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MILITARY BASE CLOSURES

Analysis of DOD's Process and Recommendations for 1995

Statement of Henry L. Hinton, Jr., Assistant Comptroller General, National Security and International Affairs Division

GAO/T-NSIAD-95-132

Mr. Chairman and Members of the Commission:

We are pleased to be here today to discuss our report entitled Military Bases: Analysis of DOD's 1995 Process and Recommendations for Closure and Realignment (GAO/NSIAD-95-133, Apr. 14, 1995). The Defense Base Closure and Realignment Act of 1990 (P.L. 101-510, as amended) established the current process for DOD base closure and realignment actions within the United States. Our report responds to the act's requirement that GAO provide to the Congress and the Defense Base Closure and Realignment Commission an analysis of the Secretary of Defense's recommendations for bases for closure and realignment and the selection process used.

On February 28, 1995, the Secretary of Defense recommended closures, realignments, and other actions affecting 146 domestic military installations. Of that number, 33 were described as closures of major installations, and 26 as major realignments; an additional 27 were changes to prior base closing round decisions. The Secretary projects that the recommendations, when fully implemented, will yield $1.8 billion in annual recurring savings.

RESULTS IN BRIEF

Although the Department of Defense (DOD) has in recent years undergone substantial downsizing in funding, personnel, and force

structure, commensurate infrastructure reductions have not been achieved. Despite some progress in reducing excess infrastructure, it is generally recognized that much excess capacity likely will remain after the 1995 BRAC round. This view is supported by the military components' and cross-service groups' analyses, which showed far greater excess capacity than will be eliminated by the Secretary's recommendations. Currently, DOD projects that its fiscal year 1996 budget represents, in real terms, a 39-percent reduction below its fiscal year 1985 peak of recent times. By way of comparison, its 1995 BRAC recommendations combined with previous major domestic base closures since 1988 would total a reduction of 21-percent.

DOD's 1995 BRAC process was generally sound and well documented and should result in substantial savings. However, the recommendations and selection process were not without problems, and in some cases, there are questions about the reasonableness of specific recommendations. At the same time, we also noted that improvements were made to the process from prior rounds, including more precise categorization of bases and activities; this resulted in more accurate comparisons between like facilities and functions and better analytical capabilities.

We raise a number of issues that we believe warrant the Commission's attention in considering DOD's recommendations. Key among those issues are the following:

-- DOD's attempt at reducing excess capacity in common support functions facilitated some important results. However, agreements for consolidating similar work done by two or more of the services were limited, and opportunities to achieve additional reductions in excess capacity and infrastructure were missed. In particular, this was the case at depot maintenance activities, test and evaluation, and laboratory facilities.

-- Although the services have improved their processes with each succeeding BRAC round, some process problems continued to be identified. In particular, the Air Force's process remained largely subjective and not well documented; also, it was influenced by preliminary estimates of base closure costs that changed when more focused analyses were made. For these and other reasons, GAO questions a number of the Air Force's recommendations. To less extent, some of the services' decisions affecting specific closures and realignments also raise questions. For example, the Secretary of the Navy's decision to exclude certain facilities from closure for economic impact reasons suggests that the economic impact criterion was not consistently applied.

Now, permit me to briefly expand my comments in a few of these areas.

BRAC Savings Are Expected to Be Substantial, but Estimates Are Preliminary

We estimate that the 20-year net present value of savings from DOD's recommendations will be $17.3 billion, with annual recurring savings of almost $1.8 billion. These estimates are not based on budget quality data, however, and are subject to some fluctuations and uncertainties inherent in the process. Nevertheless, we believe the savings will still be substantial. At the same time, it should be noted that environmental restoration was not a factor in the DOD base closure decision-making process; and such restoration can represent a significant cost following a base closure.

DOD and its components improved their cost and savings estimates for BRAC 1995 recommendations. In developing cost estimates, they took steps to develop more current and reliable sources of information and placed greater reliance, where practicable, on standardized data. Some components sought to minimize the costs of base closures by avoiding unnecessary military construction. For example, the Navy proposed a number of changes to prior BRAC decisions that will further reduce infrastructure and avoid some previously planned closure costs.

We identified a number of instances where projected savings from base closures and realignments may fluctuate or be uncertain for a variety of reasons. They include uncertainties over future

locations of activities that must move from installations being closed or realigned and errors in standard cost factors used in the services' analyses. We completed a number of sensitivity tests to assess the potential impact of these factors on projected costs and savings and found that they had a rather limited impact.

It should be noted that shortly after the Secretary of Defense announced his list of proposed closures and realignments, most DOD components began undertaking more rigorous assessments of the expected costs of implementing the recommendations and developing budget quality data for doing so. Such efforts are currently underway primarily in the Army and Air Force, and to less extent in the Navy. We suggest that the Commission obtain updated cost and savings data, to the extent it is available, and include it in summary form in its report for the recommendations it forwards to the President for his consideration.

Service Recommendations Will Reduce Infrastructure, but With Little Gain in Cross-Servicing

The BRAC 1995 process reduced some infrastructure in common support areas such as hospitals and pilot training facilities. However, the lack of progress in consolidating similar work done by two or more of the services limited the extent of infrastructure reductions that could have been achieved.

DOD tried to strengthen the 1995 BRAC process by establishing cross-service groups to provide the services with proposals for consolidating similar work in the areas of depot maintenance, laboratories, test and evaluation facilities, undergraduate pilot training, and medical treatment facilities. However, in the laboratories and test and evaluation areas, the cross-service groups were narrowly focused, and their initial proposals represented minor work load shifts that offered little or no opportunity for a complete base closure or cost-effective realignment. While the depot maintenance group identified excess capacity of 40.1 million direct labor hours, the services' recommendations would eliminate only half that amount. DOD received the services' recommendations too late in the process for meaningful give-and-take discussions to achieve greater consolidations. More time for such interactions and stronger DOD leadership will be required should there be future BRAC rounds.

DOD Components' Processes Were Sound, With Some Exceptions

While we found the components' processes for making their recommendations were generally sound and well supported, we do have some concerns, particularly related to the Air Force. Specifically, key aspects of the Air Force's process remained largely subjective and not well documented. Documentation of the Air Force's process was too limited for us to fully substantiate the extent of Air Force deliberations and analyses. However, we determined that initial analytical phases of the Air Force's

process were significantly influenced by preliminary estimates of base closure costs. And some bases were removed from initial consideration based on these estimates. Also, in some instances, closure costs appeared to materially affect how the bases were valued. For example, Rome Laboratory, in Rome, New York, was ranked high for retention purposes largely because of projected high closure costs. When the Air Force later looked at the laboratory at the suggestion of a cross-service group, it found that the closing costs were much lower. Consequently, the Air Force recommended closure of the laboratory. Without the cross-service group's suggestion, the Air Force might have missed this opportunity to reduce excess capacity and produce savings. The more numerous recommendations on Guard and Reserve activities were developed outside its process for grouping or tiering bases for retention purposes and were based largely on cost-effectiveness.

Regarding the Navy, the Secretary of the Navy's actions excluded four activities in California from consideration for closure because of concerns over the loss of civilian positions. For the activities in California, he based his decision on the cumulative statewide economic impact. The cumulative job losses in California, in absolute terms, are greater than total job losses in other states. However, the individual impact of each of the four California activities is less than the impacts estimated for other activities in other states recommended for closure. For

example, the closure of the Naval Weapons Assessment Division (NWAD) Corona, California, would have meant a total loss of 3,055 jobs, but the closure of Naval Air Station (NAS) Meridian, Mississippi, will result in an estimated loss of 3,324 jobs. However, OSD did not take exception to this apparent inconsistency.

Regarding the Army, it did not fully adhere to its regular process in assessing military value when recommending minor and leased facilities for closure. In selecting 15 minor sites for closure, the Army based its decision on the judgment of its major commands that the sites were excess and of low military value. In considering leased facilities, the Army relied on its stationing strategy and its guidance to reduce leases but did not assess the facilities separately as it did for other installations. The decisions were arrived at through some departure from the process used for installations.

Some Service Recommendations Raise Issues That Should Be Considered by the BRAC Commission

We generally agree with the Secretary's recommendations. However, we have unresolved questions about a number of Air Force recommendations and to much less extent the other components' recommendations. The following are some examples.

Even though the Air Force recognized that it had excess capacity

at its five maintenance depots and was considering closing two, it opted late in the process to realign the work load rather than close any depots. However, the Air Force based its decision on preliminary data from incomplete internal studies on the potential for consolidating and realigning work load and reducing personnel levels at the depots. Some of these studies were completed after DOD's BRAC report was published and do not fully support the BRAC-recommended consolidations. These recommended consolidations appear to expand the work load at some depots that are in the process of downsizing. Thus, the Air Force's recommendation may not be cost-effective and does not solve the problem of excess depot capacity.

The Air Force also proposed the realignment of Kirtland Air Force Base, New Mexico, because it rated low relative to the other five bases in the same category. Again, closure costs appeared to heavily influence this base's rating. However, for the military value criterion pertaining to mission requirements, the most important to the lab subcategory of bases, Kirtland rated among the highest of the six bases. Kirtland's realignment would reduce the Air Force's operational overhead, including support previously provided to the Department of Energy (DOE) and its Sandia National Laboratory located on Kirtland. However, the Air Force's savings could mean an increase in base operational support costs borne by DOE. We believe, and have recommended in the past, that DOD should consider the impact of significant

government-wide costs in making its recommendations.

The Army's proposed realignment of the Letterkenny Army Depot has generated some concerns not only about the completeness of closure cost data but also regarding the extent to which the current BRAC recommendation represents a change from a 1993 BRAC decision. BRAC 1993 produced a decision to consolidate all tactical missile maintenance at one location--Letterkenny. The Army's 1995 BRAC recommendation would split up some of the work by transferring the missile guidance system work load to Tobyhanna Army Depot while preserving the tactical missile disassembly and storage at Letterkenny. Maintenance on the associated ground support equipment, such as trucks and trailers, would be done at Anniston Army Depot. There are differences of opinion concerning the impact that separating these functions would have on the concept of consolidated maintenance.

Future BRAC Legislation May Be Needed to Reduce Remaining Excess Activities

According to DOD, its major domestic bases will be reduced by 21 percent after implementation of all BRAC recommendations from the current and prior rounds; however, DOD fell short of meeting the goal it established for BRAC 1995. To bring DOD's base infrastructure in line with the reductions in force structure, DOD's goal for the 1995 round was to reduce the overall DOD plant replacement value by at least 15 percent--an amount at least equal to the three previous base closure rounds. However, DOD's

1995 recommended list of base closures and realignments is projected to reduce the infrastructure by only 7 percent.

The Secretary of Defense recently stated that excess infrastructure will remain after BRAC 1995, and he suggested the need for additional BRAC rounds in 3 to 4 years, after DOD has absorbed the effects of recommended closures and realignments. However, the current authority for the BRAC Commission expires with the 1995 round. Should the Congress seek further reductions, some process will be needed. The current BRAC process, while not without certain weaknesses, has proven to be effective in reducing defense infrastructure. Also, without new BRAC legislation, there is no process to approve modifications of BRAC decisions if implementation problems arise. BRAC Commissions in 1991 and 1993 ruled on changes to prior BRAC round decisions, and we see nothing to indicate that changes may not occur in the future.

Now let me conclude by discussing our report's specific recommendations.

RECOMMENDATIONS

Recommendations to the Secretary of Defense

Should there be future BRAC rounds, we recommend that the

Secretary of Defense

-- begin the cross-service process 1 year before the services' BRAC process and, for each common support function studied, incorporate specific capacity reduction goals in OSD's initial BRAC guidance, and

-- prior to any BRAC round, identify and make the policy decisions necessary in each area to merge service functions that would result in further reductions in infrastructure.

Recommendation to the Secretary of the Air Force

Should Congress mandate future BRAC rounds, we recommend that the Secretary of the Air Force fully document all analyses and decisions, including cost data.

Recommendations to the Commission

We recommend that the Base Closure and Realignment Commission take the following actions:

-- Consider obtaining updated cost and savings data, to the extent it is available from the services, and include this data in summary form in its report for the recommendations it forwards to the President for his consideration.

-- Require more complete plans for eliminating excess capacity and infrastructure before approving the Air Force's recommendations to realign its depot facilities.

-- Because the services did not completely analyze the set of alternatives developed by the chairpersons of the cross-service group for test and evaluation, the BRAC Commission may wish to have the services complete detailed analyses, including cost analyses, for its consideration.

-- Closely examine expected cost savings and operational impacts associated with the Kirtland AFB realignment. Additionally, we recommend that the Commission have DOD identify those closures and realignments that have costs and savings implications affecting other federal agencies.

-- Assess the Army's approach to selecting lease facilities for termination and minor sites for closure regarding whether variances we have identified represent a substantial deviation from the selection criteria.

-- Ensure that the Army's ammunition depot recommendations are based upon accurate and consistent information and that corrected data would not materially affect military value assessments and final recommendations.

-- Assess the proposed realignment of Letterkenny Army Depot in view of the Army's recommendation to change a prior BRAC decision to consolidate tactical missile maintenance at a single location.

-- Ensure that the Army has met all permit requirements related to the closure of Fort McClellan, Alabama.

-- Explore the need for a DOD component or some other government agency to obtain the wind tunnel facility at the Naval Surface Warfare Center, White Oak, Maryland, from the Navy.

-- Thoroughly examine the basis for exclusions to the cost and savings data associated with closure and realignment scenarios such as the Naval Surface Warfare Centers in Louisville, Kentucky; Indianapolis, Indiana; and Lakehurst, New Jersey.

-- Examine, from an equity standpoint, the Navy's exclusion of activities from closure and realignment consideration due to concerns over job losses.

-- Finally, consider requiring that DOD report to the Commission on the comparative cost-effectiveness of options it is considering regarding privatization-in-place or the

transfer of workload to other depots, versus the current cost of performing operations at the Aerospace Guidance and Metrology Center at Newark Air Force Base, Ohio (a 1993 BRAC recommendation).

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Mr.Chairman, this concludes my prepared statement. We will be happy to respond to any questions.

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NOMIC SECURITY

25 MAY 1995

Honorable Alan J. Dixon
Chairman, Defense Base Closure
and Realignment Commission
1700 N. Moore Street, Suite 1425
Arlington, Virginia 22209

Dear Mr. Chairman:

This is in response to your April 27, 1995, letter requesting that the Department of Defense provide responses to questions for the record resulting from the April 17, 1995 hearing. On May 9, 1995, we forwarded an interim response to these questions. Enclosed is the final set of answers.

I trust this information will be helpful, please let me know if there is anything else we can provide.

Sincerely,

Robert L. Meyer
Director
Base Closure

Enclosure

cc: Senate and House Reading Rooms

DEPOT MAINTENANCE

QUESTIONS SUBMITTED TO MR. KLUGH FOR THE RECORD

1. You identified a spreadsheet of a database created by a team of operations research systems analysts that would be provided for the record. Please provide the constraint equations to minimize and maximize the functional military value rankings. In addition, please identify where the flexibility exists in the algorithm assumptions.

ANSWER: For the Joint Cross-Service Group for Depot Maintenance, I directed the creation of a database from the certified data provided by the Military Departments. This data base was similar to a spreadsheet, strictly mechanical, and permitted accuracy cross-checks and rapid access. On the other hand, the Department adopted a linear program, known as the Joint Cross-Service Analysis Tool, or Optimization Model, for use by all cross-Service groups. The best way for me to respond to this question is to provide the model documentation (see **TAB 1**); this should answer all of your specific questions relating to constraints. Flexibility in the model comes from allowing it to move commodity workload from depot to depot in its efforts to optimize on a criteria, i.e., minimize sites, minimize excess capacity, maximize military value, or maximize functional value. It is inflexible in that a commodity workload can not be sent to a depot that was not previously identified as having the capability to perform that type of work. In other words, the model did not add capability over that which had been certified by the Services in an effort to close more facilities. Having said that, it should be pointed out that we created a notional depot for analysis purposes which allowed us to analyze, on an individual basis, any workloads that didn't "fit". This process is fully explained in our process summary which has been provided to your staff.

2. Please provide the core functions by commodity for each Air Force depot, and the co-located weapon system for those commodities.

