



**DEPARTMENT OF THE ARMY**  
U.S. ARMY AUDIT AGENCY  
Office of Deputy Auditor General  
Installations Management  
3101 Park Center Drive  
Alexandria, VA 22302-1596

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SAAG-IMT (36-2c)

20 May 2004

MEMORANDUM FOR Director, The Army Basing Study Group

SUBJECT: Audit of the Military Value Analyzer Model (Project Code A-2003-IMT-0440.002), Audit Report: A-2004-0308-IMT

1. **Introduction.** The Director, The Army Basing Study Group asked us to audit the Military Value Analyzer Model that the Study Group will use to rank-order installations in the Army's Base Realignment and Closure (BRAC) 2005 inventory. This report summarizes the results of our audit. We will include these results, as well as additional observations of the Army's actual use of the tool, in a separate overall report on the 2005 Army Basing Study process.

2. **Background.** The Secretary of Defense initiated BRAC 2005 on 15 November 2002. The Secretary of the Army established the Deputy Assistant Secretary of the Army (Infrastructure Analysis) to lead the Army's efforts to support BRAC 2005. The Deputy Assistant Secretary directs The Army Basing Study Group, which serves as the Army's single point of contact for planning and executing the Army's responsibilities in the development of BRAC 2005 recommendations. The Study Group will:

- Assess the military value of Army installations.
- Evaluate BRAC alternatives.
- Develop recommendations for BRAC 2005 on behalf of The Secretary of the Army.

To accomplish this, the Study Group will obtain and analyze certified data from Army installations, industrial base sites and leased properties; Army corporate databases; and open source data. A flowchart of The Army Basing Study process is enclosed. In January 2004 the Study Group selected the Logical Decisions for Windows software, which quantitatively evaluates and rank-orders alternatives, to conduct the military value analysis. The analysis will rank-order installations using certified

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data related to four of the eight selection criteria that DOD established for BRAC 2005:

- Current and future mission requirements and their effect on the operational readiness of DOD's total force.
- Availability and condition of land and facilities at both existing and potential receiving locations.
- Ability to accommodate contingency, mobilization and future total force requirements at both existing and potential receiving locations.
- Cost and personnel implications.

3. **Objective, Scope and Methodology.** Our objective was to determine whether the Military Value Analyzer Model, which is modeled within the Logical Decisions for Windows software, appropriately rank-orders installations based on weighted data and algorithms. We also reviewed the basis for and documentation supporting the Study Group's selection of the weight assessment method it will use in the model. We performed our audit work from July 2003 through March 2004 in accordance with generally accepted government auditing standards. We limited the scope of this audit because BRAC 2005 data wasn't available at the time of our engagement and because we will do a sensitivity analysis of the tool once all BRAC 2005 data is available. Consequently, we reviewed only the algorithms and weights used in the software to determine if it appropriately rank-orders the alternatives. To do this we:

- Obtained 57 assessment attributes (measures) used to rank-order installations and leased facilities during BRAC 1995 and reviewed a draft Center for Army Analysis study entitled "Statistical Significance of BRAC 1995 Attributes," which became final in February 2004.
- Obtained scores (data) from the Basing Study BRAC 1995, Volume II, DA, Installation Assessment Process and Supporting Data, dated March 1995.

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- Obtained weights used to rank-order installations and leased facilities during BRAC 1995 from the BRAC 1995 Assessment Attribute Matrix, dated 16 April 1993.
- Constructed 10 alternatives (hybrid installations) based on 1995 data from multiple installations.

In addition, we interviewed key personnel from the Study Group and the contractor who developed the software, and attended training on the software at the Center for Army Analysis.

