0	0	0	4750	25.8
Conv. missiles/rockets	0	0	0	0	3000	0	0	0	0	0	3000	0	0	0	0	6000	60.3
Satelites	0	0	300	4000	0	0	0	0	0	0	250	0	0	300	0	4850	95.6
																Wgt. avg.	33.70
Workload assigned																Totals	
Air vehicles	0	3606	0	0	0	0	0	0	0	0	3000	0	0	2857	0	9463	
Munitions	0	200	4303	0	0	0	0	0	0	0	1000	0	0	0	0	5503	
Electronic combat	0	0	0	0	0	0	0	0	0	0	1691	0	0	1543	0	3234	
Fixed-wing avionics	0	0	250	3500	0	0	0	0	0	0	25	0	0	0	0	3775	
Conv. missiles/rockets	0	0	0	0	3000	0	0	0	0	0	743	0	0	0	0	3743	
Satelites	0	0	300	1630	0	0	0	0	0	0	250	0	0	300	0	2480	
Department avg. MV			2.3					0.0					3.0				
Percent change			-6.3					-100.0					25.0				

DoD average MV	2.50
Percent change	13.6

DoD weighted FVs	
Function	Wgt FV
Air vehicles	78.3
Munitions	61.0
Electronic combat	64.4
Fixed-wing avionics	93.7
Conv. missiles/rockets	82.4
Satelites	64.1
Average FV	**74.0**
Weighted avg. FV	**74.7**

Table 5. Parameterization of the MINNMV Model

	Percent of weight on FV									
	0 MAXFV	2	3	5	10	20	30	40	60	99 MINNMV
Sites/activities open	15	13	12	11	9	8	7	6	6	6
Percent excess										
Air vehicles	53.8	48.5	48.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Munitions	73.5	73.5	73.5	69.9	51.7	51.7	51.7	15.4	15.4	15.4
Electronic combat	72.0	72.0	72.0	72.0	72.0	41.1	41.1	41.1	40.5	40.5
Fixed-wing avionics	98.7	98.7	6.0	6.0	6.0	6.0	6.0	6.0	98.7	98.7
Conv. missiles/rockets	41.6	38.9	38.9	38.9	4.2	4.2	22.9	17.6	12.2	12.2
Satelites	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	97.6	97.6
Wgt. avg. % excess	**60.37**	**58.24**	**45.83**	**29.16**	**21.00**	**17.46**	**19.94**	**12.14**	**31.39**	**31.39**
Weighted FV										
Air vehicles	81.2	81.1	81.1	80.6	80.6	80.6	80.6	80.6	80.6	80.6
Munitions	79.6	79.6	79.6	79.2	76.1	76.1	76.1	65.2	65.2	65.2
Electronic combat	79.7	79.7	79.7	79.7	79.7	72.3	72.3	72.3	72.2	72.2
Fixed-wing avionics	93.9	93.9	93.0	93.0	93.0	93.0	93.0	93.0	93.9	93.9
Conv. missiles/rockets	90.8	90.7	90.7	90.7	85.4	85.4	59.6	59.5	57.6	57.6
Satelites	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	64.2	64.2
Average FV	**86.2**	**86.2**	**86.0**	**85.9**	**84.5**	**83.2**	**78.9**	**77.1**	**72.3**	**72.3**
Weighted avg. FV	**84.7**	**84.6**	**84.5**	**84.2**	**82.9**	**82.1**	**78.6**	**76.5**	**73.9**	**73.9**
DoD average MV	**2.20**	**2.31**	**2.33**	**2.27**	**2.44**	**2.50**	**2.71**	**2.67**	**2.83**	**2.83**

Figure 1. Parameterization of MINNMV

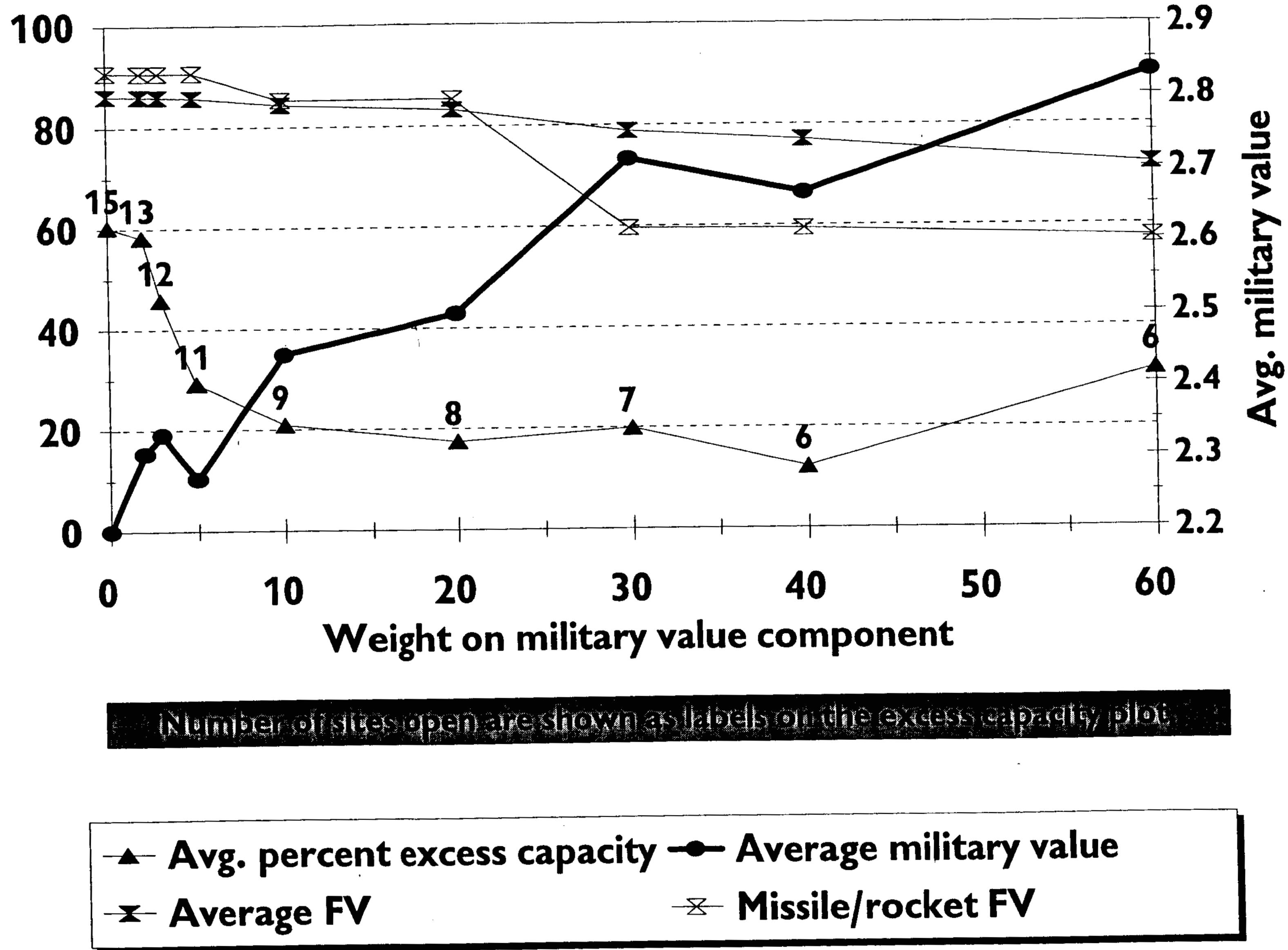


Table 6. MINNMV Model Output with Weight = 20

Function	X A	X B	X C	X D	X E	Y A	Y B	Y C	Y D	Y E	Z A	Z B	Z C	Z D	Z E	Retained totals	Percent excess
Retain=1, Close=0	1	0	1	0	1	0	0	1	0	0	1	1	0	1	1	8	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	
Air vehicles	0	0	2500	0	0	0	0	0	0	0	3000	1200	0	2857	0	9557	1.0
Munitions	850	0	4500	0	0	0	0	2000	0	0	1000	0	0	0	0	8350	51.7
Electronic combat	3000	0	0	0	0	0	0	0	0	0	0	0	0	1543	20	4563	41.1
Fixed-wing avionics	0	0	0	0	0	0	0	0	0	0	0	4000	0	0	0	4000	6.0
Conv. missiles/rockets	0	0	200	0	3000	0	0	200	0	0	0	0	0	300	200	3900	4.2
Satelites	0	0	0	0	0	0	0	0	0	0	250	0	0	300	2200	2750	10.9
																Wgt. avg.	17.46
Workload assigned																Totals	
Air vehicles	0	0	2406	0	0	0	0	0	0	0	3000	1200	0	2857	0	9463	
Munitions	850	0	1653	0	0	0	0	2000	0	0	1000	0	0	0	0	5503	
Electronic combat	1671	0	0	0	0	0	0	0	0	0	0	0	0	1543	20	3234	
Fixed-wing avionics	0	0	0	0	0	0	0	0	0	0	0	3775	0	0	0	3775	
Conv. missiles/rockets	0	0	200	0	3000	0	0	43	0	0	0	0	0	300	200	3743	
Satelites	0	0	0	0	0	0	0	0	0	0	250	0	0	30	2200	2480	
Department avg. MV			2.3					3.0					2.5				
Percent change			-2.8					66.7					4.2				

DoD average MV	2.50
Percent change	13.6

DoD weighted FVs	
Function	Wgt FV
Air vehicles	80.6
Munitions	76.1
Electronic combat	72.3
Fixed-wing avionics	93.0
Conv. missiles/rockets	85.4
Satelites	92.0
Average FV	83.2
Weighted avg. FV	82.1

Table 7. MINXCAP Model Output

Function	Department X A	X B	X C	X D	X E	Y A	Y B	Y C	Y D	Y E	Z A	Z B	Z C	Z D	Z E	Retained totals	Percent excess
Retain=1, Close=0	1	0	1	0	1	1	1	0	0	0	0	1	0	0	1	7	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	
Air vehicles	450	0	2500	0	0	5000	500	0	0	0	0	1200	0	0	0	9650	2.0
Munitions	850	0	4500	0	0	300	0	0	0	0	0	0	0	0	0	5650	2.7
Electronic combat	3000	0	0	0	0	1000	0	0	0	0	0	0	0	0	20	4020	24.3
Fixed-wing avionics	0	0	0	0	0	0	0	0	0	0	0	4000	0	0	0	4000	6.0
Conv. missiles/rockets	0	0	200	0	3000	0	0	0	0	0	0	700	0	0	200	4100	9.5
Satelites	0	0	300	0	0	0	0	0	0	0	0	0	0	0	2200	2500	0.8
																Wgt. avg.	**6.11**
Workload assigned																**Totals**	
Air vehicles	263	0	2500	0	0	5000	500	0	0	0	0	1200	0	0	0	9463	
Munitions	850	0	4500	0	0	153	0	0	0	0	0	0	0	0	0	5503	
Electronic combat	2214	0	0	0	0	1000	0	0	0	0	0	0	0	0	20	3234	
Fixed-wing avionics	0	0	0	0	0	0	0	0	0	0	0	3775	0	0	0	3775	
Conv. missiles/rockets	0	0	200	0	3000	0	0	0	0	0	0	343	0	0	200	3743	
Satelites	0	0	280	0	0	0	0	0	0	0	0	0	0	0	2200	2480	
Department avg. MV			2.3					1.5					2.0				
Percent change			-2.8					-16.7					-16.7				

DoD average MV 2.00
Percent change -9.1

DoD weighted FVs	
Function	**Wgt FV**
Air vehicles	64.9
Munitions	62.5
Electronic combat	74.5
Fixed-wing avionics	93.0
Conv. missiles/rockets	84.9
Satelites	90.5
Average FV	**78.4**
Weighted avg. FV	**74.2**

Table 8. MINSITES Model Output

Function	Department															Retained totals	
	X					Y					Z						
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E		
Retain=1, Close=0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	1	6	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	**Percent excess**
Air vehicles	0	0	2500	0	0	0	0	0	0	0	3000	1200	0	2857	0	9557	1.0
Munitions	850	0	4500	0	0	0	0	0	0	0	1000	0	0	0	0	6350	15.4
Electronic combat	3000	0	0	0	0	0	0	0	0	0	0	0	0	1543	20	4563	41.1
Fixed-wing avionics	0	0	0	0	0	0	0	0	0	0	0	4000	0	0	0	4000	6.0
Conv. missiles/rockets	0	0	200	0	0	0	0	0	0	0	3000	700	0	300	200	4400	17.6
Satelites	0	0	0	0	0	0	0	0	0	0	250	0	0	300	2200	2750	10.9
																Wgt. avg.	**12.14**
Workload assigned																**Totals**	
Air vehicles	0	0	2406	0	0	0	0	0	0	0	3000	1200	0	2857	0	9463	
Munitions	850	0	3653	0	0	0	0	0	0	0	1000	0	0	0	0	5503	
Electronic combat	1671	0	0	0	0	0	0	0	0	0	0	0	0	1543	20	3234	
Fixed-wing avionics	0	0	0	0	0	0	0	0	0	0	0	3775	0	0	0	3775	
Conv. missiles/rockets	0	0	200	0	0	0	0	0	0	0	2343	700	0	300	200	3743	
Satelites	0	0	0	0	0	0	0	0	0	0	250	0	0	30	2200	2480	
Department avg. MV			3.0					0.0					2.5				
Percent change			25.0					-100.0					4.2				

DoD average MV	2.67
Percent change	21.2

DoD weighted FVs	
Function	**Wgt FV**
Air vehicles	80.6
Munitions	65.2
Electronic combat	72.3
Fixed-wing avionics	93.0
Conv. missiles/rockets	59.5
Satelites	92.0
Average FV	**77.1**
Weighted avg. FV	**76.5**

Table 9. MAXSFV Model Output

Function	X A	X B	X C	X D	X E	Y A	Y B	Y C	Y D	Y E	Z A	Z B	Z C	Z D	Z E	Retained totals	Percent excess
Retain=1, Close=0	0	0	1	1	0	1	0	0	0	0	1	1	0	1	0	6	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	
Air vehicles	0	0	2500	0	0	5000	0	0	0	0	3000	0	0	0	0	10500	11.0
Munitions	0	0	4500	0	0	300	0	0	0	0	1000	0	0	0	0	5800	5.4
Electronic combat	0	0	0	0	0	0	0	0	0	0	2000	0	0	1543	0	3543	9.6
Fixed-wing avionics	0	0	250	0	0	0	0	0	0	0	1000	4000	0	2000	0	7250	92.1
Conv. missiles/rockets	0	0	200	0	0	0	0	0	0	0	3000	700	0	0	0	3900	4.2
Satelites	0	0	0	4000	0	0	0	0	0	0	0	0	0	0	0	4000	61.3
																Wgt. avg.	**24.10**
Workload assigned																**Totals**	
Air vehicles	0	0	2500	0	0	5000	0	0	0	0	1963	0	0	0	0	9463	
Munitions	0	0	4500	0	0	300	0	0	0	0	703	0	0	0	0	5503	
Electronic combat	0	0	0	0	0	0	0	0	0	0	2000	0	0	1234	0	3234	
Fixed-wing avionics	0	0	250	0	0	0	0	0	0	0	1000	525	0	2000	0	3775	
Conv. missiles/rockets	0	0	43	0	0	0	0	0	0	0	3000	700	0	0	0	3743	
Satelites	0	0	0	2480	0	0	0	0	0	0	0	0	0	0	0	2480	
Department avg. MV			2.5					2.0					3.0				
Percent change			4.2					11.1					25.0				
DoD average MV								2.67									
Percent change								21.2									

DoD weighted FVs	
Function	**Wgt FV**
Air vehicles	64.9
Munitions	59.6
Electronic combat	61.9
Fixed-wing avionics	73.1
Conv. missiles/rockets	56.6
Satelites	58.0
Average FV	**62.3**
Weighted avg. FV	**62.9**

Appendix A

AMPL Model Input File

```
# JCSG Model Example

# Ron Nickel
# 7-6-94

set X_sites;             # The set of Department X sites.
set Y_sites;             # The set of Department Y sites.
set Z_sites;             # The set of Department Z sites.

set SITE := X_sites union {Y_sites union Z_sites};
                   # The set of all labs and T&E sites.

set FUNC;          # The set of functions.

set SITE_CAP within {SITE, FUNC} ;  # The set of site/function
                                    # combinations that are
                                    # meaningful.

param CAPAC {SITE_CAP}; # The functional capacity at each site for each
                        # meaningful site/function combination.

param no_func := card(FUNC);  # The number of function types.

# Define the set performing missile functions.

set MISSLE_FUNC within {FUNC};

param missile_sites >= 0, default 15;
                   # Number of sites allowed to perform the
                   # missile function.  Used in the policy
                   # imperative example (missile_sites = 3).

param max_sites >= 0, default card(SITE);
                   # Number of open sites allowed in the
                   # solution.

param REQ {FUNC}; # The DoD requirement for each function.

param MV {SITE};  # Military value for each site.

param NMV {s in SITE} := 4 - MV[s]; # Negative MV scoring.

param FV {SITE_CAP} >= 0.0;   # Functional value by site and function.

#
# Calculate upper bounds for the objective function components.
#

param MINNMV_UB := sum {s in SITE} NMV[s];

param MINSITES_UB := card(SITE);

param MINXCAP_UB := sum {(s,f) in SITE_CAP} CAPAC[s,f]/REQ[f];

param MAXSFV_UB := sum {(s,f) in SITE_CAP} FV[s,f];

param MAXFV_UB := sum {f in FUNC} max {(s,f) in SITE_CAP} FV[s,f];
```

```
#
# Use WGT_PCT to weight the functional value and non-functional value
# components of the objective functions.
#

param WGT_PCT >= 0, <= 100, default 99;   # Percent of weight to put on
            # non-functional-value portion of the objective function.

param WGT1 := WGT_PCT;  # Weight for non-FV portion of the objective
                  # functions.

param WGT2 := 100-WGT1; # Weight for FV portion of the objective functions.

#
# Decision variables
#

var OPEN {SITE} binary >= 0;  # Open or closed decision variable for
                        # each site.

var SITE_LOAD {(s,f) in SITE_CAP} >= 0.0, <= CAPAC[s,f];
                  # Amount of the requirement for function f to
                  # be assigned to site s . Amount assigned
                  # is limited by capacity of site s to perform
                  # function f.

var SITE_FUNC {(s,f) in SITE_CAP} binary;
                  # 1 if any assignment of workload for function
                  # f is made to site s; 0 otherwise.

#
# Objective Functions.
#

# Minimize total open site negative military value and
# maximize the normalized FV-weighted assignment of functional workload
# to sites.

minimize MINNMV:
      (WGT1/MINNMV_UB) * sum {s in SITE} OPEN[s]*NMV[s]
      - (WGT2/MAXFV_UB) * sum {(t,g) in SITE_CAP} FV[t,g]
      * (SITE_LOAD[t,g]/REQ[g]);

# Minimize the number of open sites and maximize the normalized
# FV-weighted assignment of functional workload to sites.

minimize MINSITES:
      (WGT1/MINSITES_UB) * sum {s in SITE} OPEN[s]
      - (WGT2/MAXFV_UB) * sum {(t,g) in SITE_CAP} FV[t,g]
      * (SITE_LOAD[t,g]/REQ[g]);

# Minimize total capacity and maximize the normalized FV-weighted
# assignment of functional workload to sites.

minimize MINXCAP:
      (WGT1/MINXCAP_UB) * sum {s in SITE}  OPEN[s] *
```

```
            (sum {(s,f) in SITE_CAP} CAPAC[s,f]/REQ[f])
      - (WGT2/MAXFV_UB) * sum {(t,g) in SITE_CAP} FV[t,g]
      * (SITE_LOAD[t,g]/REQ[g]);

# Maximize functional value without workload assignment weightings
# and maximize the normalized FV-weighted assignment of functional
# workload to sites.

maximize MAXSFV:
      (WGT1/MAXSFV_UB) * sum {(s,f) in SITE_CAP} FV[s,f]
      - (WGT2/MAXFV_UB) * sum {(t,g) in SITE_CAP} FV[t,g]
      * (SITE_LOAD[t,g]/REQ[g]);

#
# Constraints
#

# The requirement for each function has to be met.

subject to func_assgn {f in FUNC}:
      sum {(s,f) in SITE_CAP} SITE_LOAD[s,f] = REQ[f];

# Cannot assign functional workload to a site unless
# the site is open for assignment of that function.

subject to func_open {(s,f) in SITE_CAP}:
      SITE_LOAD[s,f] <= SITE_FUNC[s,f]*CAPAC[s,f];

# Sites with no functional requirement assigned
# are closed.

subject to site_closed {s in SITE}:
      OPEN[s] <= sum {(s,f) in SITE_CAP} SITE_FUNC[s,f];

# Allocation of functional requirements cannot be made
# to sites that are not open.

subject to site_open {(s,f) in SITE_CAP}:
      SITE_FUNC[s,f] <= OPEN[s];

# This constraint is an example of a policy imperative.
# Constrain the number of sites doing munitions work.
# This constraint only constrains the model if
#
#     missile_sites < card(SITE).

subject to missile_2 {f in MISSLE_FUNC}:
      sum {(s,f) in SITE_CAP} SITE_FUNC[s,f] <= missile_sites;

# This constraint is used to constrain the number of
# open sites in a solution.  max_sites has a default
# value equal to card(SITE), i.e., it does not constrain
# the solution unless max_sites is set to a lower value.

subject to no_sites:
      sum {s in SITE} OPEN[s] <= max_sites;
```

Appendix B

AMPL Data Input File

```
# Data file for JCSG optimization examples.

# Ron NIckel
# 7-6-94

set X_sites :=
      X_A
      X_B
      X_C
      X_D
      X_E;

set Y_sites :=
      Y_A
      Y_B
      Y_C
      Y_D
      Y_E;

set Z_sites :=
      Z_A
      Z_B
      Z_C
      Z_D
      Z_E;

set FUNC :=
      Air_Veh
      Mun
      E_Cmbt
      Avion
      Mis
      Sat;

set SITE_CAP :    Air_Veh     Mun    E_Cmbt      Avion Mis     Sat  :=
            X_A         +            +       +           -       -       -
            X_B         +            +       -           -       -       -
            X_C         +            +       -           +       +       +
            X_D         -            -       -           +       -       +
            X_E         -            -       -           -       +       -
            Y_A         +            +       +           -       -       -
            Y_B         +            -       -           -       -       -
            Y_C         -            +       -           +       +       +
            Y_D         -            -       -           +       +       -
            Y_E         -            -       -           -       +       -
            Z_A         +            +       +           +       +       +
            Z_B         +            -       -           +       +       +
            Z_C         -            +       -           -       +       -
            Z_D         +            -       +           +       +       +
            Z_E         -            -       +           +       +       +;

# Used to model the policy imperative.

set MISSLE_FUNC := Mis;

param CAPAC:      Air_Veh     Mun    E_Cmbt      Avion Mis     Sat  :=
            X_A   450         850    3000        .       .       .
```

```
          X_B    7000        200    .           .      .      .
          X_C    2500        4500   .           250    200    300
          X_D    .           .      .           3500   .      4000
          X_E    .           .      .           .      3000   .
          Y_A    5000        300    1000        .      .      .
          Y_B    500         .      .           .      .      .
          Y_C    .           2000   .           400    200    500
          Y_D    .           .      .           3500   100    .
          Y_E    .           .      .           .      2000   .
          Z_A    3000        1000   2000        1000   3000   250
          Z_B    1200        .      .           4000   700    50
          Z_C    .           1000   .           .      200    .
          Z_D    2857        .      1543        2000   300    300
          Z_E    .           .      20          500    200    2200;

param FV:     Air_Veh     Mun     E_Cmbt      Avion  Mis    Sat  :=
       X_A    50          88      67          .      .      .
       X_B    70          71      .           .      .      .
       X_C    68          58      .           92     62     71
       X_D    .           .       .           94     .      58
       X_E    .           .       .           .      89     .
       Y_A    57          54      91          .      .      .
       Y_B    72          .       .           .      .      .
       Y_C    .           88      .           78     59     64
       Y_D    .           .       .           69     93     .
       Y_E    .           .       .           .      92     .
       Z_A    81          72      52          72     56     85
       Z_B    92          .       .           93     59     61
       Z_C    .           75      .           .      50     .
       Z_D    86          .       78          66     65     73
       Z_E    .           .       77          71     91     93;

param REQ :=
       Air_Veh      9463
       Mun          5503
       E_Cmbt       3234
       Avion        3775
       Mis          3743
       Sat          2480;

# Banded military values for each site.
# 3 is good, 1 is bad.

param MV :=
       X_A   3
       X_B   3
       X_C   3
       X_D   2
       X_E   1
       Y_A   2
       Y_B   1
       Y_C   3
       Y_D   2
       Y_E   1
       Z_A   3
       Z_B   3
       Z_C   2
```

```
Z_D    3
Z_E    1;
```

BRAC 95

Joint Cross-Service Group on Test & Evaluation

Tuesday, July 19, 1994

Minutes

The BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Mr. Lee Frame and Mr. John Bolino chaired the meeting. The agenda, a list of attendees, and handouts are attached.

The meeting began with a review of the schedule. The subgroup informed the Group that they have completed notional data runs of the optimization model, but have not run the DPAD model. They anticipate no problems with DPAD because the Army has used this model in previous BRAC rounds.

The subgroup then began briefing the Group on the weights and questions for functional value analysis. The Chairmen requested that an offline instructional meeting with him and subgroup principles be set up to provide a more detail briefing on how questions and weights were developed. A deliberative meeting will be scheduled for Friday, July 22, to formally approve the weights and questions. The Group agreed to this proposal.

Discussion then turned to how the weights assigned balanced between the functional areas, specifically between the Physical and Technical Values categories. The Group agreed that a written record of the importance of each category and subcategories relative to the weighing factors assigned.

The subgroup then briefed the Group on the section of the plan entitled Scoring Process. The Group agreed that the term Scoring Team will be changed to Working Group or Joint Working Group. Discussion then turned to the data and TEC Facility. The anticipated date for the subgroup to move in is July 20. A question arose on whether the Services have agreed to the configuration of the facility in order to release data. The Navy and Army will be performing a walk-through of the facility later this week to satisfy themselves the facility is adequate for storing raw data. The discussion then turned to handling of raw data. The Chairmen agreed that Mr. Joe Moore, DOT&E, will the primary Data Administrator with Mr. Irv Boyles, DT&E, as backup. The Group then discussed the role of the data administrator. Services could not come to agreement on how data will be retrieved and disseminated within the facility. The Chairmen requested that each Service representative find out from their respective BRAC principal what minimum requirements are necessary for sharing data **within** the TEC Facility. This will be discussed at the next meeting on Friday.

The subgroup then briefed the unresolved issue in calculating functional value. The issue has to do with scoring the Air/Land/Sea Space. The subgroup asked for clarification on what credit will be given for "control" of airspace and what credit will be given for "available" airspace. Principle disagreement centered on how to define "available." After considerable discussion, the Chairmen agreed to table this issue until Friday's meeting. This will allow the Group principles to become more familiar with the issue and formulate alternatives.

The next issue briefed by the subgroup was on access to and location of the data. This was previously discussed in the meeting. The Chairmen reiterated their position equating the TEC Facility like a closed box with rigid control of what and who enters and exits the box, but little constraint on conduct of business within the box. The idea is to trust one another to get the job done.

The notional data run results were then briefed. The subgroup stated the model behaved as they expected. The subgroup discussed an issue of unusually high unconstrained excess capacity values. There are several reasons this could happen. The subgroup will compare the notional data against historic data to see if they can determine an apparent anomaly. The subgroup discussed an issue of including OT&E capabilities in the data. Because two of the three Services could not distinguish between DT&E and OT&E capabilities in their data the Group decided to include OT&E capabilities in optimization model runs.

The final discussion centered on policy imperatives required to constrain the optimization model runs. The initial policy imperatives briefed were removed by the Group because they pertained to the overall process objective and not just constraining the model. The subgroup will continue developing policy imperatives for the next meeting.

There being no other items for discussion, the meeting adjourned at 1225.

Approved: L H Frame
Lee Frame
Co-Chairman

John V. Bolino
John Bolino
Acting Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test & Evaluation

July 19, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Bolino, Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
LTG (Ret) Howard Leaf, Air Force
Mr. Dan Stewart, Air Force
Mr. Joe Dowden, Air Force
Mr. Doug Nation, Air Force
Lt Col George London, Air Force
Mr. Walt Hollis, Army
Mr. John Gehrig, Army
Mr. Tom Roller, Army
MAJ Jack Marriott, Army
Mr. Gerald Schiefer, Navy
Mr. Don DeYoung, Navy
CDR Mark Samuels, Navy
Mr. Mike McAndrew, ODASD(ER&BRAC) BCU
Mr. Irv Boyles, OSD DT&E
Ms. Kathleen Ruemmele, BMDO
Mr. Frank Lewis, OSD PA&E
Mr. Mark Flohr, OSD DNA
Mr. Dave Vincent, DoD IG
Ms. Jeanne Karstens, OSD Comptroller

BRAC 95
T&E Joint Cross Service Group Meeting
0900, Tuesday 19 July 1994

Working Group Status Report Agenda

* Schedule

* Analysis Plan (w/ following Appendicies):
    - Functional Value Methodology
    - Workload Projection Methodology
    - Excess Capacity and Target Reduction Methodology
    - Optimization Formulations
    - Functional Value Questions, Weights & Scoring Process
        - ISSUE: Air/Land/Sea Space scoring
    - Data Base Management Process
        - ISSUE: Access to and location of T&E JCSG Data base

* Notional Data Runs
    - ISSUE: a) Apparent excessively high capacities b) OT&E / DT&E

* Action Plan

* Classified Data Procedures

* Initial Policy Imperatives

T&E JWG Schedule

For Official Use Only - Working Draft

7/18/1994

	1994 June	1994 July	1994 August
1. JCSG Decide on Cap Methodology	6/14		
2. JWG Develop Workload Requirements Methodology	6/14, 6/20, 6/21 *		
3. JWG Develop FV Framework	6/14, 6/27	7/5, 7/19 *	
- Scoring methodology		7/5, 7/14, 7/19 *	
- Weights, measures		7/5, 7/19 *	
4. Excess Cap Tgt Reduction Methodology	6/14, 6/20, 6/21 *		
5. Adapt Optimization Model for T&E	6/15		
- Evaluate Model	6/24		
- Develop T&E Optimization Formulation		7/1, 7/5, 7/15	
- Define Initial Policy Imperatives		7/5, 7/19 *	
6. Database Requirements/Selection	6/23	7/5, 7/12, 7/19 *	
7. JWG Document Analysis Plan	6/20, 6/24, 6/27	7/12, 7/19 *	
8. OSD Lab and T&E JCSG Chairs Status Brief to Mr Gottbaum - Opt. Model	6/28		
9. Action Plan	6/28	7/12, 7/19 *	

* - JCSG Approval

Near-Term Schedule

• Occupy TEC Facility	20 July '94
• Approve/Release Certified Data	22 July '94
• Initiate Joint Scoring	25 July '94

TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

ANALYSIS PLAN

FOR

BASE REALIGNMENT AND CLOSURE (BRAC 95)

JOINT ANALYSIS

July 1994

John A. Burt
Co-Chair
T&E Joint Cross-Service Group

Co-Chair
T&E Joint Cross-Service Group

T&E JOINT CROSS-SERVICE GROUP
ANALYSIS PLAN

1.0 BACKGROUND

1.1 In a 7 Jan 94 memorandum entitled "1995 Base Realignment and Closures (BRAC 95)", the DEPSECDEF established Joint Cross Service Groups (JCSGs) in six areas with significant potential for cross-service impacts in BRAC 95. Each JCSG was tasked to accomplish the following:

- To determine the common support functions and bases

- To establish the guidelines, standards, assumptions, measures of merit, data elements, and milestone schedules for DoD Component conduct of cross-service analysis of these common support functions

- To oversee DoD Component analyses of the common support functions

- To review excess capacity analyses

- To develop closure and realignment alternatives and numerical excess capacity reduction targets for consideration in such analysis

- To analyze cross-service tradeoffs

1.2 The purpose of this plan is to outline how the analysis tasks will be accomplished and to describe the methodologies to be used in completing these tasks.