ANSWER: Core functions by commodity, previously provided for all Services, are provided at **TAB 2.** It is evident from this chart that the Air Force, independent of BRAC actions, is evolving to a center of technical excellence philosophy. For example, landing gear depot maintenance workload is accomplished at Ogden ALC. The majority of the Air Force communications and electronics workload is performed at Warner Robins ALC. Aircraft engine depot maintenance is essentially accomplished at two depots, Oklahoma City ALC and San Antonio ALC. All Air Force blade and vane depot maintenance is performed at Oklahoma City ALC. The majority of bearing work is performed at Oklahoma City ALC.

3. Describe how your Joint Cross Service Group assigned functional values to each of the depots and shipyards?

ANSWER: The Joint Cross-Service Group assigned a functional value to performing maintenance on a particular commodity at a particular location. We looked at measures of merit that were applicable to all commodity groups and then assigned weights to those measures.

- CORE workloads/CORE capabilities - 30 Points
- Unique/peculiar CORE workload, capabilities and capacity - 15 Points
- Unique/peculiar CORE workload test facilities - 15 Points
- Other workloads - 30 Points
- Environmental issues/questions - 10 Points

Specific questions and weightings were developed and applied to each commodity at each activity.

4. When assigning workload, how did the functional value scores impact the positioning of workload?

ANSWER: The Optimization Model looked first to the criteria being optimized, that is :

- Minimize sites
- Minimize excess capacity
- Maximize Military value
- Maximize functional value

then within that criteria, it assigned workload to that location reporting capability and capacity on the basis of the highest functional value.

5. What is the excess capacity by Service, and by depot?

ANSWER: The spreadsheet provided at **TAB 3** and previously provided to your staff, displays excess capacity by commodity, by depot, and by Service. This spreadsheet is based upon capacity minus FY 1999 programmed, or funded core workload. All of the data were certified by the providing Service.

6. Please provide the capacity charts that describe excess capacity with implementation of this BRAC by Service, and by depot?

ANSWER: See spreadsheet at **TAB 3**. See **TAB 4** for supplemental Navy comments.

7. Cross Service Alternative Two proposes the closure of Long Beach and either Pearl Harbor or Portsmouth. Did the Joint Cross Service Group view Pearl Harbor and Portsmouth as equivalent in terms of capability as well as capacity?

ANSWER: In terms of capacity and core workloads they are similar. See **TAB 4** for supplemental Navy comments.

8. In both Alternatives One and Two, specific workload transfers are identified for each commodity group except for sea systems. In that case, the alternative states, "Consolidate as possible within the Department of the Navy." Why was the sea systems commodity area proposal not specific concerning workload distribution?

ANSWER: We felt that the commodity group of "Sea Systems" was unique to Navy and not susceptible to interservicing. We were also aware that there were nuclear and non-nuclear issues involved. We felt we could highlight the excess capacity, give the Navy some flexibility, and still track the results. See **TAB 4** for supplemental Navy comments.

9. What does the DoD BRAC recommendation do to your ability to inter-service depot maintenance work in the future?

ANSWER: It should help our efforts to interservice in the future. In my position as Deputy Under Secretary of Defense (Logistics), I chair the Defense Depot Maintenance Council, or DDMC. Joining me on that council are the Logistics Chiefs from each of the Services. By charter, the DDMC can direct the assignment of depot maintenance workloads. The extensive database developed by the Joint Cross-Service Group provides an excellent baseline. Throughout the BRAC 95 process, I held Defense Depot Maintenance Council interservicing initiatives in abeyance in order not to prejudice the BRAC process.

10. Why did the Joint Cross Service Group initially recommend decentralization of tactical missile maintenance and then later "approve" the Army plan to consolidate at Tobyhanna?

ANSWER: Based upon the certified data available, Tobyhanna did not have the capacity to perform the entire workload if Letterkenny were to close. The Army then submitted a plan realigning Letterkenny under Tobyhanna which provided sufficient capacity and allowed the best use of facilities within a hundred mile radius. This plan will also allow the Army to shed excess overhead.

Did the JCSG consider the centralization of tactical missile maintenance at Hill Air Force Base? If so, what were the findings?

ANSWER: Yes, we specifically looked at consolidating the depot maintenance of tactical missiles at Ogden Air Logistics Center. Based upon the core requirements and the certified maximum potential capacity supplied by the Air Force, Ogden lacked sufficient capacity to accept the core workload. Subsequent review, at the direction of the BRAC Commission indicates Ogden ALC does not currently have sufficient storage capacity, or personnel resources to absorb the tactical missile requirement without substantial investment and hiring.

Was Anniston Army depot considered for missile maintenance consolidation?

ANSWER: Yes, the Joint Cross-Service Analysis Tool, or Optimization Model, considered the consolidation of workloads at all depots indicating the capability to perform that type of work. That depot was then considered for workload based upon the optimized criteria, certified maximum potential capacity, and relative functional value for that commodity. The Data Analysis Team then reviewed the model outputs on a commodity-by-commodity basis to determine if further consolidations of like workloads could be accomplished.

Should the Commission decide not to accept the Department's recommendation relating to tactical missiles, I would encourage the investigation of privatization. Tactical missile workload is conducive to being performed in the private sector. This could be accomplished either by having the original equipment manufacturer perform maintenance on individual systems, or the establishment of a Government-Owned Contractor-Operated cantonment facility at Letterkenny Army Depot.

DEPOT MAINTENANCE

QUESTIONS SUBMITTED TO GENERAL BLUME FOR THE RECORD

1. The Commission staff was recently briefed on a revision to the 1 March DoD recommendation from the Air Force.

a. Please outline for the Commission the revision to the recommendation.

ANSWER: As a normal part of our process, the Air Force conducted site surveys on the implementation of the recommendation regarding the ALCs. During that site survey, we reviewed the details of the recommendation, including specific product line consolidations and the identification of specific buildings for demolition or mothballing. In the site survey, we refined our estimates of personnel reductions and transfers associated with the consolidations, as well as the costs of the actions. These refined numbers were provided to the Commission staff.

The Air Force also identified four areas where a refined approach was better from a cost or mission effectiveness standpoint. Two modifications alter the location where work would be consolidated and two alter the recommendation to fully consolidate workload. These were identified to the Commission staff for their consideration.

b. Would you please explain why the Air Force found it necessary to revise its BRAC recommendation 7 weeks into the process?

ANSWER: Subsequent to submitting its recommendations, the Air Force obtained refined data. This was provided to the Commission staff to ensure the best information was considered.

2. All of the savings from the Air Force's BRAC recommendation to downsize all Air Force depots in place is the result of a 15 % reengineering factor.

a. Have the reengineering studies been performed yet?

ANSWER: No, they have not. Establishing new shop floor layouts for new workload mixes is a time-consuming and expensive process involving substantial industrial engineering resources. The Air Force plans to conduct the majority of the required industrial reengineering using contract industrial engineering support beginning in October 1995. Until that time, advance actions will be taken so the depots are prepared to execute as soon as practical following final approval of the BRAC 95 actions. Additionally, some relatively simple industrial reengineering may be conducted using organic industrial engineers where minor shop floor layout changes are required to accommodate some of the smaller workload consolidations.

b. What is the basis of the 15 % factor?

ANSWER: The 15% industrial reengineering productivity factor is an efficiency factor developed during the AFMC TRC review process. The 15 % is based on the plan to reengineer

all production lines supporting consolidating workloads and processes at gaining sites to the most efficient layouts possible for the new workload mixes. This reengineering will retain only the minimum capacity needed to support the Core workload at a targeted 85 % utilization rate. The consensus of HQ AFMC and ALC senior managers is that the improved industrial processes will yield (on average) a productivity increase of 15%.

c. Do your site surveys confirm that a 15% productivity savings is achievable?

ANSWER: Nothing was revealed during the site surveys that challenged the 15% productivity improvement planning factor. Savings above 15% are expected in many cases, and savings below 15% may occur in some instances. On the whole, the site surveys support the planned savings of approximately 15 percent.

3. The downsizing of ALCs would not breach the BRAC thresholds if actions were to be evenly phased over the next several years. Why did the Air Force choose to use the BRAC process if it could independently accomplish the same result?

ANSWER: Personnel reductions at the depot installations was clearly an item of interest that needed to be addressed within the BRAC process. Moreover, including the ALC actions within the BRAC process provides an opportunity for communities to address their concerns, and for the Commission to compare the Air Force recommendation to the more traditional closure option. Given these advantages of the BRAC process, it appears appropriate to include this in the overall Air Force recommendations.

4. Military value is the most important criterion to be considered when sizing the DoD infrastructure through the base closure process. The Air Force has used a tiering system in place of assigning military values.

a. What was the basis for assigning Kelly and McClellan Air Force Bases to "tier" 3?

ANSWER: First, a misunderstanding evident in the question should be cleared up. There is no "military value" criterion. Instead, the first four criteria are considered when evaluating military value. Rather than an overall value, there are four criteria, including cost and manpower implications, that comprise military value. The initial tiering of bases in the Air Force process is not based solely on the military value criteria, but on all eight criteria and a level playing field scenario. This is consistent with the direction that the recommendations are to be based on all eight criteria, with emphasis given to the first four. The basis for assigning Kelly and McClellan to their tier (as well as all other Air Force bases), was the BCEG's judgment of the relative value of each base's retention based on all eight criteria and the level playing field analysis.

b. What was the basis for assigning the depot at Kelly to "tier" 3?

ANSWER: In order to accommodate the Depot Maintenance Joint Cross-Service Group's request for a single "military value" for the bases, the Air Force provided two values for its depot bases. The first value reflected the tiering for the bases considered by the Joint Cross-Service

Group for Depot Maintenance (JCSG-DM). The second value reflected a tiering by depot asset only, not as a base, and was based on the Criterion I depot operations grade only. This second tiering was not a normal part of the Air Force process, and was accomplished only to assist the JCSG-DM. Kelly AFB received a yellow grade in the Depot Evaluation under Criterion I, and this was lower than the grades for the other depot operations.

c. The Air Force Base Closure Executive Group minutes indicate that the Air Force was studying the closure of Kelly and McClellan for 11 months. Were tier values a significant basis for studying Kelly and McClellan as closure candidates?

ANSWER: The assertion that these two bases were examined for closure for 11 months is unsupported. The identification of Kelly and McClellan as potential closures was not clear until the bases were tiered on September 13, 1994, and the tiering of depot bases was not briefed to the SECAF until November 10, 1994. The SECAF direction subsequent to this meeting to examine Kelly and McClellan for closure was based on their status as lower tier bases. This is the starting point for Air Force focused closure analysis in all categories.

d. How did the low military values of Kelly Air Force Base and McClellan Air Force Base impact the Air Force's final base closure recommendations?

ANSWER: The placement of these two bases in the lower tier meant that they were the first bases examined for potential closure. This did not, in the end, affect the Air Force recommendation since the Air Force chose not to recommend the closure of any depot due to the high one-time costs and relatively low return on the costs incurred.

e. The Air Force's depot downsizing recommendation would result in a "tier" 3 base (lowest ranking) receiving workload from "tier" 1 bases (highest ranking). What is the reason for this?

ANSWER: The tiering process was based on an overall base or depot evaluation. The consolidation, however, was focused on specific commodities. A lower ranking base may have the most cost effective site for consolidation of a specific commodity.

For example, McClellan has been the AF Technology Repair Center (TRC) for the repair and overhaul of aircraft hydraulic components since the early 1970s. Despite the fact that McClellan was ranked in tier 3 compared with the other ALCs overall, it is still by far the most economical center when considering the overhaul and repair of aircraft hydraulic components. McClellan already supports over 90% of this workload and has the most modern facilities and equipment available within the DoD. Accordingly, any other hydraulic component workload currently dispersed at other ALCs was recommended for consolidation at McClellan. This is a logical, economically sound, and fully supportable decision. In addition, once a decision is made not to close a base, it is eligible to receive missions or activities regardless of the origin of the relocating mission.

f. Why was there not a means to measure the value of co-located missions on Air Force Bases?

ANSWER: No base evaluation credits a base with the fact that a mission is located on that base. Instead, all bases including depots are evaluated against their ability to support various missions. The operational evaluation of Criterion I in the Air Force analysis, as well as Criteria II and III, provide an evaluation of this ability.

g. Why did the Air Force only look at the ability to receive different operational missions?

ANSWER: For depots, the ability to receive different operational missions is an important part of these installations, most of which have significant operational missions. The ability to receive and support other missions is an important measure of a base's contribution to the Air Force and was measured also. The ability of depots to receive other depot work was evaluated, particularly in the Joint Cross-Service Group for Depot Maintenance.

5. Secretary Widnall testified that a depot closure is prohibitively expensive. We are interested in understanding the relatively high cost that you estimated for the closure of an Air Force depot.

a. Why does the closure of an Air Force installation result in the elimination of such a low percentage of jobs, particularly compared to the closure of industrial facilities in the other services?

ANSWER: The closure of a depot <u>installation</u> assumes that the mission elements, tenants, and non-Air Force organizations move without reduction to new locations. Since the depot installations have significant portions dedicated to those uses, there is no manpower savings associated with those elements. The Air Force assumes that the workload projected for the closing depot will be transferred to another depot. Since the workload is being transferred the manpower associated with that workload must also be transferred. A six percent overhead savings was assumed based on expert judgment, but most of the manpower will transfer. The other savings achieved in manpower is that associated with the BOS manpower, reduced by BOS manpower increases at receiving locations.

b. Why do 86 percent of the authorized manpower positions have to be moved with the closure of a depot installation?

ANSWER: This answer is identical to the previous question. The closure of a depot <u>installation</u> assumes that the mission elements, tenants, and non-Air Force organizations move without reduction to new locations. Since the depot installations have significant portions dedicated to those uses, there is no manpower savings associated with those elements. The Air Force assumes that the workload projected for the closing depot will be transferred to another depot. Since the workload is being transferred, the manpower associated with that workload must also be transferred. A six percent savings can be assumed based on expert judgment, but most of the manpower will transfer. The other savings achieved in manpower is that associated with the BOS manpower, reduced by BOS manpower increases at receiving locations.

c. What was the projected cost to close McClellan Air Force depot in the 1993 BRAC compared with the cost to close estimate of the 1995 BRAC?

ANSWER: 1993 (Air Force recommendation) $427.5 million
1995 (closure scenario) $559 million

d. What factors changed the estimates of '93 vs. '95?

ANSWER: Many factors contributed to the changes in cost estimates of BRAC 1993 and BRAC 1995. New versions of the costing model were used (called COBRA or Cost of Base Realignment Actions), the standard factors used by COBRA were revised, and there were different workload transfers and basing assumptions.

Several updated versions of COBRA have been released since BRAC 1993. Each new version revised the basic algorithms thus impacting the resulting cost estimate. BRAC 1993 estimates were calculated using COBRA version 4.04 and BRAC 1995 estimates used COBRA version 5.08.

The standard factors used by the COBRA model have also changed. The majority of standard factors used for BRAC 1995 were developed by a Joint COBRA team and varied significantly from BRAC 1993. The most significant changes in standard factors include the discount rate (7% in BRAC 1993 versus 2.75% in BRAC 1995), civilians not willing to move (55% versus 6%), and percent of civilians placed in priority place system (30% vs. 60%).

The workload transfers and basing assumptions were also different between BRAC 1993 and BRAC 1995. For example, the Hydraulics Component Repair operation was cantoned at McClellan AFB in BRAC 1993. In contrast, this operation was relocated to Tinker AFB in BRAC 1995. Similar situations existed with other depot and non-depot organizations.

DEPOT MAINTENANCE

QUESTIONS SUBMITTED TO GENERAL SHANE FOR THE RECORD

1. In terms of buildings and acres, Letterkenny is a considerably larger depot than Tobyhanna Army Depot. Did the Army look at possibly closing Tobyhanna Army Depot and transferring the electronics workload to Letterkenny, a facility that is partly focused on electronics and partly focused on ground vehicle maintenance?

ANSWER: Size alone is not a valid measure of comparing one depot against another without having an understanding of the respective missions of each depot. Letterkenny, is in fact "considerably larger" than Tobyhanna. However, Letterkenny is a multi-functional depot having a ground combat vehicle maintenance mission, an ammunition storage mission, a tactical missile consolidation mission, and serves as the host for several large tenant activities. On the other hand, Tobyhanna is a single function depot having only one primary mission - ground communications and electronics. The actual 19,243 acres that make Letterkenny "larger" than the 1,293 acres of Tobyhanna consist of some 12,000 acres of ammunition storage area than includes considerable areas that function as "blast zones" and safety requirements associated with storing high explosives and cannot be used for other missions. Letterkenny is also larger in total buildings, maintenance buildings, and total covered floor space. However, when evaluating "maintenance" covered floor space, Tobyhanna and Letterkenny are approximately the same. When the covered maintenance area is broken down, one finds that Tobyhanna utilizes 23% of its covered floor space as "dedicated" to maintenance while Letterkenny is only 11%. Bigger is not always better when all the data is looked at from a mission perspective.