#### 4. **Audit Results**

a. **Software.** The Military Value Analyzer Model, modeled within the Logical Decisions for Windows software, appropriately rank-orders installations based on weighted data and algorithms. Using information from the Study Group and the study by the Center for Army Analysis, we selected 12 of the 57 assessment attributes used during BRAC 1995. We obtained scores (data) from the Basing Study BRAC 1995 report and chose weights from the matrix that related to the 12 assessment attributes we selected. We entered the assessment attributes, alternatives, scores and weights into the software and applied the software using these three weight assessment methods:

- The Direct Method: Requires the direct entry of precise weights for a goal. The sum of the weights entered will always equal 1.
- The Smart Method: Requires entry of weights based on the relative importance of the assessment attributes using “swing weights.” The most important attribute receives a weight of 100 percent, the second most important attribute receives a weight less than the first attribute, the third most important attribute receives a weight less than the second attribute, and so on.
- The Smarter Method: Requires entry of weights based on the order of the relative importance of the assessment attributes. The most important attribute receives a value of 1. Each subsequent attribute receives increasing values as they

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decline in importance. Once the entries are complete, the software calculates the set of weights based on the order of the attributes as they were defined.

We repeated this process using the same information (assessment attributes, alternatives, scores and weights) in a spreadsheet and were able to replicate the results for each weight methodology. Therefore, in our opinion, the software the Study Group will use for military value analyses appropriately rank-orders alternatives based on weighted data and algorithms. Here's how the three weighting methods ranked our alternatives for the 10 hybrid installations we constructed:

Direct Method		Smart Method		Smarter Method	
Installation	LDW	Installation	LDW	Installation	LDW
A	0.666	A	0.698	A	0.690
B	0.663	B	0.649	B	0.625
C	0.555	C	0.578	E	0.605
D	0.526	E	0.568	C	0.604
E	0.516	D	0.530	D	0.572
F	0.473	F	0.523	G	0.556
G	0.466	G	0.508	F	0.525
H	0.437	H	0.431	H	0.467
I	0.408	I	0.354	J	0.377
J	0.320	J	0.328	I	0.302

LDW = Logical Decisions for Windows software.

a. **Weight Assessment Method.** An attribute's weight depends on its importance and the range of the attribute's value measure scale, which represents the variation in scores between installations. Accordingly, the Study Group developed a weighting matrix that identified the two most important factors in determining weights:

- First Factor: Relative importance among attributes (the more difficult the attribute characteristic is to change, the more important it becomes).
- Second Factor: Range of variation in installation scores (little variation between installations means there's little reason to weight an attribute heavily).

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After determining the weights for each assessment attribute, the Study Group will perform multiple objective decision analysis, which is a technique that focuses on multiple conflicting objectives. The Study Group used the same approach during BRAC 1995 and it is consistent with contemporary strategic decision-making used in private industry.<sup>1</sup> Multiple objective decision analysis follows the value measure approach inherent in the Smart Method of Weight Assessment. According to the Study Group, the Smart Method allows the Study Group to assess weights outside of the software, gain group consensus (which can be difficult), and enter the weights into the software. Consequently, given the number of conflicting objectives inherent in The Army Basing Study process, we believe the Study Group's decision to use the Smart Method is the more appropriate of the three weight assessment methods for military value analysis during BRAC 2005.

5. **Suggested Action.** At the current time, the Study Group should document the weights and how they were determined for each assessment attribute. We may have additional suggestions or recommendations for using the model, weighting assessment attributes, or conducting military value analysis once we complete additional audit work we have scheduled.

6. **Closing Remarks.** This report isn't subject to the official command-reply process described in AR 36-2. If you have any questions or need additional information, please contact Mr. Lawrence Wickens at (703) 696-9769 or (703) 428-6524, or Mr. Clarence Johnson at (410)

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<sup>1</sup> Dr. Craig W. Kirkland, Strategic Decision Making: Multiobjective Decision Analysis with Spreadsheets, Duxbury Press, 1997.

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FOR THE AUDITOR GENERAL:



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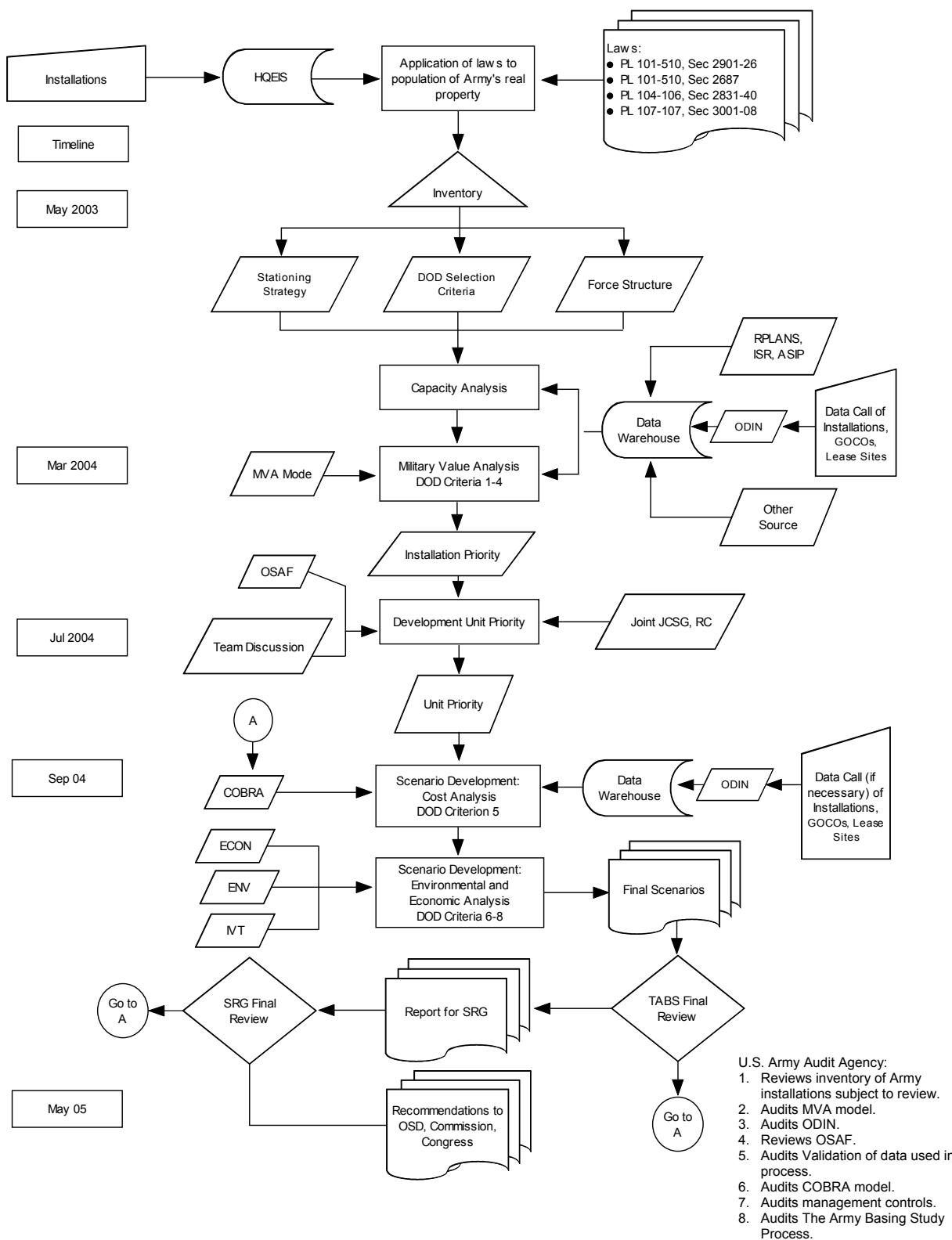
Office of the Inspector General, DOD  
U.S. General Accounting Office

Acronyms and Abbreviations Used:

ASIP = Army Stationing and Installation Plan  
 COBRA = Cost of Base Realignment Action Model  
 ECON = Economic Model  
 ENV = Environmental Model  
 GOCO = Government-Owned, Contractor-Operated  
 HQEIS = Headquarters Executive Information System

ISR = Installation Status Report  
 IVT = Installation Visualization Tool  
 JCSG = Joint Cross-Service Group  
 MVA = Military Value Analyzer Model  
 ODIN = Online Data Interface Collection

OSAF = Optimal Stationing of Army Forces  
 OSD = Office of the Secretary of Defense  
 PL = Public Law  
 RC = Reserve Components  
 RPLANS = Real Property Planning and Analysis System



- U.S. Army Audit Agency:
1. Reviews inventory of Army installations subject to review.
  2. Audits MVA model.
  3. Audits ODIN.
  4. Reviews OSAF.
  5. Audits Validation of data used in process.
  6. Audits COBRA model.
  7. Audits management controls.
  8. Audits The Army Basing Study Process.

Enclosure

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