2.0 JOINT TEAM STRUCTURE

2.1 Attachment 1 summarizes the joint team structure and responsibilities for accomplishing the DEPSECDEF analysis tasks. Overall responsibilities of the Steering Group, Review Group, Military Departments, and Joint Cross Service Groups in the BRAC cross-servicing process are documented in the 7 Jan 94 DEPSECDEF Memorandum.

2.2 The Joint Working Group (JWG) is comprised of DoD Component members and reports directly to the T&E JCSG. It's principal role is to support the T&E JCSG in the development and conduct of the analysis, subject to the approval of the T&E JCSG. The T&E JCSG will also document all results and decisions for the record.

2.3 The Tri-Department BRAC Group is comprised of BRAC members from each Military Department who report directly to their Military Department. They are responsible for controlling data and running the optimization and functional COBRA models for each JCSG. T&E inputs for the model will be provided by the T&E JCSG. Model outputs will be provided to the T&E JCSG for review and analysis by the JWG.

3.0 JOINT ANALYSIS PROCESS

3.1 Steps in the joint analysis process are summarized in Attachment 2.

3.2 The T&E JCSG will develop guidance for joint T&E data calls to support the joint analysis process. The Military Departments will conduct the data calls and provide the responses to the Joint Cross Service Group through the Tri-Department BRAC Group for control.

3.3 The T&E JCSG will use the methodologies presented in Appendices A-C to compute the T&E Functional Value (FV), Excess Capacity, and Projected Workload (PWL) based on information from the joint data call and the Future Years Defense Plan. They will also develop optimization formulations and policy imperatives to support optimization model runs (see Appendix D). Questions, weight, and scoring
criteria presented in Appendix E will be used to calculate functional values. All data will be documented IAW Appendix F.

3.4 Notional data will be used to develop the optimization formulations and initial policy imperatives. Unconstrained runs using real data will then be conducted using inputs from the T&E JCSG to develop alternatives satisfying workload requirements. Additional runs using site military values provided by the Military Departments will also be run to refine alternatives.

3.5 Collocation of T&E resources needed to support the test process in a T&E functional area (i.e., Air Vehicle, Armament/Weapons, or Electronic Combat) will be accomplished to the maximum extent possible in each alternative. Resources will be retained at other sites when geographically constrained, needed to satisfy workload, economically prohibitive to move, or for other operational reasons.

3.6 Sensitivity analysis will be conducted throughout the process to identify risk areas.

3.7 An operational feasibility assessment will be conducted by the T&E JCSG to ensure the capability to satisfy DoD T&E requirements is retained. Shortfalls in capability will be identified and necessary solutions developed to retain viable alternatives. A top-level concept of operations (CONOPS) will be generated for each alternative and will address MILCON, personnel movement and termination, equipment relocation, customer and stakeholder impacts, etc. The CONOPS will provide the basis for a Functional COBRA data call to determine if an alternative is cost effective using the COBRA Model. The functional COBRA will consist of COBRA runs using simplified input data sets and assumptions. These data sets and assumptions will be developed by the JWG and approved by the T&E JCSG. An approved version of COBRA will be used for these runs.

3.8 Alternatives that satisfy the DoD T&E workload and capability requirements and provide an acceptable return-on-investment from a T&E perspective will be recommended to the Military Departments for their consideration and integration into their closure/realignment candidates and alternatives from the other JCSGs.

4.0 SCHEDULE

4.1 Key milestones and schedules are shown in Attachment 2.

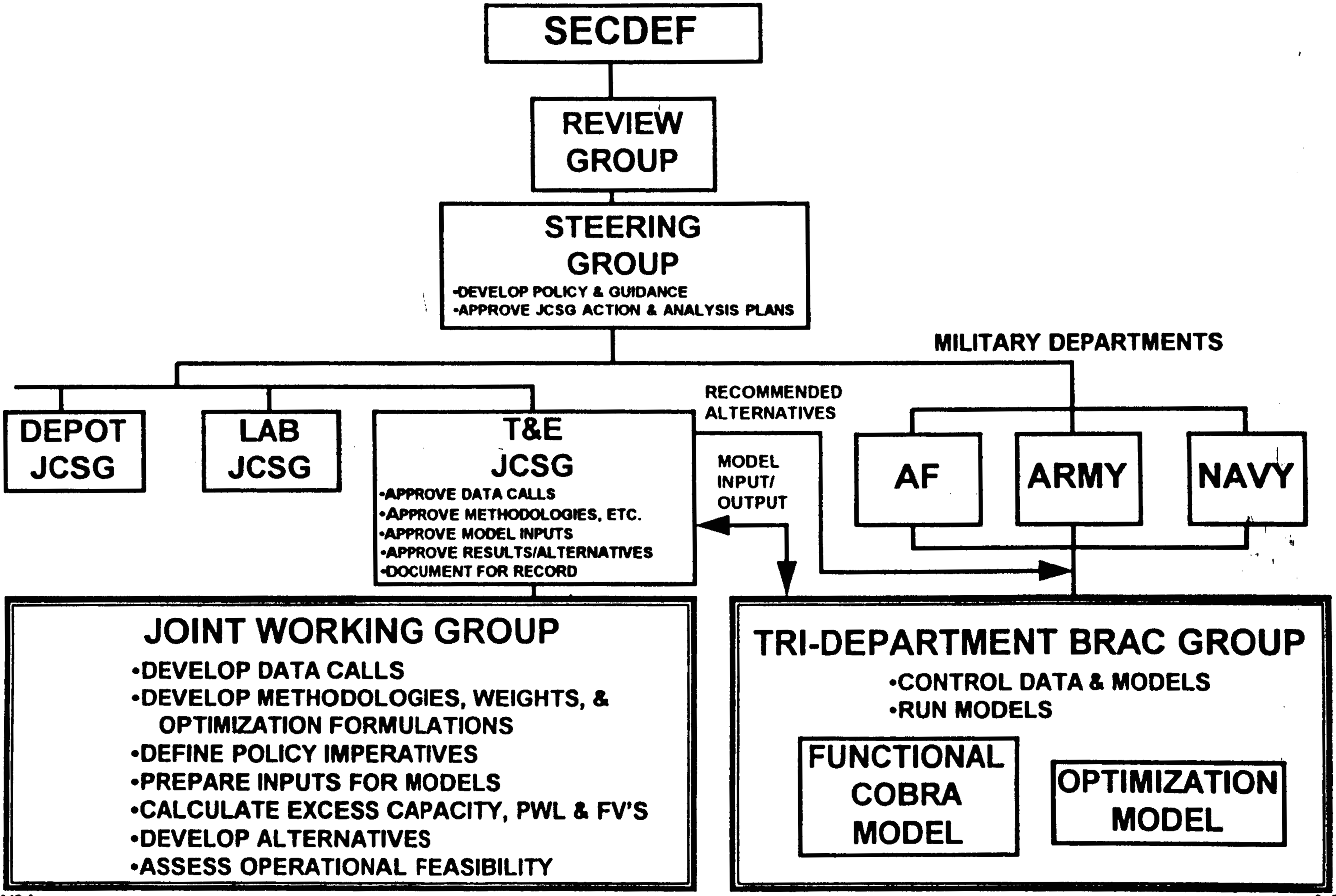
APPENDICES

A - T&E Functional Value Methodology
B - T&E Workload Projection Methodology
C - T&E Excess Capacity and Target Reduction Methodology
D - T&E Optimization Formulations
E - T&E Questions, Weights and Scoring Process
F - T&E Data Base Management Process

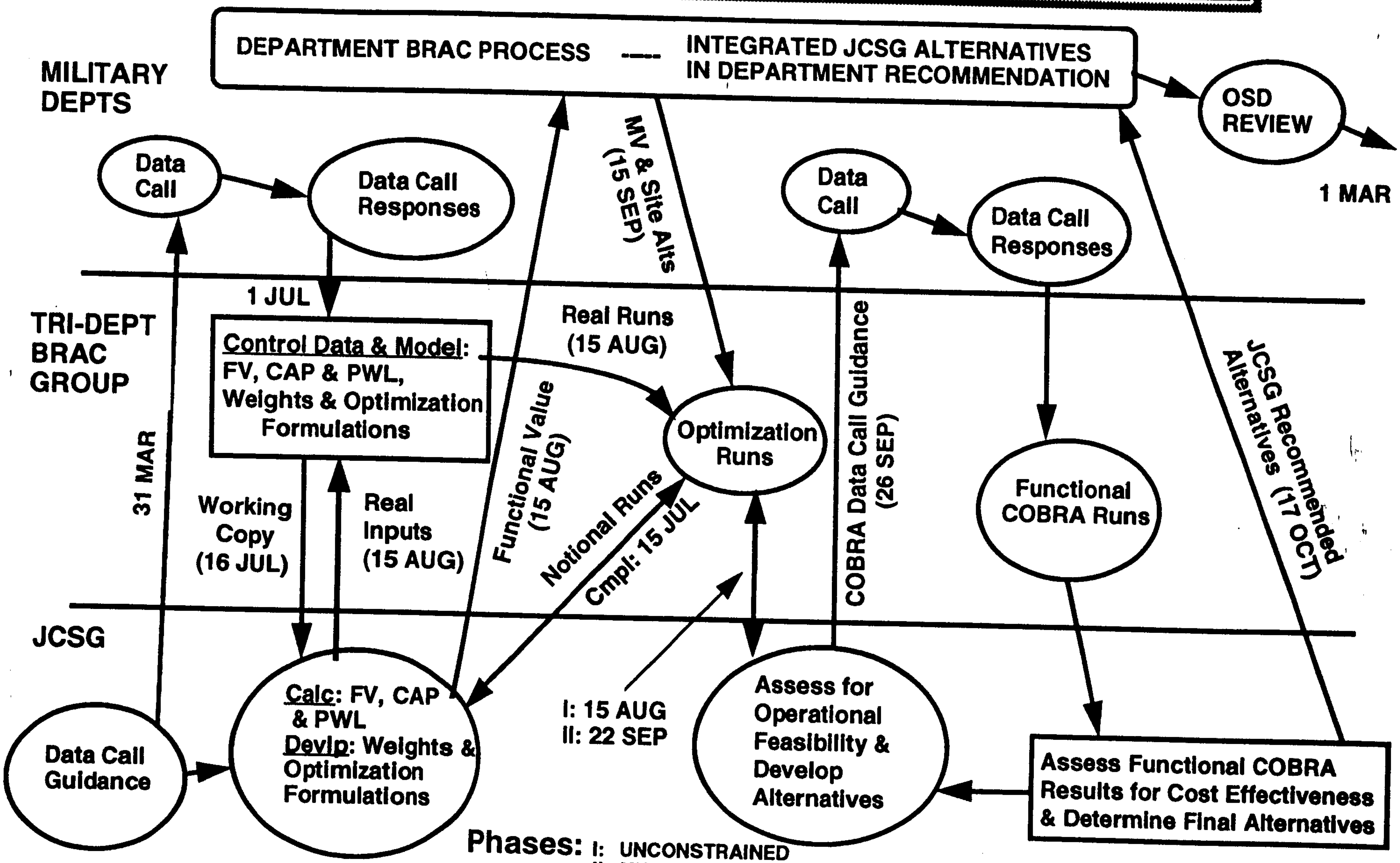
ATTACHMENTS

(1) Joint Analysis Team Structure
(2) Joint Analysis Process

JOINT ANALYSIS TEAM STRUCTURE



JOINT ANALYSIS PROCESS



Phases: I: UNCONSTRAINED
II: MV CONSTRAINED

APPENDIX A

T&E FUNCTIONAL VALUE METHODOLOGY

APPENDIX A. FUNCTIONAL VALUE

METHODOLOGY AND FRAMEWORK

1. INTRODUCTION: An objective assessment of functional value for each site/activity which supports T&E of air vehicles, electronic combat, or armament/weapons is required as part of the Base Realignment and Closure (BRAC) cross-servicing process. This value will be used to support the development of alternatives for consolidating/realigning the T&E infrastructure.

2. DEFINITION: The standard dictionary definition of "value" is:

a. Worth in usefulness or importance to the possessor; and

b. A principle, standard or quality regarded as worthwhile or desirable.

Applying this standard definition, functional value for T&E joint cross-service analysis is defined as the value of performing T&E in one of the three functional areas (Air Vehicles, Electronic Combat, and Armament/Weapons) at a given site/activity.

3. PURPOSE:

This document describes the methodology the T&E JCSG will use to arrive at functional values based on certified data from the Military Departments.

This methodology and framework provides a quantitative, consistent, and defensible basis for generating functional values for each site/activity which performs Air Vehicles, Electronic Combat, and Armament/Weapons testing.

4. SCOPE:

The methodology generates functional values for each functional area at each site/activity using certified data submitted in response to the T&E JCSG data call.

5. FRAMEWORK:

The framework for calculating functional value is based on a top down approach which captures the principal attributes required to support T&E within each functional area. The framework (see Figure 1) is comparable to a work breakdown structure (WBS). At the top level, two broad functional values (Physical and Technical) are required:

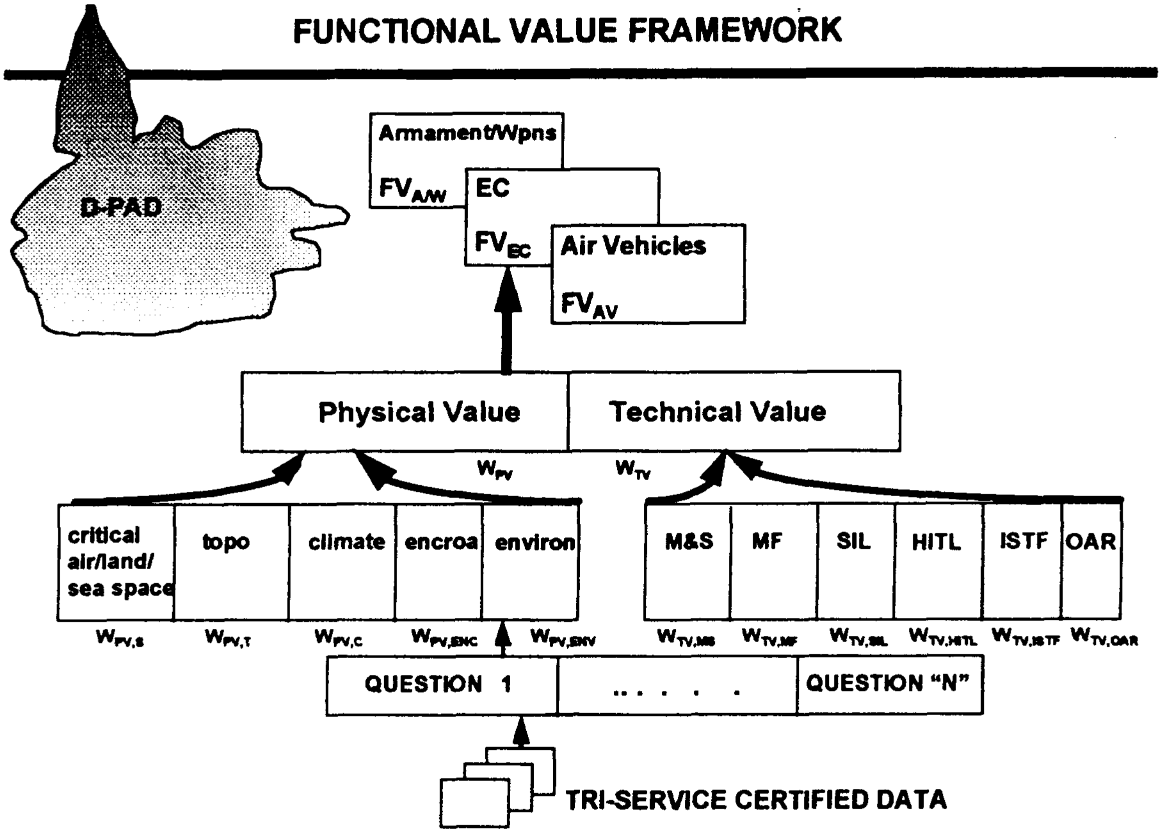


Figure 1

a. Physical Value. This category captures the intrinsic value of the air, land, and sea space as well as the varied topography and climates at a site as they relate to those required to support test and evaluation of system performance in real-world environments under realistic conditions. Encroachment and environmental categories attempt to capture to what extent future T&E operations might be affected by these factors.

b. Technical Value. This category captures the value of the man-made assets at each site/activity in terms of their capability to support test and evaluation of current and future weapon systems.

These two top level categories (Physical and Technical) are further broken down into sub-categories. Physical value is based on a roll-up of critical air/land/sea space, topography, climate, encroachment, and environmental sub-categories. Technical value is based on a roll-up of six T&E test facility categories as defined in the T&E Data Call: (1) Modeling and Simulation (M&S), (2) Measurement Facilities (MF), (3) System Integration Laboratories (SIL), (4) Hardware-In-The-Loop (HITL), (5) Installed Systems Test Facilities (ISTF), and (6) Open Air Ranges (OAR).

Each of the sub-categories will be scored based on a set of questions unique to the functional area (air vehicles, electronic combat, and armament/weapons).

Included in the functional value framework is a set of weighting factors assigned in a top down process to the top two levels. The relative importance of each capability determines its weight. The weights will be the same for all three functional areas. At lower levels, questions and scoring criteria may be different within each functional area.

All questions, weights, and scoring criteria as approved by the T&E JCSG are contained in Appendix E. Notional data will be used to support the development of the questions, weights, and scoring criteria.

6. SCORING PROCESS:

The proposed T&E functional value scoring process is shown in Figure 2. Each site's/activity's data call responses will be evaluated against functional area scoring criteria and scored by the T&E JWG. Relevant data for a facility which conducts testing in more than one functional area will be scored in each area. Decision Pad (D-PAD) software will be used to facilitate scoring data call responses and rolling up scores into functional values for each site/activity.

T&E JCSG FUNCTIONAL VALUE SCORING PROCESS

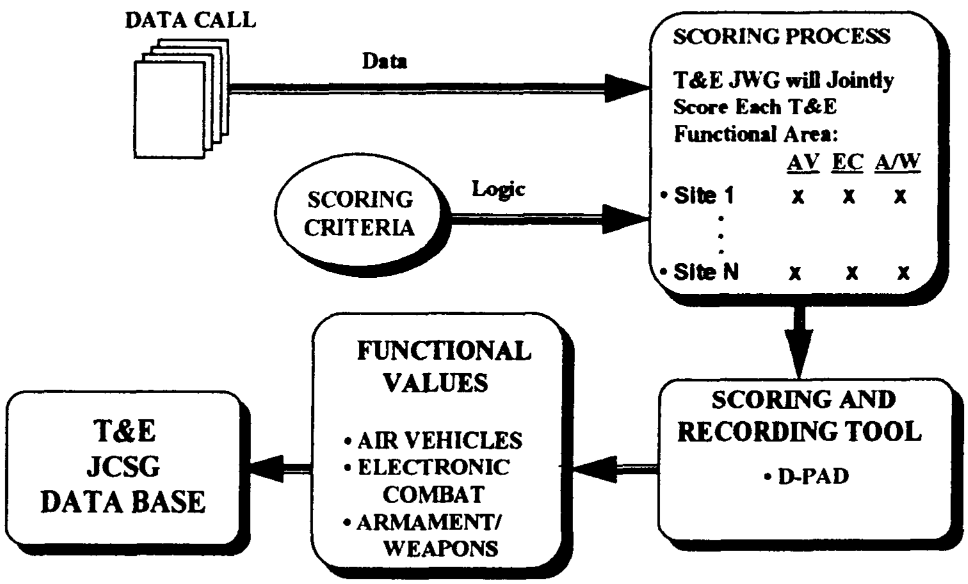


Figure 2

7. WEIGHTING NORMALIZED SCORES:

The mathematical formula for summing functional value scores is shown below. In addition, the framework consistently measures each site/activity against the same set of questions, and the method is reproducible. All resulting functional values are between 0 and 100.

FUNCTIONAL VALUE WEIGHTING/SCORING

1. NORMALIZE ALL SCORES
2. EACH SCORE HAS AN ASSOCIATED WEIGHT
3. WEIGHTS ARE DECIMAL FRACTIONS LESS THAN ONE

$$FV \equiv \sum_{i=1}^{2}\left[W_i\left(\sum_{j=1}^{m_i} W_{i,j}\left[100\left(\frac{\sum_{k=1}^{n_{i,j}} X_{i,j,k}}{\sum_{k=1}^{n_{i,j}} P_{i,j,k}}\right)\right]\right)\right]$$

$$\Sigma_i W_i = 1.0 \qquad \Sigma_j W_{ij} = 1.0$$

W_i = WEIGHT ASSOCIATED WITH CAPABILITY
i = PV and TV
$W_{i,j}$ = WEIGHT ASSOCIATED WITH CAPABILITY CATEGORY
j = 1 THROUGH NUMBER OF CATEGORIES
X_{ijk} = SITE'S/ACTIVITY'S SCORE AGAINST QUESTION x
P_{ijk} = MAXIMUM SCORE FOR QUESTION x
k = 1 THROUGH NUMBER OF QUESTIONS
FV = FUNCTIONAL VALUE FOR A PARTICULAR FUNCTIONAL AREA SUCH AS AIR VEHICLE, ELECTRONIC COMBAT, OR ARMAMENT/WEAPONS

8. SUMMARY:

In summary, the functional value methodology and framework provides complete visibility into the relative importance, or weight, of each capability. Weights establish which capabilities are most critical to DoD. The site's/activity's functional values represent its inherent worth to DoD in three key functional areas: air vehicles, electronic combat, and armament/weapons.

APPENDIX B

T&E WORKLOAD PROJECTION METHODOLOGY

APPENDIX B. T&E WORKLOAD PROJECTION METHODOLOGY

1. INTRODUCTION: Inherent to the determination of excess capacity is the development of a future T&E workload projection for each of the functional areas being examined by the T&E Joint Cross-Service Group (JCSG). This document describes the method selected for projecting future workload requirements for the T&E joint cross-service analyses. The underlying premise for this method is that future T&E workload will increase/ decrease in direct proportion to funding increases/decreases in the DoD budget. This method was selected based on its ability to provide a quantitative, consistent, and defensible basis for estimating future T&E workload.

2. ASSUMPTIONS:

a. The amount of workload generated by a fixed dollar amount is constant over the period FY92 - FY01.

b. The percentage of total workload for a given functional area that must be accomplished by each of the six test resource categories remains constant over the period FY92 - FY01.

c. The T&E JCSG analysis will include minimization of excess capacity as one of its goals; therefore, workload projections must be done at the test resource category level.

d. Outlay rates used in support of the FY95 President's Budget can be used for FYs93 - 99.

e. Workload for FY00 and FY01 equals that for FY99.

3. SCOPE: The methodology projects T&E workload throughout the FY95 - FY01 period and utilizes the workload measures specified in the JCSG T&E data call. The methodology draws upon historical workload information contained within the data call and funding data contained in the FY95 - 99 FYDP. Generation of T&E workload projections is the responsibility of the T&E JCSG.

4. METHODOLOGY: The method to be used in the T&E joint cross-service analysis generates a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. From the FYDP compute the total Budget Authority (BA) for Operation and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement funding.

b. Convert into constant FY95 dollars by deflating/inflating totals with certified inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M BA for fiscal year x expressed in constant FY95 dollars.

TR_x = total RDT&E BA for fiscal year x expressed in constant FY95 dollars.

TP_x = total Procurement BA for fiscal year x expressed in constant FY95 dollars.

TOTAL BUDGET AUTHORITY

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Compute total outlays for fiscal year x using certified outlay rates provided by the DoD Comptroller.

$$TBA_x = \sum_{k=1}^{7} (TOM_{x+1-k} \times OMOR_k + TR_{x+1-k} \times ROR_k + TP_{x+1-k} \times POR_k)$$

where $OMOR_k$ = outlay rate for O&M funding for kth year of the appropriation.

ROR_k = outlay rate for RDT&E funding for kth year of the appropriation.

POR_k = outlay rate for Procurement funding for kth year of the appropriation.

d. Compute average outlay baseline (AOB) for FY92 and FY93.

$$AOB = \frac{TBA_{92} + TBA_{93}}{2}$$

e. Divide total outlay baseline for fiscal year x from step c by the average outlay baseline from step d for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{TBA_x}{AOB} \qquad x = FY95, FY96, \ldots\ldots\ldots, FY01$$

f. Select test resource category (TRC_j; j = 1, 2, ..., 6) and functional area (FA_i ; i = 1, 2, 3).

g. Compute total workload baseline for each resource category for FY92 and FY93 within this functional area by summing over all sites s using data from the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_s \frac{FY92_i \text{ Workload } TRC_j + FY93_i \text{ Workload } TRC_j}{2}$$

h. Multiply total workload baseline from step g by the workload projection index from step e to get the projected workload W_{xij} for test resource category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi} \text{ Workload } TRC_j = I_x \times WTB_{ij}$$

i. Repeat steps f through h for each test resource category and each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

APPENDIX C

T&E EXCESS CAPACITY AND TARGET REDUCTION METHODOLOGY

Appendix C: T&E Excess Capacity and Target Reduction Methodology

1. Introduction: Inherent to the determination of excess capacity is the determination of upper and lower limits in order to measure the arithmetic difference. Appendix B outlines the method for determining the lower limit, called Projected Workload. This document describes the method selected for establishing the upper limit, called T&E facility category Capacity. Excess capacity is the arithmetic difference between Capacity and Projected Workload. The T&E JCSG has determined that capacity will be calculated on an estimated single shift standard.

2. Assumptions:

a. A standard single shift workyear is 2008 hours, which does not include leave or administrative and training time.

b. Workload per facility hour remains constant over the period of FY93 through FY01

c. Capacity of the facility/capability will be prorated to the T&E Functional Area and T&E Test Facility Category as indicated on the General Information Worksheet of the data call.

d. MS Excel software will be used to input and compute capacity values.

3. Scope: The methodology estimates the workload capacity of a T&E facility/capability by using the workload per facility hour of that facility/capability and extrapolating it over an annual single shift operation. This value is then allocated by T&E Functional Area and T&E Test Facility Category as indicated on the General Information Worksheet supporting that facility/capability. This capacity is then compared to the projected workload to determine the excess capacity.

4. Methodology:

a. CAPACITY: The method to be used in the T&E JCSG calculations generates a single estimated T&E capacity for each T&E Test Facility Category within each T&E Functional Area. The basic steps in this method are as follows:

(1) Total Facility/Capability Capacity (TFCC): Compute the TFCC by taking the "Total Σ" figure from Column 7 on the Determination of Unconstrained Capacity worksheet, and multiplying it by 2008.

(2) Total T&E Capacity (TEC): Compute the TEC by multiplying TFCC by the percent of T&E usage of the facility/capability as indicated in the General Information worksheet.

(3) Total T&E Capacity Allocated by Functional Area: Compute the total T&E capacity of the facility/capability to be allocated to each functional area (AVCAP for Air Vehicles, WEPCAP for Armanent/Weapons & ECCAP for Electronic Combat) by multiplying the TEC by the percentage indicated for each functional area in the General Information worksheet.

(4) Add the above functional area capacities to the respective T&E Test Facility Category totals, within each functional area, as indicated on the General Information worksheet.

b. EXCESS CAPACITY: The method to be used in the T&E JCSG calculations generates a single T&E excess capacity for each T&E Test Facility Category within each T&E Functional Area. The basic step in this method is to subtract the projected workload for the appropriate T&E Test Facility within a T&E Functional Area from the total T&E capacity allocated to that same T&E Test Facility within the same T&E Functional Area.

c. TARGET REDUCTION: Targets for reducing excess capacity will be determined based on the methodology outlined in Attachment 1 to this Appendix. Special attention will be given to facilities/capabilities that show a negative excess capacity as a result of the nature of their operations.

5. Execution: The above algorithm will be incorporated into an MS Excel spreadsheet that will automatically calculate and prorate the capacities using the following inputs:

a. TOTSUM: Workload per facility hour. Taken from column 7 of the Determination of Unconstrained Capacity worksheet.

b. %T&E: Percentage of T&E usage of the facility/capability. Taken from the "PERCENTAGE USE:" row of the General Information worksheet.

c. %AV: Percentage of T&E usage for Air Vehicle T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

d. %WEP: Percentage of T&E usage for Armament/Weapons T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

e. %EC: Percentage of T&E usage for Electronic Combat T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

f. PWL: Projected workload for each intersection of T&E Test Facility Categories and T&E Functional Areas (a total of 18 inputs).

EXCESS CAPACITY REDUCTION TARGET METHODOLOGY

- **Tasking** - Each JCSG has been tasked to:

  - Review excess capacity analyses, and
  - Develop numerical excess capacity reduction targets

- **Proposed Target**

  - Reduce all excess capacity as defined below, where cost effective

- **Excess Capacity Definition**

  - Delta between single-shift capacity and projected workload

- **Reduction Target Constraints**

  - Separate for each T&E functional area
  - Separate for each test facility category within each T&E functional area
  - Exclude excess capacity associated with unique, one-of-a-kind facilities

- **Cost Effectiveness**

  - Based on total costs, to include non-T&E and customer costs

Attachment 1

APPENDIX D

T&E OPTIMIZATION FORMULATIONS

APPENDIX D. T&E OPTIMIZATION FORMULATIONS

1. INTRODUCTION: To assist in the generation of cross-service functional alternatives for consideration by the Military Departments, a common analytical tool based on mixed integer, linear programming has been adopted by the Joint Cross-Service Groups (JCSGs). This document describes the specific adaptation of this common tool to support the T&E joint cross-service analysis process.

2. ASSUMPTIONS:

a. Policy imperatives agreed to by the T&E JCSG can be incorporated into the optimization formulations in the form of additional constraints.

b. The following data will be available for all of the sites and T&E functional areas:

Data Elements	Description
mv_s	Military value of site *s* expressed as 3 (high), 2 (medium), or 1 (low).
fv_{sf}	Functional value for performing function *f* at site *s* expressed as a number from 0 (low) to 100 (high).
cap_{sfr}	Capacity of site *s* to perform function *f* using test facility category *r*
req_{fr}	Total DoD requirement to perform function *f* using test facility category *r*

The military value of a site, mv_s, measures the overall value of the site to the department and will be provided by the Military Departments. The methods to be employed by the T&E JCSG to determine the functional value, capacity and workload requirements are described in other appendices.

3. SCOPE: Different optimization formulations (as described in the following section) have been selected to support the identification of cross-service alternatives and to provide a full understanding of the effect of individual parameters (*eg*, functional value, capacity, workload, *etc*) on the benefits/risks associated with each alternative.

Optimization model runs will be performed by the Tri-Department BRAC Group using AMPL and inputs as approved by the T&E JCSG. During the course of the analysis, modifications, revisions, and additions to the optimization formulations and policy imperatives may be required to support the identification and refinement of viable cross-service alternatives. All modifications, revisions, and additions will be approved by the T&E JCSG prior to implementation.

4. OPTIMIZATION FORMULATIONS: The four optimization formulations described below vary only in the specification of the objective function. Some of the objective functions involve summing terms across different types of test facilities and functional areas, where the terms including factors for the workload assigned or workload capacity are measured in units that reflect a different cost basis. These workload factors are always normalized in the objective functions by dividing by the corresponding workload requirements, so that the objective functions will only sum terms with consistent relative workload units. All four of the optimization formulations support a parametric variation in the relative weights (w and $1-w$) applied to a pair of terms in each objective function. This allows the T&E JCSG to develop alternatives which evaluate the impact of composite objective functions; for example, minimizing the number of open sites as a primary objective while maximizing the functional value of the workload assignment as a subordinate objective. The weight w is constrained between the values of 0 and 1 to avoid any distortion of the scale or units for the components of the objective functions.