Tobyhanna is the Army's best rated depot in terms of military value. The Army Stationing Strategy is to have a ground communications and electronics depot, a single ground combat vehicle depot, and a single aviation depot. In the Army analysis, the stationing strategy was complied with and each depot was considered during the evaluation process. Being "partly" focused on electronics does not constitute a communications and electronics mission. The Army has recently done analysis on closing Tobyhanna and moving that mission into Letterkenny as a result of a BRAC Commission request. Our analysis indicates that such a realignment is neither practical nor economical.

2. In determining military value, why did the Army place heavy emphasis on capacity, which is based on the number of work stations to produce a particular workload, and relatively less emphasis on building square footage and expandable acreage?

Were other options considered as an alternative to the Letterkenny / Tobyhanna scenario recommended by DoD? For example, did the Army look at sending all of the tactical missile storage and maintenance workload to Hill Air Force Base and sending the residual conventional ammunition storage mission to other DoD storage locations? This would result in a total base closure, rather than a partial realignment.

ANSWER: The Army determined that capacity is a more accurate method of determining military value than square footage. As with the buildings and acres issue above, bigger is not always better nor more economical since the Army is has approximately 40% excess capacity within its maintenance depots. In the case of Tobyhanna, the Letterkenny workload could be absorbed with a very minimum cost. It makes no sense to expand the capacity of Letterkenny when the Army already has excess depot capacity.

The Joint Cross-Service Group for Depot Maintenance did consider realigning the tactical missile workload to Hill Air Force Base. But the storage requirement for such a move was not available at Hill Air Force Base according to Department of the Air Force certified data. The required construction included a considerable number of ammunition storage bunkers, making the scenario unacceptable.

3. The Army plans to transfer ground vehicle workload from Letterkenny to Anniston, but none of the personnel authorizations would be realigned. How can this work be accomplished at Anniston with no additional people?

ANSWER: The transfer of the workload to Anniston was verified by labor skills required and available personnel at the time transfer would be accomplished. Based on the required skills, Anniston had the identical skills required along with experienced personnel. The transfer of workload would be accomplished at a time when the Anniston workload would be decreasing. Rather than eliminate positions at Anniston and transfer the exact same job skills from Letterkenny, it was determined that it was more economical to eliminate positions at Letterkenny and not assume the added costs associated with personnel movements.

4. Did the Army look at moving the Tobyhanna Depot workload to Letterkenny? If so, what were the results? Do you believe this would be a good idea?

ANSWER: The Army Stationing Strategy requires a single ground communications and electronics depot. Tobyhanna is the number one rated of the Army's four maintenance depots, Letterkenny is rated fourth. In order to assume the mission of Tobyhanna, considerable new construction and renovation would be required. The Army did not consider realigning the Tobyhanna workload to Letterkenny due to the overwhelming advantages of Tobyhanna - military value, technical skills, modernization investments, and the cost of doing business.

Recently, the BRAC Commission Staff has requested that the Army analyze closing Tobyhanna and transferring its workload to Letterkenny. Our analysis shows that it would be costly and not preferable to DoD's recommendation.

DEPOT MAINTENANCE

QUESTIONS SUBMITTED TO MR NEMFAKOS FOR THE RECORD

1. Did the Navy consider consolidating platting operations at Louisville's new $36 million modern platting facility?

ANSWER: No specific scenario was run that consolidated plating operations at NSWC Louisville. Although it is recognized that Louisville has a modern plating facility, the DON analysis focused on entire capability of an installation. It is the goal of DON to reduce excess capacity/infrastructure primarily by the total closure of installations. The plating process is only one of the many depot maintenance functions performed by NSWC Louisville. The final scenario adopted by DON for the closure of Louisville, not only transfers all other depot work to other depot activities, but allows for the plating work currently accomplished at Louisville to be performed at other existing DoD installations. This not only equates to greater savings in operational costs, but provides a significantly more positive environmental impact.

2. Regarding the Naval Air Warfare Center in Indianapolis, could you explain why the Navy gave this installation a 0 in the Military Value category for integrated capabilities?

ANSWER: Within the "Mission Statement" section of the Technical Centers military value matrix, NAWC Indianapolis received a "0" for question #4, "Includes systems integration responsibility", and question #5, "Includes component integration responsibility". Questions within this section of the matrix were based on the activity's literal/official mission statement, as reported in the Military Value data call #5. Since the mission statement for NAWC Indianapolis did not assign responsibility for systems integration or component integration, both of these questions were scored "0".

3. During the Commission's recent visit to the Naval Air Warfare Center in Indianapolis, we were shown the systems design facility for the EP-3 and ES-3 aircraft. We were told by the Naval Air Warfare Center that the cost to relocate those facilities to China Lake would be $30 million. Could you please explain why the Navy only provided $1.17 million for Military Construction at China Lake to accommodate these facilities?

ANSWER: In COBRA analysis, the Navy included $1.17M for military construction at NAWC China Lake precisely as submitted by NAWC Indianapolis in the certified Scenario Development data call.

4. The Navy says that "continuing decreases in force structure eliminates the need to retain the capacity to dry-dock large naval vessels for emergent requirements." How many large-decked ships (CV, CVN, LHA & LHD) are in the Pacific Fleet now? How many less are expected to be in the Pacific Fleet in 2001?

ANSWER: The continuing decrease in force structure describes the fleet's requirement for drydock capacity as it relates to the force structure used as a basis for BRAC-91. Since the '91 round, and through 2001, the number of large-decked ships in the Pacific Fleet will decrease from 14 to 12, including a reduction of 2 CVN/CVs. The Navy has retained two U.S. Navy shipyards in the Pacific theater, capable of handling any of the 12 large-deck ships homeported in that area.

5. How many positions has the Navy historically saved with the closure of a Naval Aviation Depot or comparable industrial activity?

ANSWER: The following represents the positions/billets eliminated based on the closure of 3 Naval Aviation Depots during BRAC-93:

Activity	Positions/Billets Eliminated
NADEP Alameda	764
NADEP Pensacola	1,000
NADEP Norfolk	1,464

UNDERGRADUATE PILOT TRAINING

ITEMS FOR INCLUSION IN THE RECORD

1. Mr. Finch, during your testimony, you stated to Commissioner Robles that you would provide a list of those criteria used by the UPT-Joint Cross-Service Group to constrain the linear programming model from presenting nonsensical results. Please provide these criteria.

ANSWER: In addition to the "Site/Function Constraint Matrix" which limited potential site/functions combinations from the outset of the modeling process, constraints were imposed as the JCSG proceeded with its Optimization Model process. These constraints which were applied in an additive manner are as follows:

1. Flight screening would not be performed/collocated with any other function - based on JCSG military judgment.
2. Primary and advanced NAV/NFO, advanced NFO Strike, and advanced NFO Panel functions would be joint and single-sited - based on DEPSECDEF memo of October 24, 1994.
3. No function would be "spread" or fractionalized smaller than a "notionalized" or smallest squadron (approximately 100 annual production) - JCSG military judgment.
4. Flight screening function limited to the Air Force Academy and Hondo, TX sites - JCSG military judgment.
5. Primary function limited to four sites - JCSG military judgment. (This constraint was later dropped.)
6. Three site closure results (MIN PRIME model run) used as baseline for follow-on Optimization Model runs.
7. Air space and outlying airfield operations capacity from sites closed in MIN PRIME model run were transferred to remaining sites in close proximity for all additional modeling efforts.

2. Mr. Finch, during your testimony, you stated to Commissioner Cornella that Flight Screening was "basically" included as a matter of completeness. For the record, please respond to the following question:

Why did you include Flight Screening, a function not now nor envisioned to be done at UPT bases, but did not include Introduction to Fighter Fundamental (IFF) training, a function that is done at UPT bases, in the scope of your analysis?

ANSWER: The JCSG defined its category scope to include: DoD flight programs which support and facilitate selection and training of pilots, naval flight officers, and navigators to the point of awarding "Wings." Post-"Wings" flying missions such a IFF, the Blue Angels, and a large number of graduate rotary-wing courses were excluded from direct analysis. Non-flying missions at the bases (such as technical training at Sheppard AFB and NAS Meridian) were also excluded. When forwarding alternatives for consideration, the JCSG asked the military departments to quantify any such missions that impacted their capacity.

3. General Blume/Mr. Nemfakos/General Shane, during your testimony, Commissioner Davis asked how much surge capacity exists in each service. Please respond to this question in terms of capacity to recover from temporary situations, such as a period of prolonged bad weather, and also in terms of capacity to accommodate an increase in the Pilot Training Rate in the event of a long-term increase in pilot requirements.

ANSWER: Maj Gen Blume. If Reese AFB closes as recommended by DoD, the Air Force will retain approximately 12 percent surge capacity to recover from temporary situations at the Specialized Undergraduate Pilot Training bases. In addition, bases will have the capability to respond to temporary requirements by lengthening the duty day, increasing sortie density, flying on the weekend, etc. Increases such as these are not sustainable over a sufficient period of time to generate net increases in production. For extended operations such as an increase in the pilot training rate, the Air Force will retain between 7 and 12 percent surge capacity.

Mr. Nemfakos. To ensure the DON has capacity to support future unforeseen increases in pilot/NFO training rates, as part of its configuration analysis the BSEC looked at scenarios where all the FY 2001 pilot and NFO training rates were increased by 10 and 20 percent. (This includes increases in the Air Force training scheduled for Naval air stations.) The results showed that even with the its closure recommendations, the DON could support a 20 percent increase in PTR requirements and still have some excess capacity.

In addition, the capacity analysis was based on a 237-day work year and accounted for down time due to bad weather. If need be, training capacity could be increased at each air station by increasing the operating schedule (e.g., pilots could train on weekends to make up for lost flying time during the week days).

Brig Gen Shane. The ability to recover from temporary situations, such as a period of prolonged bad weather is excellent. Because our flight training facilities are underutilized, our capability to surge is only constrained on the availability of instructor pilots, aircraft, and OMA funding. USAAVNC has the capability to support long term training increases. According to the Undergraduate Pilot Training Joint Cross-Service Group certified data, the Pilot Training Rate could be increased to 2,056 annually with no additional MILCON.

4. General Blume/Mr. Nemfakos/General Shane, during your testimony, Commissioner Robles requested that each Service provide data summarizing the costs to train pilots. Please include in this information the fixed costs for Base Operating Support (BOS), Real Property Management Account (RPMA), Overhead and Personnel at each UPT base, and the variable costs which vary by the number of students and flight hours/sorties flown. These costs should reflect only the portion attributable to UPT for the installations that also host other tenant units.

ANSWER: Maj Gen Blume.

COST ESTIMATE BASED ON FY94 DATA

	Mission Fixed Costs (in $M)	RPM Fixed Costs (in $M)	BOS Fixed Costs (in $M)	Medical* Fixed Costs (in $M)	Total Fixed Costs (in $M)	SUPT Variable Cost Per Graduate
Columbus	$33.5	$4.9	$27.9	$8.5	$74.8	$237,507
Laughlin	$35.3	$5.7	$32.2	$11.0	$84.2	$245,039
Reese	$32.1	$5.5	$31.0	$9.9	$78.5	$244,619
Vance	$33.8	$5.7	$25.4	$4.9	$69.8	$232,394

* Although not specifically asked for, medical fixed costs are also provided. These costs are not included in any other of the fixed costs provided.

Definitions:

Mission Fixed Costs: Open-the-door costs to enter one student. Includes Instructors, school overhead, and maintenance.

RPM Fixed Costs: The upkeep on the facilities that is required whether or not you have students in training (e.g., utilities).

BOS Fixed Costs: Base operating support costs that are required to support the fixed personnel (e.g., transportation, supply, grounds maintenance, chaplains, comptroller).

Medical Fixed Costs: Open-the-door costs to enter one student (e.g., supplies, and equipment to support fixed population).

Variable Cost Per Graduate: The cost of sending one additional student through SUPT. It does not include any fixed costs.

Mr. Nemfakos. The Navy has issued a data call to collect these data. We will forward a response as soon as possible.

Brig Gen Shane.

Estimated costs for Undergraduate Pilot Training
Undergraduate Pilot Training fixed-cost: $45,611,784
Undergraduate Pilot Training variable-cost: $30,599 per student
Undergraduate Pilot Training flying hour variable-cost: $322 per flying hour
Undergraduate Pilot Training actual total cost: $114,745,433 (FY 94)
Undergraduate Pilot Training actual civilian salary proportion: $9,150,860 (8.0%)

Estimated costs for Undergraduate Pilot Training Share of Base Operations
Base Operations fixed cost for Undergraduate Pilot Training: $2,926,,412
Base Operations fixed variable for Undergraduate Pilot Training: $1,009 per student
Base Operations total cost for Undergraduate Pilot Training: $4,985,370
[Base Operations civilian salary proportion: $3,300,315 (66.2%)]
Note: RPMA, overhead and personnel are included in above calculations.

5. Mr. Finch, during your testimony, you stated that in order to achieve uniformity when making comparisons between the services, the UPT-Joint Cross-Service Group drafted rules used by the FAA to measure airfield operations capacity at each UPT base. Please provide the formula that the FAA uses and how these rules were applied by your group.

ANSWER: In collecting runway capacity data, the JCSG data call asked for the sustainable capacity of the air station's main field and each outlying field in terms of the number of flight operations per hour each runway complex can support. To ensure consistency in the responses, the question instructed the air stations to base their capacity calculations on the methodology in the FAA Advisory Circular 150/5060-5 entitled "Airport Capacity and Delay." This methodology accounts for the type and mix of aircraft, the runway and taxiway configurations, and reductions in operations due to weather and times the airfield is closed to flying operations for other reasons. The attached pages at **TAB 5** excerpted from the Circular describe the procedure for determining the weighted hourly capacity for each runway.

6. General Blume, during your testimony, you stated you would provide answers to several questions relating to weather. Please respond to the following questions:

ANSWER: These questions pertain to Joint Cross-Service Group analysis and data and should therefore be directed to the Joint Cross-Service Group.

Why was the percent of time at which the ceiling and visibility are better than 1000 feet and 3 miles given any weight in the analysis when it is 1500 feet and 3 miles that represents a key weather decision factor in conducting Air Force flight training operations?

Mr. Finch: The measures and criterion reflected the JCSG developed consensus decision. The 1000/3 ceiling visibility cutoff represents a key Navy decision factor. Missions were analyzed based on the users. For example, both Military Departments will conduct primary training, so both 1000/3 and 1500/3 were used. In Air Force unique bomber-fighter training, on the other hand, 1500/3 was used while 1000/3 was not.

In tracking weather attrition, factors such as actual attrition experience, cancellations due to forecast icing conditions, and the occurrence of crosswinds out of limits can be used. Why was so much weight placed on crosswinds rather than some of these other factors in the UPT-Joint Cross-Service Group functional value analysis?

Mr. Finch: All weather factors (icing, crosswinds, etc.) were captured by weather attrition inputs. The extra weight given to crosswinds represents a measurement of the frequency of crosswinds, not a measure of "lost sorties." While some crosswind exposure is useful, frequent crosswinds complicate the learning process and can cause last-minute scheduling changes.

The T-38 attrition rate planning factor at Reese is 28 percent compared to 17 percent for the T-1. Since the T-1 factor is currently in use at Reese, why did the UPT-Joint Cross-Service Group use the T-38 instead of the T-1 planning factor in its functional value analysis?

Mr. Finch: In computing the T-1 attrition planning factors, the JCSG used the reported value for Reese AFB and a surrogate, based on existing aircraft, for the other sites. In the final analysis, no Air Force site received points for the T-1 planning factor in the JCSG model. Based on T-37/T-38 attrition planning factor comparisons across sites, there is no reason to believe that Reese AFB would gain an advantage from a T-1 planning factor comparison.