Objective Functions.

a. The **MAXSFV** formulation. This formulation maximizes the sum of the functional values for all of the retained sites. The objective function for this formulation is given in Table 1. If the number of sites to be retained is not included as a constraint, all of the sites will be retained in the solution because the objective function is maximized when $o_s = 1$ for all sites. Obtaining meaningful results with this formulation, therefore, requires a constraint on the number of sites retained. If $w = 1$, then this formulation reduces to maximizing the functional value sum over the open sites. If $w = 0$, then the objective function maximizes functional value weighted by the fraction of required workload assigned to the site.

b. The **MINNMV** formulation. This formulation will find a small number of sites having the highest military value that can accommodate the DoD required workload. In addition, it will assign the DoD requirement for each cross-service function to the retained sites (or activities) having the highest functional value for that function. The purpose of this formulation is to assign, to the extent possible, the cross-service functional requirements to sites or activities having high military value and high functional values.

The objective function for this formulation is given in Table 2. This formulation is referred to as **MINNMV** because it minimizes the sum of $4 - nmv_s$ for retained sites or activities. Sites or activities having a high military value (3) will have 1 as their value for *nmv*, while sites with low military values (1) will have 3 as their value for *nmv*.

If $w = 1$, then the objective function includes only military value as a term. If $w = 0$, then the objective function is identical to **MAXSFV** with its $w = 0$.

c. The **MINXCAP** formulation. If the parameter w is set to a large value (*eg*, $w = 0.9$), this problem formulation will find the set of retained sites having the smallest total functional capacity but still able to perform the DoD functional requirement. Depending on w, functional assignments are also optimized. The objective function for this formulation is given in Table 3.

If $w = 0$, this formulation - like the **MINMNV** formulation - is also equivalent to the **MAXSFV** formulation with its $w = 0$. If w is set to a large value, excess capacity is reduced as much as possible with minimal regard for functional value.

d. The **MINSITES** formulation. This formulation, depending on the value of w, will find the minimum-sized set of sites that can perform the DoD functional requirement. The objective function for this formulation is given in Table 4.

If w is set to a large value (*eg*, 0.9), the cross-service functional workload is assigned to the smallest number of sites, with minimal regard for functional values.

Constraints. The constraint equations common to all four optimization formulations are given in Table 5. The constraint on the number of sites will be deactivated for some optimization runs - in particular, for the **MINSITES** formulation which seeks the minimum number of sites to be retained as part of the solution.

TABLE 1.

MAXSFV OPTIMIZATION FORMULATION

$$\underset{\text{with respect to } O_s,\, l_{sfr}}{\text{Maximize}} \left\{ \frac{w}{u_1} \cdot \sum_s o_s \cdot \sum_f \mathrm{fv}_{sf} + \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s l_{sfr} \cdot \mathrm{fv}_{sf}}{\mathrm{req}_{fr}} \right\},$$

where s is the site index,

f is the functional area index, and

r is the test facility category index,

w and $1 - w$ are weights assigned for each optimization run ($0 \leq w \leq 1$),

u_1 is calculated from $\sum_s \sum_f \mathrm{fv}_{sf}$,

u_2 is calculated from $\sum_f \sum_r \mathrm{fv}_{max}$,

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 2.

MINNMV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s, l_{sfr}}}{\text{Minimize}} \left\{ \frac{w}{u_1} \cdot \sum_s o_s \cdot \text{nmv}_s - \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s l_{sfr} \cdot \text{fv}_{sf}}{req_{fr}} \right\},$$

where s is the site index,
f is the functional area index,
r is the test facility category index.

w and $1-w$ are weights assigned for each optimization run ($0 \leq w \leq 1$),

u_1 is calculated from $\sum_s \text{nmv}_s$,

u_2 is calculated from $\sum_f \sum_r \text{fv}_{max}$,

o_s is the open-site decision variable for each site s,

nmv_s is equal to ($4 - mv$) for site s and mv is its military value (assigned as 1, 2, or 3),

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 3.

MINXCAP OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s,\, \ell_{fr}}}{\text{Minimize}} \left\{ \frac{w}{u_1} \cdot \sum_f \sum_r \frac{\sum_s o_s \cdot cap_{sfr}}{req_{fr}} - \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s \ell_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right\}$$

where s is the site index,

f is the functional area index,

r is the test facility category index,

w and $1-w$ are weights assigned for each optimization run ($0 \leq w \leq 1$),

u_1 is calculated from $\sum_f \sum_r \frac{\sum_s cap_{sfr}}{req_{fr}}$,

u_2 is calculated from $\sum_f \sum_r \frac{\sum_s \mathrm{fv}_{max}}{req_{fr}}$

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

ℓ_{sfr} is the workload assigned to site s for functional area f and test facility category r,

cap_{sfr} is the capacity of site s for functional area f and test facility category r

TABLE 4.

MINSITES OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s, l_{sfr}}}{\text{Minimize}} \left\{ \frac{w}{u_1} \cdot \sum_s o_s - \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s l_{sfr} \cdot fv_{sf}}{req_{fr}} \right\},$$

where s is the site index,

f is the functional area index,

r is the test facility category index,

w and $1-w$ are weights assigned for each optimization run ($0 \le w \le 1$),

u_1 is calculated from $\sum_s 1$,

u_2 is calculated from $\sum_f \sum_r fv_{max}$,

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 5.

CONSTRAINT EQUATIONS

$$\sum_s o_s \cdot cap_{sfr} \geq req_{fr}, \text{ for all } f, r$$

$$\sum_s l_{sfr} = req_{fr}, \text{ for all } f, r$$

$$0 \leq l_{sfr} \leq o_s \cdot cap_{sfr}, \text{ for all } s, f, r$$

$$o_s = \{ 0 \text{ or } 1 \}, \text{ for all s}$$

$$\sum_f \sum_r l_{sfr} \geq o_s, \text{ for all s}$$

$$\sum_s o_s = n_{limit},$$

where n_{limit} is assigned as a run limit on the number of sites

APPENDIX E

T&E QUESTIONS, WEIGHTS AND SCORING PROCESS

Appendix E: Questions, Weights, and Scoring Process

1. INTRODUCTION:

This appendix provides the questions, weights, and scoring process used by the JCSG to derive functional value (see Appendix A for a discussion of functional value (FV) methodology and framework). The questions, weights and scoring process provides a quantitative, consistent, and defensible basis for generating functional values for each site/activity which performs Air Vehicles, Electronic Combat, and Armament/Weapons testing.

2. QUESTIONS:

The questions were developed as a means to assign T&E FV to physical and technical capabilities of each responding site/activity within each of the three functional areas in which it performs work. The questions were derived from the official T&E JCSG Data Call of 31 March 1994, and are to be used in the scoring of the FV for functions at each site/activity.

The data used to answer these questions comes only from the certified data received from each site/activity. Data not used to answer these questions will be evaluated in the configuration scenario phase of the study. This is the phase of the evaluation process in which technical and military judgment is exercised to ensure that the required DoD T&E capability is retained for each proposed alternatives.

The actual questions are administratively sensitive and are held separately within an Annex to this Appendix.

3. WEIGHTS:

Weights were approved by the T&E JCSG based on recommendations from the T&E JWG. The weights measure relative importance of the major elements of physical value, the T&E test facility categories, and the site/activity's physical and technical value.

The actual weights are administratively sensitive and are held separately within an Annex to this Appendix.

4. SCORING PROCESS:

Consistent with the Internal Control Plan, a disciplined and controlled process for scoring and evaluating the data will be used in order to preserve the integrity of the process and to control access to the certified data. The following describes elements of the scoring process:

A. Scoring Team.

Each functional area -- Air Vehicles, Electronic Combat, and Armament/Weapons -- will have a Scoring Team comprised of one or two members from each Military Department. Scoring Team members are to be designated in writing by each Military Department BRAC office to the OSD Co-Chairs prior to the start of the scoring process.

Each team member will score the T&E questions independently, after which the Team will jointly review the scoring. The Scoring Team will use a consensus approach, with disagreements resolved by the lead member of the JWG from each Military Department.

B. The Data.

The data used in the scoring process will be extracted only from hard copies of the certified data call responses provided by the BRAC offices from each Military Department. The BRAC offices will provide only one hard copy of each activity's data call response. Due to the sensitive nature of the data, the Office of the Secretary of Defense will designate an Administrator who will serve as a central control point for the data.

The Administrator will be charged with maintaining the integrity of the data by storing the data, with accompanying questions, weights, score sheets, and computer disks, in a safe to which only the Administrator has access, by providing T&E Data Call responses only to the designated Scoring Team members from the Military Department that "owns" the data, and by recording the time of the data's "check-out" and to whom it was released. The Administrator will be available to perform this function in a manner that does not adversely affect the efficiency and effectiveness of the scoring process.

C. Physical Facility.

Scoring will be done in a common area within IDA's Test & Evaluation Center (TEC), where members of the Scoring Teams will have unrestricted access to all the T&E data after check-out by the Administrator, provided a representative of all three Military Departments are present. Access to the TEC and T&E JCSG data, will be limited to Military Department BRAC personnel as identified, in writing, to the T&E JCSG Co-Chairs, including the OSD appointed administrators. The Scoring Teams will have unlimited access to the TEC. During the scoring process, or any other time, no data or working papers will be removed from the scoring workspace without concurrence from all members of the Scoring Team. At no time will official scoring be conducted without a member from all three Military Departments being present.

D. The Scoring Procedures.

The score sheets will be maintained and controlled with the data call responses. They shall be initialed by each scoring team member when the member completes the evaluation. There will be at least two reviews of the data. The first review will be for obvious errors and for comprehensiveness of the activity's data call response. This will also serve as an indication of the consistency with which sites/activities interpreted the data call questions.

If clarifications of the data are required, the parent Military Department's BRAC office will obtain the clarification using procedures established by individual Service BRAC process. The Scoring Team members from all three Military Departments must agree on clarification requests. Requested clarifications can be initially submitted by FAX but must be followed up with a fully certified copy, as required. Memos-to-the-File must be prepared and signed by all three Military Departments to document minor clarifications received via telephone or fax.

Some criteria for requesting data clarification are as follows: (1) data is not provided by T&E test facility category; (2) data is missing, inconsistent or incomplete; (3) an inappropriate N/A response was provided; (4) data is not in the correct format, e.g., wrong units; and (5) other errors or trends are contained which would impact the analysis and are agreed to by all members of the Scoring Team.

The second review will be for the FV scoring of the certified data. If, during scoring, further clarifications are required, the clarification procedure described above will be followed. Finally, when the scoring process is completed, the data on the scoring sheets shall be entered into D-PAD software which will be used to facilitate scoring site/activity responses and rolling up scores into functional values for each site/activity. D-PAD is a commercially available product used by the Department of the Army in BRAC-91 and BRAC-93.

Throughout this process the lead member of the JWG from each Military Department will conduct quality reviews, provide guidance and resolve issues and disagreements raised by the scoring teams. If necessary, issues and disagreements will be presented to the T&E JCSG for final resolution.

When the above procedures are complete, the JCSG-approved Air Vehicles, Electronic Combat, and Armament/Weapons FV scores for each site/activity will be provided to the Tri-Department BRAC Group as inputs to the optimization model.

1 Annex: Functional Value questions & weights (*To be held: **CLOSE HOLD - FOUO***)

APPENDIX D

T&E OPTIMIZATION FORMULATIONS

NOTIONAL DATA RUNS

OUTPUT

- 5 FORMULATIONS WERE RUN

FORMULATION	ACTIVITIES OPEN
MAXSFV	18
MAXFV	9
MINSITES	7
MINNMV	7
MINXCAP	9

- 6 ACTIVITIES REMAINED OPEN FOR ALL FORMULATIONS

NOTIONAL DATA RUNS

WORK REMAINING

- IMPLEMENTATION OF POLICY IMPERATIVES
- RUNNING OF "SENSITIVITY" EXCURSIONS
- DEVELOPMENT OF MORE COMPREHENSIVE REPORTS

NOTIONAL DATA RUNS

OPEN ISSUES

- EXCESSIVELY HIGH UNCONSTRAINED CAPACITY VALUES
  - EXCESS CAPACITY METHODOLOGY
  - INTERPRETATION OF DATA CALL
- INCLUSION OF OT&E CAPABILITIES

NOTIONAL DATA RUNS

CONCLUSIONS

- FORMULATIONS VALIDATED
- ISSUES IDENTIFIED
- ADDITIONAL WORK REMAINS

APPENDIX F

T&E DATABASE MANAGEMENT PROCESS

APPENDIX F. T&E DATABASE MANAGEMENT PROCESS

1. Purpose:

This document describes the process to be used for the storage, retrieval, and disposition of the data/information used by the T&E Joint Cross-Service Group (JCSG) and its Joint Working Group (JWG) for T&E cross-service analysis.

2. Scope:

The database is the repository for all working data/information used to conduct the T&E cross-service analysis and will consist of hard and soft copy information. Specifically, the database will serve as repository for working copies of the T&E data call responses; FYDP information; computed functional values, capacity, excess capacity, and workload; functional COBRA inputs and outputs; and optimization model inputs and outputs (See Atch 1). In addition, the database will maintain an audit trail for all data and model runs by the JWG. Copies of all T&E JCSG approved data/information will be provided to the Tri-Department BRAC Group for inclusion into its official database.

A separate database will be established and maintained for classified data/information. Strict need to know rules will be applied to control access to this classified information.

3. Approach:

3.1 Inputs/Outputs:

The initial database inputs will be the certified responses from the data call and certified pertinent information from the FYDP. These initial data will be provided by the Tri-Department BRAC Group.

Requisite data will be retrieved from the database to compute functional value, capacity, excess capacity, and workload. This computed information will also be stored in the database and provided to the Tri-Department BRAC Group as inputs to the optimization model. Results of the optimization runs will be stored in the database and used to develop realignment/consolidation alternatives. Functional COBRA runs will be conducted for the alternatives using data call responses and computed data extracted from the database. Results of functional COBRA runs will also be stored in the T&E database.

3.2 Configuration Control:

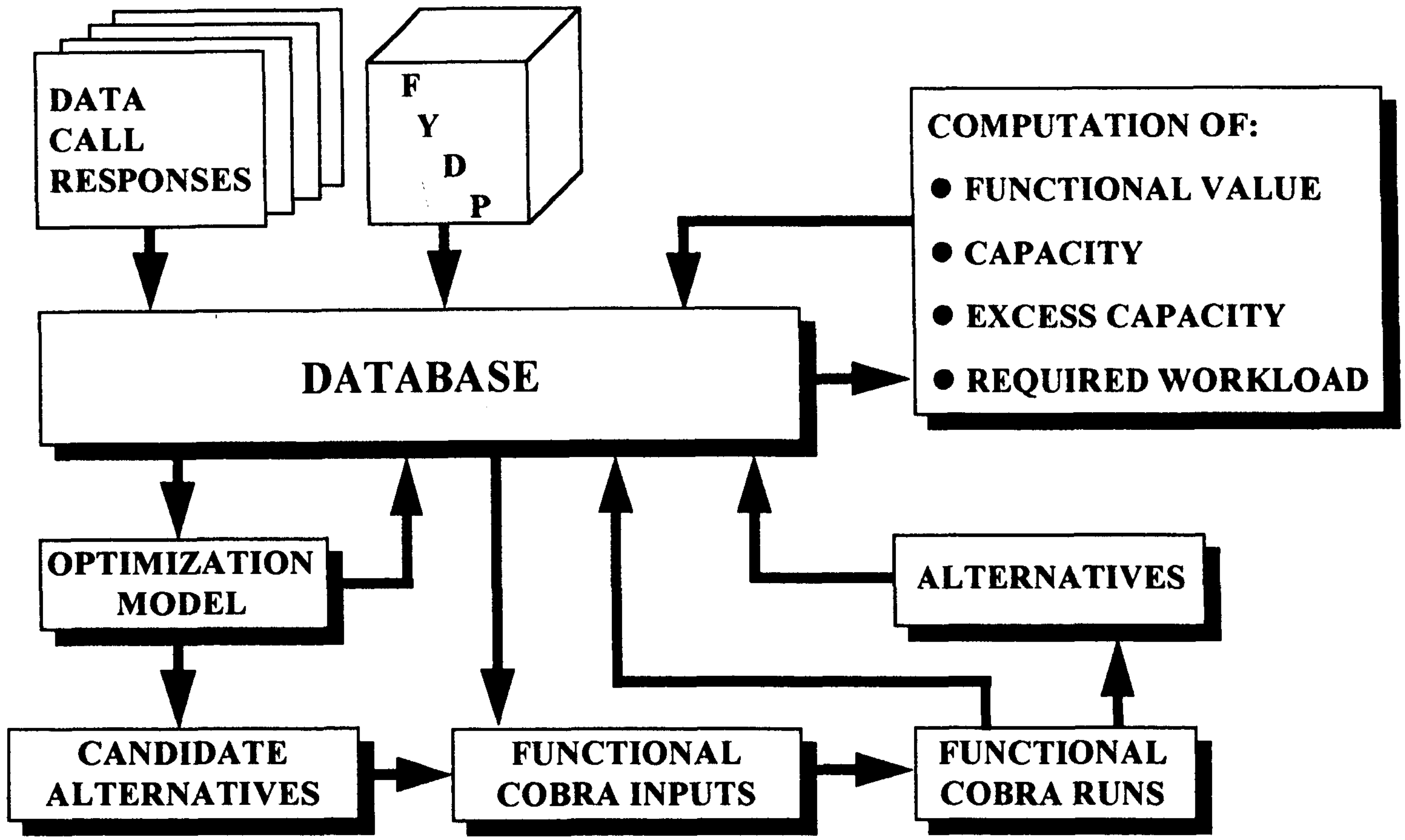
The data will be kept in a locked storage area with limited access. A data administrator will be appointed by the JCSG to insure that data is properly controlled and maintained. The data administrator will keep track of revisions and maintain an audit trail on all changes to the database. The data administrator will serve as principal database interface with the Tri-Department BRAC Group and will maintain a log of control numbers for model runs.

4. Database Disposition at End of Study:

All the requisite database information will be submitted to the Tri-Department BRAC Group for their record. This database information will include alternatives, input and output data, and other pertinent information. All working copies of the database and its supporting documentation will be destroyed.

Attachment 1

DATABASE MANAGEMENT PROCESS



NOTIONAL DATA RUNS

INPUTS

DEPARTMENT	NUMBER OF ACTIVITIES
ARMY	9
NAVY	7
AIR FORCE	7
	23

- SOME ACTIVITIES WERE NOT INCLUDED

- RANGE OF FUNCTIONAL VALUES 5 TO 95
- RANGE OF CAPACITIES 3 TO 6,700,000
- RANGE OF PROJECTED WORKLOAD 6,300 TO 3.9M
  - MIXED METHODOLOGIES USED:
    - PERCENTAGE OF SINGLE-SHIFT CAPACITY
    - FY 92/93 ACTUAL WORK PROJECTED TO FY99

- TEST FACILITY CATEGORIES 96 OF 414 (1 TO 13 PER ACTIVITY)

TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

ACTION PLAN AND MILESTONES

FOR

BASE REALIGNMENT AND CLOSURE (BRAC) 95 CROSS SERVICE ANALYSES

Addendum, July 1994

John A. Burt
Co-Chair
T&E Joint Cross-Service Group

Co-Chair
T&E Joint Cross-Service Group

I. PURPOSE and SCOPE

This addendum updates the Actions and Milestone schedule necessary to support identification of opportunities for consolidating/realigning the T&E infrastructure associated with Air Vehicle, Electronic Combat and Armament/Weapons testing as part of the FY95 Base Realignment and Closure (BRAC) joint cross-service analyses.

This addendum focuses on the activities associated with conducting the T&E cross- service analyses, formulating alternatives for consideration by the Military Department's BRAC offices, and oversight of the process by T&E Joint Cross-Service Group (JCSG).

II. ACTIONS

The major actions required for conduct of the T&E joint cross-service analyses are:

ACTION 1: Develop an Overall Analysis Methodology that provides capacity, future workload requirements, excess capacity reduction targets and functional values for Air Vehicle, Electronic Combat, and Armament/Munitions T&E.

1.1 Develop an analysis framework that uses the FYDP and certified information provided in response to the T&E JCSG data call and that leads to the identification of opportunities for realigning/consolidating the T&E infrastructure.

1.2 Develop methodologies for:
- Projecting future workload requirements
- Computing excess capacity within each functional area
- Establishing excess capacity reduction targets
- Computing functional value (FV) for each T&E functional area

1.3 Adapt a linear optimization model to support the development of T&E cross-service realignment/consolidation alternatives

ACTION 2: Conduct Analysis Using Notional Data

2.1 Compute functional value using notional data to finalize questions and weights.

2.2 Conduct optimization runs using notional data to develop initial policy imperatives, optimization formulations, data analysis procedures, and data presentation formats.

ACTION 3: Generate Inputs for Analysis

3.1 Provide questions, weights, and scoring criteria and compute functional value using Decision PAD software.

3.2 Compute future workload requirements and excess capacity for each functional area and test resource category.

3.3 Provide policy imperatives and other inputs required to run linear optimization and functional COBRA models.

3.4 Provide functional values (FV's) for each functional area for each site to the Military Departments.

ACTION 4: Conduct Analysis Using Real Data

4.1 Review inputs of model runs for accuracy.

4.2 Analyze outputs and develop initial set of realignment/consolidation alternatives.

4.3 Assess operational feasibility and cost effectiveness of each alternative; modify, revise, or delete alternatives as required. The assessment will include a determination as to whether the alternative retains the capability to satisfy DoD T&E requirements.

4.4 Provide revised set of alternatives to Tri-Department BRAC Group for additional optimization and functional COBRA runs.

ACTION 5: Finalize Alternatives to be provided to the Military Departments

5.1 Review inputs of model runs for accuracy.

5.2 Analyze final outputs from Tri-Department BRAC Group.

5.3 Review each alternative to ensure it is operationally feasible, retains the capability to satisfy DoD T&E requirements within each functional area, and is economically affordable.

5.4 Forward recommended alternatives along with supporting rationale and documentation to the Military Departments.

INTERNAL CONTROLS

The T&E Joint Cross-Service Group will adhere to the 13 April 1995 OSD BRAC95 internal control plan for base realignment, closure or consolidation studies to ensure the accuracy of data collection and analyses.

MILESTONES FOR CROSS SERVICE ANALYSIS

TABLE I

MILESTONE	Due Date
Data Call released to Services	31 Mar 94
ACTION 1 Overall Analysis Methodology JCSG Approves: Capacity Calculation Future Workload Projection Methodology Functional Value Target Reduction Methodology	6 Jul 94
ACTION 2 Conduct Analysis Using Notional Data JCSG Approves: Questions Weights Scoring Criteria Initial Policy Imperatives Optimization Formulations	15 Jul 94
ACTION 3 Generate Inputs for Analysis JCSG Approves: Functional Values Capacity/Requirements Policy imperatives	15 Aug 94
ACTION 4 Conduct Analysis using Real Data JCSG Provides: Inputs for Optimization/Cobra Models Functional Values (FV's) for Mil Dept's	15 Oct 94
ACTION 5 Finalize Alternatives Finalize Alternatives and provide to Mil Departments JCSG Approves: Alternatives Provide to Mil Dept's	1 Nov 94

Issue

- Definitions of "Available" and "Restricted" used for critical Air/Land/Sea space in data call and Functional Value determinations

Concerns

- Major contributors to FV
- Ambiguous terminology could lead to major inconsistencies across service sites
- "Restricted" airspace typically applies to overland
  - Could be interpreted to exclude "Warning Areas" over water, even though "controlled/scheduled" by site
- "Available" airspace can be interpreted as any airspace available for use, regardless of who "controls/schedules" the airspace or where it is located
  - i.e., "All" airspace is "available" to any site

Background

- FV is intended to reflect the value of a site's capabilities
  - Whether natural or technical resources
- T&E JCSG direction (12 Jul 94) was to divide into two parts
  - Credit site with airspace they "own/control"
  - Additional credit for "Available" airspace
  - Request "clarifications" if necessary
  - However, did not define "Available" or "Restricted"
- JWG agreement on "Restricted"
  - Will include "Warning", as well as "Restricted" areas, since both are controlled by site
- Disagreement over definition of "Available"

Options

- I. Define "Available" Air/Land/Sea space areas as "contiguous to a site"
  - Allow exceptions, but define upfront
- II. Establish maximum thresholds for "Available" for each functional area
  - Prevent overstatement of "Available" space

NOTIONAL DATA RUNS

INPUTS

DEPARTMENT	NUMBER OF ACTIVITIES
ARMY	9
NAVY	7
AIR FORCE	7
	23

- SOME ACTIVITIES WERE NOT INCLUDED

- RANGE OF FUNCTIONAL VALUES 5 TO 95
- RANGE OF CAPACITIES 3 TO 6,700,000
- RANGE OF PROJECTED WORKLOAD 6,300 TO 3.9M
    - MIXED METHODOLOGIES USED:
        - PERCENTAGE OF SINGLE-SHIFT CAPACITY
        - FY 92/93 ACTUAL WORK PROJECTED TO FY99
- TEST FACILITY CATEGORIES 96 OF 414 (1 TO 13 PER ACTIVITY)

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  - EXCESS CAPACITY METHODOLOGY
  - INTERPRETATION OF DATA CALL
- INCLUSION OF OT&E CAPABILITIES

NOTIONAL DATA RUNS

CONCLUSIONS

- FORMULATIONS VALIDATED
- ISSUES IDENTIFIED
- ADDITIONAL WORK REMAINS

APPENDIX D. T&E OPTIMIZATION FORMULATIONS

1. INTRODUCTION: To assist in the generation of cross-service functional alternatives for consideration by the Military Departments, a common analytical tool based on mixed integer, linear programming has been adopted by the Joint Cross-Service Groups (JCSGs). This document describes the specific adaptation of this common tool to support the T&E joint cross-service analysis process.

2. ASSUMPTIONS:

a. Policy imperatives agreed to by the T&E JCSG can be incorporated into the optimization formulations in the form of additional constraints.

b. The following data will be available for all of the sites and T&E functional areas:

Data Elements	Description
mv_s	Military value of site *s* expressed as 3 (high), 2 (medium), or 1 (low).
fv_{sf}	Functional value for performing function *f* at site *s* expressed as a number from 0 (low) to 100 (high).
cap_{sfr}	Capacity of site *s* to perform function *f* using test facility category *r*
req_{fr}	Total DoD requirement to perform function *f* using test facility category *r*

The military value of a site, mv_s, measures the overall value of the site to the department and will be provided by the Military Departments. The methods to be employed by the T&E JCSG to determine the functional value, capacity and workload requirements are described in other appendices.

3. SCOPE: Different optimization formulations (as described in the following section) have been selected to support the identification of cross-service alternatives and to provide a full understanding of the effect of individual parameters (*eg*, functional value, capacity, workload, *etc*) on the benefits/risks associated with each alternative.

Optimization model runs will be performed by the Tri-Department BRAC Group using inputs as approved by the T&E JCSG. During the course of the analysis, modifications, revisions, and additions to the optimization formulations and policy imperatives may be required to support the identification and refinement of viable cross-service alternatives. All modifications, revisions, and additions will be approved by the T&E JCSG prior to implementation.

4. OPTIMIZATION FORMULATIONS: The four optimization formulations described below vary only in the specification of the objective function. Some of the objective functions involve summing terms across different types of test facilities and functional areas, where the terms including factors for the workload assigned or workload capacity are measured in different units.

BRAC 95
Joint Cross-Service Group on Test & Evaluation

Friday, 22 July 1994

Minutes

The twenty-first (21st) meeting of the BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. John Burt was absent; Lee Frame and John Bolino co-chaired the meeting. The list of attendees, the agenda, and the handouts are attached.

Variances in Assigned Weights

Mr. Frame referred to the weighing portion of the T&E JCSG Analysis Plan and pointed out where the same question, in three different functional areas, produces answers with three different weights. It was then discussed whether substantial differences between the weights can be justified. The Navy Representative then put up a slide he had put together on the integrity of the BRAC 95 process. He stated that the key elements of the BRAC process must be such that the Service Principles can defend them before the BRAC Commission, the Congress, the public, etc. He said the Services should be comfortable with, and able to defend, "every question, methodology and decision associated with the process".

Mr. Frame then suggested that perhaps the T&E sub-group should go back and review again the rationale for each of the questions in order to produce a clearer understanding of the questions and answers. Navy pointed out that, we have not yet had a discussion on rationale for the weights. It was then agreed that the T&E sub-group would go back through those questions where there are different weights for the same question in different functional areas. A representative of the sub-group said that such a review could be accomplished by COB today. It was then agreed that the review of weights would be accomplished by noon on Monday, in advance of the next T&E JCSG meeting on 26 July.

Data Administration

The issue was raised of the administration of data during the cross-service analysis process. The Army representative maintained that the previously discussed arrangement regarding the data administration area, located at the TEC Building, needed to be changed. The Co-Chairmen said there would be separate safes for the T&E data and the Lab data, with each Group (T&E and Labs) making their own rules for the handling of data. They said the separation would be more for administrative reasons rather than for security reasons. With regard to the T&E data, they said that each Service could work with their own data any time they choose. Air Force argued for free access on the part of each Service to the data from the other Services. It was decided that each Service can get access to any T&E data, even from another Service, without any representative of the other Service being present.

Weighing of Airspace

The Air Force representative said we are giving more weight or credit to airspace that is owned and controlled by a site and less to airspace that is now owned or controlled by another site but is available for use. We are treating airspace as a resource differently than we are treating other resources, such as facilities, in that a site does not get credit for use of another site's facilities in the determination of functional value. The Army representative stated that airspace "customarily available" should be given weight or value.

Irv Boyles then distributed a memorandum he had prepared, subject "Airspace Scoring for BRAC 95" (see attachment). Time was allowed for each attendee to look at this memorandum.

At this time there were distributed copies of a draft unsigned memorandum, subject "Framework for Scoring Airspace for BRAC 95" (see attachment). Mr. Frame explained that this memorandum reflects the position of Mr. Burt (who is not present today) on the matter of scoring airspace. Mr. Frame said he was inclined to have the same position on this matter as indicated in the memorandum. After some further discussion, it was decided that there would be further work done on the wording of the memorandum explaining the framework for scoring airspace.

Appendix G: Classified Data Handout

A handout was distributed titled, "Appendix G: Classified Data Analysis" (see attachment). This was a draft of an appendix to the T&E JCSG Analysis Plan. After review by each attendee, Navy said that Section 2, "Policy Imperative" needed to be looked at very carefully for security, that it was really not necessary to have this policy statement here in this Appendix. After discussion, it was decided that Air Force would go back and look at that Section to see if any changes should be made to it.

Section 4 of the Appendix, with regard to personnel to be granted access to the data, was then discussed. It was decided to leave Section 4 as it is.

Excess Capacity Calculation

There was then a brief discussion, on the subject of "Excess Capacity Calculations", as to whether test hours or man hours should be used. It was decided to use test hours rather than man hours.

Workload Projections

The issue was discussed of whether the workload projections should extend out to FY 1997 or FY 1999. It was decided to stay with using workload projections out to FY 1999.

Service Operational Test Agencies

It was agreed that the Military Service operational test agencies, since they have no facilities, are to be "taken off the table" as far as being considered for BRAC 95. That is, they would not be included in the arena of consideration.

It was further decided that, at the next meeting of the T&E JCSG, there would be discussed any additional facilities to be considered for removal from consideration.

Topics for Discussion at Steering Group Meeting

Discussion then turned to the upcoming BRAC 95 Steering Group Meeting expected to be held on 28 July. It was pointed out by the Co-Chairmen, and agreed to by all, that not every JCSG is required to use the analysis model in the same manner. It was agreed that the T&E JCSG will use the model according to the writeup in our Action Plan.

The problem was discussed of too many notional runs being requested from Dr. Ron Nickel of Navy's CNA, causing a queuing problem. It was decided to let the T&E sub-group take the lead in resolving the problem and further agreed that just one person from the T&E sub-group would contact Dr. Ron Nickel for notional runs.

It was decided that, at the next T&E JCSG meeting next Tuesday morning, there would be a presentation of the slides and narrative to be presented to the Steering Group meeting on 28 July. An Air Force representative said the A.F. would take the lead in preparing the materials.

Action Items

It was then agreed upon that the following are Action Items that will be followed up on after this meeting:

1. The rationale for the weights and questions will be developed and provided to the OSD DOT&E/DT&E offices by noon Monday, 25 July. The sub-group will prepare this rationale.

2. The memorandum, subject, "Airspace Scoring for BRAC 95", will be revised; Irv Boyles will take the lead on that.

3. The Air Force will re-look at the Section 4, "Security", portion of the Appendix G handout with an eye toward making revisions.

Fax and Copier in TEC Facility Area

Discussion followed on the advisability of a fax machine and a copier in the data administration area at the TEC Facility. It was decided that the issue will be resolved in the very immediate future.

The meeting adjourned at 1005 hours.

Approved: L H Frame
Lee Frame
Co-Chairman

J. V. Bolino
John Bolino
Acting Co-Chairman

Attachments

BRAC 95

Joint Cross-Service Group on Test and Evaluation

July 22, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Bolino, Acting Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
LTG(Ret) Howard Leaf, Air Force
Mr. Dan Stewart, Air Force
LtCol George London, Air Force
Mr. Walter Hollis, Army
Mr. Thomas Roller, Army
Mr. Gerald Schiefer, Navy
Ms. Jeanne Karstens, DoD Compt
Mr. Dave Vincent, DoDIG
Mr. Frank Lewis, OSD PA&E
Mr. Irv Boyles, DT&E, OUSD(A&T)
Mr. Joe Moore, DOT&E

BRAC 95 T+E Cross Service Group
Meeting 0900, Friday, 22 July 94

Attendance

Name	Organization	Phone Number if First Time Attendee
Joe Moore	DOT+E	—
Dan Stewart	AF/TE	DSN 227-1165
Tom Rollen	Army TEMA	
Joanne Karstens	DODC	614-0346
George London	AF/TER	
David Vincent	IG-DoD	(NEW) 604-9058
John Bolino	OSD/DTE	697-4819
Frank Lewis	OSD PA&E	
G R Schiefer	Navy BSAT	
Irv Boyles	DT&E	
Nick Toomer	OSD/DOT&E	
Howard Leaf	AF/TE	
Walt Hollis	Army Sec.	
Lee Frame	DOT&E	

TOPICS FOR T&E JSCG 22 JUL MEETING

- Appendix G: Classified Data Analysis
  - Request JCSG Approval
- Major Issues
  - Scoring of Critical Airspace
  - T&E JCSG Data Issue (Access & Handling)
  - Excess Capacity Calculations (Test Hrs vs Man Hrs)
- Concern
  - Workload Projections (FY97 vs FY99)
- Questions, Weights & Scoring Process
  - Recommend JWG Products Be Accepted By JCSG

TOPICS FOR T&E JSCG 22 JUL MEETING

- Preparation for 28 Jul Steering Group Meeting
  - Final Analysis Plan (w/Appendices) As Read Ahead
  - Final Action Plan
  - Recommended Revisions to "Optimization Model" Writeup
  - Charts for OSD Co-Chair to Brief
  - AF Turn to Support

on the integrity of the BRAC process.
Presented at 22 July 94 meeting of T&E JCS

The BRAC effort is based on an act of congress and is therefore a legal process unlike other general studies heretofore performed. BRAC is then a very disciplined process with checks and balances and with oversight by various investigative groups including service audit agencies, the DOD IG and the General Accounting Office. These agencies can have access to any data , in-process information, and personnel at any time. The entire process, its data, deliberative minutes and results are open to Commission, Congressional and public scrutiny on 15 Mar 1995. Hearings will be held in all affected areas and community/personnel expressions of concerns are welcomed and considered. The Commission is charged by law with trying to find areas where the process may have deviated from a fair and defensible effort. Any impacted site will challenge the process and look for any imbalance and indications of unfairness and deviations from disciplined procedures. There is already many personnel in communities near sites covered by the T&E and Lab Joint Cross-Service Groups that are poised with their consultants, lawyers and delegations waiting for any indications of impropriety. Therefore, the Joint BRAC effort must be balanced, squeaky clean, and cannot have the slightest appearance of unfairness.

With the above preamble in mind, there are areas concerned with weights and questions for the T&E scoring process that must be discussed. The questions and their weights and the general weighting structure will be defended by the JCSG Co-Chairs and probably Service Principals, to the Commission, its staff; any member of congress and their staffs and the lawyers representing communities across the country. It is imperative that the JSCG principals have ownership, and can recite and defend the rationale, for every question, weight, methodology and decision. associated with the process.

There is agreement that Air-Land-Sea space is an irreplaceable asset and should have high weighting. But that weighting must be balanced with technical and must also be distributed rationally across all of the sub elements it contains. These weights and questions must appear fair to all sites and not have the appearance of favoring one over the other. However, they must also be able to determine relative functional value so they must show some discrimination. What was presented to the JCSG was a quick and dirty strawman with just general discussion and no detailed look for balance and proper treatment across all categories. This detailed look is important because the various Departments perform different and multiple functions in their facilities and categorize them with different titles. Even within a Department the same type functions can be performed in different facilities so when a higher weight is given to one category that weight can be proper for one site but not proper for another site that performs the same function in a facility with a different title.

Measurement facilities in many cases are also very dependent on the physical attributes of land and air just like open air ranges. Horizontal and look down radar cross section ranges, aircraft/weapons survivability complexes, propulsion firing complexes, gun firing complexes, fuze encounter simulation laboratories, electro-magnetic pulse test complexes, sled tracks, and warhead and magazine test arenas are examples. Much higher weighting must be given to this category than was shown in the strawman.

ISTF was given the next highest value to outdoor ranges. Primarily because the facilities are big and cannot be moved easily. Many of the measurement facilities are equally as large and harder to move. The MESA facility and the radar cross-section range at China Lake and the

DRAFT

MEMORANDUM FOR JOINT CROSS-SERVICE GROUP FOR TEST AND EVALUATION

SUBJECT: Framework for Scoring Airspace for BRAC 95

The positions of each of the three military departments have been reviewed on how airspace should be scored during analysis by the Joint Cross-Service Group for Test and Evaluation. Considering the arguments and features from each, the following framework has been accepted for use.

Heaviest weight is to be assigned to airspace available to a site or activity (not necessarily owned or controlled by that site or activity) to perform testing routinely (maybe 95% of the test missions) against DoD-wide test requirements. And some points (small weight) for having contiguous airspace available/accessible for the rare occasional extraordinary missions that might require expansion temporarily or linking ranges together to provide a flight corridor. Inability of a site or activity to perform tests or requiring the testing to be conducted at another location because of available airspace constraints should a major discriminator between sites and activities. Features should be:

- A maximum number of points that a site or activity can achieve for routinely used airspace will be the same for all sites and activities (e.g., 100 points) per functional area, and will be based of the maximum safety footprint and maneuvering envelope determined by agreement by all Services required to routinely test weapons in the FYDP per each functional area. Scoring will be by percentage of available airspace used routinely against the DoD-wide requirements.

- For the extraordinary test missions, again a uniform maximum number of points will be established for all sites and activities, and scoring will be based on percentage available/accessible to support maximum envelope and safety footprint to satisfy DoD-wide requirements agreed to by all Services for that functional area.

DRAFT

- A site or activity should receive no points for deploying tests to other sites or activities because of airspace constraints, even though they may retain the responsibility for conducting the tests.

For the foregoing, available airspace per functional area is any airspace that is useable on a routine basis, regardless of who owns or controls it. Airspace that does not support safety footprints and maneuver requirements should not be considered as available.

The key part of the foregoing approach will be to achieve tri-Service agreement of the required routine available airspace to satisfy DoD-wide test requirements for each functional area for weapons systems expected during the FYDP. This should be accomplished prior to the beginning of the analysis process using real data from the data call -- working group members per each functional area should propose values to the Joint Cross-Service Group for Test and Evaluation for approval. Extraordinary airspace requirements for each functional area should also be identified.

John A. Burt
Director
Test and Evaluation

Director
Operational Test and Evaluation

ACQUISITION AND TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

MEMORANDUM FOR DIRECTOR OF TEST AND EVALUATION
DIRECTOR OF OPERATIONAL TEST AND EVALUATION

THRU DEPUTY DIRECTOR, TEST FACILITIES AND RESOURCES

SUBJECT: Airspace Scoring for BRAC 95

Each of the three military departments have offered their positions on how airspace should be scored during analysis by the Joint Cross-Service Group for Test and Evaluation (Attachments 1-3). All three positions are different; however, the positions of the Army and the Navy are close, and could be used as a basis for a fourth compromise position. Summary of the three positions follow:

ISSUE	ARMY	NAVY	AIR FORCE
Definitions			
Available Airspace	Space routinely used	Footprint Needed	Controlled/ owned + accessible
Controlled/ Owned	Irrelevant	Irrelevant	Restricted and Warning Areas
Scoring			
Controlled/ owned	No credit	No credit	Maximum Credit
Available Airspace	% available to max needed	% available to max needed in FYDP	Minimum credit if not controlled/ owned by site

Recommended compromise position is as follows. Heaviest weight to airspace available to a site or activity (not necessarily owned or controlled by that site or activity) to perform testing routinely (maybe 95% of the test missions). And some points (small weight) for having airspace available/accessible for the rare occasional extraordinary missions that might require expansion temporarily or linking ranges together to provide a flight corridor. Features could be:

- A maximum number of points for routinely used airspace that a site or activity can achieve will be the same for all, and will be based of the maximum safety footprint and maneuvering envelope determined by agreement by all Services required to routinely test weapons in the FYDP at that site. Scoring will be by percentage of available to required.

- For the extraordinary test missions, again a uniform maximum number of points will be established for all sites and activities, and scoring will be based on percentage available/accessible to support maximum envelope and safety footprint agreed to by all Services for that site or activity.

The foregoing approach uses features from all three Service positions. I feel it levels the playing field giving all sites and activities (i.e., all Services) equal opportunity to score maximum points (e.g., Army ranges do not require the same airspace as needed for testing high performance aircraft), discriminates against those that are inadequate to conduct the test missions in their workload projections over the FYDP, and doesn't greatly reward sites and activities for having more airspace available than needed for their routine test missions. The hardest part will be to achieve tri-Service agreement of the required routine available airspace at each site prior to seeing the data.

Irvin Boyles
Staff Specialist
Test Facilities and Resources

Attachments:
1-3 Positions from Services

APPENDIX G: CLASSIFIED DATA ANALYSIS

1. INTRODUCTION: This appendix provides the data analysis process used by the Joint Cross-Service Group (JCSG) to utilize classified data (as required) to supplement the overall data analysis process as described in the Test and Evaluation (T&E) Analysis Plan. This classified data analysis process provides a quantitative and defensible basis for incorporating classified data into the Electronic Combat (EC) functional value analysis and alternative evaluation process while requiring minimum exposure of sensitive information.

2. POLICY IMPERATIVE: [redacted]

3. DATA

a. Classified information used for workload and capacity analysis comes only from certified data received [redacted] in response to the [redacted] T&E JCSG Data Call of 31 Mar 94. Due to the classified nature of this data, it will be maintained by SAF/AAZ.

b. SAF/AAZ will arrange for appropriately cleared facilities for data review, when required. Only appropriately designated (in writing to the T&E JCSG co-chairs) and cleared BRAC team members will have access to the data, and SAF/AAZ will record to whom and when access was granted. At no time will classified data be removed from SAF/AAZ control.

c. A minimum level of required information pertaining to the Site's workload and capacity may be incorporated into other data for optimization runs and alternative development purposes. The facility may be identified only in generic terms (ie, as Site "A") and, of course, classified information cannot be included.

4. SECURITY

a. Personnel in the following positions should be granted program access (assuming appropriate clearance levels):

1) One member from each Service to serve on the EC Analysis Team

2) The principal Service members on the T&E Joint Working Group

3) The principal OSD and Service members on the T&E JCSG

b. The names, ranks/grades, social security numbers, organizations, home stations, phone numbers, dates and places of birth, citizenship, and types and levels of clearances and security investigations for personnel serving in the above positions should be forwarded to Col Wes Heidenreich of the Air Force BRAC Team at (703) 416-8481, fax 416-8485, not later than two weeks before access to classified data is required.

BRAC 95
Joint Cross-Service Group on Test & Evaluation

Tuesday 26 July 1994

Minutes

The twenty-second (22nd) meeting of the BRAC 95 Joint Cross-Service Group on Test and Evaluation convened at 0900. Lee Frame and John Burt co-chaired the meeting. The list of attendees, the agenda, and the handouts are attached.

Changes to Minutes of Previous Meetings

With regard to the minutes of the meeting of 19 July, in the third paragraph from the end, bottom line of paragraph, it was agreed that the sentence should end "the Group decided to study whether to include OT&E capabilities in the optimization model runs".

Consensus on Analysis Plan

The question was raised as to whether the Analysis Plan is an "agreed-upon" document. Air Force said they did not agree with the document with reference to airspace scoring, believing we are treating the scoring of airspace different from the scoring of facilities. (This issue was addressed later in the meeting; see minutes under "Airspace Scoring".)

Scoring

The question was raised as to whether all Services have to be present during any scoring. It was decided that each Service can do its own preliminary scoring separately and "bring their scores to the table". When, however, the final official scoring is done, all three Services must be present. It was agreed that the Analysis Plan will so reflect.

Changes to Appendix E of Analysis Plan

On page E-2 of the Analysis Plan, second paragraph, it was decided to add the word "final".

On page E-2 of the Analysis Plan, it was decided to change the last paragraph to strike out "that owns the data".

On page E-3 of the Analysis Plan, it was decided that no one will take data out of the secure facility designated for BRAC 95 T&E joint cross-service analysis. Data should not leave the secure facility except to go to the Tri-Department BRAC Group. Paragraph 1 was changed on this page to reflect this. It was also agreed that all scoring sheets should be destroyed except the final for-the-record copies.

Classified Data Analysis

Irv Boyles said he talked to the Special Programs Office of the OUSD(A&T). He said the guidance from them was that we should not identify sites that have classified facilities because it will tend to call unneeded attention to those highly classified facilities.

Finalization of Appendix G to Analysis Plan

Appendix G of the Analysis Plan was reviewed and finalized. Agreement was reached on the final version.

Airspace Scoring

Airspace scoring was reviewed by Irv Boyles. See attached slide.

The Air Force representative said we are treating sites that have land and airspace differently from the way we are treating sites that have facilities. If there is an anechoic chamber, the site gets credit for it. However, if there is airspace, you don't get credit for it if you don't control it but just have access to it, which is often the case. It was resolved and agreed upon that points will be awarded based on availability of airspace, not ownership or control of airspace. It was further decided that Irv Boyles of DT&E, OUSD(A&T) and Gary Holloway of Army will sit down and go over the Airspace Scoring process. They will attempt to come up with a final version of "Airspace Scoring" as a paragraph in the T&E JCSG Analysis Plan.

Army then presented a slide, "Scoring Scales--Air/Land/Sea Space" showing the scoring of air, land and sea space using a curve or exponential to give slightly greater credit for the first increments of such space and less credit for the farthest out amounts. The Co-Chair made the point that every site seems to have a large quantity of claimed airspace so it wouldn't make much of a difference. There was no determination with regard to the Army's proposal.

Rationale for Questions and Weighing

The issue was discussed as to whether, with regard to technical capability, there should be a primary question and then more detailed questions. The decision was that we should ensure that every area has at least one substantive or detailed question. What we are really looking for is capability and limitations.

On Page 4 in the Section on Air Vehicles, under "Open Air Ranges", the point was made that no questions have to do with instrumentation. Further, that 72% of the weight is on the capability of the air field. It was decided that the T&E sub-group should go back and review the questions and weights one more time.

Page-by-Page Review of Attachments to Appendix E

At this point the Co-Chair led a page-by-page review of the attachments to Appendix E, listing the questions and weights. The point was made that the questions should not be worth both "Zero to Max" and also a specific point value for each sub-category of the question. (An example is in question 1.2 on page 2 under Armaments/Weapons.) The decision was made that it should be one or the other.

The Co-Chair thereupon said the review to be conducted by the sub-group needs to ensure consistence of scoring.

"Functional Value Framework" Chart

The "Functional Value Framework" chart, showing top-level scoring, was put up on the screen. It was decided to let representatives of the three Services go through the questions to be sure all members of the JCSG agree on the terminology being used and that it is accurate terminology.

TEC Facility

It was announced that the TEC facility, where the cross-service analysis will be conducted, will be ready for occupancy at noon today. However, it was agreed that the Administrator need not be on site until the Analysis Plan is signed and approved and until data is ready to be delivered to the TEC facility offices. That will not be before Friday.

Briefing to Steering Group

There was then presented to the Co-Chairs a draft of the briefing to be given to the BRAC 95 Steering Group on Thursday, 28 July. Several minor changes were made and it was decided that the sub-group will have the revised charts ready for delivery to the OSD BRAC office by noon the next day, 27 July 1994.

Action Items

It was also decided that the final version of the Analysis Plan will be delivered to the T&E JCSG Co-Chairs by early afternoon, Thursday, 28 July 1994.

Approved: Lee Frame
Co-Chair

John Burt
Co-Chair

Attachments

BRAC 95

Joint Cross-Service Group on Test and Evaluation

July 22, 1994

List of Attendees

Mr. Lee Frame, Co-Chair
Mr. John Burt, Co-Chair
Mr. John Bolino, Acting Co-Chair
Mr. Nick Toomer, Co-Study Team Leader
LTG(Ret) Howard Leaf, Air Force
Mr. Parker Horner, Air Force
Mr. Dan Stewart, Air Force
LtCol George London, Air Force
Mr. Walter Hollis, Army
Mr. Gary Holloway
Mr. Thomas Roller, Army
Mr. Gerald-Schiefer, Navy
CAPT Dave Rose, Navy
Cdr Mark Samuels, Navy
Mr. Don DeYoung, Navy
Ms. Kathleen Ruemmele, BMDO
Ms. Jeanne Karstens, DoD Compt
Mr. Dave Vincent, DoDIG
Mr. Frank Lewis, OSD PA&E
Mr. Irv Boyles, DT&E, OUSD(A&T)
Mr. Joe Moore, DOT&E

AGENDA

T&E JOINT CROSS-SERVICE GROUP
26 JULY 1994

- OPENING REMARKS
- COMMENTS ON 12, 19, 22 JULY MINUTES
- APPENDIX E: QUESTIONS, WEIGHTS, AND SCORING PROCESS
- APPENDIX G: CLASSIFIED DATA ANALYSIS
- AIRSPACE SCORING
- ANNEX TO APPENDIX E: RATIONALE FOR QUESTIONS AND WEIGHTING (EXCEPTIONS ONLY)
- WEIGHTING REVIEW AND CLOSURE
- TEC FACILITY UPDATE
- PROPOSED BRIEFING TO BRAC STEERING GROUP
- ISSUES AND ACTION ITEMS

TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

ANALYSIS PLAN

FOR

BASE REALIGNMENT AND CLOSURE (BRAC 95)

JOINT ANALYSIS

July 1994

John A. Burt
Co-Chair
T&E Joint Cross-Service Group

Co-Chair
T&E Joint Cross-Service Group

T&E JOINT CROSS-SERVICE GROUP
ANALYSIS PLAN

1.0 BACKGROUND

1.1 In a 7 Jan 94 memorandum entitled "1995 Base Realignment and Closures (BRAC 95)", the DEPSECDEF established Joint Cross Service Groups (JCSGs) in six areas with significant potential for cross-service impacts in BRAC 95. Each JCSG was tasked to accomplish the following:

- To determine the common support functions and bases
- To establish the guidelines, standards, assumptions, measures of merit, data elements, and milestone schedules for DoD Component conduct of cross-service analysis of these common support functions
- To oversee DoD Component analyses of the common support functions
- To review excess capacity analyses
- To develop closure and realignment alternatives and numerical excess capacity reduction targets for consideration in such analysis
- To analyze cross-service tradeoffs

1.2 The purpose of this plan is to outline how the analysis tasks will be accomplished and to describe the methodologies to be used in completing these tasks.

2.0 JOINT TEAM STRUCTURE

2.1 Attachment 1 summarizes the joint team structure and responsibilities for accomplishing the DEPSECDEF analysis tasks. Overall responsibilities of the Steering Group, Review Group, Military Departments, and Joint Cross Service Groups in the BRAC cross-servicing process are documented in the 7 Jan 94 DEPSECDEF Memorandum.

2.2 The Joint Working Group (JWG) is comprised of DoD Component members and reports directly to the T&E JCSG. It's principal role is to support the T&E JCSG in the development and conduct of the analysis, subject to the approval of the T&E JCSG. The T&E JCSG will also document all results and decisions for the record.

2.3 The Tri-Department BRAC Group is comprised of BRAC members from each Military Department who report directly to their Military Department. They are responsible for controlling data and running the optimization and functional COBRA models for each JCSG. T&E inputs for the model will be provided by the T&E JCSG. Model outputs will be provided to the T&E JCSG for review and analysis by the JWG.

3.0 JOINT ANALYSIS PROCESS

3.1 Steps in the joint analysis process are summarized in Attachment 2.

3.2 The T&E JCSG will develop guidance for joint T&E data calls to support the joint analysis process. The Military Departments will conduct the data calls and provide the responses to the Joint Cross Service Group through the Tri-Department BRAC Group for control.

3.3 The T&E JCSG will use the methodologies presented in Appendices A-C to compute the T&E Functional Value (FV), Excess Capacity, and Projected Workload (PWL) based on information from the joint data call and the Future Years Defense Plan. They will also develop optimization formulations and policy imperatives to support optimization model runs (see Appendix D). Questions, weight, and scoring
criteria presented in Appendix E will be used to calculate functional values. All data will be documented IAW Appendix F.

3.4 Notional data will be used to develop the optimization formulations and initial policy imperatives. Unconstrained runs using real data will then be conducted using inputs from the T&E JCSG to develop alternatives satisfying workload requirements. Additional runs using site military values provided by the Military Departments will also be run to refine alternatives.

3.5 Collocation of T&E resources needed to support the test process in a T&E functional area (i.e., Air Vehicle, Armament/Weapons, or Electronic Combat) will be accomplished to the maximum extent possible in each alternative. Resources will be retained at other sites when geographically constrained, needed to satisfy workload, economically prohibitive to move, or for other operational reasons.

3.6 Sensitivity analysis will be conducted throughout the process to identify risk areas.

3.7 An operational feasibility assessment will be conducted by the T&E JCSG to ensure the capability to satisfy DoD T&E requirements is retained. Shortfalls in capability will be identified and necessary solutions developed to retain viable alternatives. A top-level concept of operations (CONOPS) will be generated for each alternative and will address MILCON, personnel movement and termination, equipment relocation, customer and stakeholder impacts, etc. The CONOPS will provide the basis for a Functional COBRA data call to determine if an alternative is cost effective using the COBRA Model. The functional COBRA will consist of COBRA runs using simplified input data sets and assumptions. These data sets and assumptions will be developed by the JWG and approved by the T&E JCSG. An approved version of COBRA will be used for these runs.

3.8 Alternatives that satisfy the DoD T&E workload and capability requirements and provide an acceptable return-on-investment from a T&E perspective will be recommended to the Military Departments for their consideration and integration into their closure/realignment candidates and alternatives from the other JCSGs.

4.0 SCHEDULE

4.1 Key milestones and schedules are shown in Attachment 2.

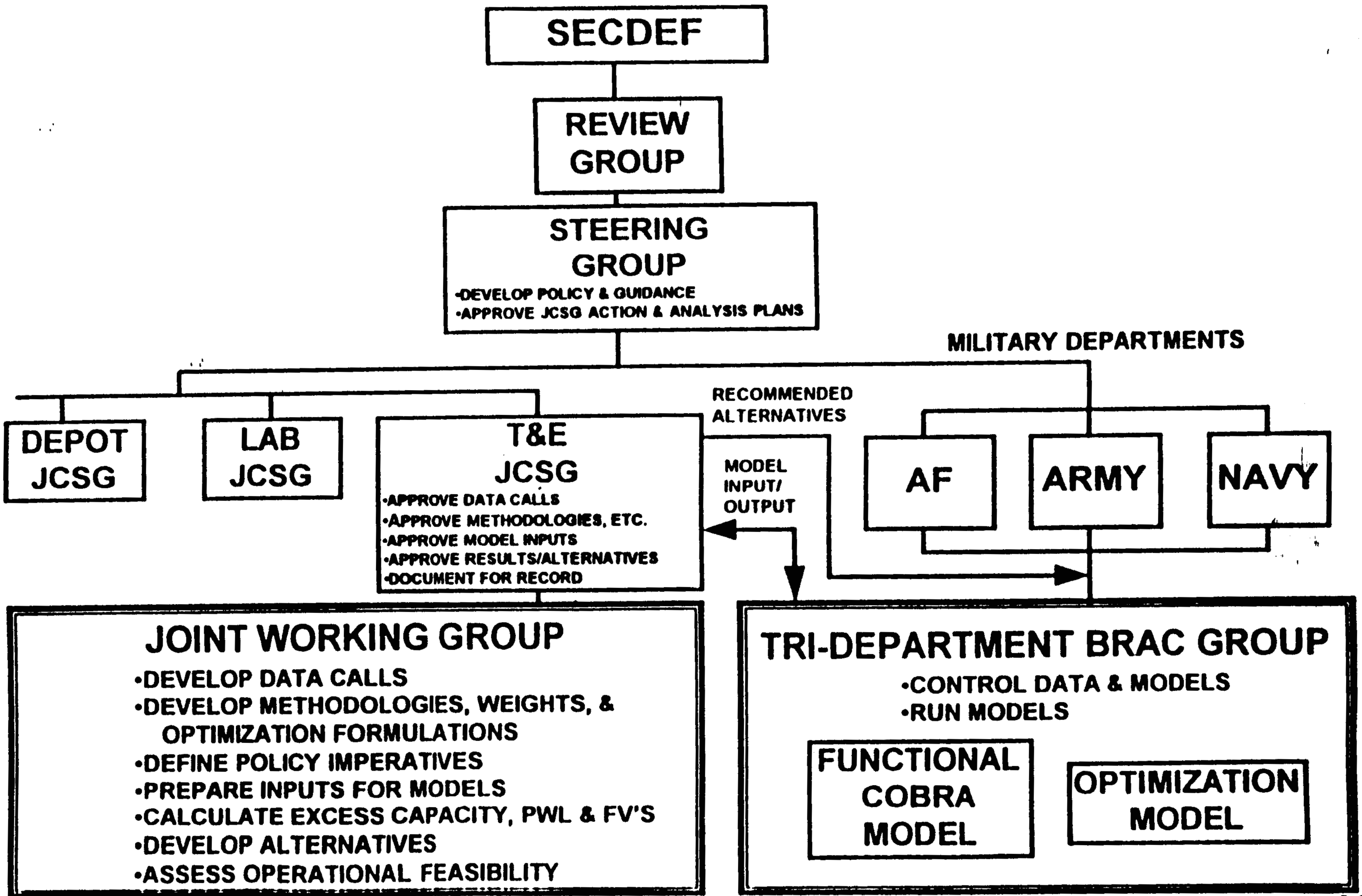
APPENDICES

A - T&E Functional Value Methodology
B - T&E Workload Projection Methodology
C - T&E Excess Capacity and Target Reduction Methodology
D - T&E Optimization Formulations
E - T&E Questions, Weights and Scoring Process
F - T&E Data Base Management Process
G - T&E Classified Data Analysis

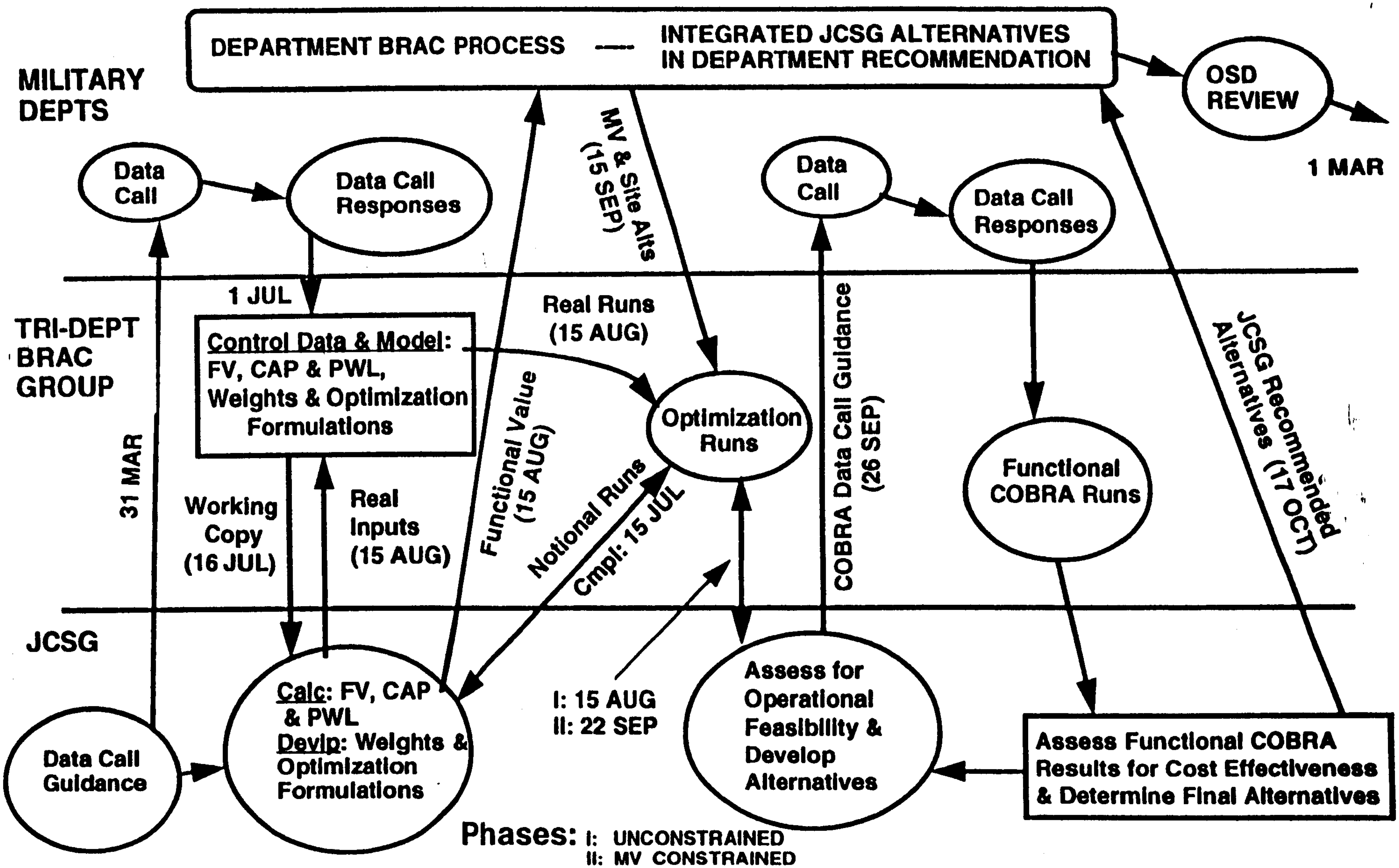
ATTACHMENTS

(1) Joint Analysis Team Structure
(2) Joint Analysis Process

JOINT ANALYSIS TEAM STRUCTURE



JOINT ANALYSIS PROCESS



APPENDIX A

T&E FUNCTIONAL VALUE METHODOLOGY

APPENDIX A. FUNCTIONAL VALUE

METHODOLOGY AND FRAMEWORK

1. INTRODUCTION: An objective assessment of functional value for each site which supports T&E of air vehicles, electronic combat, or armament/weapons is required as part of the Base Realignment and Closure (BRAC) cross-servicing process. This value will be used to support the development of alternatives for consolidating/realigning the T&E infrastructure.