7. Mr. Nemfakos, during your testimony, you stated to Commissioner Davis that you would provide for the record your analysis on Strike Pilot Training Rates. Please provide that general data along with your response to the following specific questions:

Are the flight operations per strike Pilot Training Rate (PTR) at NAS Meridian and NAS Kingsville used in your capacity analysis the same? Please explain any differences.

ANSWER: Yes, the analysis used 1511 daylight flight operations per Strike PTR

What is the current operations per strike Pilot Training Rate at NAS Kingsville? How does this compare with the figure used to determine strike Pilot Training Rate capacity at NAS Kingsville?

ANSWER: NAS Kingsville's data call reported a daylight flight operations requirement for an all T-45 syllabus of 1393 ops. The 1511 ops used in the analysis was derived as follows. Because in FY 2001 not all strike training will be done in T-45 aircraft, we assumed 50 percent of the Strike pilots would go through an all T-45 syllabus and 50 percent would go through a split syllabus consisting of an Intermediate phase in the T-2 aircraft and an Advanced phase in the T-45 aircraft. Based on certified data, the flight ops requirement for this split syllabus was calculated as follows:

Intermediate Phase in T-2 -- 741 (from NAS Meridian' data call)
Advanced Phase in T-45 -- 888 (from NAS Kingsville's data call)
Total: 1,629

Taking a weighted average, this gives

(1393 x .5) + (1629 x .5) = 1511 daylight flight ops per Strike PTR

To what extent was the Navy's determination that a single intermediate/advanced strike UPT base containing sufficient capacity to conduct training to support the strike Pilot Training Rate (PTR) in the future and under surge operations based upon the availability of NAS Corpus Christi as an outlying field?

ANSWER: Under the recommended scenario, the main airfield at NAS Corpus Christi is needed to support the single-siting of Strike training at NAS Kingsville.

What is the maximum strike Pilot Training Rate (PTR) that NAS Kingsville could support with Orange Grove and NAS Corpus Christi available as outlying fields?

ANSWER: Because daylight runway operations is the capacity limiter at training air station, we will show the capacity of this complex to support Strike training in these terms. As explained in response question 6b, the certified data showed that the daylight runway operations per pilot training rate (PTR) for Strike training is 1511 operations. The capacity at NAS Kingsville, OLF Orange Grove, and NAS Corpus Christi (after the proposed runway extensions) is as follows:

NAS Kingsville ------- 237 days x 12.1 hrs/day x 80 ops/hr = 229,416 annual flight ops
OLF Orange Grove -- 237 days x 11.6 hrs/day x 54 ops/hr =148,457 annual flight ops
NAS Corpus Christi -- 237 days x 11.6 hrs/day x 80 ops/hr = 219,936 annual flight ops
Total: 597,806 annual flight ops

Dividing the total annual flight ops by the flight ops required per PTR gives a strike PTR capacity of

597,806/1511 = 396 PTR

The FY 2001 pilot training rate for Strike is 336 pilots. Thus, the recommended scenario provides an excess capacity of

396 - 336 = 60 PTR

which equates to about an 18% surge capability under planned and budgeted operations. Note that the Strike training capacity at this complex will increase as the Navy completes its transition to an all T-45 training syllabus. Once this transition is completed, the capacity at this complex will be

597,806/1393 = 427 PTR

which increases the surge capability to about 28%

To what extent would the strike training capacity of NAS Kingsville be impacted if NAS Corpus Christi was not available?

ANSWER: Without the use of NAS Corpus Christi, NAS Kingsville would need another outlying field to support all Strike training.

8. Mr. Finch, your optimization analysis apparently placed primary emphasis on the installation military value data provided to you by the services, and less emphasis on the functional values developed by the UPT-Joint Cross-Service Group.

Please explain the reasoning for this approach?

ANSWER: Sites have value both with respect to their ability to accommodate activities involving specific functions (e.g., those associated with flight training) and the more general military missions of the Military Departments. For the former, the initial means of representing value for flight training functions was to consider the capacity of sites collectively to carry out all the functions associated with flight training. This was done by introducing a set of constraints that ensured that there was sufficient capacity in the collection of sites that remained open to handle all flight training functions.

Beyond ensuring there was sufficient capacity to perform flight training functions, the Group's methods next considered military value, maximizing the inherent military value of all sites that remained open to carry out general military missions of the Military Departments.

Finally, the Group's method considered the value of sites that remained open to perform flight training functions. Since functional value was already considered implicitly by setting constraints that guaranteed sufficient capacity to carry out all functions, this additional consideration of functional value was given lower priority.

To allow functional value to drive the model is relevant only if we assume functions can be easily moved and are completely interoperable. In practice, this led to nonsensical results during the early, "unconstrained" model runs. For example, Navy Strike training with its attendant costly T-45 infrastructure was spread to four sites. Other functions were swapped between Air Force and Navy sites. Site functional value was also a more narrow look at installation value, as it did not consider collateral missions such as technical training. The Military Departments' inputs encompassed all functions and potential alternative uses of the installation.

9. Mr. Finch, your Joint Cross-Service Group minutes of March 24, 1994, state that the UPT category is largely installation oriented. If the value of a UPT base is best reflected in its functional rather than military value, why didn't you base your alternatives on model output which maximized functional value unconstrained by installation military value?

Since there is a direct correlation between the Joint Cross-Service Group's functional value rating and the Air Force's determination of military value, didn't the use of both functional and military value in the model simply increase the impact of functional value in the result?

ANSWER: Functional and military values are not independent. SECDEF guidelines define the first four BRAC criteria as military value. Criterion one is "mission requirements." This indicates functional value is a significant element of military value. There is also no single

functional value for each base. The JCSG generally analyzed each site for all UPT missions, regardless of whether the site currently supported those missions. The JCSG did not analyze non-UPT missions. Functional value is only a subset of military value.

10. General Blume, since the Air Force relied so heavily on the results of the Joint Cross-Service Group's computer model, did you analyze the model for calculation errors?

ANSWER: The Air Force had representatives on the Joint Cross-Service Group and its Study Team to continuously monitor the process and its output. The Base Closure Executive Group also did an independent capacity analysis to confirm the required infrastructure level.

11. General Blume/Mr. Nemfakos, your Service recommendations used your own BRAC process as well as non-BRAC policy decisions to choose which UPT bases to close or realign. Why didn't your recommendations necessarily reflect the high functional value scores from the UPT-Joint Cross-Service Group?

ANSWER: Maj Gen Blume. The Air Force recommendations do reflect the high functional value scores. The recommendation to close Reese AFB is consistent with the fact Reese had the lowest average functional value.

Mr. Nemfakos: The DON's process did not consider functional value. It used its own documented method for evaluating the military value of its installations.

12. Gen Blume, the average functional value for each Air Force UPT base is shown (the Reese score is adjusted based on your recent memo to us).

Columbus AFB	6.74
Vance AFB	6.67
Randolph AFB	6.53
Laughlin AFB	6.50
Reese AFB	6.22

The Air Force Base Closure Executive Group (BCEG) apparently used the functional values from the UPT-Joint Cross-Service Group. These averages were used to find military value by performing a standard deviation analysis to assign a color "Stop Light" code to Criteria I, "Flying Mission Evaluation." All eight criteria were then considered to derive an overall Air Force ranking: the result was Tier I for Columbus, Laughlin, Randolph, and Vance, and Tier III for Reese.

Why didn't the Air Force simply use the functional value for the training that is actually accomplished at each specific UPT base to determine its score? Would the result have been different?

ANSWER: Functional value is an important part of military value, but is not necessarily the only indicator. For example, Randolph AFB houses a Major Command Headquarters, a Numbered Air Force Headquarters, and the Air Force Military Personnel Center besides having a

flying mission. In the case of UPT bases, average functional value scores, the BCEG "Stop Light" analysis, and professional judgment all indicated Reese AFB is the correct base to close. The Air Force does not believe the results would have been different if functional value were used as an exclusive measure. However, using only functional value would be a narrow analysis and would not comply with Secretary of Defense guidelines. In addition, the Air Force made a conscious effort to fully integrate, where possible, the Joint Group process into its entire 1995 BRAC analysis. For the Laboratory, Test and Evaluation, and Depot subcategories, the Air Force used Joint Group data, the same methodology and, with few exceptions, the same measures of merit to produce the functional portion of the Criterion I grade for those installations. For the Undergraduate Flying Training category, the Air Force used the Joint Group functional values as the basis for its Criterion I grade. These steps ensured that the Air Force analysis was consistent, to the maximum extent possible, with the Joint Group direction on analysis of these functions.

It should be noted that the average functional values were not used to find "military value," but were instead used to determine the Criterion I grade. Military value, under the criteria, consists of the first four criteria.

Finally, the BCEG examined the functional values derived by JCSG-UPT. After discussion, the BCEG agreed to include all activities pertaining to Air Force operations as the basis for the average functional value. Including all potential flying training activities rather than the training actually accomplished provides a better analysis of both current and potential training value.

13. Mr. Finch, did the UPT-Joint Cross-Service Group run any excursions using the Linear Programming Optimization Model, such as the ones shown on below:

a. Examining only Air Force Bases
b. Examining only Naval Air Stations
c. Excluding flight screening
d. Excluding Navy-unique functional areas
e. Excluding Air Force-unique functional areas
f. Changing the weights on various factors, such as airspace.

ANSWER: The Group was sensitive to the potential issue of adjusting the model after the data had been collected. Excursions to evaluate the sensitivity of the model to movement of new functions to new sites given differing minimum site levels was performed. Service specific excursions were not performed, given the joint perspective of the Group's efforts.

What would the results be if these excursions were run?

ANSWER: It would be inappropriate to speculate as to potential results without running the model.

14. Mr. Finch, what were the options you considered for measuring capacity, and why did you choose the methods you did?

ANSWER: Factors of capacity and the methods to measure them were developed over time by the JCSG. The process started with development of the Data Call followed by construction of the Capacity Analysis Matrix and the questions utilized in point distribution for the Measures of Merit. As the process evolved, the JCSG refined its methods of measurement in the framework of sound operational experience and military judgment.

15. Mr. Finch, a separate functional value for the Air Force's post-UPT Introduction to Fighter Fundaments (IFF) training was not included among the 10 functional areas selected for assessing the overall functional value of each UPT-category base.

Even though it is conducted after "Wings" are awarded, IFF is conducted at a UPT base, consumes capacity, and is similar in content to training events contained within the latter stages of the Navy's Strike Training syllabus.

Why didn't the UPT-Joint Cross-Service Group include IFF as an additional functional area?

ANSWER: Post-"Wing" flying missions such as IFF, the Blue Angels, and a large number of graduate rotary-wing courses were excluded from direct JCSG analysis. Non-flying missions collocated at the UPT sites (such a technical training a Sheppard AFB and NAS Meridian) were also excluded. When forwarding alternatives for consideration, the JCSG asked the military departments to quantify any such missions that impacted their capacity.

16. General Blume, did the Air Force consider transferring the Introduction to Fighter Fundamentals training from Columbus AFB to another location such as Luke AFB in order to increase the capacity to do other training at Columbus?

ANSWER: No. The Air Force collocated Introduction to Fighter Fundamentals (IFF) training on the UPT bases in 1993 when it stood up Air Education and Training Command during a major reorganization. This allowed a more seamless training continuum for fighter-bound students, particularly as the Air Force converted from generalized UPT to specialized UPT. Luke AFB also does not have the capacity to absorb this training. Even if Luke could absorb IFF, this would require an additional move for many fighter-bound students whose final formal training units were located elsewhere. To return to a different basing structure would be expensive and counterproductive.

17. Mr. Finch, in the consideration of training airspace for both capacity analysis and functional value, the UPT-Joint Cross-Service Group methodology permitted a base to claim credit for large sectors of airspace so long as any portion of it was within 100 nautical miles of the base. For bases near the Gulf of Mexico, this meant credit for huge over-water sectors.

Both Air Force and Navy UPT programs train predominantly over land. This is to permit such over-land flight training events as ground reference maneuvers and low-level navigation. Over-water training is performed close to shore. Since actual UPT practice precludes the use of large blocks of over-water airspace, doesn't giving credit for such over-water airspace unfairly skew the results in favor of coastal bases?

ANSWER: Over-water airspace has intrinsic value to the Navy and the consensus of the JCSG was to consider it equally with over-land airspace.

18. Mr. Finch, did either the Services or the UPT-Joint Cross-Service Group consider the impact of contracting some UPT functional training areas to outside sources?

ANSWER: No. The JCSG charter was to help size infrastructure, not to make policy decisions.

19. General Blume, does closing Reese AFB leave sufficient capacity in the UPT area to provide for surge capability in pilot training?

ANSWER: Yes. The closure of one Air Force UPT base leaves sufficient capacity to provide for surge capability. However, there is not enough excess capacity to close more than one Air Force UPT base.

20. Mr. Finch, all of your alternatives move the Navy's helicopter training to Fort Rucker. There are several different ways to implement this alternative. For example, the Navy could retain their current helicopter training process and be collocated at Fort Rucker as an Army tenant; or the Navy's pilots could be integrated into the Army training through a consolidation. Did the Joint Cross Service Group consider the issue of consolidation vs. collocation when developing its alternatives?

ANSWER: No. The JCSG was not established to consider policy issues related to undergraduate pilot training. Therefore, its approach was to use existing policies that were applicable to the various functions considered by the Group. In the case of helicopter training, existing policy was, and is, not to consolidate such training for the Army and Navy. Therefore, only alternatives that involved collocating or not collocating this function were considered.

21. Mr. Finch, the Navy responded to your alternatives to close Whiting Field with COBRA analyses that showed a high cost of implementing the move of primary training to Naval Air Station Pensacola and helicopter training to Fort Rucker.

Did the UPT-Joint Cross Service Group look at variations to this scenario, such as the relocation of helicopter training to Fort Rucker with primary training remaining at Whiting Field?

ANSWER: Given the resource requirements, site capacities and functional values, and site military values, the Optimization Model consistently moved the helicopter function to Fort Rucker and closed NAS Whiting Field. The Group did not look at additional variations.

22. Mr. Nemfakos, would moving helicopter training out of Whiting Field help the Navy meet its requirement for outlying fields for primary training?

Does your answer change when considering the transition to any of the Joint Primary Aircraft Training System (JPATS) aircraft?

ANSWER: No, the OLFs used for helicopter training are not configured to support fixed-wing training. JPATS does not change this situation.

23. Mr. Nemfakos, the Navy Base Structure Evaluation Committee (BSEC) record states that the reason for rejecting the movement of helicopter training to Fort Rucker is the high one-time cost and long return on investment.

Did operational concerns also enter into this decision or was it strictly an economic decision?

ANSWER: The decision not to co-locate helicopter training at Fort Rucker was strictly an economic decision -- high one-time costs and a poor return on investment. Operational considerations, however, lead the DON to evaluate a co-location scenario as opposed to a consolidation scenario.

24. General Blume, please summarize the main reasons why the Base Closure Executive Group (BCEG) choose Reese AFB to close?

ANSWER: When all eight criteria were applied to the bases in the UFT category, Reese AFB ranked lowest relative to the other bases in the Undergraduate Flying Training category. In addition, Reese AFB was recommended for closure in each alternative recommended by the DoD Joint Cross-Service Group for UPT.

25. Mr. Nemfakos, please summarize the main reasons why the Base Structure Evaluation Committee (BSEC) chose NAS Meridian to close?

ANSWER: First, the current Force Structure Plan shows a continuing decline in the PTR (particularly in the decline from 11 to 10 carrier air wings) so that Navy strike training could be handled by a single full-strike training base. Second, the consolidation of strike training that follows the closure of NAS Meridian is in the spirit of the policy of the Secretary of Defense that functional pilot training be consolidated. The training conducted at NAS Meridian is similar to that conducted at NAS Kingsville, which has a higher military value, presently houses T-45 assets (the Department of the Navy's new primary strike training aircraft) and its supporting infrastructure, and has ready access to larger amounts of air space, including over-water air space if such is required. Lastly, the net of all costs and savings associated with this recommendation is a savings of $158.8 million. Annual recurring savings after implementation are $33.4 million with an immediate return on investment expected.

26. Mr. Finch, please discuss the process used to analyze a potential NAS Meridian/Columbus AFB complex.

What alternatives or "strawmen" did the UPT-Joint Cross-Service Group consider?

ANSWER: The Group evaluated three alternatives for the NAS Meridian/Columbus AFB complex: 1) A JPATS Primary "Master" site, 2) a Strike/Bomber-Fighter complex with Strike at NAS Meridian and Bomber-Fighter at Columbus AFB, and 3) moving Maritime and Primary/Intermediate NFO/NAV to NAS Meridian to allow creation of a JPATS Primary "Master" site at NAS Pensacola and NAS Whiting Field. The first alternative's up-front costs - building five outlying fields and relocating Columbus AFB's Bomber Fighter function to Laughlin AFB were considered excessive. The second alternative was dropped because it did not result in the net increase of a "base complex," would waste significant investment in the T-45 training system at NAS Kingsville, and it would also require high, up-front cost at NAS Meridian. The third alternative, while not as costly to implement as alternative one, was discounted as the Maritime and Primary/Intermediate NFO/NAV functions could be readily accommodated by those flight training bases not recommended for closure. (JCSG Meeting Minutes of February 23, 1995).

What COBRA runs were performed to assess a potential NAS Meridian/Columbus AFB complex?

ANSWER: None.

What cost advantages were considered (for example, NAS Meridian and Columbus AFB using joint targets and outlying fields and sharing excess capacity during runway maintenance)?

ANSWER: The JCSG considered potential savings in shared or combined facilities from a JPATS site consolidation or formation of a JPATS base complex, but found they could not readily be identified. The Group also agreed that savings, if any, would be well in the future. In reviewing the base complex issue, the Group found no clear or compelling rationale to change the Military Departments' recommendations.

27. Mr. Nemfakos, if the redirect of mine warfare helicopter assets to NAS Corpus Christi is not approved, what impact would that have on the operations per day available for pilot training at Corpus Christi?

How much do other flight operations at Corpus Christi reduce daily operations available for pilot training?

ANSWER: Operating mine warfare helicopters out of NAS Corpus Christi would have a negligible effect on the runway operations available for pilot training. All other flight operations at NAS Corpus Christi, to include the proposed mine warfare helicopter operations, require less than 5 percent of NAS Corpus Christi's pilot training capacity.

28. Mr. Finch, will Joint Primary Aircraft Training System (JPATS) increase or decrease the number of bases required for UPT training?

ANSWER: The answer will depend on the aircraft selected and the evolution of the JPATS training syllabus. For example, some contenders may require longer runways than others. On the other hand, these same aircraft may be able to absorb some flying time from the more costly and more infrastructure-intensive advanced training tracks (i.e., T-45 Strike training).

29. Mr. Finch, what was the impact of Joint Primary Aircraft Training System (JPATS)-related issues on the group's assessment of functional value?

What specific facility and airspace requirements were used to determine Joint Primary Aircraft Training System (JPATS) functional values?

ANSWER: For purposes of the analyses, the Measures of Merit utilized the maximum requirements identified in the source selection process for JPATS (i.e., 5,000 ft runway).

CONGRESSIONAL QUESTIONS SUBMITTED FOR THE RECORD

UNDERGRADUATE PILOT TRAINING

Questions submitted by Congressman Smith:

1. Since the Navy has recommended relocating the Naval Air Technical Training Center (NATTC) from Lakehurst, NJ, to Pensacola, do you envision recreating the Carrier Aircraft Launch and Recovery System (COLASSES) at Pensacola or do you expect to disassemble, package, ship and reinstall those devices that are critical to training pilots for flying off and onto aircraft carriers?

ANSWER: The mission of NATTC Lakehurst Detachment does not include training pilots for flying off and onto aircraft carriers. The NATTC Lakehurst Detachment personnel and equipment support training requirements specific to operations and maintenance of aircraft carrier catapult, launch, and recovery equipment systems. The personnel and equipment necessary to continue supporting this training will be relocated to NAS Pensacola.

2. At what cost do you envision recreating the unique aircraft flight training facility in Pensacola?

ANSWER: NATTC Lakehurst Detachment is not a unique aircraft flight training facility and therefore will not be recreated as such. However, all appropriate costs to relocate NATTC Lakehurst Detachment necessary personnel and equipment that support training requirements specific to operations and maintenance of aircraft carrier catapult, launch, and recovery equipment systems were included in the COBRA analysis for Lakehurst. These costs are calculated automatically by COBRA algorithms from various input data and appear as part of the

aggregate one-time costs for NAWC AC Lakehurst, NJ plus the one-time costs for NAS Pensacola, FL. The exact cost will be determined as part of the implementation planning and budgeting process; however, it would be expected that the final cost would be of a similar magnitude.

3. Do facilities exist at Pensacola for the housing of the Lakehurst NATTC students?

ANSWER: Yes. BRAC 93 moved average onboard of 5004 students to NAS Pensacola. BRAC 95 adds the relocation of aviation students from both NTTC Meridian and Lakehurst, a total of 162 additional students. Barracks space was sized under BRAC 93 to accommodate the planned force structure through the end of the century. The FY 2001 average onboard for aviation students, including Meridian and Lakehurst, is 4226. The Navy is under contract to build BEQ space for 4924 beds. This number includes planned onboard, transient students and a surge capability. In view of this, the BSEC made a determination that no additional BEQ construction was required.

4. What type of delay or disruptions are anticipated or planned for in the training of these aircraft carrier student pilots while the training facility is disassembled, moved and recreated in Pensacola?

ANSWER: NATTC Lakehurst Detachment does not train aircraft carrier student pilots.

Questions submitted by Senators Shelby and Heflin and Congressman Everett:

1. In November of 1994, the Joint Cross-Service Group on Undergraduate Pilot Training submitted three different alternatives for consideration by the military departments and Secretary Perry. According to documents submitted to the BRAC, each alternative reduced excess capacity while maintaining high military value. Each of the three alternatives consistently recommended consolidating all military undergraduate helicopter pilot training at Fort Rucker.

However, these recommendations were not adhered to in there entirety. Secretary Perry chose not to consolidate UHPT at Fort Rucker as recommended due to high MILCON costs associated with closing Whiting NAS. He then directed consolidating all Navy initial fixed-wing training at Whiting NAS.

a. Why is it that consolidation of UHPT at Ft. Rucker was not adopted?

ANSWER: Mr. Nemfakos. While the recommendations forwarded by the UPT Joint Cross-Service Group called for moving the DON's Advanced Helicopter training to Fort Rucker, they said nothing about consolidating UHPT. Because of operational differences in training Navy and Army helicopter pilots, in evaluating these proposals, the DON only considered the co-location of UHPT.

b. Since the Navy is moving all of its initial fixed-wing training to Whiting NAS, wouldn't limited space be freed-up if UHPT was moved to Ft. Rucker?

ANSWER: Mr. Nemfakos. Moving the DON's Advanced Helicopter training to Fort Rucker would free-up space at NAS Whiting Field for fixed-wing training. However, because there is no issue of limited space at NAS Whiting Field for fixed-wing training, this additional space would be of little value.

c. From an efficiency standpoint, doesn't it make sense to have all initial rotary-wing training dedicated at one location?

ANSWER: Mr. Nemfakos. It would make sense to have all initial rotary wing training at one location if both the Navy and Army had the same training syllabi, same trainers, and identical aircraft. They do not. The DON has unique training requirements which are driven by its operational missions (i.e., a sea-based environment). Because of this, a consolidation of UHPT training would still require separate training tracks for Navy and Army pilots, and therefore, only create costs.

2. On March 30, 1993 General Colin Powell stated at the House Armed Services Committee Army Posture Hearing that, "I believe the proper place to do the centralization (of UHPT) and where it can be done very well is at Fort Rucker, Alabama." He went on to say, "I am committed to push this as hard as possible because there are real savings here and this is where we ought to find the savings."

The cost to transfer the UHPT operation at Whiting Field to Fort Rucker is less than $18 million dollars. In 1992 the DoD IG reported that relocation of UHPT to Fort Rucker would save at least $79 million dollars over 5 years.

a. Is this savings estimate still valid today?

ANSWER: Mr. Nemfakos. It should be noted that the Assistant Secretary of Defense (Force Management and Personnel) and the Department of the Navy nonconcurred with the portion of the 1992 DoD IG audit report in which were presented the savings estimate cited above, believing that the audit analysis attempted to compare dissimilar programs and also questioning the estimated monetary benefits from relocation.

In considering the UPT JCSG alternatives during the 1995 base realignment and closure process, the BSEC used only data, certified to be accurate and complete, contained in our 1995 Base Structure Data Base, and information provided and verified by the other Military Departments. Based on our analysis of this certified data, the total estimated one-time cost to implement the "non-JPATS' alternative is $155.7 million with an annual recurring savings after implementation of $13 million and a return on investment expected in 14 years. The net present value of the costs and savings over 20 years for this scenario is a savings of $9 million. The total estimated one-time cost to implement the "JPATS' alternative is $159 million with an annual recurring savings after implementation of $13 million and a return on investment expected in 15

years. The net present value of the costs and savings over 20 years for this scenario is a savings of $7 million.

3. In a proposal to the Roles & Missions Commission, the Army has stated that by consolidating all primary DoD rotary-wing training, integration and standardization among the services would be enhanced to truly support jointness. Each of the services would continue to provide advanced training for their own unique aspects of rotary-wing aviation.

The Army has the capacity to train all of DoD's primary helicopter pilot requirements without any need for expansion or new construction.

a. From an efficiency and interoperability standpoint, doesn't it make sense for all introductory helicopter pilot training to be conducted by the Army?

ANSWER: Mr. Nemfakos. There is a fundamental difference in how the Army and the naval services desire to train their pilots from an operational perspective; each has its own set of validated requirements that drive its training program, the location for the training, and efficiencies derived. The Navy, Marine Corps, and Coast Guard training requirements include fixed-wing training for all students, emphasis on basic and radio instrument training, situational awareness/unusual attitude/aerobatic training and shipboard landing training. We use aircraft systems as well as simulators and ground support systems that are different from those used by the Army in support of this specialized training. Then too, we believe that the operational environment in which our helicopter pilots will eventually be required to fly validates and mandates our current approach to UHPT. For example, the absolute necessity for aviator competence in over water flight, where aircraft performance and navigational techniques employed differ significantly from those over land, carries unique training demands. And, especially for Marine helicopter pilots, replacement of the aging CH-46 fleet with V-22 aircraft that feature in-flight transitions between rotary and fixed-wing modes will spawn a completely different dynamic for which they must be trained. In contrast, Army requirements and training are oriented toward the day/night VMC, ground contact environment that supports the Army mission in the field.

What makes the most sense for all the Services is to adhere to training programs that best prepare pilots to function in the respective operational environments in which they will be employed. Different requirements produce efficiencies unique to the specific training program at each base (NAS Whiting Field and Fort Rucker). It should be noted that intent of the Secretary of Defense in establishing a JCSG for UPT was not for it to examine the UPT programs of the Services with an eye toward consolidation, but to assist the Military Departments in identifying asset sharing opportunities. To what extent "jointness" is served by consolidation of UHPT, whether it should be, and which Service ought to conduct consolidated UHPT for all are issues more appropriately addressed outside the base realignment and closure process.

4. During the BRAC 95 Navy hearing earlier this year, General Mundy commented that in the 1970's the Army was training Marine helicopter pilots, and that this arrangement worked very well.

a. Is there any reason why the Marine Corps couldn't return to this arrangement?

ANSWER: Mr. Nemfakos. The Department of the Navy does not endorse Army UHPT for Marine pilots, because it does not meet the training requirements for service with the Fleet and Fleet Marine Forces. During the Vietnam War, the Marine Corps experienced a severe shortage of pilots, and following the direction of the Secretary of Defense, accepted helicopter pilots who had been trained by the Army. To meet Marine Corps requirements those Army-trained pilots, whose training was complete by Army requirements, required an additional 70 to 75 hours of flight training that was provided in Marine Corps helicopter training groups. General Mundy's comment during the Commission's hearing on March 6, 1995, did not indicate his willingness to change the training syllabus for Marine Corps helicopter pilots, but was offered in rebuttal to suggestions that our current resistance to UHPT consolidation is fueled in whole or in part by interservice rivalry.

5. In 1992, the JCS report on Roles & Missions recommended consolidation of all primary helicopter training with the Army. A team led by the Navy was tasked by Secretary of Defense Aspin to review this recommendation. Their findings concluded that consolidation would need to be put on hold until primary training for both fixed wing and rotary wing could be evaluated together, the service and operating costs of the new TH-67 trainer had been determined, and that the decision would be made with the context of a base closure round.

a. Each of these points has been satisfied, yet DoD only adopted the fixed-wing portion of the Cross-Service Group recommendation. Why was rotary-wing training ignored?

ANSWER: Mr. Nemfakos. The 1992 JCS Report on Roles & Missions, signed by General Colin Powell in February 1993, did not recommend consolidation of primary helicopter training. Instead, it stated *"If it is cost effective, Navy, Marine Corps and Coast Guard helicopter training will be moved from Pensacola to Ft Rucker."* A joint working group, led by the Navy with assistance from the Army, recommended *"retaining existing Navy helicopter training at Whiting Field and continuing use of the T-34C for primary training and track selection at least through JPATS introduction. This proven training format is presently the least costly approach to producing Navy helicopter pilots that meet service requirements."* The study further recommended that *"All services reevaluate each of the options presented in this study shortly after the following events occur: JPATS source selection is complete and acquisition/operating costs are identified. Final force levels are established and this flight training requirements determined. Army receives TH-67 deliveries and actual inventory and operating costs are identified."* The study was forwarded with concurrence from the Army.

Rotary-wing training was considered on an equal basis with all other types of UPT in both the Department of the Navy's analysis and that conducted by the UPT JCSG. The rationale for the Department of the Navy's rejection of the UPT JCSG alternative to close NAS Whiting Field is explained in response to question 1.

6. Earlier this year, the Navy testified before the BRAC 95 commission that the consolidation of Navy helicopter training with the Army was not feasible because it was a "people" issue, or a quality of life issue and that Navy Pilots fly in more extreme weather conditions at sea than the Army does. If that in fact is the case, why does the Pentagon continue to request Army helicopters and pilots to support naval missions?

A number of Army missions in support of Naval operations:

1983: Operation Urgent Fury
*Shipboard operations involving the Army's 18th Airborne Corps: UH-60's, OH-58A/C's, AH-1's

1987: Operation Prime Chance
*Shipboard and overwater operations involving the Army's 4/17th CAV (now 4/2) with OH-58D's
*valid CONOPS mission today

1994: Operation Uphold Democracy - Haiti
*10th Mountain Division operated from the USS Eisenhower
*OH-58D's had extensive missions prior to invasion
*UH-60's, CH-47's, OH-58A/C's and AH-I's transported troops and equipment to the AO for several days, followed by command & control missions

Each Army Aviation unit has a task for shipboard operations incorporated in their mission essential list of tasks. The Army trains for shipboard operations and performs shipboard operations.

ANSWER: Mr. Nemfakos. As mentioned in response to question 1, training for Army helicopter pilots and naval aviators is designed to prepare them for two significantly different operational environments. The record of employment of Army helicopters shows that the Army does operate from Navy ships on certain occasions and under visual meteorological (VMC) weather conditions. However, Army helicopter pilots are not trained for, and do not operate during, degraded weather conditions. In contrast, every Navy pilot is trained to operate from large and small deck ships under all weather conditions. In each of the cases cited above, Army helicopters were required due to unique mission circumstances and operated under favorable weather conditions as directed by senior Defense Department officials.

7. In 1992, MGen. Dave Robbins, then-Commander of the Army Aviation Center, noted that one of the main reasons the Navy was opposed to consolidating this training with the Army was because the Navy used initial fixed-wing training as a "cutting" tool for students.

a. Do you believe this to be the case, and is there any legitimate reason why the Navy needs this extra "cutting" tool?

b. Could the Navy use the Army's training syllabus that places student pilots directly into the rotary wing pipeline?

ANSWER: Mr. Nemfakos. The Navy practice of using fixed-wing aircraft in rotary-wing pilot track selection and training was validated by a 1994 Center for Naval Analysis study which concluded that *"Splitting the current Navy primary into two separate tracks, rotary primary and fixed-wing primary, could increase attrition if current standards are maintained. Attrition would be higher in each track than in the present unified primary and thus would be higher overall."* Increasing attrition will increase the cost of training and require increased accessions. In addition, the study forwards the following training considerations:

"The motor skills and learned responses needed to fly helicopters and fixed-wing airplanes in forward flight are almost exactly the same... These skills are transferable."