2. DEFINITION: The standard dictionary definition of "value" is:

a. Worth in usefulness or importance to the possessor; and

b. A principle, standard or quality regarded as worthwhile or desirable.

Applying this standard definition, functional value for T&E joint cross-service analysis is defined as the value of performing T&E in one of the three functional areas (Air Vehicles, Electronic Combat, and Armament/Weapons) at a given site.

3. PURPOSE:

This document describes the methodology the T&E JCSG will use to arrive at functional values based on certified data from the Military Departments.

This methodology and framework provides a quantitative, consistent, and defensible basis for generating functional values for each site which performs Air Vehicles, Electronic Combat, and Armament/Weapons testing.

4. SCOPE:

The methodology generates functional values for each site and each functional area using certified data submitted in response to the T&E JCSG data call.

5. FRAMEWORK:

The framework for calculating functional value is based on a top down approach which captures the principal attributes required to support T&E within each functional area. The framework (see Figure 1) is comparable to a work breakdown structure (WBS). At the top level, two broad functional values (Physical and Technical) are required:

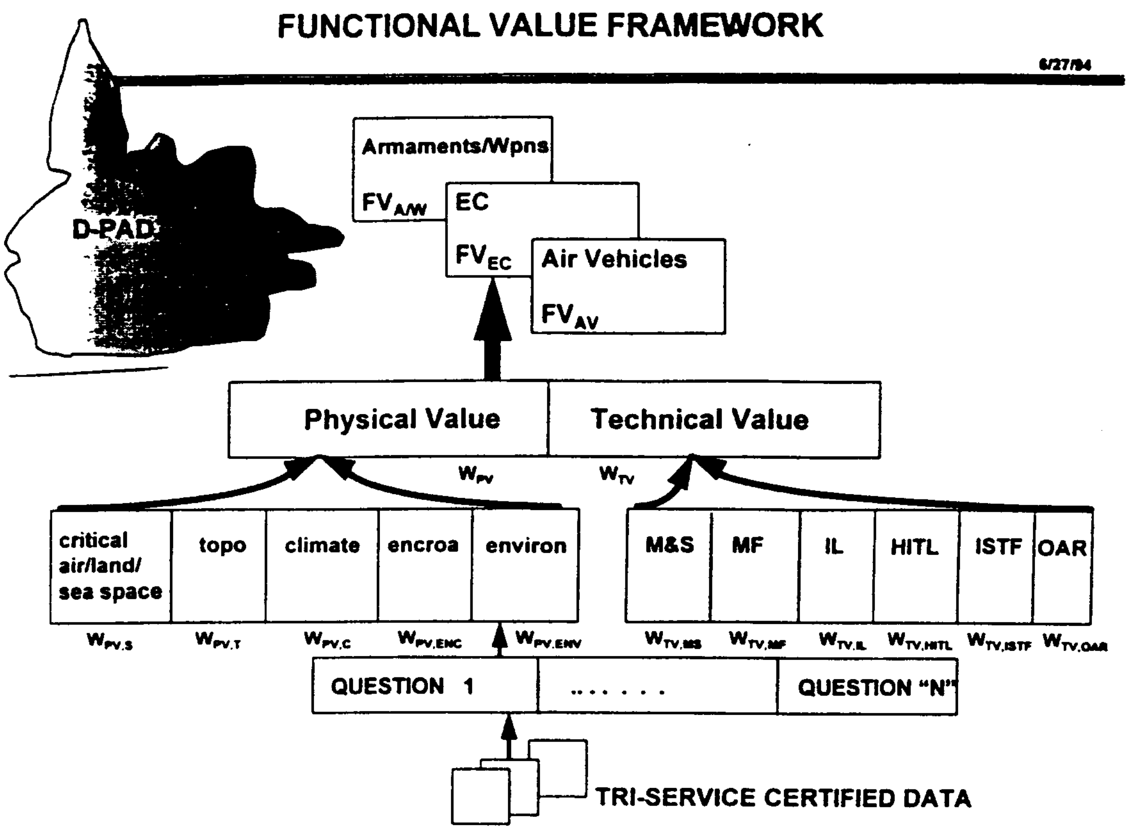


Figure 1

a. Physical Value. This category captures the intrinsic value of the air, land, and sea space as well as the varied topography and climates at a site as they relate to those required to support test and evaluation of system performance in real-world environments under realistic conditions. Encroachment and environmental categories attempt to capture to what extent future T&E operations might be affected by these factors.

b. Technical Value. This category captures the value of the man-made assets at each site in terms of their capability to support test and evaluation of current and future weapon systems.

These two top level categories (Physical and Technical) are further broken down into sub-categories. Physical value is based on a roll-up of critical air/land/sea space, topography, climate, encroachment, and environmental sub-categories. Technical value is based on a roll-up of six T&E test facility categories as defined in the T&E Data Call: (1) Modeling and Simulation (M&S), (2) Measurement Facilities (MF), (3) System Integration Laboratories (SIL), (4) Hardware-In-The-Loop (HITL), (5) Installed Systems Test Facilities (ISTF), and (6) Open Air Ranges (OAR).

Each of the sub-categories will be scored based on a set of questions unique to the functional area (air vehicles, electronic combat, and armament/weapons).

Included in the functional value framework is a set of weighting factors assigned in a top down process to the top two levels. The relative importance of each capability determines its weight. The weights will be the same for all three functional areas. At lower levels, questions and scoring criteria may be different within each functional area.

All questions, weights, and scoring criteria as approved by the T&E JCSG are contained in Appendix E. Notional data will be used to support the development of the questions, weights, and scoring criteria.

6. SCORING PROCESS:

The proposed T&E functional value scoring process is shown in Figure 2. Each site's data call responses will be evaluated against functional area scoring criteria and scored by the T&E JWG. Relevant data for a facility which conducts testing in more than one functional area will be scored in each area. Decision Pad (D-PAD) software will be used to facilitate scoring site responses and rolling up scores into functional values for each site.

T&E JCSG FUNCTIONAL VALUE SCORING PROCESS

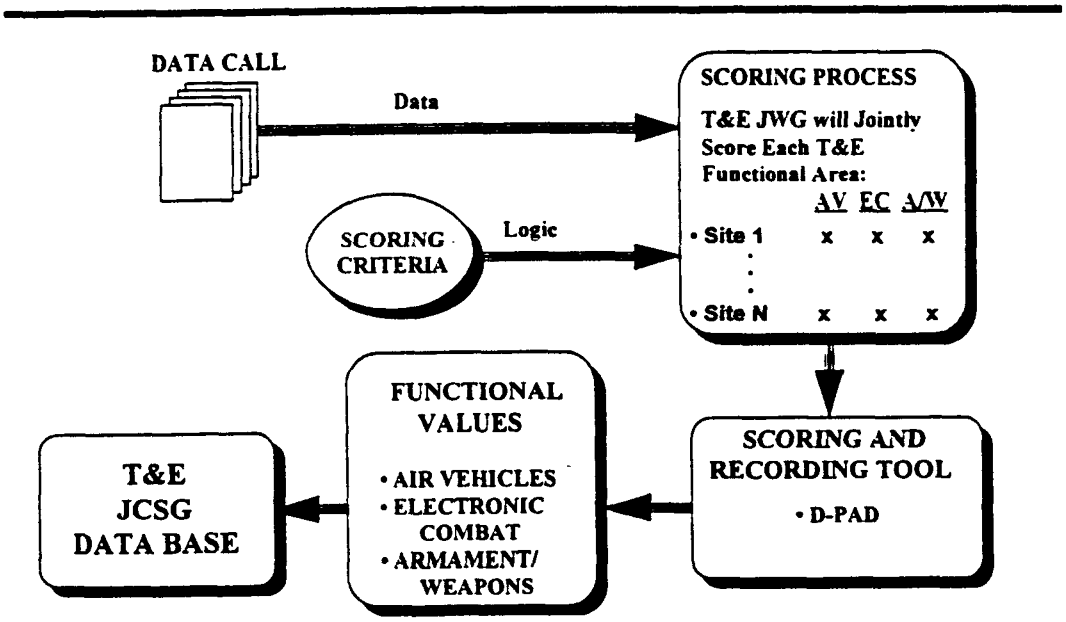


Figure 2

7. WEIGHTING NORMALIZED SCORES:

The mathematical formula for summing functional value scores is shown below. In addition, the framework consistently measures each site against the same set of questions. and the method is reproducible. All resulting functional values are between 0 and 100.

FUNCTIONAL VALUE WEIGHTING/SCORING

1. NORMALIZE ALL SCORES
2. EACH SCORE HAS AN ASSOCIATED WEIGHT
3. WEIGHTS ARE DECIMAL FRACTIONS LESS THAN ONE

$$\mathbf{FV} \equiv \sum_{i=1}^{2}\left[W_i\left(\sum_{j=1}^{m_i} W_{i,j}\left[100\left(\frac{\sum_{k=1}^{n_{i,j}} X_{i,j,k}}{\sum_{k=1}^{n_{i,j}} P_{i,j,k}}\right)\right]\right)\right]$$

$\Sigma_i W_i = 1.0$

$\Sigma_j W_{i,j} = 1.0$

W_i = WEIGHT ASSOCIATED WITH CAPABILITY

i = PV and TV

$W_{i,j}$ = WEIGHT ASSOCIATED WITH CAPABILITY CATEGORY

j = 1 THROUGH NUMBER OF CATEGORIES

$X_{i,j,k}$ = SITE'S SCORE AGAINST QUESTION k

$P_{i,j,k}$ = MAXIMUM SCORE FOR QUESTION k

k = 1 THROUGH NUMBER OF QUESTIONS

FV = FUNCTIONAL VALUE FOR A PARTICULAR FUNCTIONAL AREA SUCH AS AIR VEHICLE, ELECTRONIC COMBAT, OR ARMAMENT/WEAPONS

8. SUMMARY:

In summary, the functional value methodology and framework provides complete visibility into the relative importance, or weight, of each capability. Weights establish which capabilities are most critical to DoD. The site's functional values represent its inherent worth to DoD in three key functional areas: air vehicles, electronic combat, and armament/weapons.

APPENDIX B

T&E WORKLOAD PROJECTION METHODOLOGY

APPENDIX B. T&E WORKLOAD PROJECTION METHODOLOGY

1. INTRODUCTION: Inherent to the determination of excess capacity is the development of a future T&E workload projection for each of the functional areas being examined by the T&E Joint Cross-Service Group (JCSG). This document describes the method selected for projecting future workload requirements for the T&E joint cross-service analyses. The underlying premise for this method is that future T&E workload will increase/decrease in direct proportion to funding increases/decreases in the DoD budget. This method was selected based on its ability to provide a quantitative, consistent, and defensible basis for estimating future T&E workload.

2. ASSUMPTIONS:

a. The amount of workload generated by a fixed dollar amount is constant over the period FY92 - FY01.

b. The percentage of total workload for a given functional area that must be accomplished by each of the six test facility categories remains constant over the period FY92 - FY01.

c. The T&E JCSG analysis will include minimization of excess capacity as one of its goals; therefore, workload projections must be done at the test facility category level.

d. Outlay rates used in support of the FY95 President's Budget can be used for FYs93 - 99.

e. Workload for FY00 and FY01 equals that for FY99.

3. SCOPE: The methodology projects T&E workload throughout the FY95 - FY01 period and utilizes the workload measures specified in the JCSG T&E data call. The methodology draws upon historical workload information contained within the data call and funding data contained in the FY95 - 99 FYDP. Generation of T&E workload projections is the responsibility of the T&E JCSG.

4. METHODOLOGY: The method to be used in the T&E joint cross-service analysis generates a single T&E workload projection index for all functional areas for each fiscal year between FY95 - FY01. The basic steps in this method are as follows:

a. From the FYDP compute the total Budget Authority (BA) for Operation and Maintenance (O&M); Research, Development, Test and Evaluation (RDT&E); and Procurement funding.

b. Convert into constant FY95 dollars by deflating/inflating totals with certified inflation indices provided by the DoD Comptroller.

where TOM_x = total O&M BA for fiscal year x expressed in constant FY95 dollars.

TR_x = total RDT&E BA for fiscal year x expressed in constant FY95 dollars.

TP_x = total Procurement BA for fiscal year x expressed in constant FY95 dollars.

TOTAL BUDGET AUTHORITY

	FY90	FY91	FY92	FY93	....	....	FY00	FY01
O&M	TOM_{90}	TOM_{91}	TOM_{92}	TOM_{93}	....	....	TOM_{00}	TOM_{01}
RDT&E	TR_{90}	TR_{91}	TR_{92}	TR_{93}	....	....	TR_{00}	TR_{01}
Procurement	TP_{90}	TP_{91}	TP_{92}	TP_{93}	....	....	TP_{00}	TP_{01}

c. Compute total outlays for fiscal year x using certified outlay rates provided by the DoD Comptroller.

$$TBA_x = \sum_{k=1}^{7} (TOM_{x+1-k} \times OMOR_k + TR_{x+1-k} \times ROR_k + TP_{x+1-k} \times POR_k)$$

where $OMOR_k$ = outlay rate for O&M funding for kth year of the appropriation.

ROR_k = outlay rate for RDT&E funding for kth year of the appropriation.

POR_k = outlay rate for Procurement funding for kth year of the appropriation.

d. Compute average outlay baseline (AOB) for FY92 and FY93.

$$AOB = \frac{TBA_{92} + TBA_{93}}{2}$$

e. Divide total outlay baseline for fiscal year x from step c by the average outlay baseline from step d for fiscal years FY95 - FY01 to get the workload projection index for all functional areas.

$$I_x = \frac{TBA_x}{AOB} \qquad x = FY95,\ FY96,\ \ldots\ldots\ldots,\ FY01$$

f. Select test facility category (TRC_j; $j = 1, 2, \ldots\ldots, 6$) and functional area ($FA_i$; $i = 1, 2, 3$).

g. Compute total workload baseline for each test facility category for FY92 and FY93 within this functional area by summing over all sites s using test hour data from the Historical Workload form in the T&E JCSG Data Calls.

$$WTB_{ij} = \sum_{s} \frac{FY92_i\ \text{Workload}\ TRC_j + FY93_i\ \text{Workload}\ TRC_j}{2}$$

h. Multiply total workload baseline from step g by the workload projection index from step e to get the projected workload W_{xij} for test facility category j for fiscal year x and functional area i.

$$W_{xij} = FY_{xi}\ \text{Workload}\ TRC_j = I_x \times WTB_{ij}$$

i. Repeat steps f through h for each test facility category and each functional area.

TOTAL PROJECTED T&E WORKLOAD

Functional Area	Test Resource Category	FY95	FY96	....	....	FY01
Air Vehicles	DMS	W_{9511}	W_{9611}	....	....	W_{0111}
	MF	W_{9512}	W_{9612}	....	....	W_{0112}
	IL	W_{9513}	W_{9613}	....	....	W_{0113}
	HITL	W_{9514}	W_{9614}	....	....	W_{0114}
	ISTF	W_{9515}	W_{9615}	....	....	W_{0115}
	OAR	W_{9516}	W_{9616}	....	....	W_{0116}
EC	DMS	W_{9521}	W_{9621}	....	....	W_{0121}
	MF	W_{9522}	W_{9622}	....	....	W_{0122}
	IL	W_{9523}	W_{9623}	....	....	W_{0123}
	HITL	W_{9524}	W_{9624}	....	....	W_{0124}
	ISTF	W_{9525}	W_{9625}	....	....	W_{0125}
	OAR	W_{9526}	W_{9626}	....	....	W_{0126}
Armament/Weapons	DMS	W_{9531}	W_{9631}	....	....	W_{0131}
	MF	W_{9532}	W_{9632}	....	....	W_{0132}
	IL	W_{9533}	W_{9633}	....	....	W_{0133}
	HITL	W_{9534}	W_{9634}	....	....	W_{0134}
	ISTF	W_{9535}	W_{9635}	....	....	W_{0135}
	OAR	W_{9536}	W_{9636}	....	....	W_{0136}

APPENDIX C

T&E EXCESS CAPACITY AND TARGET REDUCTION METHODOLOGY

Appendix C: T&E Excess Capacity and Target Reduction Methodology

1. Introduction: Inherent to the determination of excess capacity is the determination of upper and lower limits in order to measure the arithmetic difference. Appendix B outlines the method for determining the lower limit, called Projected Workload. This document describes the method selected for establishing the upper limit, called T&E facility category Capacity. Excess capacity is the arithmetic difference between Capacity and Projected Workload. The T&E JCSG has determined that capacity will be calculated on an estimated single shift standard.

2. Assumptions:

a. A standard single shift workyear is 2008 hours, which does not include leave or administrative and training time.

b. Workload per facility hour remains constant over the period of FY93 through FY01

c. Capacity of the facility/capability will be prorated to the T&E Functional Area and T&E Test Facility Category as indicated on the General Information Worksheet of the data call.

d. MS Excel software will be used to input and compute capacity values.

3. Scope: The methodology estimates the workload capacity (calculated in units of test hours) of a T&E facility/capability by using the workload per facility hour of that facility/capability and extrapolating it over an annual single shift operation. This value is then allocated by T&E Functional Area and T&E Test Facility Category as indicated on the General Information Worksheet supporting that facility/capability. This capacity is then compared to the projected workload to determine the excess capacity.

4. Methodology:

a. CAPACITY: The method to be used in the T&E JCSG calculations generates a single estimated T&E capacity for each T&E Test Facility Category within each T&E Functional Area. The basic steps in this method are as follows:

(1) Total Facility/Capability Capacity (TFCC): Compute the TFCC (in units of test hours) by taking the total of the "Test At One Time" from Column 5 on the Determination of Unconstrained Capacity worksheet, and multiplying it by 2008.

(2) Total T&E Capacity (TEC): Compute the TEC by multiplying TFCC by the percent of T&E usage of the facility/capability as indicated in the General Information worksheet.

(3) Total T&E Capacity Allocated by Functional Area: Compute the total T&E capacity of the facility/capability to be allocated to each functional area (AVCAP for Air Vehicles, WEPCAP for Armanent/Weapons & ECCAP for Electronic Combat) by multiplying the TEC by the percentage indicated for each functional area in the General Information worksheet.

(4) Add the above functional area capacities to the respective T&E Test Facility Category totals, within each functional area, as indicated on the General Information worksheet.

b. EXCESS CAPACITY: The method to be used in the T&E JCSG calculations generates a single T&E excess capacity for each T&E Test Facility Category within each T&E Functional Area. The basic step in this method is to subtract the projected workload for the appropriate T&E Test Facility within a T&E Functional Area from the total T&E capacity allocated to that same T&E Test Facility within the same T&E Functional Area.

c. TARGET REDUCTION: Targets for reducing excess capacity will be determined based on the methodology outlined in Attachment 1 to this Appendix. Special attention will be given to facilities/capabilities that show a negative excess capacity as a result of the nature of their operations.

5. Execution: The above algorithm will be incorporated into an MS Excel spreadsheet that will automatically calculate and prorate the capacities using the following inputs:

a. TOTSUM: Workload or Test At One Time (per facility hour). Taken from column 5 of the Determination of Unconstrained Capacity worksheet.

b. %T&E: Percentage of T&E usage of the facility/capability. Taken from the "PERCENTAGE USE:" row of the General Information worksheet.

c. %AV: Percentage of T&E usage for Air Vehicle T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

d. %WEP: Percentage of T&E usage for Armament/Weapons T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

e. %EC: Percentage of T&E usage for Electronic Combat T&E. Taken from the "T&E" column of the "BREAKOUT BY T&E FUNCTIONAL AREA (%):" section of the General Information worksheet.

f. $\overline{\text{PWL}}$: Projected workload for each intersection of T&E Test Facility Categories and T&E Functional Areas (a total of 18 inputs).

EXCESS CAPACITY REDUCTION TARGET METHODOLOGY

➢ **Tasking** - Each JCSG has been tasked to:

- Review excess capacity analyses, and
- Develop numerical excess capacity reduction targets

➢ **Proposed Target**

- Reduce all excess capacity as defined below, where cost effective

➢ **Excess Capacity Definition**

- Delta between single-shift capacity and projected workload

➢ **Reduction Target Constraints**

- Separate for each T&E functional area
- Separate for each test facility category within each T&E functional area
- Exclude excess capacity associated with unique, one-of-a-kind facilities

➢ **Cost Effectiveness**

- Based on total costs, to include non-T&E and customer costs

Attachment 1

These workload factors are always normalized in the objective functions by dividing by the corresponding workload requirements, so that the objective functions will only sum terms with consistent relative workload units. All four of the optimization formulations support a parametric variation in the relative weights (w and $1-w$) applied to a pair of terms in each objective function. This allows the T&E JCSG to develop alternatives which evaluate the impact of composite objective functions; for example, minimizing the number of open sites as a primary objective while maximizing the functional value of the workload assignment as a subordinate objective. The weight w is constrained between the values of 0 and 1 to avoid any distortion of the scale or units for the components of the objective functions.

Objective Functions.

a. The **MAXSFV** formulation. This formulation maximizes the sum of the functional values for all of the retained sites. The objective function for this formulation is given in Table 1. If the number of sites to be retained is not included as a constraint, all of the sites will be retained in the solution because the objective function is maximized when $o_s = 1$ for all sites. Obtaining meaningful results with this formulation, therefore, requires a constraint on the number of sites retained. If $w = 1$, then this formulation reduces to maximizing the functional value sum over the open sites. If $w = 0$, then the objective function maximizes functional value weighted by the fraction of required workload assigned to the site.

b. The **MINNMV** formulation. This formulation will find a small number of sites having the highest military value that can accommodate the DoD required workload. In addition, it will assign the DoD requirement for each cross-service function to the retained sites (or activities) having the highest functional value for that function. The purpose of this formulation is to assign, to the extent possible, the cross-service functional requirements to sites or activities having high military value and high functional values.

The objective function for this formulation is given in Table 2. This formulation is referred to as **MINNMV** because it minimizes the sum of $4 - nmv_s$ for retained sites or activities. Sites or activities having a high military value (3) will have 1 as their value for nmv, while sites with low military values (1) will have 3 as their value for nmv.

If $w = 1$, then the objective function includes only military value as a term. If $w = 0$, then the objective function is identical to **MAXSFV** with its $w = 0$.

c. The **MINXCAP** formulation. If the parameter w is set to a large value (*eg*, $w = 0.9$), this problem formulation will find the set of retained sites having the smallest total functional capacity but still able to perform the DoD functional requirement. Depending on w, functional assignments are also optimized. The objective function for this formulation is given in Table 3.

If $w = 0$, this formulation - like the **MINMNV** formulation - is also equivalent to the **MAXSFV** formulation with its $w = 0$. If w is set to a large value, excess capacity is reduced as much as possible with minimal regard for functional value.

d. The **MINSITES** formulation. This formulation, depending on the value of *w*, will find the minimum-sized set of sites that can perform the DoD functional requirement. The objective function for this formulation is given in Table 4.

If *w* is set to a large value (*eg*, 0.9), the cross-service functional workload is assigned to the smallest number of sites, with minimal regard for functional values.

Constraints. The constraint equations common to all four optimization formulations are given in Table 5. The constraint on the number of sites will be deactivated for some optimization runs - in particular, for the **MINSITES** formulation which seeks the minimum number of sites to be retained as part of the solution.

Policy Imperatives. A policy imperative is any statement that can be formulated as a constraint in the model and is added to the basic set of constraints given in Table 5. Policy imperatives are generally imposed on an individual site or subset of the sites.

TABLE 1.

MAXSFV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s,\, l_{sfr}}}{\text{Maximize}} \left\{ \frac{w}{u_1} \cdot \sum_s o_s \cdot \sum_f \text{fv}_{sf} + \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s l_{sfr} \cdot \text{fv}_{sf}}{\text{req}_{fr}} \right\},$$

where s is the site index,

f is the functional area index, and

r is the test facility category index,

w and $1 - w$ are weights assigned for each optimization run ($0 \leq w \leq 1$),

u_1 is calculated from $\sum_s \sum_f \text{fv}_{sf}$,

u_2 is calculated from $\sum_f \sum_r \text{fv}_{max}$,

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 2.

MINNMV OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s,\, t_{sfr}}}{\text{Minimize}} \left\{ \frac{w}{u_1} \cdot \sum_s o_s \cdot nmv_s - \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s t_{sfr} \cdot fv_{sf}}{req_{fr}} \right\},$$

where s is the site index,
f is the functional area index.
r is the test facility category index,

w and $1-w$ are weights assigned for each optimization run ($0 \le w \le 1$),

u_1 is calculated from $\sum_s nmv_s$,

u_2 is calculated from $\sum_f \sum_r fv_{max}$,

o_s is the open-site decision variable for each site s,

nmv_s is equal to ($4 - mv$) for site s and mv is its military value (assigned as 1, 2, or 3),

fv_{sf} is the functional value for site s and functional area f,

t_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 3.

MINXCAP OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s,\, t_{sfr}}}{\text{Minimize}} \left\{ \frac{w}{u_1} \cdot \sum_f \sum_r \frac{\sum_s o_s \cdot cap_{sfr}}{req_{fr}} - \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s t_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right\}$$

where s is the site index,

f is the functional area index,

r is the test facility category index,

w and $1-w$ are weights assigned for each optimization run ($0 \le w \le 1$),

u_1 is calculated from $\sum_f \sum_r \frac{\sum_s cap_{sfr}}{req_{fr}}$,

u_2 is calculated from $\sum_f \sum_r \frac{\sum_s \mathrm{fv}_{max}}{req_{fr}}$

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

t_{sfr} is the workload assigned to site s for functional area f and test facility category r,

cap_{sfr} is the capacity of site s for functional area f and test facility category r

TABLE 4.

MINSITES OPTIMIZATION FORMULATION

$$\underset{\substack{\text{with respect to} \\ o_s, l_{sfr}}}{\text{Minimize}} \left\{ \frac{w}{u_1} \cdot \sum_s o_s - \frac{(1-w)}{u_2} \cdot \sum_f \sum_r \frac{\sum_s l_{sfr} \cdot \mathrm{fv}_{sf}}{req_{fr}} \right\},$$

where s is the site index,

f is the functional area index,

r is the test facility category index,

w and $1 - w$ are weights assigned for each optimization run $(0 \le w \le 1)$,

u_1 is calculated from $\sum_s 1$,

u_2 is calculated from $\sum_f \sum_r \mathrm{fv}_{max}$,

o_s is the open-site decision variable for each site s,

fv_{sf} is the functional value for site s and functional area f,

l_{sfr} is the workload assigned to site s for functional area f and test facility category r,

req_{fr} is the workload requirement for functional area f and test facility category r

TABLE 5.

CONSTRAINT EQUATIONS

$\sum_{s} o_s \cdot cap_{sfr} \geq req_{fr}$, for all f, r

$\sum_{s} l_{sfr} = req_{fr}$, for all f, r

$0 \leq l_{sfr} \leq o_s \cdot cap_{sfr}$, for all s, f, r

$o_s = \{ 0 \text{ or } 1 \}$, for all s

$\sum_{f} \sum_{r} l_{sfr} \geq o_s$, for all s

$\sum_{s} o_s = n_{limit}$,

where n_{limit} is assigned as a run limit on the number of sites

APPENDIX E

T&E QUESTIONS, WEIGHTS AND SCORING PROCESS

Appendix E: Questions, Weights, and Scoring Process

1. INTRODUCTION:

This appendix provides the questions, weights, and scoring process used by the T&E Joint Cross-Service Group (JCSG) to derive functional value (see Appendix A for a discussion of functional value (FV) methodology and framework). The questions, weights and scoring process provides a quantitative, consistent, and defensible basis for generating T&E functional values for each site/activity in the areas of Air Vehicles, Electronic Combat, and Armament/Weapons testing.

2. QUESTIONS:

The questions were developed as a means to assign T&E FV to physical and technical capabilities of each responding site/activity within each of the three functional areas in which it performs work. The questions were derived from the T&E JCSG Data Call of 31 March 1994. and are to be used in the scoring of the T&E FV for common functions at each site/activity.

The data used to answer these questions comes only from the certified data received from each site/activity. Data not used to answer these questions will be evaluated in the operational feasibility phase of the study. This is the phase of the evaluation process in which technical and military judgment is exercised to ensure that the required DoD T&E capability is retained for each proposed alternatives.

The actual questions are administratively sensitive and are held separately within an Annex to this Appendix.

3. WEIGHTS:

Weights were approved by the T&E JCSG based on recommendations from the T&E Joint Working Group (JWG). The weights measure relative importance of the major elements of physical value, the T&E test facility categories, and the site/activity's physical and technical value.

The actual weights are administratively sensitive and are held separately within an Annex to this Appendix.

4. SCORING PROCESS:

Consistent with the Internal Control Plan, a disciplined and controlled process for scoring and evaluating the data will be used in order to preserve the integrity of the process and to control access to the certified data. The following describes elements of the scoring process:

A. Scoring by the JWG.

Each functional area -- Air Vehicles, Electronic Combat, and Armament/Weapons -- will be scored by one or two JWG members from each Military Department. JWG members are to be designated in writing by each Military Department BRAC office to the OSD Co-Chairs prior to the start of the scoring process.

Each JWG member will score the T&E questions independently, after which the scores will be jointly reviewed. A consensus approach will be employed, with disagreements resolved by the lead members of the JWG from each Military Department.

B. The Data.

The data used in the scoring process will be extracted only from hard copies of the certified data call responses provided by the Tri-Department BRAC group. They will provide only one hard copy of each activity's data call response. With this transfer of the data's control, the Office of the Secretary of Defense (OSD) assumes responsibility for the integrity of the information. Due to the sensitive nature of the data, the Office of the Secretary of Defense will designate an Administrator who will serve as a central control point for the data.

The Administrator will be charged with maintaining the integrity of the data by storing the data, with accompanying questions, weights, score sheets, and computer disks, in a safe to which only the Administrator has access, by providing T&E Data Call responses only to the designated JWG members from the Military Department that "owns" the data, and by recording the time of the data's "check-out" and to whom it was released. The Administrator will be available to perform this function in a manner that does not adversely affect the efficiency and effectiveness of the scoring process.

C. Physical Facility.

Scoring will be done in a common area within IDA's Test & Evaluation Center (TEC), where JWG members will have unrestricted access to all the T&E data after check-out by the Administrator, provided a representative of all three Military Departments are present. Access to the TEC and T&E JCSG data, will be limited to Military Department BRAC personnel as identified, in writing, to the T&E JCSG Co-Chairs, including the OSD appointed administrators. The JCSG and JWG members (as designated above) will have unlimited access to the TEC. During the scoring process, or any other time, no data or working papers will be removed from the scoring workspace without concurrence from all members of the JWG. At no time will official scoring be conducted without a JWG member from all three Military Departments being present.

D. The Scoring Procedures.

The score sheets will be maintained and controlled with the data call responses. They shall be initialed by each JWG member when the member completes the evaluation. There will be at least two reviews of the data. The first review will be for obvious errors and for comprehensiveness of the activity's data call response. This will also serve as an indication of the consistency with which sites/activities interpreted the data call questions.

If clarifications of the data are required, the parent Military Department's BRAC office will obtain the clarification using procedures established by individual Service BRAC process. At least two of the three Military Departments must agree on clarification requests. Requested clarifications can be initially submitted by FAX but must be followed up with a fully certified copy, as required. Memos-to-the-File must be prepared and signed by all three Military Departments to document minor clarifications received via telephone or fax. All changes made to reported data, with an accompanying justification for those changes, shall be transmitted back to the respective BRAC office(s) for any necessary amendments to the official data call response(s).

Some criteria for requesting data clarification are as follows: (1) data is not provided by T&E test facility category; (2) data is missing, inconsistent or incomplete; (3) an inappropriate N/A response was provided; (4) data is not in the correct format, e.g., wrong units; and (5) other errors or trends are contained which would impact the analysis and are agreed to by the JWG lead members or their designee.

The second review will be for the FV scoring of the certified data. If, during scoring, further clarifications are required, the clarification procedure described above will be followed. Finally, when the scoring process is completed, the data on the scoring sheets shall be entered into D-PAD software which will be used to facilitate scoring site/activity responses and rolling up scores into functional values for each site/activity. D-PAD is a commercially available product used by the Department of the Army in BRAC-91 and BRAC-93.

Throughout this process the lead member of the JWG from each Military Department will conduct quality reviews, provide guidance and resolve issues and disagreements raised in the scoring process. If necessary, issues and disagreements will be presented to the T&E JCSG for final resolution.

When the above procedures are complete, the JCSG-approved Air Vehicles, Electronic Combat, and Armament/Weapons FV scores for each site/activity will be provided to the Tri-Department BRAC Group as inputs to the optimization model.

1 Annex: Functional Value questions & weights (*To be held: **CLOSE HOLD - FOUO***)

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ANNEX to Appendix E: Functional Value Questions & Weights

1. INTRODUCTION:

Appendix E provided the scoring process to be used by the T&E JCSG to derive ~~T&E~~ Functional Value (FV). This ANNEX provides;

a. The rationale supporting the assignment of the weights and points to be used in the calculation of FV ~~for T&E sites.~~

b. The weights to be applied to each T&E Test Facility Category (TFC) ~~element~~ for the calculation of Technical Value (TV) and to each element of Physical Value (PV) (i.e.: Critical Air/Land/Sea Space, Topography, Climate, etc.).

c. The FV questions with the maximum points and scoring method for each question.

2. DISCUSSION:

The value of a T&E site is composed of three unique ~~elements:~~

a. Physical - As described in Appendix A to the basic document, the physical ~~characteristics~~ of a site ~~provide its intrinsic value~~. These include Critical Air/Land/Sea Space, Topography, Climate, Encroachment, and Environment characteristics which combine to produce the PV of the site.

b. Technical - As also described in Appendix A to the basic document, technical characteristics of a site ~~provide its~~ man-made ~~value~~. These ~~include all~~ of the ~~T&E~~ TFC of Modeling & Simulation (M&S), Measurement Facilities (MF), Integration Labs (IL), Hardware-in-the-Loop (HITL) Facilities, Installed Systems Test Facilities (ISTF), and Open Air Ranges (OAR), which combine to produce the TV of the site.

c. People - The personnel who conduct and support the T&E ~~activities~~ provide the intellectual value of the site.

Physical characteristics that are essential for the conduct of test missions are impossible to relocate and consolidate at another site. Therefore, physical characteristics are given higher weighing when determining FV. Technical characteristics, for the most part, were constructed or acquired at a site and can be relocated with varying degrees of cost and difficulty depending upon the complexity of the infrastructure required to support them, and to the extent it they are geographically constrained. Therefore, technical characteristics are given a lower weighting. People are the most mobile ~~element~~ resource. They can be moved ~~very easily and~~ at ~~minimal~~ cost. Reconstitution of the intellectual skills required to support test missions can be accomplished anywhere that has existing T&E sites ~~in a relatively short~~ period of time. Therefore, this ~~element of value~~ resource is not used in the calculation of FV.

Section 3 below provides the assigned weights and rationale for PV, TV, and their associated elements. Section 4 provides the rationale for the points assigned to each FV question. Figure 1 of Appendix A to the basic document provides a graphic view of how the points and weights are rolled-up to obtain FV for a particular Functional Area.

3. RATIONALE FOR WEIGHTS:

The following paragraphs provide the basis for the T&E JCSG determination of appropriate FV weights.

a. <u>Physical Value (XX%)</u> - It is of paramount importance that the DoD retain a sufficient quantity of air, land, and sea space with broad diversity of physical and climatological environments to replicate all geographic regions that the U.S. Armed Forces may be called upon to operate weapons, platforms and sensors ~~in~~. Such a capability must be retained not only for equipment that is currently in the inventory, but also for those under development ~~or consideration~~ within the period covered by the FYDP. The DoD must retain the ~~right~~ ability to test these equipments while concurrently being sensitive to the development & environmental concerns of the land it is steward of and the regional communities. ~~it is a part of~~. Such quantities and diversity of space are irreplaceable, and should not be threatened by encroachment from community development or ~~increasing~~ environmental limitations. Therefore PV is given a higher weight to ensure that higher FV is assigned to those sites which ~~can~~ most fully satisfy the physical requirements.

(1) <u>Critical Air/Land/Sea Space (xx%)</u> - The requirement for sufficient quantities of space to conduct test operations is considered the strongest driver in the assignment of FV. At some point in time the equipment that has been subjected to a broad battery of focused testing must be fully exercised in realistic operational environments. Such testing areas must be large enough, and at times secure enough, to contain the test and ensure ~~the integrity of~~ public safety. The availability of ~~restricted~~ DoD controlled space is of particular concern ~~for weapons/munitions testing~~. Therefore, Critical Air/Land/Sea Space was assigned the highest weight.

(2) <u>Topography & Climate (xx% each)</u> - The worldwide employment of U.S. Armed Forces requires that T&E facilities be able to test equipment in the diverse topographies and ~~climatic~~ zones ~~that~~ they will be employed ~~in~~. No single T&E site ~~can~~ support all required operational environments. Therefore, these two elements were each given a ~~much~~ lower weight than the element of Critical Air/Land/Sea Space.

(3) <u>Encroachment & Environment (E&E) (xx% each)</u> - Although very important to the long-term availability of a site, E&E issues were deemed to play a secondary role in the development of FV. The large land or sea areas that most T&E sites operate in are large enough to enable the site to coordinate with regional planning and regulatory agencies to develop ~~work arounds~~ to E&E issues that do not restrict or inhibit a sites ability to fully support its T&E mission. Therefore, E&E issues are not "drivers" in the formulation of ~~closure/consolidation alternatives. Furthermore,~~ the comprehensive impact of these issues will be fully addressed in each Military Departments treatment of the installations that their T&E facilities are located on. Accordingly, the elements E&E were each assigned ~~relatively~~ low weights.

b. <u>Technical Value (YY%)</u> - TV elements are typically infrastructure dependent. They require a ~~building~~ of some sort to house equipment used for testing equipment - sometimes in controlled environments. Although the elements of TV are very important to the overall value of a site, some are relocatable and can be built anywhere independent of the physical characteristics. However, some of them do depend on the ~~physical characteristics~~ of ~~the site for their value. The~~ diversity of land forms and available elevations ~~are critical to their effectiveness~~. For these reasons the T&E JCSG ~~determined to give~~ TV a ~~slightly~~ lower weight in recognition of its ~~strong~~ influence ~~, albeit lower than PV, to~~ the overall FV of a T&E site.

(1) <u>Modeling & Simulation Facilities (yy%)</u> - M&S facilities are not infrastructure intensive and are very transportable. In ~~many~~ cases they require no more investment than that required for normal office space. Therefore, M&S facilities were assigned ~~a relatively~~ low weight.

(2) <u>Measurement Facilities (yy%)</u> - In ~~many~~ Some instances MF are ~~very~~ dependent on the physical characteristics of air and land space. ~~They are also~~ infrastructure intensive due to the unique design and support requirements of the buildings and structures that support them. Due the size of some of these facilities (some of which are as large as some ISTF) ~~they~~ are ~~irreplaceable or~~ very expensive to replicate at another site. Therefore, MF were assigned a ~~relatively high~~ weight.

They represent a broad spectrum from simple to complex facilities, and can

(3) Integration Laboratories (yy%) - Most IL facilities are less infrastructure intensive and can be relocated, albeit with some degree of difficulty. Although they typically only do integration at the component level, ~~many~~ SOME perform ~~the same~~ integration functions ~~as~~ AND TO THE ~~performed by an ISTF - some even being equal in size to an ISTF.~~ Therefore, IL were assigned a ~~relatively~~ ~~medium~~ LOW weight.

SYSTEM LEVEL

(4) Hardware-in-the-Loop Facilities (yy%) - HITL facilities ~~are~~ CAN also BE infrastructure intensive with sizeable equipment investments that are integral to the facilities that support them. They typically support integration at the ~~more complex~~ SUB systems level. Therefore, HITL facilities were assigned a ~~relatively high~~ MEDIUM weight.

(5) Installed Systems Test Facilities (yy%) - ~~There are very few ISTF in the three Military Departments.~~ However, those that do exist are as infrastructure intensive as HITL facilities. ISTF typically support integration within the weapon platform. Therefore, ISTF were assigned a ~~relatively~~ ~~high~~ MEDIUM weight.

(6) Open Air Ranges (yy%) - OAR represent an extensive investment in instrumentation AND SUPPORT [illegible]. The value of the instrumentation is enhanced by the diversity of azimuth and elevation at which it can be placed relative to the air/land/sea space it supports. In most cases it's the OAR that enables a site to ~~take~~ full advantage of its physical characteristics AND WHICH REPLICATE THE REAL WORLD ENVIRONMENT. Therefore, OAR facilities were assigned the highest weight for TV.

DRIVEN BY QUANTITY AND CONDITION, AND

4. RATIONALE FOR QUESTIONS & POINTS:

Attachments 1, 2 & 3 provide the FV questions with points and scoring method for each. The attachments will be used to score the functional areas of Air Vehicles, Electronic Combat, and ~~Weapons~~ ARMAMENT/Munitions respectively.

ISTFs ARE TYPICALLY USED TO TEST A FULLY INTEGRATED WEAPON SYSTEM PLATFORM, AND ARE AND INFRASTRUCTURE INTENSIVE. ~~AS OTHER~~

a. SCORING SCALES FOR FUNCTIONAL VALUE.

Four types of scoring scales will be used to determine T&E functional values: Yes/No, 0-Max, Hybrid, and 0-Max with Threshold. These scales will be used to determine what portion of the total points available to a given question are credited to a site/activity within a given functional area. Yes/No and 0-Max are applied to the great majority of the T&E functional value questions and are therefore discussed first.

(1) **Yes/No.** This scale is applied to questions for which only a binary response is possible. Depending on the sense of the question, all of the available points will be credited to a "Yes" response with none being credited to a "No" response (e.g., "Is the facility equipped to support TOP SECRET or Special Access work?"); or, all of the available points will be credited to a "No" response (e.g., Does the facility have limiting environmental characteristics?").

(2) **0-Max.** This scale is applied to questions for which a continuum of responses is possible. Generally, this scoring approach assigns credit on a "bigger is better" basis. For example, "What is the ramp space available?" In this case, the site with the most ramp space will be credited with all the points available to that question. Credit to all other sites will be apportioned linearly (i.e., $y = mx$), such that a site with half the amount of ramp space as that of the site with the most ramp space will get exactly half of the points available to that question. A site with no ramp space will get no points.

In the "bigger is worse" case, (e.g., "What is the total population inside a 50 mile radius of the facility?"), the site with no population within the 50 mile radius will be credited with all of the points available. The site with the most population will get no credit. For scoring purposes, responses to questions which were cast in the negative sense (bigger is worse) will be converted to the positive sense (bigger is better) prior to application of the 0-Max scoring scale. This will give functional value credit for the inherent positive value of a site's characteristic. For example, responses to "What percent of test missions were canceled due to encroachment in the past two years?" are easily converted to correspond to the more appropriate (from a functional value perspective) question, "What percent of test missions were <u>not</u> canceled due to encroachment in the past two years?"

(3) **Hybrid.** A hybrid of the preceding two scoring scales has been developed to cover a very few questions. It is applied to questions which seek "yes/no" responses to a given set of sub-questions. For example, "How many of the following spectra are available to test against: RF, EO, IR, MMW, UV, laser?" is equivalent to asking six separate "yes/no" sub-questions. If no site/activity has all six spectra, then the site/activity with the maximum number of spectra will set the "maximum" and will get all of the available points. Sites/activities with fewer available spectra will be scored on a 0-Max basis.

(4) **0-Max with Threshold.** A variation of the 0-Max scoring approach can be applied when the capabilities of any given site/activity exceed the DoD requirement (threshold). In this case, a portion of the points available to a question (e.g., x %) can be assigned linearly based on a 0-Threshold approach. The remaining points (100-x %) can be assigned linearly on a Threshold-Max

basis. An example of this is airspace. The site/activity with the most airspace would get all of the points available to that question. A site/activity with an amount of airspace which just meets the airspace requirements for the most stressing weapon system, current or in the FYDP would get x % of the points available to that question.

b. QUESTION POINTS FOR FUNCTIONAL VALUE.

(1) PHYSICAL VALUE

(a) Critical Air/Land/Sea Space

Critical air/land/sea space is the most important physical value of any other physical subcategory (i.e., topography, climate, encroachment, and environment) because it represents an irreplaceable asset that must be maintained to support/satisfy DoD test requirements within each of the three functional areas -- Air Vehicles, Electronic Combat, and Armament/ Weapons.

(b) Topography

Air Vehicles. Five out of six types of topography included in the Data Call's question were land and one type was water. Therefore, it was reasonable to make sea topography count twice as much as any one type of land topography. All types of land topography are equally valued and, therefore, equally weighted. Since there is only one question in this category, it receives the full 100 points.

Electronic Combat. Same as Air Vehicles.

Armament/Weapons. Same as Air Vehicles.

(c) Climate

Air Vehicles. Two questions were used to define the climatic category. One addresses visibility greater than three miles in order to identify VFR flight conditions and atmospheric conditions which support photo-optic tracking. The other addresses percentage of time test missions are canceled due to weather. To air vehicles, which routinely use VFR conditions, visibility greater than three miles is weighted higher than missions cancelled.

Electronic Combat. To electronic combat, test missions can be conducted under IFR conditions without adverse impact to mission efficiency or data quality. Therefore, the question regarding visibility greater than three miles was eliminated. The other question addressing the percentage of time test missions are canceled due to weather, was the only question used so it received the full 100 points.

Armament/Weapons. Two questions were used to define the climatic category. One addresses visibility greater than three miles in order to identify VFR flight conditions and atmospheric conditions which support photo-optic tracking. The other addresses percentage of time test missions are canceled due to weather. To armament/weapons the questions are equally important.

(d) Encroachment

Air Vehicles. Historical test mission impacts due to commercial/public use and encroachment are direct indicators of current encroachment and are weighted twice as high as the indirect/future encroachment indicators related to total population within 50 and 100 miles

Electronic Combat. Same as Air vehicles.

Armament/Weapons. Same as Air Vehicles.

(e) **Environmental**

Air Vehicles. One question addresses the environmental limitations and receives 100% of the points.

Electronic Combat. Same as Air Vehicles.

Armament/Weapons. Same as Air Vehicles.

(2) TECHNICAL VALUE

(a) Digital Models and Simulations

Air Vehicles. DM&S facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Same as Air Vehicles.

Armament/Weapons. Same as Air Vehicles.

(b) Measurement Facilities

Air Vehicles. Measurement facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. The question regarding specific spectra to test against drives, to a large extent, the value of a given facility (replacement cost) as well as whether EC testing can be done at one location or work must be distributed among many, which is more costly and the data is difficult to correlate. Therefore, the majority of the value (and points) are associated with the technical capabilities. Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers. Specific technical test areas are equally weighted.

Armament/Weapons. The majority of the value (and points) are associated with the technical capabilities for armament/weapons. Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers. Specific technical test areas are equally weighted.

(c) Integration Laboratories

Air Vehicles. Integration laboratories that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Same as Air Vehicles, except questions 1 and 2 are weighted equally due to the significantly increased cost involved with enabling an integration lab to accommodate TOP SECRET/SAR work

Armament/Weapons. Same as Electronic Combat.

(d) **Hardware-in-the-Loop Capabilities**

Air Vehicles. Hardware-in-the-Loop facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Questions 1 and 2 are weighted higher because they are the primary cost and capability drivers for HTIL capabilities (question 1 more so than question 2, as additional labs are generally required for additional spectra). Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers.

Armament/Weapons. As with EC, the majority of the value (and points) are associated with the technical capabilities for armament/weapons. Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers. Specific technical test areas are equally weighted.

(e) **Installed Systems Test Facilities**

Air Vehicles. Installed Systems Test facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Questions 1 through 4 are weighted higher because they are the primary cost and capability drivers (especially MILCON) for ISTF's. Therefore, the majority of the value and points are associated with these required technical capabilities, which are equally weighted. Sub-areas of a technical question are also evenly weighted. Of less value and points are the questions associated with test types and higher than irreparable harm, TOP SECRET/Special Access Required, and specialized facilities.

Armament/Weapons. As with EC, the majority of the value and points are associated with these required technical capabilities, which are equally weighted. Sub-areas of a technical question are also evenly weighted. Of less value and points are the questions associated with test types and higher than irreparable harm, TOP SECRET/Special Access Required, and specialized facilities.

(f) **Open Air Ranges**

Air Vehicles. OAR facilities comprise the most important technical value category for air vehicle testing. In addition to required physical attributes, the primary drivers behind an OAR's capability and cost are length of runway, ramp area available, hangar space, instrumentation, etc. TOP SECRET/Special Access Required is not a major capability or cost driver for an OAR and therefore receive less points.

Electronic Combat. In addition to required physical attributes, the primary drivers behind an OAR's capability and cost are threat simulators and instrumentation. These assets are the topics for questions 1 through 8 (question 8 actually combines attributes of physical and technical threat simulator capabilities). Questions 9 and 10 are not major capability or cost drivers for an OAR and therefore receive less points.

Armament/Weapons. Maximum value and points are again associated with the technical capabilities of an OAR. The types of armament/weapon tests which a site conducts/schedules are the highest value technical questions, since ability to conduct/schedule a substantial quantity of Air Armament tests is an indicator of infrastructure capability, completeness, quality, and uniqueness. The individual (specific) types of tests are equally weighted. Validated targets and maximum number of simultaneous missions requiring telemetry are valued lower than the capability associated with test types and higher than irreparable harm, TOP SECRET/Special Access Required, and specialized facilities.

ANNEX to Appendix E: Functional Value Questions & Weights

1. INTRODUCTION:

Appendix E provided the scoring process to be used by the T&E JCSG to derive the Functional Value (FV) for T&E sites/activities. This ANNEX provides;

a. The rationale supporting the assignment of the weights and points to be used in the calculation of FV.

b. The weights to be applied to each T&E Test Facility Category (TFC) for the calculation of Technical Value (TV) and to each element of Physical Value (PV) (i.e.: Critical Air/Land/Sea Space, Topography, Climate, etc.).

c. The FV questions with the maximum points and scoring method for each question.

2. DISCUSSION:

The value of a T&E site/activity is composed of three unique resources:

a. Physical - As described in Appendix A to the basic document, the physical value of a site is comprised of its natural characteristics. These include Critical Air/Land/Sea Space, Topography, Climate, Encroachment, and Environment characteristics which combine to produce the PV of the site/activity.

b. Technical - As also described in Appendix A to the basic document, the technical value of a site is composed of its man-made characteristics. These include all of the T&E TFC of Modeling & Simulation (M&S), Measurement Facilities (MF), Integration Labs (IL), Hardware-in-the-Loop (HITL) Facilities, Installed Systems Test Facilities (ISTF), and Open Air Ranges (OAR), which combine to produce the TV of the site/activity.

c. People - The personnel who conduct and support the T&E mission provide the intellectual value of the site/activity.

Physical characteristics that are essential for the conduct of test missions are impossible to relocate and consolidate at another site. Therefore, physical characteristics are given higher weighting when determining FV. Technical characteristics, for the most part, were constructed or acquired at a site and can be relocated with varying degrees of cost and difficulty depending upon the complexity of the infrastructure required to support them. Therefore, technical characteristics are given a lower weighting. People are the most mobile resource. They can be moved at lower cost. Reconstitution of the intellectual skills required to support test missions can be accomplished anywhere that has existing T&E sites over a period of time. Therefore, this resource is not used in the calculation of FV.

Section 3 below provides the assigned weights and rationale for PV, TV, and their associated elements. Section 4 provides the rationale for the points assigned to each FV question. Figure 1 of Appendix A to the basic document provides a graphic view of how the points and weights are rolled-up to obtain FV for a particular Functional Area.

3. RATIONALE FOR WEIGHTS:

The following paragraphs provide the basis for the T&E JCSG determination of appropriate FV weights.

a. **Physical Value (XX%)** - It is of paramount importance that the DoD retain a sufficient quantity of air, land, and sea space with broad diversity of physical and climatological environments to replicate all geographic regions that the U.S. Armed Forces may be called upon to operate weapons, platforms and sensors. Such a capability must be retained not only for equipment that is currently in the inventory, but also for those under development within the period covered by the FYDP. The DoD must retain the capability to test these equipments while concurrently being sensitive to the development & environmental concerns of the land it is steward of and their regional communities. Such quantities and diversity of space are irreplaceable, and should not be threatened by encroachment from community development or environmental limitations. Therefore PV is given a higher weight to ensure that higher FV is assigned to those sites which most fully satisfy the physical requirements.

(1) Critical Air/Land/Sea Space (xx%) - The requirement for sufficient quantities of space to conduct test operations is considered the strongest driver in the assignment of FV. At some point in time the equipment that has been subjected to a broad battery of focused testing must be fully exercised in realistic operational environments. Such testing areas must be large enough, and at times secure enough, to contain the test and ensure of public safety. The availability of DoD controlled space is of particular concern. Therefore, Critical Air/Land/Sea Space was assigned the highest weight.

(2) Topography & Climate (xx% each) - The worldwide employment of U.S. Armed Forces requires that T&E facilities be able to test equipment in the diverse topographies and climatic zones in which they will be employed. No single T&E site/activity may be able to support all required operational environments. Therefore, these two elements were each given a lower weight than the element of Critical Air/Land/Sea Space.

(3) Encroachment & Environment (E&E) (xx% each) - Although very important to the long-term availability of a site, E&E issues were deemed to play a secondary role in the development of FV. The comprehensive impact of these issues will be fully addressed in each Military Departments treatment of the installations where their T&E facilities are located. Furthermore, the large land or sea areas that most T&E sites operate in are large enough to enable the site to coordinate with regional planning and regulatory agencies to develop solutions to E&E issues that do not restrict or inhibit a sites ability to fully support its T&E mission. Therefore, E&E issues are not "drivers" in the formulation of T&E FV. Accordingly, the elements E&E were each assigned low weights.

b. **Technical Value (YY%)** - TV elements are typically infrastructure and/or instrumentation dependent. They require a capital investment of some sort to house equipment used for testing equipment - sometimes in controlled environments. Although the elements of TV are very important to the overall value of a site, some are relocateable and can be built anywhere independent of the physical characteristics. However, some of them do depend on the diversity of land forms and available elevations. For these reasons the T&E JCSG gave TV a lower weight in recognition of its influence on the overall FV of a T&E site/activity.

(1) Modeling & Simulation Facilities (yy%) - M&S facilities typically consist of computer software and hardware components, and are very transportable and not infrastructure intensive. In cases they require no more investment than that required for normal office space. Therefore, M&S facilities were assigned a low weight.

(2) Measurement Facilities (yy%) - In some instances MF are dependent on the physical characteristics of air and land space. They represent a broad spectrum from simple to complex facilities, and can be infrastructure intensive due to the unique design and support requirements of the buildings and structures that support them. Some of these facilities, due their large size (some of which are as large as some ISTFs), would be very expensive to replicate at another site/activity. Therefore, MF were assigned a medium weight.

(3) Integration Laboratories (yy%) - Most IL facilities are less infrastructure

intensive and can be relocated, albeit with some degree of difficulty. Although they typically only do integration at the component level, some perform integration functions up to the system level. Therefore, IL were assigned a low weight.

(4) Hardware-in-the-Loop Facilities (yy%) - HITL facilities can also be infrastructure intensive with sizeable equipment investments that are integral to the facilities that support them. They typically support integration at the more complex sub-systems level. Therefore, HITL facilities were assigned a medium weight.

(5) Installed Systems Test Facilities (yy%) - ISTFs are typically used to test a fully integrated weapons system platform, and are also infrastructure intensive. Therefore, ISTF were assigned a medium weight.

(6) Open Air Ranges (yy%) - OAR represent an extensive investment in instrumentation and supporting infrastructure. The value of the instrumentation is driven by quantity and complexity, and is enhanced by the diversity of azimuth and elevation at which it can be placed relative to the air/land/sea space it supports. In most cases it's the OAR that enables a site to take full advantage of its physical characteristics, and ultimately replicate the real world environment. Therefore, OAR facilities were assigned the only high weight for TV.

4. RATIONALE FOR THE SCORING SCALES & POINTS TO FUNCTIONAL QUESTIONS:

Attachments 1, 2 & 3 provide the FV questions to be used to score the functional areas of Air Vehicles, Electronic Combat, and Armament/Munitions respectively. The following paragraphs provide the basis for the T&E JCSG determination of appropriate FV points and scoring scales used to score the FV questions.

a. SCORING SCALES FOR FUNCTIONAL VALUE.

Four types of scoring scales will be used to determine T&E functional values: Yes/No, 0-Max, Hybrid, and 0-Max with Threshold. These scales will be used to determine what portion of the total points available to a given question are credited to a site/activity within a given functional area. Yes/No and 0-Max are applied to the great majority of the T&E functional value questions and are therefore discussed first.

(1) **Yes/No.** This scale is applied to questions for which only a binary response is possible. Depending on the sense of the question, all of the available points will be credited to a "Yes" response with none being credited to a "No" response (e.g., "Is the facility

equipped to support TOP SECRET or Special Access work?"); or, all of the available points will be credited to a "No" response (e.g., Does the facility have limiting environmental characteristics?").

(2) **0-Max.** This scale is applied to questions for which a continuum of responses is possible. Generally, this scoring approach assigns credit on a "bigger is better" basis. For example, "What is the ramp space available?" In this case, the site with the most ramp space will be credited with all the points available to that question. Credit to all other sites will be apportioned linearly (i.e., y = mx), such that a site with half the amount of ramp space as that of the site with the most ramp space will get exactly half of the points available to that question. A site with no ramp space will get no points.

In the "bigger is worse" case, (e.g., "What is the total population inside a 50 mile radius of the facility?"), the site with no population within the 50 mile radius will be credited with all of the points available. The site with the most population will get no credit. For scoring purposes, responses to questions which were cast in the negative sense (bigger is worse) will be converted to the positive sense (bigger is better) prior to application of the 0-Max scoring scale. This will give functional value credit for the inherent positive value of a site's characteristic. For example, responses to "What percent of test missions were canceled due to encroachment in the past two years?" are easily converted to correspond to the more appropriate (from a functional value perspective) question, "What percent of test missions were <u>not</u> canceled due to encroachment in the past two years?"

(3) **Hybrid.** A hybrid of the preceding two scoring scales has been developed to cover a very few questions. It is applied to questions which seek "yes/no" responses to a given set of sub-questions. For example, "How many of the following spectra are available to test against: RF, EO, IR, MMW, UV, laser?" is equivalent to asking six separate "yes/no" sub-questions. If no site/activity has all six spectra, then the site/activity with the maximum number of spectra will set the "maximum" and will get all of the available points. Sites/activities with fewer available spectra will be scored on a 0-Max basis.

(4) **0-Max with Threshold.** A variation of the 0-Max scoring approach can be applied when the capabilities of any given site/activity exceed the DoD requirement (threshold). In this case, a portion of the points available to a question (e.g., x %) can be assigned linearly based on a 0-Threshold approach. The remaining points (100-x %) can be assigned linearly on a Threshold-Max basis.

b. QUESTION POINTS FOR FUNCTIONAL VALUE.

(1) PHYSICAL VALUE

(a) <u>Critical Air/Land/Sea Space</u>

Critical air/land/sea space is the most important physical value of any other physical subcategory (i.e., topography, climate, encroachment, and environment) because it represents an irreplaceable asset that must be maintained to support/satisfy DoD test requirements within each of the three functional areas -- Air Vehicles, Electronic Combat, and Armament/ Weapons.

Air Vehicles. All questions dealing with air, land, and sea space are valued highest, since physical resources are not replaceable (cannot be duplicated). Questions with altitude limits and supersonic airspace were given a medium weighting. The length of straight line segments was not considered significant for air vehicles, and the T&E JCSG gave them low weightings.

Electronic Combat. All questions dealing with air, land, and sea space are valued highest, since physical resources are not replaceable (cannot be duplicated). Questions with altitude limits and supersonic airspace were given a medium weighting. The length of straight line segments was not considered significant for Electronic Combat, and the T&E JCSG gave them low weightings.

Armament/Weapons. All questions dealing with air, land, and sea space are valued highest, since physical resources are not replaceable (cannot be duplicated). Unlike Air Vehicles and Electronic Combat, maximum straight line range questions are heavily valued for Armaments/Munitions. Of lesser value were altitude and supersonic corridors, since these areas are less of a differentiator among sites. Armament/weapons questions deal with restricted air space, to include warning areas, since armament/weapons must be launched within restricted airspace (warning area). Also, since armament/weapons must impact on DoD land space, the associated question reflects this requirement.

(b) Topography

Air Vehicles. Five out of six types of topography included in the Data Call's question were land and one type was water. Therefore, sea was given twice as much weight as any one type of land topography due to its importance the naval warfare. All types of land topography are equally valued and, therefore, equally weighted. Since there is only one question in this category, it receives the full 100 points.

Electronic Combat. Same as Air Vehicles.

Armament/Weapons. Same as Air Vehicles.

(c) Climate

Air Vehicles. Two questions were used to define the climatic category. One addresses visibility greater than three miles in order to identify VFR flight conditions and atmospheric conditions which support photo-optic tracking. The other addresses percentage of time test missions are canceled due to weather. To air vehicles, which routinely use VFR conditions, visibility greater than three miles is weighted higher than missions cancelled.

Electronic Combat. To electronic combat, test missions can be conducted under IFR conditions without adverse impact to mission efficiency or data quality. Therefore, the question regarding visibility greater than three miles was eliminated. The other question addressing the percentage of time test missions are canceled due to weather, was the only question used so it received the full 100 points.

Armament/Weapons. Two questions were used to define the climatic category. One addresses visibility greater than three miles in order to identify VFR flight conditions and atmospheric conditions which support photo-optic tracking. The other addresses percentage of time test missions are canceled due to weather. To armament/weapons the questions are equally important.

(d) Encroachment

Air Vehicles. Historical test mission impacts due to commercial/public use and encroachment are direct indicators of current encroachment and are weighted twice as high as the indirect/future encroachment indicators related to total population within 50 and 100 miles

Electronic Combat. Same as Air vehicles.

Armament/Weapons. Same as Air Vehicles.

(e) Environmental

Air Vehicles. One question addresses the environmental limitations and receives 100% of the points. As stated in Section 3, the comprehensive impact of environmental issues will be fully addressed in each Military Department's treatment of the installation on which their T&E facilities are located.

Electronic Combat. Same as Air Vehicles.

Armament/Weapons. Same as Air Vehicles.

(2) TECHNICAL VALUE

(a) Digital Models and Simulations

Air Vehicles. DM&S facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Same as Air Vehicles.

Armament/Weapons. Same as Air Vehicles.

(b) Measurement Facilities

Air Vehicles. Measurement facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. The question regarding specific spectra to test against drives, to a large extent, the value of a given facility (replacement cost) as well as whether EC testing can be done at one location or work must be distributed among many, which is more costly and the data is difficult to correlate. Therefore, the majority of the value (and points) are associated with the technical capabilities. Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers. Specific technical test areas are equally weighted.

Armament/Weapons. The majority of the value (and points) are associated with the technical capabilities for armament/weapons. Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers. Specific technical test areas are equally weighted.

(c) Integration Laboratories

Air Vehicles. Integration laboratories that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Same as Air Vehicles, except questions 1 and 2 are weighted equally due to the significantly increased cost involved with enabling an integration lab to accommodate TOP SECRET/SAR work.