"Flying helicopters in hover mode is different from flying them in forward flight mode. From a training standpoint, it is sensible to first teach rotary-wing pilots forward flight in a fixed-wing trainer. Student pilots can then move to helicopters where they acquire specialized flight skills."

"Some flight training, particularly navigation and instrument flying, involves skills that are not specific to a particular type of aircraft."

The Air Force also supports the concept of undergraduate, primary fixed-wing training for its helicopter pilots. In December 1992 the Assistant Secretary of the Air Force stated *"...fixed-wing training before rotary-wing training produces a better trained helicopter pilot for less money."*

Based on the benefits of fixed-wing primary training, using the Army's curriculum would not meet Navy, Marine Corps and Coast Guard requirements.

8. According to the DoD IG, "Relocating the Navy's primary helicopter training to Fort Rucker would relieve ground and air traffic congestion at Whiting Field NAS."

a. Is there a problem with congestion at Whiting Field, both in the air and on the ground? If so, would relocation of the Navy's Undergraduate Helicopter Pilot Training program free-up space at Whiting Field?

b. How does Fort Rucker compare with Whiting with regard to available space?

c. Since the Army already owns nearly 80% of all DoD helicopters, does Fort Rucker have the capacity to train all of DoD's primary helicopter pilot requirements?

ANSWER: Mr. Nemfakos. There is no ground or air congestion at NAS Whiting Field. As previously stated, fixed wing (T-34C) aircraft normally conduct training operations at altitudes above 1500 feet and rotary wing (TH-57B/C) training aircraft operate in the airspace structure

below 1500 feet. Commercial airliners overfly training airspace at altitudes above 24,000 feet. Navy fixed-wing aircraft conduct landing operations at exclusive fixed-wing airfields, which are specifically designed to train naval aviators to land day or night, in fair or foul weather, and aboard the confined landing areas of our ships at sea. These airfields are located within ten miles of home field, enhancing training efficiency and lowering cost per completed student sortie. NAS Whiting, in effect, is two airfields for the price of one. There are no course rule conflicts between fixed-wing and rotary-wing aircraft operating at these two fields. Operations in joint-use areas are normally conducted using air traffic control procedures and/or radar monitoring. Additionally, helicopters, by design, can operate at very slow airspeeds. As a result, near mid-air collisions involving Navy helicopters are virtually non-existent. In contrast, increased congestion at Fort Rucker would result from consolidating training there.

Fort Rucker is larger than NAS Whiting Field. However, NAS Whiting Field meets all present and future Navy requirements for primary and helicopter training and includes sufficient maritime operating areas for the Helicopter Landing Trainer ship. Additionally, the area around Fort Rucker has a much greater concentration of noise sensitive areas than does NAS Whiting Field.

Fort Rucker requires significant facilities MILCON, extensive rehabilitation and upgrade of existing structures and, equally important, extensive quality of life improvements to support consolidated training. Facilities meeting the Navy's requirements for both mission and quality of life are currently available and in use at NAS Whiting Field.

Brig Gen Shane. Yes. According to Undergraduate Pilot Training Joint Cross- Service Group certified data, the total DoD throughput in the near future is 1,481. This training rate would only engage 72% of Fort Rucker's present capacity for undergraduate helicopter pilot training.

MEDICAL JOINT CROSS-SERVICE GROUP

PROCESS

Questions submitted to Dr. Edward Martin

1. All but one of the 16 Joint Cross Service Group alternatives describe realignment of an acute care hospital to an outpatient clinic.

Why were so many of the Joint Cross Service Group's alternatives realignments rather than closures?

ANSWER: The Joint Cross Service Group (JCSG) did not attempt to eliminate a medical presence unless the medical facility was the host unit or the installation closed and there was not a significant active duty population projected to remain in the area. If a significant active duty population does remain, then a minimum of an ambulatory clinic will be required. This was the reason most of the proposed alternatives that the JCSG developed called for realignment to clinic status.

Is realignment to a clinic a cost effective way to eliminate excess capacity?

ANSWER: Yes, if it is clear that the hospital capability is not required. We parallel the civilian health care industry's move toward increased use of ambulatory service clinics instead of inpatient hospitals. The most significant difference in a super clinic and a small hospital is the requirement NOT to maintain a 24 hour blood bank, 24 hour nursing care and 24 hour ancillary services, such as pharmacy, laboratory and radiology. This is especially cost effective at locations with small inpatient services, and adequate civilian facilities in the immediate communities.

Would it be more cost effective to close rather than realign hospitals, especially in areas that have additional military hospitals or substantial civilian capacity?

ANSWER: The "733 Study" states that "on average, MTFs appear to provide a given amount of care at significantly less cost than is the case in the private sector." Aside from this, however, there are many other issues which mandate a medical presence on an installation other than the cost effectiveness of the medical care. Our rightsizing initiatives take into account factors such as readiness, operational medicine in support of a flying or other mission, lost time from training, TRICARE, etc.

2. What exactly did the Joint Cross Service Group have in mind when it used the word "clinic?"

ANSWER: The simplest definition of a "clinic" is a military treatment facility without inpatient services. In its April 15, 1995 Report to the BRAC 95 Review Group, the BRAC 95 Joint Cross-Service Group for MTFs and GME defined a clinic as "An outpatient treatment facility that has a

commanding officer, receives funds directly from the Service headquarters, and provides care to active duty and other beneficiaries."

It is expected that the medical service plans developed for each realignment location will specify the services and personnel required to best support the remaining beneficiary population. In some cases that may be a "super clinic" in which there is significant capability to provide comprehensive ambulatory services to include same day surgery, laboratory, pharmacy and radiology services. A super clinic might also often include the capability for overnight care for active duty personnel who cannot return to the billets.

3. Who has the final say as to what is included in a clinic, and who decides how many people it takes to operate one?

ANSWER: The Military Departments have responsibility for providing medical and dental care for their personnel and allocation of staffing to provide those services. This is done by the medical command or line authority responsible for the military treatment facility. The responsible command takes many factors, including operational medicine, special base concerns, and local circumstances into consideration as they make these determinations.

TRICARE, the Department's regionalized managed care plan brings together the health care delivery system of each of the military services, as well as the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), in a cooperative and supportive manner to better serve military patients and to better use the resources available to military medicine. The organization of TRICARE includes twelve regions, each administered by a lead agent, who is a commander of one of the military medical centers located within the region. These lead agents have developed, and are in the process of implementing, in collaboration with all the military treatment facility commanders in the region, integrated plans for the delivery of health care to beneficiaries residing in the region. This will shape the level of service and staffing found in each facility.

4. Given that direct care services in military hospitals are essentially free to beneficiaries, while services received under CHAMPUS involve co-payments and deductibles, do you believe it is reasonable to conclude that demand for services may diminish when direct care services are reduced?

ANSWER: It is possible that the number of visits may decrease slightly, but there probably would not be a corresponding decrease in the intensity of services. Various DoD studies, including the "733 study", found an "induced-demand" effect given free MTF care in lieu of CHAMPUS; however, this applied mostly to routine outpatient care and not specialty care.

PRIOR ROUND AND NON-BRAC ACTIONS

5. Please describe how reductions in the medical area fit into the larger, DOD-wide drawdown context?

ANSWER: The Department of Defense is changing and so is its medical support. Assuming all BRAC and other DHP programming actions are implemented, the Department will have reduced our infrastructure by 59 hospitals and 12,000 beds worldwide since 1988,. This is a 35% reduction in hospitals and a 42% reduction in bed capacity. 17 facilities overseas were closed and 42 inpatient facilities within CONUS have been closed or realigned. 25 of those inpatient facilities have occurred due to BRAC 88, 91, and 93.

6. Do past BRAC actions and the current set of recommendations keep pace with changes in the rest of the military or are medical assets drawing down at a faster or slower pace?

ANSWER: Medical infrastructure reductions parallel similar changes occurring elsewhere in the Department. Overall active duty strength has decreased approximately 30% with a corresponding 35% reduction in hospitals and a 42% reduction in bed capacity.

7. In meetings with Commission staff, you described a number of hospital realignment actions taking place outside of the BRAC process.

Please specify what the Department is doing to eliminate excess inpatient capacity beyond the recommendations sent to this Commission. Please include name of hospital, details of the action, and the time frame during which the action is to occur.

ANSWER: Since the end of the Cold War, the Department has aggressively sought to reduce excess infrastructure. Over 58 hospitals will have closed or realigned. The Defense Health Program has also experienced approximately 12,000 normal bed reduction during this period. These reductions account for a 43% decrease in beds and a 35% decrease in number of inpatient facilities since 1988.

Within the continental United States, 42 hospitals will have closed by the end of BRAC 95, assuming the current recommendations are accepted. These actions were accomplished by the cumulative base realignment and closure rounds and the Defense Health Program initiatives. These initiatives include, but are not limited to the following type actions:

- Small Hospital Study
- Realignment of hospitals to ambulatory care centers
- Modification of emergency room services
- Evaluation of alternative staffing options and delivery models
- Reshaping the medical force to focus toward managed care and shift to ambulatory surgery
- Joint staffing

- Sharing agreements with the Department of Veterans Affairs

Discontinuation of inpatient services:

- Naval Station, Adak, Alaska
- Naval Home, Gulfport, Mississippi
- McConnell Air Force Base, Kansas
- Kirtland Air Force Base, New Mexico (resource sharing with DVA)
- Malstrom AFB, Montana
- Naval Hospital, Newport, Rhode Island
- Grissom Air Force Base, Indiana
- Reese Air Force Base, Texas
- McGuire Air Force Base, New Jersey

Defense Programming Action is slated to terminate inpatient services in the following Navy hospitals:

- Naval Hospital Charleston, South Carolina
- Naval Hospital Patuxent River, Maryland
- Naval Hospital Millington, Tennessee
- Naval Hospital Corpus Christi, Texas
- Naval Hospital Groton Connecticut

Discontinuation of emergency room services:

Emergency room services have been modified at 18 Air Force bases (level III to level IV emergency services)

- Seymour Johnson Air Force Base, North Carolina
- Griffiss Air Force Base, Indiana
- Sawyer Air Force Base, Michigan
- Moody Air Force Base, Georgia
- Cannon Air Force Base, New Mexico
- Holloman Air Force Base, New Mexico
- Castle Air Force Base, California
- Beale Air Force Base, California
- Little Rock Air Force Base, Arkansas
- Whiteman Air Force Base, Missouri
- Plattsburgh Air Force Base, New York
- Columbus Air Force Base, Ohio
- Laughlin Air Force Base, Texas
- Tyndall Air Force Base, Florida
- Reese Air Force Base, Texas
- McGuire Air Force Base, New Jersey
- Grand Forks Air Force Base, North Dakota
- Maxwell Air Force Base, Alabama

The Air Force is evaluating two other facilities.

Termination of Obstetric and nursery Services:

- March Air Force Base, California
- McClellan Air Force Base, California
- Beale Air Force Base, California
- Fairchild Air Force Base, Washington
- The Air Force is evaluating an additional eight facilities.

In particular, please describe current or planned actions for realignment, consolidation, or other "right-sizing" at the following facilities:

ANSWER:

-- **Blanchfield Army Community Hospital, Fort Campbell, Kentucky**
-- **Ireland Army Community Hospital, Fort Knox, Kentucky**

Ireland Army Community Hospital is consolidating small outlying clinics and realigning internally to focus on product line management.

-- **Madigan Army Medical Center, Fort Lewis, Washington**
-- **Naval Hospital Bremerton, Washington**
-- **Naval Hospital Oak Harbor, Washington**

These three facilities are all in DoD Health Service Region 11 which recently began implementation of TRICARE, our regionalized managed care program for the Department of Defense. Madigan Army Medical Center (MAMC) is the lead agent for this area and has developed, and is in the process of implementing, in collaboration with all the military treatment facility commanders in this region, integrated plans for the delivery of health care to beneficiaries residing within the region. TRICARE brings together the health care delivery systems of each of the military services, as well as the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), in a cooperative and supportive effort to better serve military patients and to better use the resources available to military medicine.

The Puget Sound Federal Health Council was established three years ago. It includes representatives from the Military Departments, Veterans Administration, Coast Guard and University of Washington. The council fosters resource sharing initiatives, such as:

- consolidation of laboratory functions so as to obtain bulk rates on supplies and the designation of MAMC as the sole site for certain tests
- regionalization of the pharmacy to maximize prime vendor efforts
- transportation sharing to enhance medical evacuation between the facilities.

While Madigan Army Medical Center (MAMC) has no current plans to reduce beds or service from their present levels, these issues are, and have been, under constant review. As a result of utilization reviews and implementation of improved pre-admission process for surgical candidates, MAMC has reduced bed capacity to better match care requirements. Changes in services are also anticipated at a number of outlying clinics in response to BRAC initiatives now under study.

The Navy is realigning nine officer and seven enlisted billets to Naval Hospital, Bremerton, Washington to meet anticipated increase of over 9,100 active duty and their family members. There is a BRAC military construction project scheduled for FY 98 for ambulatory care additions.

- **Walter Reed Army Medical Center, DC**
- **Dewitt Army Community Hospital, Fort Belvoir, Virginia**
- **National Navy Medical Center, Maryland**
- **Malcolm Grow USAF Medical Center, Andrews AFB, Maryland**

ASD(Health Affairs) Medical Program Guidance, FY 1997 - 2001, requires the Services "to integrate, right size and eliminate unnecessary duplication in the National Capital Region." The medical treatment facilities in this area are aggressively working to pursue graduate medical education consolidation as well as clinical services realignment/integration. This is a maturing initiative with the two most mature actions being the OB/GYN/NICU realignment between Walter Reed Army Medical Center (WRAMC) and the National Navy Medical Center (NNMC) and mental health initiatives that involve all three medical centers in the national capital area. The OB/GYN/NICU initiative will permit concentration of resources for accommodation of larger beneficiary workloads (WRAMC will provide specialty gynecological services; NNMC will be responsible for neonatal ICU and problem obstetric cases). A similar initiative to consolidate and eliminate redundant mental health services within the region is expected to result in a 30% - 40% reduction in inpatient beds in the national capital area with significantly reduced outpatient CHAMPUS costs as well.

By October 1, 1995 WRAMC will have integrated all the Army medical assets within this area to provide command and control of a cost effective, multidisciplinary, customer focused health care network. This will allow appropriate shifting, consolidation, and efficiencies. DeWitt Army Community Hospital is in the middle of a major primary care initiative aimed at recapture of the primary care base in Northern Virginia and involves major realignments within the hospital and between outlying clinics to include PRIMUS clinics.

Malcolm Grow USAF Medical Center has decreased inpatient operating beds by 31% in the last two years.

- **McDonald Army Community Hospital, Fort Eustis, Virginia**
- **Naval Hospital Portsmouth, Virginia**
- **1st Medical Group, Langley AFB, Virginia**

The military services have a long tradition of cooperation and collaboration in the Tidewater area as evidenced by the many tri-service health care initiatives in this area in recent years. The Navy Medical Center, Portsmouth, Virginia is the Lead Agent for DoD Health Service Region II which includes all three facilities. Recent initiatives in this area include:

- the establishment of voice and data communication networks to allow joint utilization of medical resources
- integration of major information management systems to create enrollment, health care finder and provider networks
- establishment of a patient service center
- increased use of inpatient military resources and better, smarter, utilization of assets in the civilian community is resulting in a decline in both outpatient visits and hospital admissions.

The Navy is evaluating current staffing in this area and may realign some manpower resources into their Branch Clinic at Oceana. The 1st Medical Group at Langley AFB has decreased inpatient operating beds by 20% in the last two years and has developed resource sharing agreements in ENT and neonatology. In addition they have developed an oxygen contract buy-in with the Hampton VA Medical Center. McDonald Army Community Hospital will have a "TriPrime Clinic" open in January 1996 in a continuing effort to develop their primary care network.

-- **Munson Army Community Hospital, Fort Leavenworth, Kansas**
-- **Irwin Army Community Hospital, Fort Riley, Kansas**
-- **351st Medical Group, Whiteman AFB, Missouri**

The distance between these facilities, and their relative size and mission, diminish many of the opportunities for effective resource sharing between them. Individually however they have all incorporated managed care principles into their operations which contribute to efficiency and right-sizing at their own facilities. For example, Irwin ACH at Fort Riley, Kansas has combined its pediatric and medical/surgical wards into one in an effort to better utilize available health care resources for the community they serve.