Armament/Weapons. Same as Electronic Combat.

(d) <u>Hardware-in-the-Loop Capabilities</u>

Air Vehicles. Hardware-in-the-Loop facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Questions 1 and 2 are weighted higher because they are the primary cost and capability drivers for HITL capabilities (question 1 more so than question 2, as additional labs are generally required for additional spectra). Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers.

Armament/Weapons. As with EC, the majority of the value (and points) are associated with the technical capabilities for armament/weapons. Less value (and points) are associated with the critical, Top Secret/Special Access, and specialized facilities answers. Specific technical test areas are equally weighted.

(e) <u>Installed Systems Test Facilities</u>

Air Vehicles. Installed Systems Test facilities that are critical to the operational effectiveness of the armed forces of the U.S. are valued highly and received the highest number of points. The capability to perform Top Secret and/or Special Access work gives the facility higher value than the possession of specialized facilities.

Electronic Combat. Questions 1 through 4 are weighted higher because they are the primary cost and capability drivers (especially MILCON) for ISTF's. Therefore, the majority of the value and points are associated with these required technical capabilities, which are equally weighted. Sub-areas of a technical question are also evenly weighted. Of less value and points are the questions associated with test types and higher than Irreparable Harm, TOP SECRET/Special Access Required, and specialized facilities answers.

Armament/Weapons. As with EC, the majority of the value and points are associated with these required technical capabilities, which are equally weighted. Sub-areas of a technical question are also evenly weighted. Of less value and points are the questions associated with test types and higher than Irreparable Harm, TOP SECRET/Special Access Required, and specialized facilities.

(f) <u>Open Air Ranges</u>

Air Vehicles. OAR facilities comprise the most important technical value category for air vehicle testing. In addition to required physical attributes, the primary drivers behind an OAR's capability and cost are length of runway, ramp area available, hangar space, instrumentation, etc. TOP SECRET/Special Access Required is not a major capability or cost driver for an OAR and therefore receive less points.

Electronic Combat. In addition to required physical attributes, the primary drivers behind an OAR's capability and cost are threat simulators and instrumentation. These assets are the topics for questions 1 through 7 (question 7 actually combines attributes of physical and technical threat simulator capabilities). Questions 8, 9 and 10 are not major capability or cost drivers for an OAR and therefore receive less points. Additionally, question 2 (although appearing redundant to the sum of questions 3 through 6) is necessary because some threat simulators are electronically able to simulate more than one type of threat, but not simultaneously. Thus, question 2 provides information concerning overall signal density, while questions 3 through 6 address specific types of threats (question 6 being related primarily to early warning, ground controlled intercept, acquisition, and command and control threats, and the other questions to categories of actual shooters.)

Armament/Weapons. Maximum value and points are again associated with the technical capabilities of an OAR. The types of armament/weapon tests which a site conducts/schedules are the highest value technical questions, since ability to conduct/schedule a substantial quantity of Air Armament tests is an indicator of infrastructure capability, completeness, quality, and uniqueness. The individual (specific) types of tests are equally weighted. Validated targets and maximum number of simultaneous missions requiring telemetry are valued lower than the capability associated with test types and higher than Irreparable Harm, TOP SECRET/Special Access Required, and specialized facilities answers.

ATTACHMENT 1
TO THE ANNEX OF APPENDIX E

FUNCTIONAL VALUE QUESTIONS & WEIGHTS FOR

AIR VEHICLES

25 Jul, 1730

AIR VEHICLE EVALUATION QUESTIONS

POINTS

1. **PHYSICAL**

a. CRITICAL AIR/LAND/SEA SPACE

15 1) How many square miles of land space are available to support test operations? (3.1.G.1) (0 to Max)

15 2) How many square miles of sea space are available to support test operations? (3.1.G.1) (0 to Max)

7 3) Does DoD own or control none, some, or all of the land under the restricted airspace? (3.1.G.2) (0, 1/2 ,1)

15 4) How many square miles of restricted airspace (including warning areas) are available to support test operations? (3.1.G.3) (0 to Max)

7 5) What altitude limits are associated with the restricted airspace (including warning areas) ? (3.1.G.3) (0 to 100 K - height of block)

7.5 6) How many square miles of available airspace are over land? (3.1.G.5) (0 to Max)

7.5 7) How many square miles of available airspace are over water? (3.1.G.5) (0 to Max)

2.5 8) What is the maximum straight line segment in the airspace, in nautical miles? (3.1.G.7) (0 to Max)

7 9) Do supersonic areas and/or corridors exist? (3.2.A.1) (N/Y)

7 10) What altitude limits are associated with the supersonic airspace? (3.2.A.3) (0 to 100K - height of block)

2.5 11) What is the maximum straight line segment in the supersonic airspace, in nautical miles? (3.2.A.4) (0 to Max)

7 12) What is the minimum altitude allowable in the restricted airspace (including Warning Areas) (3.1.G.3) (0 to MaX)

b. TOPOGRAPHICAL

100 1) How many of the following types of topography and ground cover/vegetation exist within your test airspace: mountains, forest/jungle, cultivated lowland, swamp/riverine, desert, or sea? (3.1.H.1) (1,1,1,1,1,2)

c. CLIMATIC

60 1) What is the average percentage of days per year that visibility is greater than 3 miles? (3.1.H.8) (0 to Max)

40 2) What is the percent of test missions ,1986 - 1993, canceled due to weather? (3.1.H.6) (0 to Max)

(D /

POINTS

d. ENCROACHMENT

35 1) What is the average percentage of test missions per year canceled due to commercial or public use over the period reported? (3.1.C.5) (0 to Max)

35 2) What percent of test missions were canceled due to encroachment in the past two years? (3.1.C.6) (0 to Max)

15 3) What is the total population inside a 50 mile radius of the facility? (3.1.C.4) (Max to 0)

15 4) What is the total population inside a 100 mile radius of the facility? (3.1.C.4) (Max to 0)

e. ENVIRONMENTAL

100 1) Does the facility have limiting environmental characteristics? (3.1.C.1) (N/Y)

POINTS 2. **TECHNICAL**

a. DIGITAL MODELS AND SIMULATIONS

50 1) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2) (N/Y)

30 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.E.3) (N/Y)

20 3) Do you have specialized facilities which are required to support you in conducting your test operations at your facility? (3.1.D.1) (N/Y)

b. MEASUREMENT FACILITIES

50 1) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2) (N/Y)

30 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.E.3) (N/Y)

20 3) Do you have specialized facilities which are required to support you in conducting your test operations at your facility? (3.1.D.1) (N/Y)

c. INTEGRATION LABORATORIES

50 1) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2) (N/Y)

30 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.E.3) (N/Y)

20 3) Do you have specialized facilities which are required to support you in conducting your test operations at your facility? (3.1.D.1) (N/Y)

d. HARDWARE-IN-THE-LOOP CAPABILITIES

50 1) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2) (N/Y)

30 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.E.3) (N/Y)

20 3) Do you have specialized facilities which are required to support you in conducting your test operations at your facility? (3.1.D.1) (N/Y)

Points e. INSTALLED SYSTEMS TEST FACILITIES

45 1) Can the facility support fighter/helo-sized aircraft testing? (3.2.C.3 & Fac form) (N/Y)

45 2) Can the facility support B-1 bomber/cargo-sized aircraft testing? (3.2.C.3 & Fac form) (N/Y)

5 3) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2) (N/Y)

3 4) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.E.3) (N/Y)

2 5) Do you have specialized facilities which are required to support you in conducting your test operations at your facility? (3.1.D.1) (N/Y)

f. OPEN AIR RANGES

18 1)) How many of the following types of airvehicles can be tested: fixed wing, rotary wing, unmanned, cruise missile? (3.2.C.1) (1,1,1,1)

18 2) What is the length (in feet) of available concrete runway? (3.2.B.1) (0 to Max)

18 3) What is the ramp area available (in sq ft)? (3.2.B.1) (0 to Max)

18 4) What is the hangar space available (in sq ft)? (3.2.B.1) (0 to Max)

18 5) Are ground facilities available to support preflight checkout and/or rehearsal of test missions? (3.2.C.2) (N/Y)

5 6) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2) (N/Y)

3 7) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.E.3) (N/Y)

2 8) Do you have specialized facilities which are required to support you in conducting your test operations at your facility? (3.1.D.1) (N/Y)

ATTACHMENT 2
TO THE ANNEX OF APPENDIX E

FUNCTIONAL VALUE QUESTIONS & WEIGHTS FOR

ELECTRONIC COMBAT

FOR OFFICIAL USE ONLY 25 Jul, 1900

EC EVALUATION QUESTIONS

POINTS

1. **PHYSICAL**

a. CRITICAL AIR/LAND/SEA SPACE

15 1) How many square miles of land space are available to support test operations? (3.1.g.1) (0/Max Ramp)

15 2) How many square miles of sea space are available to support test operations? (3.1.g.1) (0/Max Ramp)

8.75 3) Does DoD own or control all, some, or none of the land under the restricted airspace (including warning areas)? (3.1.g.2) (3,2,1)

15 4) How many square miles of restricted airspace (including warning areas) are available to support test operations? (3.1.g.3) (Ramp)

8.75 5) What altitude limits are associated with the restricted airspace (including warning areas)? (3.1.g.3) (Ramp - height of block)

7.5 6) How many square miles of available airspace are over land? (3.1.g.5) (Ramp)

7.5 7) How many square miles of available airspace are over water? (3.1.g.5) (Ramp)

5 8) What is the maximum straight line segment in the airspace, in nautical miles? (3.1.g.7) (Ramp)

8.75 9) What is the minimum altitude allowable in the restricted airspace (including warning areas)? (3.1.g.3) (Ramp)

8.75 10) Do supersonic areas and/or corridors exist? (3.2.a.1) (Y/N)

100 b. TOPOGRAPHICAL: How many of the following types of topography and ground cover/vegetation exist within your test airspace: mountains, forest/jungle, cultivated lowland, swamp/riverine, desert, or sea? (3.1.h.1) (1,1,1,1,1,2)

100 c. CLIMATIC: What is the percent of test missions, 1986 - 1993, canceled due to weather? (3.1.h.6) (Max/0 Ramp)

d. ENCROACHMENT

35 1) What is the average percentage of test missions per year canceled due to commercial or public use over the period reported? (3.1.c.5) (Max/0 Ramp)

35 2) What percent of test missions were canceled due to encroachment in the past two years? (3.1.c.6) (Max/0 Ramp)

15 3) What is the population inside a 50 mile radius of the facility? (3.1.c.4) (Max/0 Ramp)

^ POINTS

15 4) What is the population inside a 100 mile radius of the facility? (3.1.c.4) (Max/0 Ramp)

100 e. ENVIRONMENTAL: Does the facility have limiting environmental characteristics? (3.1.c.1) (Y/N)

2. TECHNICAL

a. DIGITAL MODELS AND SIMULATIONS

50 1) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.b.2) (N/Y)

30 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.e.3) (N/Y)

20 3) Are specialized facilities available to support EC test operations? (3.1.d.1) (N/Y)

b. MEASUREMENT FACILITIES

90 1) How many of the following spectra are available to test against: RF, EO, IR, MMW, UV, laser? (3.3.a.2, 3.3.b.4) (1,1,1,1,1,1)

5 2) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.b.2) (N/Y)

2 3) Are specialized facilities available to support EC test operations? (3.1.d.1) (N/Y)

3 4) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.e.3) (N/Y)

c. INTEGRATION LABORATORIES

50 1) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.b.2) (N/Y)

30 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.e.3) (N/Y)

20 3) Are specialized facilities available to support EC test operations? (3.1.d.1) (N/Y)

d. HARDWARE-IN-THE-LOOP CAPABILITIES

60 1) How many of the following spectra are available to test against: RF, EO, IR, MMW, UV, laser? (3.3.a.2, 3.3.b.4) (1,1,1,1,1,1)

30 2) Does the facility have closed-loop threat simulators? (3.3.a.4) (N/Y)

5 3) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.b.2) (N/Y)

3 4) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.e.3) (N/Y)

2 5) Are specialized facilities available to support EC test operations? (3.1.d.1) (N/Y)

e. INSTALLED SYSTEMS TEST FACILITIES

36 1) How many of the following spectra are available to test against: RF, EO, IR, MMW, UV, laser? (3.3.a.2, 3.3.b.4) (1,1,1,1,1)

18 2) Are radio frequency threat signals radiated, injected, or both? (3.3.a.2) (1-2)

18 3) Can the facility support fighter/helicopter-sized aircraft testing? (3.2.c.3, 3.3.b.1, fac forms) (N/Y)

18 4) Can the facility support B-1 bomber/cargo-sized aircraft testing? (3.2.c.3, 3.3.b.1, fac forms) (N/Y)

5 5) Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness the armed forces of the US? (2.3.b.2) (N/Y)

3 6) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.e.3) (N/Y)

2 7) Are specialized facilities available to support EC test operations? (3.1.d.1) (N/Y)

f. OPEN AIR RANGE

18 1) How many of the following spectra are available to test against: RF, EO, IR, MMW, UV, laser? (3.3.a.2, 3.3.b.4) (1,1,1,1,1,1)

3 2) Is the facility equipped to support TOP SECRET or Special Access Required work? (3.1.e.3) (N/Y)

12 3) How many simultaneous threats can be simulated? (3.3.a.2) (0/Max Ramp)

12 4) How many surface-to-air missile threats can be simulated simultaneously? (3.3.a.2) (0/Max Ramp)

12 5) How many airborne interceptor threats can be simulated simultaneously? (3.3.a.2) (0/Max Ramp)

ATTACHMENT 3
TO THE ANNEX OF APPENDIX E

FUNCTIONAL VALUE QUESTIONS & WEIGHTS FOR
ARMAMENT/WEAPONS

ARMAMENT/WEAPONS
FUNCTIONAL VALUE QUESTIONS

No.	Capabilities/Questions	Points	Absolute vs Relative
1.0	**Natural (Physical) Value**		
1.1	**Critical Air/Land/Sea Space**		
1.1.1	How many square miles of restricted air space (including warning areas) are available to support test operations? (3.1.G.3, 3.1.G.4, Data Forms)	15	0-Max
1.1.2	How many square miles of DoD land space are available to support test operations? (3.1.G.1, 3.1.G.2, 3.4.B.1.A, Data Forms)	15	0-Max
1.1.3	How many square miles of sea warning area space are available to support test operations? (3.1.G.1, 3.1.G.4, 3.4.B.1.A, Data Forms)	15	0-Max
1.1.4	What is the maximum straight line range (in nautical miles) that the site can use to test the following? (3.1.G.7, 3.4.B.1.C, Data Forms) a. Air-to-air missiles (10 points) b. Air-to-surface weapons (10 points) c. Surface-to-air missiles (10 points)	30	0-Max

1.1.5	What altitude limits are associated with restricted airspace (including warning areas)? [Maximum altitude - minimum altitude] (3.1.G.3, 3.1.G.4, Data Forms) a. Over land (5 points) b. Over sea (5 points)	10	0-Max
1.1.6	What is the site's largest supersonic area? [length X width in nautical miles] (3.2.A.4, Data Forms)	10	0-Max
1.1.7	What is the minimum to maximum altitude within site's supersonic corridor or area which is used to conduct testing? [Maximum altitude - minimum altitude] (3.2.A.3, Data Forms)	5	0-Max

1.2 Topographical

	How many of the following types of topography and ground cover/vegetation exist within your test airspace? (3.1.H.1) a. Mountainous (14 points) b. Forested or jungle (14 points) c. Cultivated lowland (farmland) (14 points) d. Swamp or riverine (14 points) e. Desert (14 points) f. Sea (30 points)	100	0-Max

1.3 Climatic

1.3.1	What is the average percentage of test missions per year canceled due to weather? (3.1.H.6, Data Forms) [100% minus (% derived from # of test missions canceled in FY86-93 divided by # of test missions FY86-93)]	50	0-Max

1.3.2	What is the average number of days per year (1985-1993) the visibility is greater than 3 miles? (3.1.H.8, Data Forms)	50	0-Max

1.4 Encroachment

1.4.1	What is the average percentage of test missions per year canceled due to commercial or public use ? [100% minus (% derived from # of test missions canceled divided by the # of test missions over period reported)] (3.1.C.5.A, Data Forms)	35	0-Max
1.4.2	What percent of test missions were canceled due to encroachment in the past two years [100% minus (% derived from sum of 92 and 93 canceled missions divided by the sum of 92 and 93 test missions)] (3.1.C.6, Data Forms)	35	0-Max
1.4.3	What is the total population inside a 50 mile radius of the facility? (3.1.C.4)	15	Max-0
1.4.4	What is the total population inside a 100 mile radius of the facility? (3.1.C.4)	15	Max-0

1.5 Environment

1.5.1	Does the facility have limiting environmental characteristics? (3.1.C.1.)	100	Yes/No

2.0 Technical Value

2.1 Digital Models and Simulations

2.1.1	Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2)	50	No/Yes
2.1.2	Is the facility equipped to support Top Secret or Special Access Required work? (3.1.E.3)	30	No/Yes
2.1.3	Does the facility have specialized facilities to support conduct of test operations? (3.1.D.1)	20	No/Yes

.2	**Measurement Facilities (MF)**		
2.2.1	Site's armament/weapons T&E measurement facilities conduct how many of the following? (Data Forms) a. Environmental T&E (9 points) b. Safety T&E (9 points) c. Warhead performance T&E (9 points) d. Fuze T&E (9 points) e. Seeker, sensor and guidance/control performance and target/background signature characterization T&E (9 points) f. Propulsion performance T&E (9 points) g. Airframe/aerodynamic/aerothermal performance T&E across subsonic, transonic, and hypersonic regimes (9 points) h. Gun performance T&E(9 points) i. Electromagnetic Environmental Effects (9 points) j. Directed energy (9 points)	90	0-Max
2 2.2	Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2)	5	No/Yes
2.2.3	Is the facility equipped to support Top Secret or Special Access Required work? (3.1.E.3)	3	No/Yes
2.2.4	Does the facility have specialized facilities to support conduct of test operations? (3.1.D.1)	2	No/Yes
2.3	**Integration Labs (IL)**		

2.3.1	Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2)	50	No/Yes
2.3.2	Is the facility equipped to support Top Secret or Special Access Required work? (3.1.E.3)	30	No/Yes
2.3.3	Does the facility have specialized facilities to support conduct of test operations? (3.1.D.1)	20	No/Yes

2.4 Hardware-In-The-Loop (HITL)

2.4.1	Does the facility provide armament/weapons HITL T&E capabilities in the following areas? (3.3.B.4, Data Forms): a. RF (15 points) b. IR (15 points) c. Laser (15 points) d. MMW (15 points) e. EO/visible (15 points) f. Midcourse Inertial/GPS (15 points)	90	0-Max
2.4.2	Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2)	5	No/Yes
2.4.3	Is the facility equipped to support Top Secret or Special Access Required work? (3.1.E.3)	3	No/Yes
2.4.4	Does the facility have specialized facilities to support conduct of test operations? (3.1.D.1)	2	No/Yes

2.5 Installed Systems Test Facilities (ISTF)

2.5.1	How many of the following spectra are available to test against? (3.3.A.2, 3.3.B.4) a. RF (6 points) b. EO (6 points) c. IR (6 points) d. MMW (6 points) e. UV (6 points) f. Laser (6 points)	36	0-Max
2.5.2	Are radio frequency threat signals: (3.3.A.2) a. radiated? (9 points) b. injected? (9 points)	18	0-Max
2.5.3	Can the facility support fighter/helicopter-sized aircraft testing ? (3.3.B.1)	18	No/Yes
2.5.4	Can the facility support multiple fighter-sized and strategic bomber/cargo-sized aircraft testing? (3.3.B.1)	18	No/Yes
2.5.5	Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2)	5	No/Yes
2.5.6	Is the facility equipped to support Top Secret or Special Access Required work? (3.1.E.3)	3	No/Yes
2.5.7	Does the facility have specialized facilities to support conduct of test operations? (3.1.D.1)	2	No/Yes

.6 Open Air Ranges (OAR)

2.6.1	How many of the following types of tests can the site schedule? (3.4.B.2.A) a. Unguided 2000-lb class ballistic weapons (14 points) b. Guided weapons (14 points) c. Stand-off weapons (14 points) d. Short-range missiles (14 points) e. Long-range missiles(14 points)	70	0-Max
2.6.2	Does the facility provide the following validated targets? (3.1.D.2, 3.1.D.2.A) a. Specialized land targets (5 points) b. Specialized airborne targets (5 points)	10	0-Max
2.6.3	What is the maximum number of simultaneous missions the facility can support that require telemetry? (3.2.C.6)	10	0-Max
2.6.4	Does the facility provide a T&E product or service without which irreparable harm would be imposed on any mission (other than test) deemed critical to the operational effectiveness of the armed forces of the US? (2.3.B.2)	5	No/Yes
2.6.5	Is the facility equipped to support Top Secret or Special Access Required work? (3.1.E.3)	3	No/Yes
2.6.6	Does the facility have specialized facilities to support conduct of test operations? (3.1.D.1)	2	No/Yes

APPENDIX F

T&E DATABASE MANAGEMENT PROCESS

APPENDIX F. T&E DATABASE MANAGEMENT PROCESS

1. Purpose:

This document describes the process to be used for the storage, retrieval. and disposition of the data/information used by the T&E Joint Cross-Service Group (JCSG) and its Joint Working Group (JWG) for T&E cross-service analysis.

2. Scope:

The database is the repository for all working data/information used to conduct the T&E cross-service analysis and will consist of hard and soft copy information. Specifically, the database will serve as repository for working copies of the T&E data call responses; FYDP information; computed functional values, capacity, excess capacity, and workload; functional COBRA inputs and outputs; and optimization model inputs and outputs (See Atch 1). In addition, the database will maintain an audit trail for all data and model runs by the JWG. Copies of all T&E JCSG approved data/information will be provided to the Tri-Department BRAC Group for inclusion into its official database.

A separate database will be established and maintained for classified data/information. Strict need to know rules will be applied to control access to this classified information.

3. Approach:

3.1 Inputs/Outputs:

The initial database inputs will be the certified responses from the data call and certified pertinent information from the FYDP. These initial data will be provided by the Tri-Department BRAC Group.

Requisite data will be retrieved from the database to compute functional value, capacity, excess capacity, and workload. This computed information will also be stored in the database and provided to the Tri-Department BRAC Group as inputs to the optimization model. Results of the optimization runs will be stored in the database and used to develop realignment/consolidation alternatives. Functional COBRA runs will be conducted for the alternatives using data call responses and computed data extracted from the database. Results of functional COBRA runs will also be stored in the T&E database.

3.2 Configuration Control:

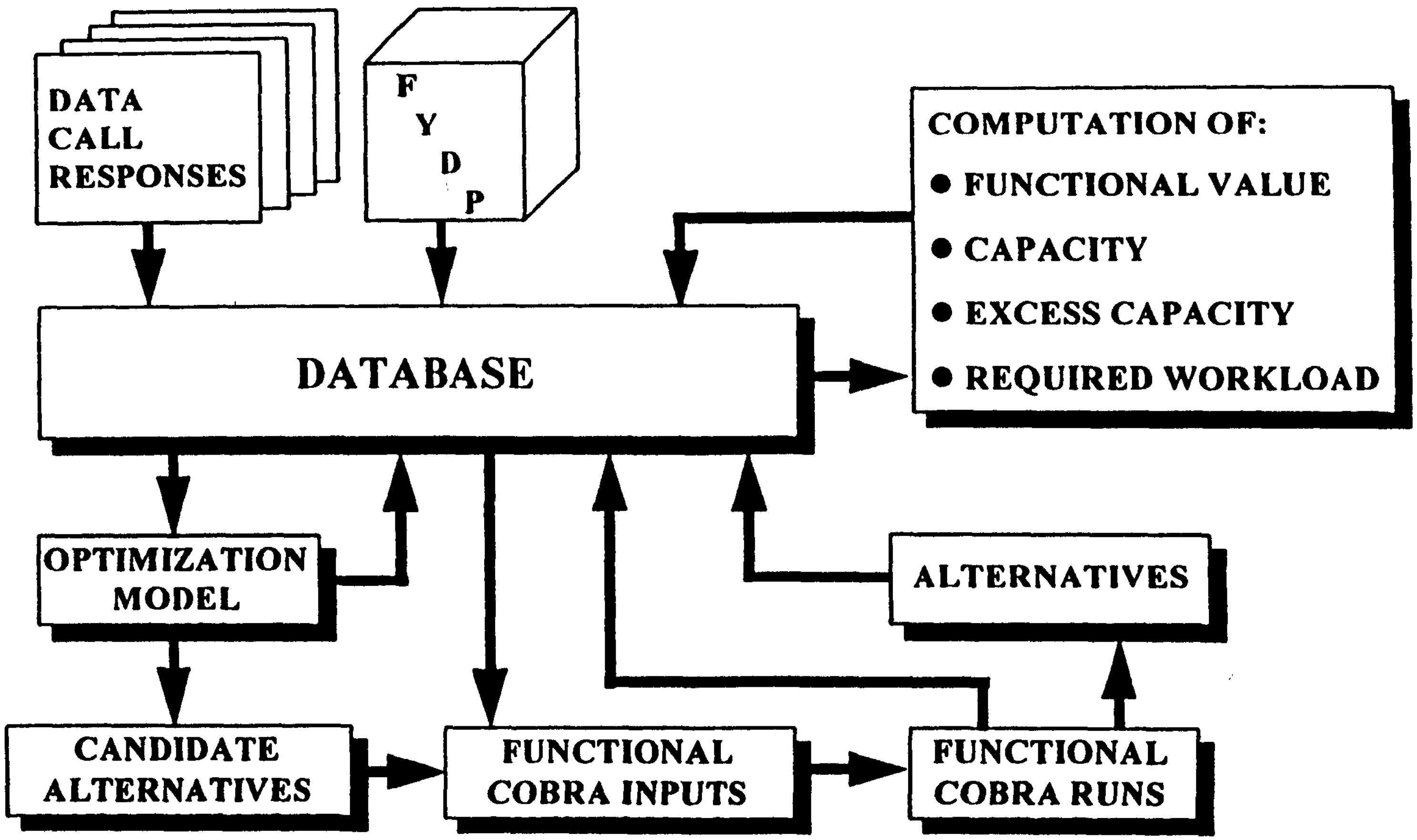
The data will be kept in a locked storage area with limited access. A data administrator will be appointed by the JCSG to insure that data is properly controlled and maintained. The data administrator will keep track of revisions and maintain an audit trail on all changes to the database. The data administrator will serve as principal database interface with the Tri-Department BRAC Group and will maintain a log of control numbers for model runs.

4. Database Disposition at End of Study:

All the requisite database information will be submitted to the Tri-Department BRAC Group for their record. This database information will include alternatives, input and output data, and other pertinent information. All working copies of the database and its supporting documentation will be destroyed.

Attachment 1

DATABASE MANAGEMENT PROCESS



APPENDIX G

CLASSIFIED DATA ANALYSIS

APPENDIX G: CLASSIFIED DATA ANALYSIS

1. INTRODUCTION: This appendix provides the data analysis process used by the T&E Joint Cross-Service Group (T&E JCSG) to utilize classified data (as required) to supplement the overall data analysis process as described in the T&E Analysis Plan. This classified data analysis process provides a quantitative and defensible basis for incorporating classified data into the T&E functional value analysis and alternative evaluation process while requiring minimum exposure of sensitive information.

2. POLICY IMPERATIVE: There are classified T&E locations (hereafter referred to as "Sites") to which classified BRAC data pertains. As these classified sites are DoD unique and geographically constrained, and the rationale for existing capabilities there to remain in place is itself classified, a policy imperative will be established for use during the optimization process and subsequent evaluation of alternatives and scenarios. This policy imperative will specify the need for the sites' continued existence under any optimization or scenario outcome, and establish that T&E capabilities at these sites will not be subject to closure or relocation. Test workload from other locations may be relocated to the sites as capacity allows, and certain other T&E capabilities can be relocated there depending upon requirements.

3. DATA:

a. Classified information used for workload and capacity analysis comes only from certified data received from the Sites in response to the official T&E JCSG Data Call of 31 Mar 94. Due to the classified nature of this data, it will be maintained by SAF/AAZ.

b. SAF/AAZ will arrange for appropriately cleared facilities for data review, when required. Only appropriately designated (in writing to the T&E JCSG Co-Chairs) and cleared BRAC team members will have access to the data, and SAF/AAZ will record to whom and when access was granted. At no time will classified data be removed from SAF/AAZ control.

c. A minimum level of required information pertaining to the sites' workloads and capacities maybe incorporated into other data for optimization runs and alternative development purposes. Classified material may be identified only in generic terms (i.e., as Site "A") and, of course, classified information cannot be included.

4. SECURITY:

a. Personnel in the following positions should be granted program access (assuming appropriate clearance levels):

1) One member from each Service to serve on the Analysis Team

2) The principal Service members on the T&E Joint Working Group

3) The principal OSD and Service members on the T&E JCSG

b. The names, ranks/grades, social security numbers, organizations, home stations, phone numbers, dates and places of birth, citizenship, and types and levels of clearances and security investigations for personnel serving in the above positions should be forwarded to Col Wes Heidenreich of the Air Force BRAC Team at (703) 416-8481, fax 416-8485, not later than two weeks before access to classified data is required.

TEST AND EVALUATION (T&E) JOINT CROSS-SERVICE GROUP

ACTION PLAN AND MILESTONES

FOR

BASE REALIGNMENT AND CLOSURE (BRAC) 95 CROSS SERVICE ANALYSES

Addendum, July 1994

John A. Burt
Co-Chair
T&E Joint Cross-Service Group

Co-Chair
T&E Joint Cross-Service Group

I. PURPOSE and SCOPE

This addendum updates the Actions and Milestone schedule necessary to support identification of opportunities for consolidating/realigning the T&E infrastructure associated with Air Vehicle, Electronic Combat and Armament/Weapons testing as part of the FY95 Base Realignment and Closure (BRAC) joint cross-service analyses.

This addendum focuses on the activities associated with conducting the T&E cross- service analyses, formulating alternatives for consideration by the Military Department's BRAC offices, and oversight of the process by T&E Joint Cross-Service Group (JCSG).

II. ACTIONS

The major actions required for conduct of the T&E joint cross-service analyses are:

ACTION 1: Develop an Overall Analysis Methodology that provides capacity, future workload requirements, excess capacity reduction targets and functional values for Air Vehicle, Electronic Combat, and Armament/Munitions T&E.

1.1 Develop an analysis framework that uses the FYDP and certified information provided in response to the T&E JCSG data call and that leads to the identification of opportunities for realigning/consolidating the T&E infrastructure.

1.2 Develop methodologies for:
- Projecting future workload requirements
- Computing excess capacity within each functional area
- Establishing excess capacity reduction targets
- Computing functional value (FV) for each T&E functional area

1.3 Adapt a linear optimization model to support the development of T&E cross-service realignment/consolidation alternatives

ACTION 2: Conduct Analysis Using Notional Data

2.1 Compute functional value using notional data to finalize questions and weights.

2.2 Conduct optimization runs using notional data to develop initial policy imperatives, optimization formulations, data analysis procedures, and data presentation formats.

ACTION 3: Generate Inputs for Analysis

3.1 Provide questions, weights, and scoring criteria and compute functional value using Decision PAD software.

3.2 Compute future workload requirements and excess capacity for each functional area and test resource category.

3.3 Provide policy imperatives and other inputs required to run linear optimization and functional COBRA models.

3.4 Provide functional values (FV's) for each functional area for each site to the Military Departments.

ACTION 4: Conduct Analysis Using Real Data

4.1 Review inputs of model runs for accuracy.

4.2 Analyze outputs and develop initial set of realignment/consolidation alternatives.

4.3 Assess operational feasibility and cost effectiveness of each alternative; modify, revise, or delete alternatives as required. The assessment will include a determination as to whether the alternative retains the capability to satisfy DoD T&E requirements.

4.4 Provide revised set of alternatives to Tri-Department BRAC Group for additional optimization and functional COBRA runs.

ACTION 5: Finalize Alternatives to be provided to the Military Departments

5.1 Review inputs of model runs for accuracy.

5.2 Analyze final outputs from Tri-Department BRAC Group.

5.3 Review each alternative to ensure it is operationally feasible, retains the capability to satisfy DoD T&E requirements within each functional area, and is economically affordable.

5.4 Forward recommended alternatives along with supporting rationale and documentation to the Military Departments.

III. INTERNAL CONTROLS

The T&E Joint Cross-Service Group will adhere to the 13 April 1995 OSD BRAC95 internal control plan for base realignment, closure or consolidation studies to ensure the accuracy of data collection and analyses.

MILESTONES FOR CROSS SERVICE ANALYSIS

TABLE I

MILESTONE	Due Date
Data Call released to Services	31 Mar 94
ACTION 1 Overall Analysis Methodology JCSG Approves: Capacity Calculation Future Workload Projection Methodology Functional Value Target Reduction Methodology	6 Jul 94
ACTION 2 Conduct Analysis Using Notional Data JCSG Approves: Questions Weights Scoring Criteria Initial Policy Imperatives Optimization Formulations	15 Jul 94
ACTION 3 Generate Inputs for Analysis JCSG Approves: Functional Values Capacity/Requirements Policy imperatives	15 Aug 94
ACTION 4 Conduct Analysis using Real Data JCSG Provides: Inputs for Optimization/Cobra Models Functional Values (FV's) for Mil Dept's	3 Oct 94
ACTION 5 Finalize Alternatives Finalize Alternatives and provide to Mil Departments JCSG Approves: Alternatives Provide to Mil Dept's	17 Oct 94

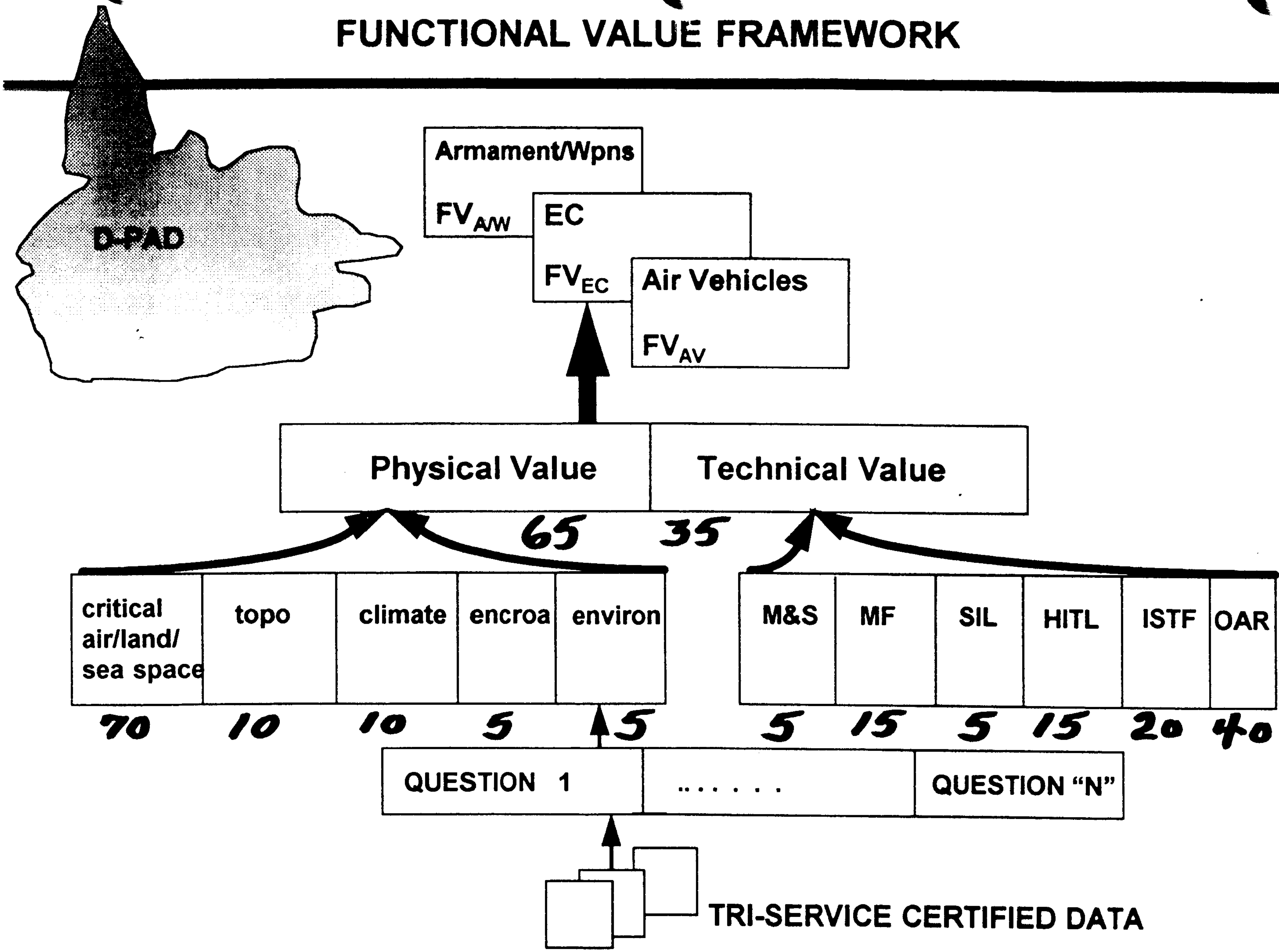
PROCEDURAL ISSUES

- SCORING: ALL THREE SERVICES PRESENT?
- REMOVAL OF DATA OR WORKING PAPERS FROM TEC
  - "CONCURRENCE BY JWG" <u>OR</u>
  - PROHIBITED
- CHECKOUT OF T&E DATA
  - DATA ADMINISTRATOR <u>OR</u>
  - INDIVIDUAL LOGOUT
- SCORING PER FUNCTIONAL AREA
  - BY SPECIFIC FUNCTIONAL TEAMS
  - BY ALL
- ACCESS BY MIL DEPT BRAC PERSONNEL

AIRSPACE SCORING

ISSUE	DT&E FRAMEWORK	SERVICES
TYPES OF AVAILABLE AIRSPACE SCORED	ROUTINELY NEEDED AND EXTRAORDINARILY NEEDED (EG, CRUISE MISSILES, STANDOFF WEAPONS, NASP)	NEEDED FOR TEST MISSION AND EXCESS
SCORING BASIS	AGAINST DOD-WIDE DEFINED REQUIREMENTS PER THRESHOLD (THRESHOLDS) FOR SAFETY AND MANUVERING ENVELOPE FOR ROUTINE (~95%) AND EXTRAORDINARY	AGAINST "PRACTICAL" SAFETY FOOTPRINT AND MANEUVERING ENVELOPE OF WEAPONS IN FYDP
SCORING	PERCENTAGE OF DOD-WIDE REQUIREMENT SATISFIED FOR ROUNTINE AND EXTRAORDINARY (VIA CONTIGUOUS ACCESSIBLE AIRSPACE)	PERCENTAGE OF "PRACTICAL" REQUIREMENT SATISFIED PER SITE PLUS EXTRA POINTS (UNDEFINED BASIS) FOR "EXPANSION CAPBILITY"
ALCM, GLCM, SLCM	HANDLED AS EXTRAORDINARY	PART OF "PRACTICAL"?

FUNCTIONAL VALUE FRAMEWORK



T&E Joint Cross Service Group Analysis Plan Briefing To BRAC Steering Group

July 28, 1994

By: Mr John Burt
Mr Lee Frame

Purpose

- Present T&E JCSG Plans
- Request approval
  - Analysis Plan
  - Action Plan
- Authorize services to exchange data and begin analysis

Agenda

- Analysis Plan
- Issues
- Summary/Recommendation

T&E Joint Cross-Service Group Analysis Plan

- Joint Analysis Plan Completed Containing
  - Background
  - Joint Team Structure
  - Joint Analysis Process/schedule

- Appendices contain

  A- T&E Functional Value Methodology
  B- T&E Workload Projection Methodology
  C- T&E Excess Capacity and Target Reduction Methodology
  D- T&E Optimization Formulations
  E- T&E Questions, Weights, and Scoring Process
  F- T&E Data Base Management Process
  G- Classified Data Analysis Procedures

Appendix A- T&E Functional Value

- Top Down Approach; captures principal attributes required to support T&E for Air Vehicle, Electronic Combat, and Armaments/Weapons

- Functional Value Based on Physical and Technical Attributes at the activities/sites

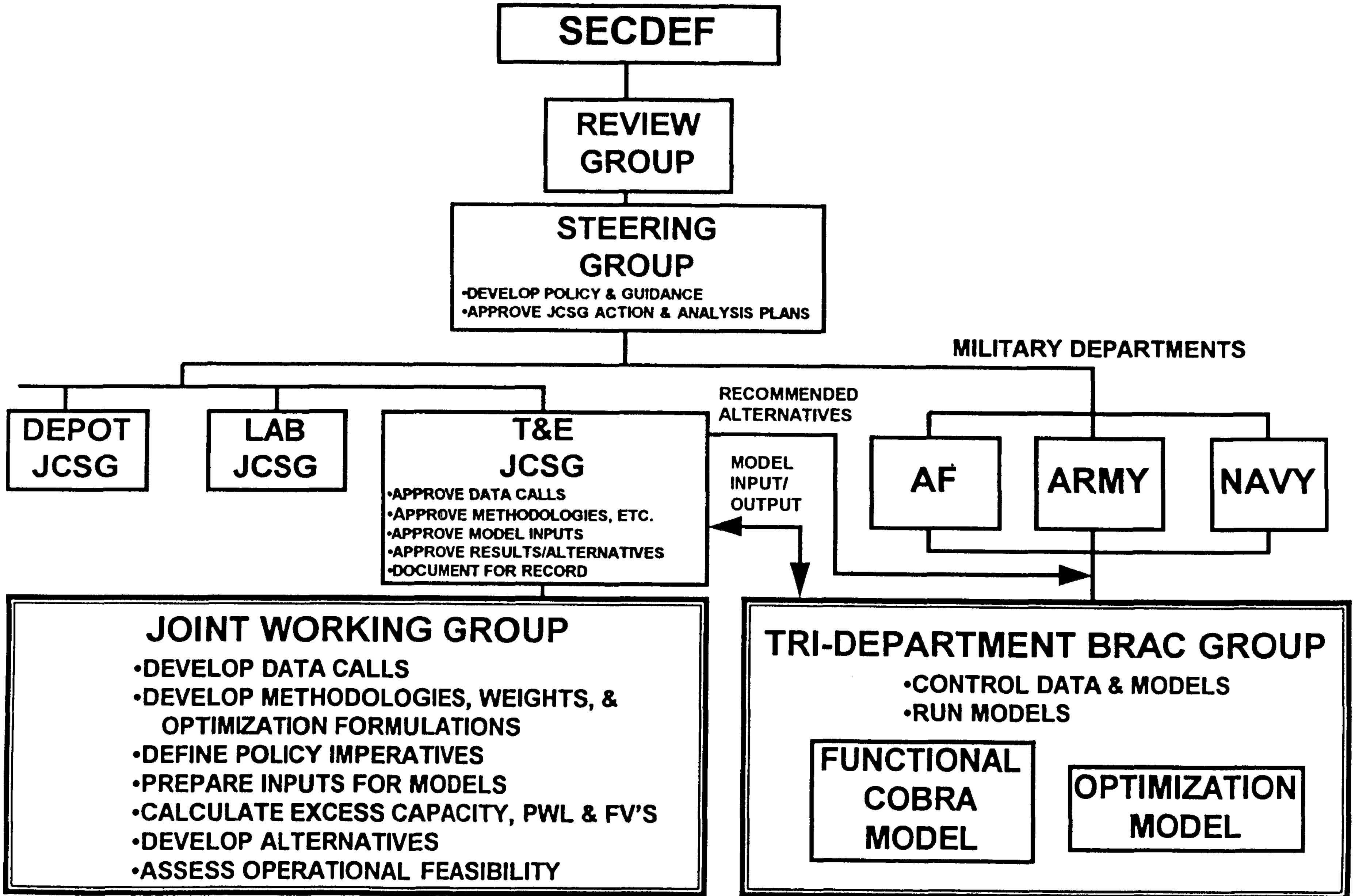
- Physical Value based on roll-up of critical air/land/sea space, topography, climate, encroachment, and environment subcategories

- Technical Value based on roll-up of six T&E test facility categories: Modeling and simulation (M&S), Measurement Facilities (MF), Integration Laboratories (IL), Hardware-in-the-Loop (HITL), Installed Systems Test Facilities (ISTF), and Open Air Ranges (OAR).

T&E Functional Value Methodology (cont)

- Identical weights for all functional areas
  - Higher weight to irreplacable natural assets
- Many common questions; but have tailored specific questions for each T&E functional area. Individual questions assigned point value based on functional area.
- Scoring to use Decision Pad (D-PAD) software
- Scores will range from 0 and 100

JOINT ANALYSIS TEAM STRUCTURE



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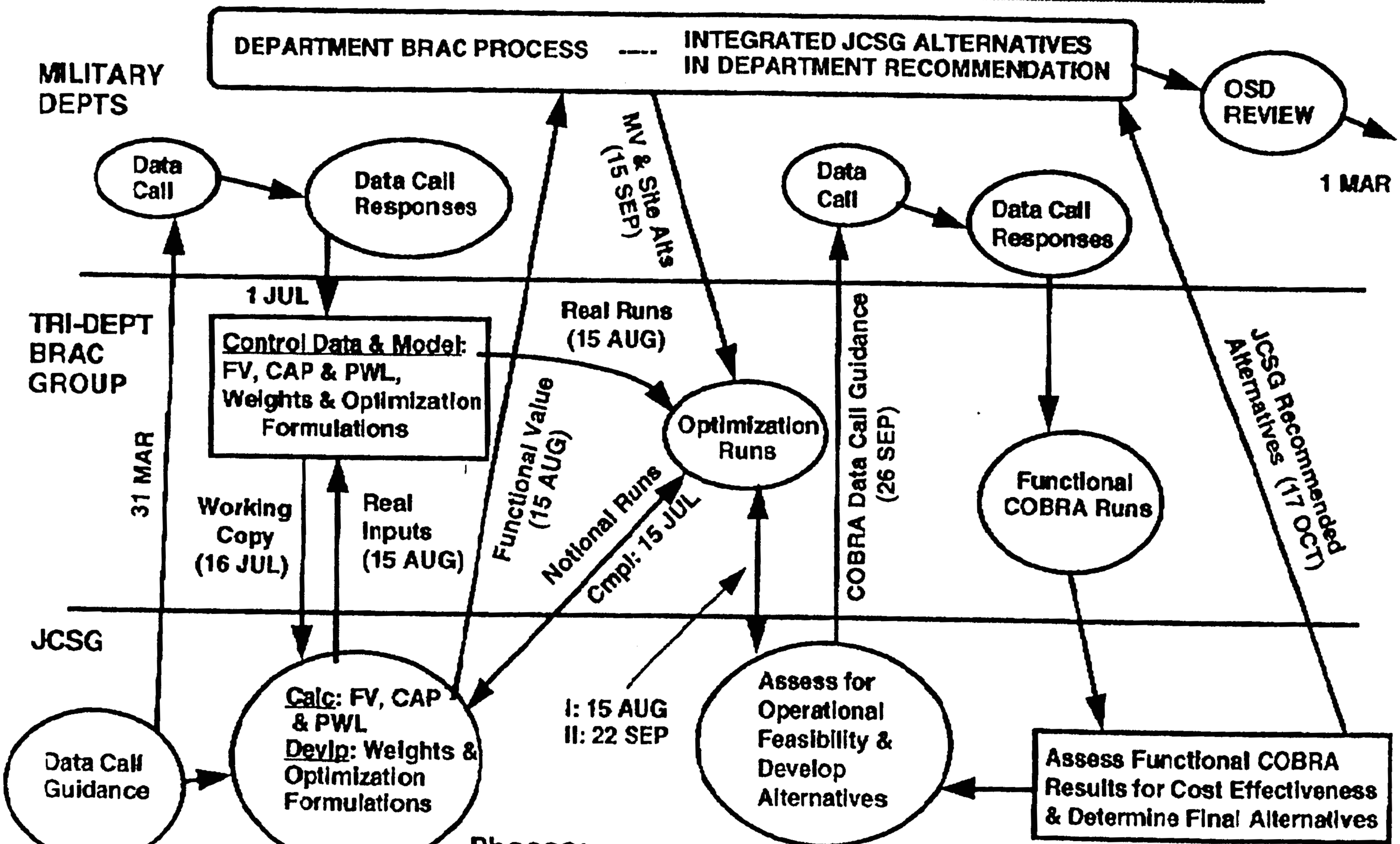
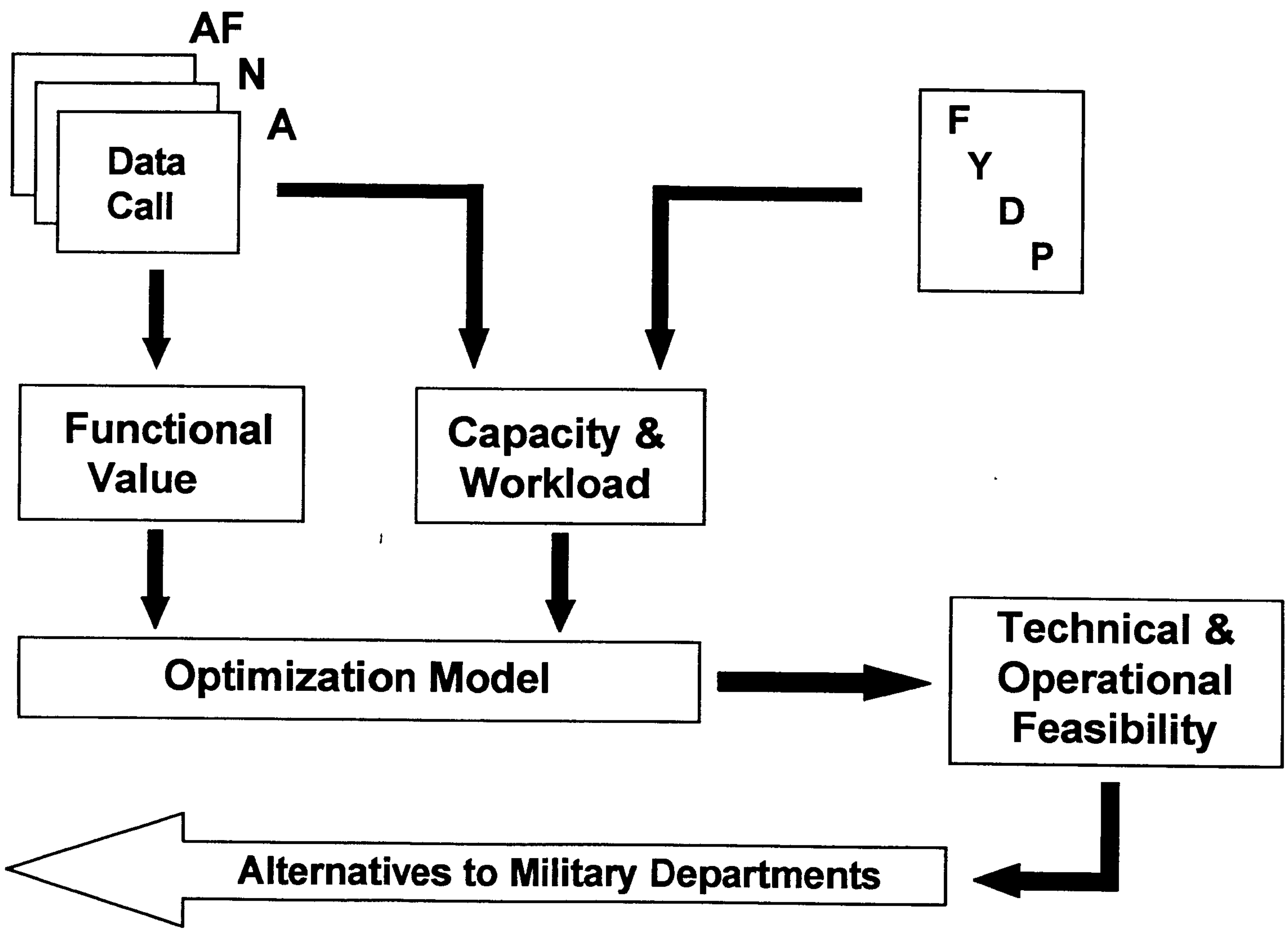
JOINT ANALYSIS PROCESS



Phases: I: UNCONSTRAINED
II: MV CONSTRAINED

ANALYSIS FRAMEWORK



Appendix B -- T&E Workload Projection Methodolgy

- **Assumptions**
  - Amount of work generated by a fixed dollar amount and the percentage of work accomplished by each functional area category are constant
  - Workload for FY00 and FY01 are the same as that for FY99
- **Projected workload (W) computed from FYDP and data call as:**

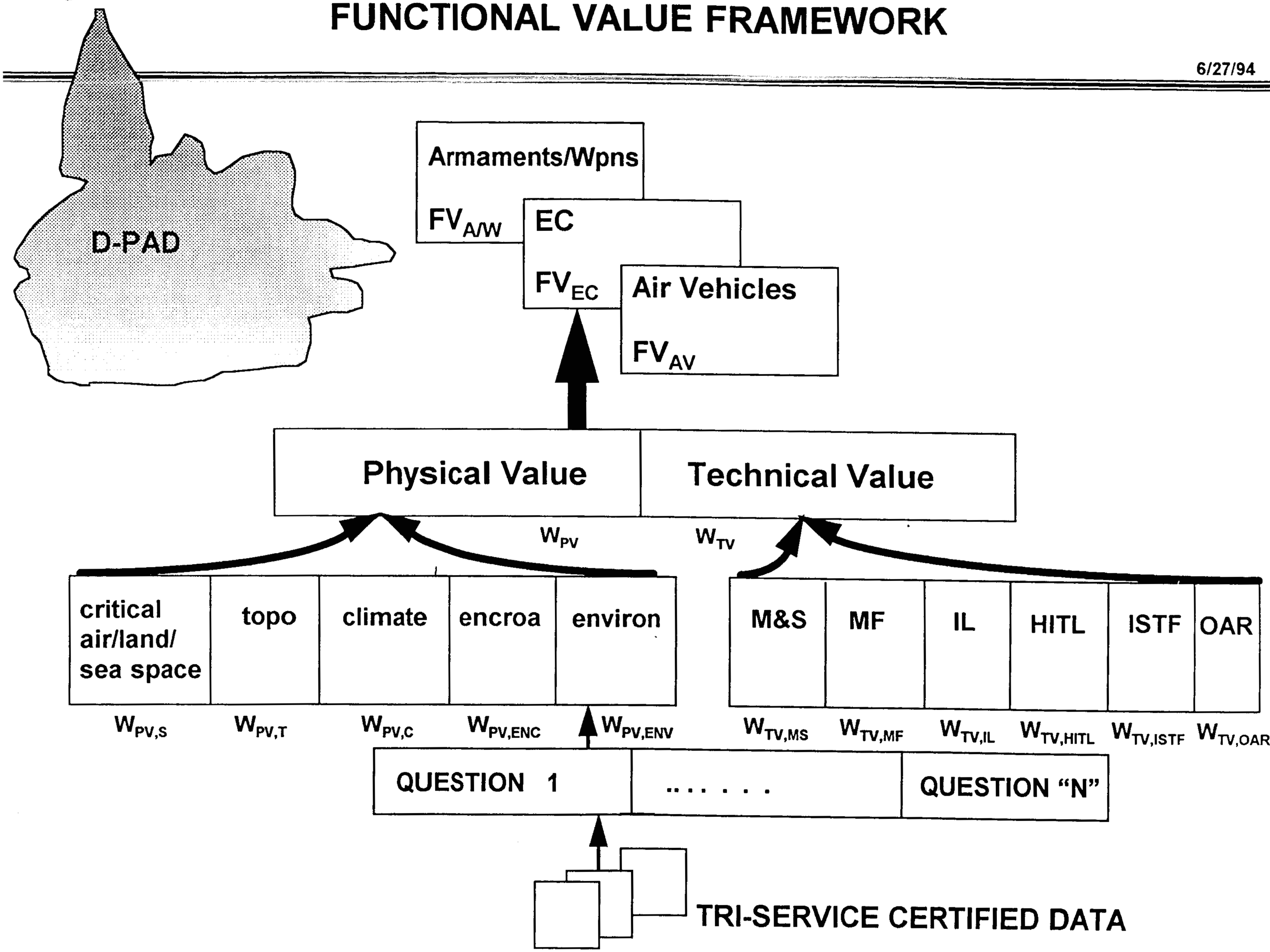
$$W\ (FY(99)) = W\ ((FY92 + FY93)/2) \times \frac{\text{Budget Outlays (FY99)*}}{\text{Budget Outlays ((FY92 + FY93)/2)*}}$$

* Constant FY95 dollars

- **Certified inflation indices and outlay rates provided by DoD comptroller**

FUNCTIONAL VALUE FRAMEWORK

6/27/94



Appendix C -- Excess Capacity Methodology

- Capacity is based on the number of representative tests a T&E test facility can conduct simultaneously, using an estimated single shift standard of 2008 facility hours per year
- Capacity is based on the existing infrastructure
- Assumes that the downtime can be accomodated outside of the single shift time period
- Excess Capacity = Capacity - FY2001 Projected Workload

Excess Capacity Reduction Target Methodology

- Excess Capacity Definition
  - Delta between single-shift capacity and projected workload
- Reduction Target Constraints
  - Separate for each T&E functional area
  - Separate for each test facility category within each T&E functional area
  - Exclude excess capacity associated with unique, one-of-a-kind facilities

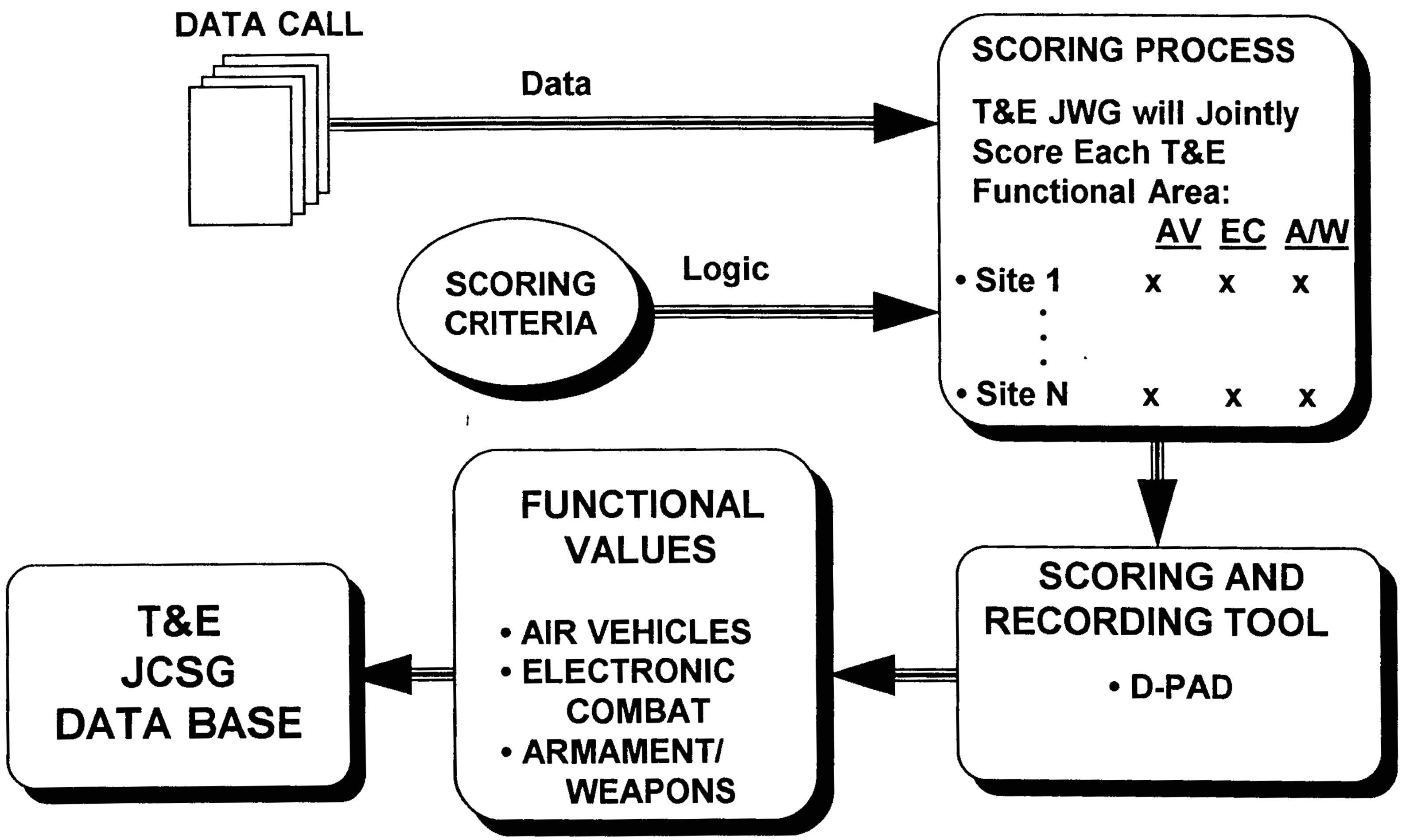
Appendix D -- T&E Optimization Formulations

- Agreement on multiple formulations, including objective functions and constraint equations
  - MAXSFV: Maximizes functional value for open sites
  - MINXCAP: Minimizes excess capacity for open sites
  - MINSITE: Minimize the number of open sites
  - MINNMV: Maximize the military value (MV) by minimizing its negative plus 4 to keep MV positive
- Formulations examined with trial runs
  - Performed by Tri-Dept BRAC Team
  - Used notional data from each service
- Tools for analysis of results being developed

Appendix E -- Questions, Weights, and Scoring Process

- Provides rationale for the choice of scoring scale (i.e. Yes/No, 0-Max, Hybrid, 0-Max with threshold) and rationale for each FV question
- Provides recommended weights for each FV question and accompanying justification
- Scoring of each functional area will be performed by one or two members from each Military Dept
  - Members are to be designated in writing by BRAC offices to the OSD Co-chairs prior to start of scoring process

T&E JCSG FUNCTIONAL VALUE SCORING PROCESS



Appendix F -- Database management process

- **Database serves as repository for working copies of:**
  - T&E data call responses
  - FYDP information
  - Functional Values
  - Capacity and Excess Capacity
  - Workload projections
  - Functional COBRA inputs/outputs
  - Optimization model inputs/outputs
  - Maintains audit trail
- **Control of Database**
  - T&E JCSG appoints data administrator
  - Data locked in storage area with limited access (TEC complex)
  - Data administrator maintains log of data and model runs
- **Disposition of database at end of study**
  - Record copies submitted to Tri-Dept BRAC Group
  - Working copies of database/supporting documents will be destroyed

Appendix G -- Classified Data Analysis

- DoD unique and geographically constrained
- T&E capabilities not subject to closure or relocation (rationale is classified)
- May absorb workload or other capabilities
- Proposed access
  - One member for each Service analysis team
  - Lead Service member on T&E JWG
  - Principal OSD and Service members on T&E JCSG
- Defines procedure for
  - Data handling/storage/analysis
  - Cleared facility
  - SAF/AAZ OPR for both

Issues

- FY99 (T&E) vs FY97 (Lab/Depot) for sizing infrastructure
- Schedule -- 1 month behind

Summary/Recommendation

- Analysis plan completed
- Request approval of analysis and action plan
- Request Tri-Department data release for scoring