-- **Womack Army Community Hospital, Fort Bragg, North Carolina**
-- **Naval Hospital Cherry Point, North Carolina**
-- **Naval Hospital Camp Lejeune, North Carolina**
-- **4th Medical Group, Seymour Johnson AFB, NC**

These facilities are part of DoD Health Services Region Two; the Lead Agent being the Navy Medical Center, Portsmouth, Virginia. A managed care organization, Eastern Carolina Coordinated Care, has been established to maximize referrals to the MTFs through the TRICARE Service Center that assists in locating appointments for beneficiaries with preferred and participting providers.

Womack Army Medical Center continues to develop its primary care initiative, started in January 1992, with the objective of developing a primary care network that would be capable of offering managed care enrollment to 80% of the eligible population in preparation for the transition to TRICARE. The 4th Medical Group at Seymour Johnson AFB modified emergency medicine services from level III to level IV in 1993.

-- **Naval Hospital Camp Pendleton, California**
-- **Naval Hospital San Diego, California**

These facilities are part of DoD Health Services Region Nine; the Lead Agent being the Navy Medical Center, San Diego, California. San Diego is just entering its implementation of region-wide resource sharing. They have a long standing association with the Naval Hospital Camp Pendleton to assist in graduate medical training. Some general surgical residents from the Naval Medical Center, San Diego obtain their obstetrics training at Pendleton and transitional inters perform their family practice rotation there. In addition family practice residents from Camp Pendleton rotate through the medical center for specialty training not available at their facility. In addition, NMC San Diego routinely provides specialty physicians to NH Camp Pendleton, in particular pediatric support and orthopedic support assist in reducing CHAMPUS and supplemental care expenditures.

-- **Evans Army Community Hospital, Fort Carson, Colorado**
-- **USAF Academy Hospital, Colorado**

ASD(Health Affairs) Medical Program Guidance, FY 1997 - 2001, requires the Services "to integrate, right size and eliminate unnecessary duplication at... Ft. Carson Army Community Hospital/Air Force Academy Hospital." The two facilities have formed the Pikes Peak Area Initiative in a proactive effort to improve cooperation and collaboration between their facilities. Resource sharing in urology and ENT is underway. Evans ACH has reduced inpatient beds from 110 to 85 and combined medical and surgical wards.

-- **Bliss Army Community Hospital, Fort Huachuca, Arizona**
-- **355th Medical Group, Davis-Monthan AFB, Arizona**

These facilities are part of DoD Health Services Region Seven; the Lead Agent being William Beaumont Army Medical Center (WBAMC), Texas. Their is a joint Davis-Monthan/WBAMC preferred provider network that covers all specialties. Referral workload is sent to William Beaumont and Wilford Hall Medical Center. The Air Force also used the Navy Clinic, Yuma, AZ for orthopedic cases. The Air Force hospital has decreased inpatient operating beds by 14% in the last two years.

-- **Naval Hospital Pensacola, Florida**
-- **646th Medical Group, Eglin AFB, Florida**
-- **325th Medical Group, Tyndall AFB, Florida**
-- **Keesler USAF Medical Center, Keesler AFB, Mississippi**

These facilities are all part of DoD Health Services Region Four; the Lead Agent being Keesler USAF Medical Center. The lead agent is exploring the idea of locating a tri-service alcohol rehabilitation program at Pensacola Naval Hospital for all the southeast. A region-wide reference laboratory service, for all beneficiaries in this area is also being pursued.

Pensacola NH and Keesler USAF Medical Center have agreements regarding several training programs and reciprocal medical board processing. Pensacola NH and the 646th Medical Group at Eglin AFB have combined efforts in procuring some highly specialized diagnostic equipment for their facilities. In addition Eglin cares for Pensacola's inpatient psychiatric patients in exchange for Pensacola taking Eglin's outpatient alcohol rehabilitation patients. Tyndall AFB refers all specialty required work to Keesler.

Other right-sizing initiatives have resulted in the 646th Medical Group decreasing inpatient operating beds by 19% in the last two years while Keesler has decreased beds by 8% in this same period.

- **Martin Army Community Hospital, Fort Benning, Georgia**
- **Lyster Army Community Hospital, Fort Rucker, Alabama**
- **502nd Medical Group, Maxwell AFB, Alabama**
- **653rd Medical Group, Robins AFB, Georgia**

The relative distance between these facilities limits many types of right-sizing opportunities although they do share assets. Robbins AFB is exploring possible sharing agreements with the Veterans Administration medical center in the area and with a local civilian medical facility. There has been a 50% decrease in operating beds at Maxwelll AFB in the last two years.

- **Reyonlds Army Community Hospital, Fort Sill, Oklahoma**
- **97th Medical group, Altus AFB, Oklahoma**
- **654th Medical Group, Tinker AFB, Oklahoma**
- **396th Medical Group, Sheppard AFB, Texas**

Reynolds Army Community Hospital has several initiatives to maximize assets. Resource sharing agreement with the adjacent VA outpatient clinic has been completed. Reynolds anticipates completion later this year of resource sharing agreements with two nearby Air Force facilities through their "Friends and Neighbors" program that promotes cost avoidance in such areas as orthopedics, general surgery, neurology, and dermatology. Their outlying family practice facilities have been consolidated in the main hospital facility thereby allowing turn in of excess buildings. Other consolidations of wards, clinics and staff have also occurred.

Tinker AFB, OK provides orthopedic surgeons to assist McDonnell AFB, KS. A proposal to covert the emergency room at Tinker AFB into a 24 hour acute care clinic is currently being developed. Sheppard AFB provides monthly manning assistance to Altus, Tinker, and Reese AFBs in such areas as ENT, audiology, orthopedics and podiatry. Other such cross-

sharing of assets in frequent between these facilities. Inpatient beds at Altus AFB have declined by 53% in the last two years and 29% at Tinker AFB.

-- **Moncrief Army Community Hospital, Fort Stewart, Georgia**
-- **363rd Medical Group, Shaw AFB, South Carolina**

Inpatient operating beds have decreased 17% in the last two years at Shaw AFB and the Special Care Inpatient Nursing Unit is being evaluated for closure. Air Force ophthalmologists care for Army beneficiaries at Moncrief Army Community Hospital. Army radiologists read mammography films for Shaw AFB and the Air Force provides gynecological care to Army beneficiaries at SHAW AFB.

-- **Winn Army Community Hospital, Fort Stewart, Georgia**
-- **Naval Hospital Beaufort, South Carolina**

No formal agreements or programs are in place though they share assets on a frequent basis. 66 miles separate the facilities making routine sharing difficult.

In regards to planned actions, please be specific about the status of those plans in Defense Health Program budgeting.

ANSWER: ASD(Health Affairs) Medical Program Guidance, FY 1997 - 2001, requires the Services "to integrate, right size and eliminate unnecessary duplication at Ft. Carson Army Community Hospital/Air Force Academy, at Brooke Army Medical Center/Wilford Hall USAF Medical Center, and in the National Capital Region."

In addition the programming guidance addresses graduate medical education: " The components shall integrate remaining duplicate training GME programs in the National Capital Region and San Antonio, Texas not later than FY 1998."

Also, please describe in detail the status of current plans to convert Naval Hospital Charleston, SC; Naval Hospital Patuxent River, MD; 9th Medical Group, Beale AFB, CA; 323rd FTW Hospital, Mather AFB, CA; and 438th Medical Group, Fort Dix, NJ into outpatient clinics.

ANSWER:
Navy hospitals

A "quick analysis" of these five facilities was performed in April 1994 and it was determined that ambulatory health care centers were viable alternatives at these sites. As a result of this "rightsizing," Navy could optimize manpower and fiscal resources by transferring end strength from these facilities to OCONUS and Fleet units, and by off-setting very expensive contracts in Navy MTFs. The contractual and MILCON savings realized by this action equate to over $270 million dollars across the FYDP.

A complete analysis of each facility is currently in progress by BUMED. It is anticipated that this detailed analysis will be completed later this summer. If the analysis supports the earlier review, then the projected transition date should coincide with t he implementation plan for realignment.

Change in service dates, now projected, are as follows:

Naval Hospital, Millington	Nov 96
Naval Hospital, Groton	Nov 97
Naval Hospital, Patuxent River	Nov 97
Naval Hospital, Corpus Christi	Nov 96
Naval Hospital, Charleston	Nov 97

Naval Hospital, Charleston

As a result of BRAC actions closing Naval Base Charleston and the decommissioning of many associated fleet units and the migration of many others, it became necessary to right-size the Naval Hospital, Charleston to support remaining active duty members and their families.

Naval Hospital, Charleston reduced operating beds from 130 to 90 in December 1992. As of October 1995, it is projected that approximately 29,000 active duty and family members will remain in the Charleston catchment area. Historic utilization rates project an average daily inpatient census of between 35 and 37 for that remaining population and the decision was made to further reduce operating beds to 40 effective 1 October 1995. As a result, external partnerships for routine inpatient obstetric service and inpatient psychiatric services were initiated and are in place.

The result of BRAC 95 and other fleet and operational movements is being carefully monitored to determine if it will be necessary to increase operating beds or, with the arrival of TRICARE in May 1997, to further decrease or eliminate inpatient beds. The plan would use contracts and partnerships for the limited number of active duty inpatient beds required and rightsize the Naval Hospital to an ambulatory care center later in 1997.

Air Force Hospitals

9th Medical Group, Beale AFB -- A change from hospital to clinic status is currently being evaluated. Obstetrical services closed in 1994 and inpatient operating beds have decreased 17% in the last two years.

323rd FTW Hospital, McClellan AFB -- Obstetrical services closed in 1994. Inpatient operating beds have declined 17% in the last two years.

438th Medical Group, Ft Dix -- This facility was reduced to clinic status from an inpatient facility on 1 January 1995.

Why isn't the Department doing these actions through the BRAC process?

ANSWER: Our purpose during BRAC 95 was to evaluate cross Service opportunities for Single Service asset sharing, decrease excess capacity, and reduce duplication within the Military Health Service System (MHSS). The alternatives submitted by the Joint Cross-Service Group on Military Treatment Facilities have been largely accomplished through the BRAC process and other ongoing management initiatives. I understand and support the rationale the Services have provided for maintaining most of the remaining facilities that were provided for their consideration.

The MHSS is sensitive to structuring itself to the needs of the world-wide community it serves, and has been aggressively addressing this issue outside the BRAC process. Additional rightsizing initiatives, such as the planned integration of Wilford Hall USAF Medical Center and Brooke Army Medical Center and the integration of Evans Army Community Hospital and the USAF Academy Hospital, will be addressed thorough future Defense program and budget review processes.

Our goal is to reduce unneeded infrastructure thus allowing us to use our resources for more critical requirements. The Services have taken different approaches to how to accomplish this. We are concerned with the results, not the process the Military Departments have taken to achieve them. Our cumulative record of infrastructure reductions since the end of the Cold War demonstrate the success of our efforts.

Given the frequency with which budgets can and do change, what assurances do you and the Commission have that these actions are really going to take place?

ANSWER: The ASD(Health Affairs) has been the program manager for the Department's health resources since 1991. As a consequence, we have worked on a joint basis for several years and will continue to develop and implement programs and systems that facilitate effective and efficient use of resources.

Do you believe it would be beneficial for the Commission to add any or all of the actions you describe to its list of actions to consider?

ANSWER: I don't think this is necessary. We are confident that the rightsizing initiatives now underway and planned can achieve the management goals we have established.

8. San Antonio, Texas is home to two large military medical centers and a large number of civilian hospitals. This appears to be an example of an opportunity to eliminate a substantial portion of excess capacity, and, indeed, the Air Force facility, Wilford Hall, was on the Joint Cross Service Group list of realignment alternatives. Yet neither facility is on the DOD list.

Why?

Why did the Air Force choose not to realign Wilford Hall to either a clinic, as the Joint Cross Service Group alternative suggests, or a community hospital?

Is there a plan to realign and consolidate services at Wilford Hall and Brooke Army Medical Center? If so, what is its status?

Are you comfortable with the Army and Air Force plans to enact such an alternative through the budget process? If not, do you feel that Commission action could better ensure that the necessary realignment takes place?

Given the unique aspects within both the Brooke Army Medical Center and Wilford Hall, would you envision any actual infrastructure operating efficiencies by a consolidation? Would you actually be able to close a facility by consolidation?

ANSWER: The Joint-Cross Service Group for Medical Treatment Facilities analysis did provide an alternative for consideration by the Air Force that realigned Willford Hall Medical Center (WHMC) to a clinic. This option was based on computer modeling that consolidated the acute and medical center inpatient care requirements in San Antonio at Brooke Army Medical Center and converted Willford Hall to an ambulatory care facility. The alternative was based on quantitative modeling results that suggest the reduced beds are not needed for wartime demand nor to meet the projected peacetime direct care inpatient requirements.

The Air Force evaluated, and strongly rejected, this alternative based on consideration of several additional factors that were not included in the model. Wilford Hall Medical Center is the premier Air Force medical facility and is known internationally for its specialty medical services and graduate medical education teaching program. It is the largest, single contributor to their readiness capability, houses 34% of their GME training programs of which 27 are unique to WHMC, and accounts for 41% of the total physician training man-years, is the only designated Specialty Treatment Center in the Air Force, as well as its only operating Level 1 Trauma Center. The Air Force believed that any decrease in capability along the lines of the two options indicated will impact negatively on both their wartime readiness mission and operational healthcare costs.

The Department fully agreed with the Air Force's assessment. We are currently developing a plan for consolidating health services throughout DoD Health Service Region VI that includes most of Texas, Oklahoma, Louisiana and Arkansas. One aspect of this is the integration Wilford Hall USAF Medical Center and Brooke Army Medical Center so as to eliminate any nonessential duplication of services in the San Antonio area. Integration of graduate medical education programs between these two facilities is already underway.

I believe this can, and will, be achieved by the management initiatives now planned and underway. It is expected there will be considerable operating efficiencies gained through these actions. I don't think action by the Defense Base Closure and Realignment Commission is necessary. We are confident that the rightsizing initiatives now underway and planned can achieve the management goals we have established.

REQUIREMENTS

9. The Commission staff understands that there is some disagreement within the Department in the area of wartime readiness requirements for hospital beds.

However, do even the highest estimates of required wartime beds exceed the current inventory of over 20,000 mobilization beds?

ANSWER: The General Accounting Office's report on DoD's 1995 process and recommendations for closure and realignment states, " several key variables that greatly affect the wartime demand for medical care are still in debate. And, while the cross-service group's analysis and other studies indicate some excess capacity in medical facilities will remain after BRAC 1995, it is unclear that there is consensus on wartime requirements and therefore on how much excess capacity exists DoD-wide."

Overall active duty strength has decreased approximately 30% with a corresponding 35% reduction in hospitals and a 42% reduction in bed capacity. For BRAC 95, our wartime requirements were based on the most current Defense Planning Guidance, which was approximately 10,000 beds. Our modeling of the MHSS required that any alternative solution retain the aggregate number of wartime beds to meet the MHSS system wide and Service specific bed requirements. We also defined requirements based on FY 94 direct care inpatient rates for active duty members, retired personnel, and their family members. The rates were applied to the projected 2001 populations associated with each catchment area and resulted in a bed requirement for each MTF. This requirement could be met by either the direct care system or civilian sector resources. Our model ensured enough beds were retained in the aggregate MHSS to meet the non-wartime requirement.

Tertiary care demand was also based on FY 94 direct care rates for our GME facilities. Demand was generated based on populations east and west of the Mississippi. Our model then found the "best fit" of our MHSS resources to meet the requirements.

SERVICES' RESPONSES TO JOINT CROSS SERVICE GROUP ALTERNATIVES

10. Eleven of the sixteen alternatives provided to the Services by the Joint Cross Service Group were not accepted.

Are you satisfied that the DOD list goes as far as it should in reducing medical infrastructure?

Do the eleven rejected alternatives represent missed opportunities?

ANSWER: There is probably some excess capacity still in our system. I don't at all consider these "missed opportunities." The alternatives submitted by the Joint Cross-Service Group on Military Treatment Facilities have been largely accomplished through the BRAC process and

other ongoing management initiatives. I understand and support the rationale the Services have provided for maintaining most of the remaining facilities that were provided for their consideration. Additional rightsizing initiatives will be addressed thorough future Defense program and budget review processes.

TESTIMONY BEFORE THE COMMISSION

11. In testimony before the Commission on April 17, 1995, you stated that there is a significant change in how DoD delivers care to eligible beneficiaries within its facilities. Specifically, you stated that the Air Force has stopped doing emergency services in 11 hospitals and closed 17 others. In addition, you testified that the Navy is in the final process of making judgment about downsizing five hospitals to clinics.

Please provide for the record the details upon which your statements were based. At a minimum, please include the locations of affected hospitals, the date the change became or will become effective, and what other plans your office may have to continue the significant changes in how DoD delivers care.

ANSWER: See question 7 above for the response.

Questions Submitted for General Shane

1. How did the Army define "clinic" for the Fort Lee and Fort Meade realignments and what was the basis for the size of the staff reductions in the recommendations for these two hospitals?

ANSWER: Both Kenner and Kimbrough General Community Hospitals perform same day surgery and would therefore normally generate a one day admission even without "inpatient services." Kenner and Kimbrough Army Community Hospitals did not receive a listing of what services to provide to qualify as a clinic. US Army Medical Command expectation is that the Medical Service Action Plan developed by Kenner and Kimbrough staffs will describe the services they think best for the community and the amount support staff. The staff reductions were developed using a manpower staffing assessment model (Benchmark). This methodology determined manpower requirements at 25 Army medical treatment facilities (MTF). By the end of CY 95, 100 percent of the Army MTFs will have been assessed using the Benchmark Requirements Determination Process. The Army Personnel Proponency Directorate (APPD) uses the model to detmine AMEDD Program Objective Memorandum manpower requirements.

2. In developing the cost savings estimates for the two Army hospital realignment actions, what assumptions did the Army make about both inpatient and outpatient CHAMPUS cost increases?

ANSWER: Trade-off factors developed and validated by DoD project the civilian sector utilization when a MTF is realigned. Active duty family members' care would shift to outside sources at a ratio of 1:1. Beneficiaries other than active duty family members would seek care

from outside sources at a rate of 1:2.8 MTF dispositions and outpatient visits All scenarios depicting the elimination of inpatient services at any MTF assume that sufficient personnel and funding resources remain to provide outpatient, diagnostic, ancillary, and referral services commensurate with the remaining mission.

The elimination of inpatient services would result in a 100 percent reduction in personnel supporting the inpatient services. A portion of these personnel would transfer with associated funding to other MTFs to provide the inpatient care formerly performed or subsequently referred by the realigning MTFs.

For Fort Lee, the costing assumes that the fiscal year 1994 dispositions would transfer to outside sources at the tradeoff factor rates shown above.

For Fort Meade, the costing assumes 85 percent of the fiscal year 1994 dispositions would transfer to Walter Reed Army Medical Center (WRAMC); the remaining 15 percent would live a significant distance outside the WRAMC catchment are to warrant their seeking care through CHAMPUS; i.e., the CHAMPUS deductible/copay would be less the cost/inconvenience of traveling to WRAMC.

3. Please explain why the Army accepted some of the Joint Cross Service Group alternatives but not others?

ANSWER: The Army accepted some JCSG alternatives and not others for operational and financial reasons. DeWitt Army Community Hospital (DACH), Fort Belvoir, VA, is a keystone to the Northern Virginia Primary Care Initiative that provides the area beneficiaries with scarce primary care services so vital to a successful managed care program. The closure or downsizing of DACH to a clinic would not have only jeopardized the primary care initiative (for which DACH received the Vice President's Reinventing Government Award), but might have caused ASD (HA) to loss valuable Congressional support for DoD's TRICARE program. The DACH averages about 42,000 outpatient visits per month, which is greater than the outpatient contribution of Malcom Grow Medical Center (39,000 monthly). Additionally, the realignment of DACH never had a return on investment which was primarily caused by the high increase to the recurring CHAMPUS cost of $23.6 M/year.

Downsizing or closure of Lyster Army Community Hospital (LACH), Fort Rucker, AL, would impact readiness by reducing specialized medical support for the Army Aviation School. The closure or downsizing of LACH to a clinic would force active duty patients (flight students and cadre) to on-post care in Dothan, AL about 45 minutes away. The lack of on-post care would result in high levels of pilot "downtime." Additionally, the realignment scenario never had a return on investment.

Questions Submitted for Major General Blume

1. Based on documents provided to the Commission and discussions between the Commission staff and DoD representatives, it is understood that both the Army and the Navy performed

COBRA analyses for all of the Joint Cross Service Group alternatives, but that the Air Force did not perform any.

Is this correct? If so, why didn't the Air Force do the analyses needed to determine such an important aspect of the feasibility of the alternatives?

ANSWER: Yes, this is correct. The Air Force performed no COBRA analyses on the JCSG alternatives because any list provided by the model at that time was premature. The initial results provided by the model in December did not incorporate (remove) the Services' proposed bases for closure and realignment before it was run. Medical facilities at installations which should have been removed from the model included those at Reese and Kirtland AFBs; Army facilities at Fort McClellan, Fort Ritchie, and Fitzsimmons AMC; and Navy installations at Long Beach, and centers in Kentucky, Indiana, Maryland, New Jersey, and Pennsylvania.

Also, and just as important, the model used by the JCSG needed improvements and enhancements in order to provide an accurate list of alternatives for further discussion. Some of these included correcting the excessive flow of GME beds to OCONUS, disallowing binary constraints to keep a facility open at medical center level, and verifying that MTF data accurately reflected reality.

Did the Air Force actively participate in the Joint Cross Service Group effort?

ANSWER: Yes, officers from the Air Force Surgeon General's office participated in the Joint Cross Service Group effort; however, this involvement should not be interpreted as Air Force endorsement of the final results. The alternatives produced by the Joint Cross-Service Group would require review against the total Air Force installation BRAC evaluation and recommendations.

If the Air Force wasn't going to consider the Joint Cross Service Group alternatives, why did the Joint Cross Service Group bother to consider Air Force Hospitals at all?

ANSWER: The Air Force would have considered the Group's alternatives if the model had incorporated each of the Services' proposed bases for closure and realignment made in this round. But, since these alternatives were based on the current base structure and did not factor in the Services' BRAC 95 recommended closures and realignments, it was considered premature to pursue any action on this list of alternatives. Improving and enhancing the model, then returning it with the '95 BRAC basis included, would have certainly provided a worthwhile bases from which to discuss potential rightsizing actions and how best to meet the needs of our beneficiary population.

Additionally, and for your consideration, the Air Force prefers to facilitate medical mission changes programmatically rather than through the BRAC process in order to maintain a degree of flexibility in sculpting its future medical force. Flexibility is important in implementing TRICARE initiatives and delivery of health care to all beneficiaries. The Air Force advocates aggressive efforts in rightsizing its medical facilities based on its readiness

mission, along with TRICARE, through a strategic resourcing methodology. This methodology forges the results of a population-based, demand projection, business-case analysis with capitated-based resource allocation and incorporates best business practices to culminate in the most effective and efficient use of health care resources. Using these tools will methodically and purposely eliminate duplication of services and provide for an optimum product-line and personnel mix.

Question Submitted for Mr. Nemfakos

1. Please explain why the Navy did not accept either of the two Naval Hospital realignment alternatives on the Joint Cross Service Group list?

ANSWER: The alternative to realign Naval Hospital Beaufort to a clinic is not a feasible alternative. Navy Medicine has an obligation to support the operational requirements of the Fleet and Fleet Marine Force. Analysis showed the local civilian health care infrastructure has insufficient accredited inpatient and critical care capability to support the Marine Corps training operations at Parris Island and the Marine Corps Air Station at Beaufort. Naval Hospital Beaufort is the only hospital in the area with adequate inpatient and critical care capability to support any significant operational mishap. Therefore, realigning Naval Hospital Beaufort to an outpatient clinic would require the transfer of military medical personnel to a nearby Military Treatment Facility to meet inpatient care needs of the active duty population in the Beaufort area. Since there will be no savings associated with the elimination of military end strength and there will be increased CHAMPUS costs in the Beaufort area with the loss of military inpatient care capability, this alternative produces no savings for the Department of the Navy.

Although the alternative to realign Naval Hospital Corpus Christi to a clinic was cost effective, it is not feasible due to the personnel demographics of the area. The Naval Hospital Corpus Christi will provide care for the mine warfare helicopter assets relocating to Naval Air Facility Corpus Christi in support of the Mine Warfare Center of Excellence and for the strike training units being consolidated at Kingsville-Corpus Christi. Consequently, while the 1995 actions eliminate from Naval Air Station Corpus Christi the students who traditionally do not have their dependents with them during flight training, they bring in active duty members with their dependents who will all require medical care.

LABORATORY AND TEST AND EVALUATION

LABORATORY

QUESTIONS FOR THE RECORD

1. Dr. Dorman, please explain the context in which your group proposed the closing of Rome Lab and the alternative for cross service collocation of common Command, Control, Communications, Computers, and Intelligence (C4I) activities at Fort Monmouth.

ANSWER: The Laboratory Joint Cross Service Group actually proposed the collocation of most common C4I activities (acquisition, R&D, in service engineering and procurement). During our analysis it became evident that Ft. Monmouth was the only installation with the capacity to accommodate C4I activities from all three services. We realized that such a proposal, in spite of its inherent contribution to joint warfighting and quality, might not prove cost effective or might conflict with service unique goals. Therefore, we identified four elements of C4I consolidation that made sense from a functional and technical perspective:

a. Realign C4I functions of the Space and Naval Warfare Systems Command (SPAWAR; appropriate portions of Codes 00, 05 and staff, 01, 02, and 10; the PEO for Space, Communications and Sensors; and PDs 50 and 60 [to be PD 70]) to Fort Monmouth, NJ (collocate with U.S. Army Communications and Electronics Command [CECOM]), or to Hanscom AFB, MA (collocate with U.S. Air Force Electronic Systems Command [ESC]).

b. Realign ESC, Hanscom AFB, MA to Ft. Monmouth, NJ (collocate with CECOM and potentially SPAWAR at Ft. Monmouth).

c. Realign Rome Laboratory, Griffiss AFB, NY to a combination of Naval Command, Control, and Ocean Systems Center RDT&E Division (NRaD), San Diego, CA; Communications RDEC, Ft. Monmouth, NJ; Topographic Engineering Center, Ft Belvoir, VA; and Wright Laboratory, Wright-Patterson AFB, OH.

d. Realign Rome Laboratory, Hanscom AFB, MA to NRaD, San Diego, CA; or to CECOM Communications RDEC, Ft Monmouth, NJ (or to Rome Laboratory, Griffiss AFB, NY, if it remains in place).

We used the word realign rather than close in these alternatives because each Military Department could elect to maintain other, service unique, functions at these bases.

2. Dr. Dorman, what organizations and how many personnel would have been located at Fort Monmouth under this alternative?

ANSWER: Our analysis was based on the certified data provided by the MILDEPs, and the following assumptions:

- attrition and force structure reductions will reduce the current fiscal year workforce by at least an additional 20% over the implementation period. (this is less than the "FR-20%" used for detailed analyses of Common Support Functions)
- Selected support functions (non-S&T; e.g. legal, contracting support) could be reduced an additional 10 to 20 percent.
- Base Operations Support (BOS) would not move.

The functions/organizations and personnel which could collocate at Fort Monmouth under these assumptions are:

Organization	Personnel
SPAWAR (appropriate functions)	800
ESC, Hanscom	1,500
Rome, Hanscom	80
Rome, Griffiss	680

We believe these numbers are conservative. They account only for Full Time Equivalent (FTE) reductions comparable to those assumed for our detailed analyses of Common Support Functions. Additional savings should be achievable (i.e. less people moved) as a result of programmatic and technical commonalties identified during detailed implementation planning.

Our data indicated that Fort Monmouth could accommodate 1,085 workyears with little or no modification, and an additional 2,200 with renovation and conversion of existing facilities.

3. Dr. Dorman, as you know, Rome was designated as one of the Air Force's four Tier I laboratories. As Director of Defense Research and Engineering, are you concerned that closing the lab and moving some of its C4I functions to Fort Monmouth and the others to Hanscom Air Force Base will have a major impact on the DoD's and the Services' ability to conduct current and further C4I research and development?

ANSWER: No, I think that collocating common C4I work among the services will strengthen our warfighting capability by improving interoperability as well as help avoid unnecessary and costly duplication of research staffs and projects. Much of the work in C4I is done by industry. I am more concerned that the services will be left with excessive infrastructure after this round of base closures. As funding declines this infrastructure will consume resources which would better serve our national defense by sustaining and leveraging the private sector.

The Laboratory Joint Cross-Service Group actually recommended the collocation of most common C4I functions from all services as described in my answer to an earlier question (#1). The services found the cost of this alternative prohibitive based on COBRA analyses.

4. Dr. Dorman, does it make sense to split Rome Lab's C3I functions between two military installations?

ANSWER: Yes. The Laboratory Joint Cross-Service Group actually recommended that the Air Force could place appropriate functions of Rome Lab at a combination of Naval Command, Control, and Ocean Systems Center RDT&E Division (NRaD), San Diego, CA; Communications RDEC, Ft. Monmouth, NJ; Topographic Engineering Center, Ft Belvoir, VA; and Wright Laboratory, Wright-Patterson AFB, OH.

These other locations do science and technology similar to that done at Rome, with greater "center of mass" in their areas of expertise. As stated in the previous question (#3), I think that collocating common C4I work among the services would strengthen our warfighting capability by improving interoperability and would help avoid unnecessary and costly duplication of research staffs and projects.

The question is whether to collocate common C4I functions at functional "centers of excellence", if you will, versus collocating C4I functions within each service. I happen to believe that the Department can improve joint warfighting capability as well as reduce infrastructure by doing the former.

5. General Blume, how did the Air Force determine the cost and savings of the Rome Laboratory recommendation? Did anyone from the Air Force involved in the decision to close the lab and realign its functions visit the lab before the recommendation was made to: (1) discuss these actions with the lab's managers, (2) evaluate the impact of these actions on the lab's current and future C4I work, (3) determine the Lab's requirements at the receiving locations, and (4) determine what had to be moved to the new location and at what cost?

ANSWER: The costs and savings associated with the Rome Lab recommendation were developed using COBRA based on certified data, originated at Rome Lab, that went through the Air Force Internal Control Plan process. Additionally, a preliminary site survey was conducted in January 1995 by AF/CE and RT personnel. The proposed actions were discussed with the Rome Lab Commander prior to the recommendation being finalized. The allocation of the Rome Lab activities were developed in discussions with the SECAF, AF/CV and the BCEG based on the impact to future C4I work.

6. Major General Blume, during the Commission's visit of Brooks, the San Antonio community presented a plan to establish a cantonment area, close Brooks, and preserve the functions of the Human Systems Center, that is, Armstrong Laboratory, the School of Aerospace Medicine, and other related activities.

Had the Air Force considered this option previously?

How does the Air Force plan to eliminate excess capacity at Wright-Patterson Air Force Base should the San Antonio community proposal be adopted?

ANSWER: The Air Force did not consider this option previously. The Air Force seeks to reduce infrastructure prudently. In the case of Brooks AFB, closure is the preferred approach. We are only now looking at a Brooks AFB cantonment option at the request of the Commission. This option does not represent the Air Force position. The Air Force has not developed any plans on eliminating excess capacity at Wright-Patterson AFB should the San Antonio community proposal be adopted by the Commission.

7. Major General Blume and Dr. Dorman, the current DoD recommendations dictate that the Aircrew Training Research Division of Armstrong Laboratory remain as a stand-alone facility at the closed Williams Air Force Base.

Nearby Luke Air Force Base already conducts the majority of the fighter weapons training for the Air Force, and has a long history of cooperation with Williams.

How strongly did the Air Force consider moving this unique and necessary function from Williams Air Force Base to Luke Air Force Base? Have any COBRA runs performed?

If so, could they be provided to the Commission as soon as possible?

ANSWER: **Maj Gen Blume**. The Air Force gave due consideration to moving this unique and necessary function from Mesa, AZ (formerly, Williams AFB) to Luke AFB among several other options. COBRA runs for this option were accomplished and the COBRA run presented to the BCEG has been attached at **TAB 6**. The recommendation to retain the Division at it's current location continues to take advantage of the considerable resources of Luke AFB but avoids the expenses and disruption associated with the movement of this small, largely civilian operation to Luke AFB.

Dr. Dorman. I cannot answer for the Air Force. As you know, a previous BRAC decision directed the collocation of the Air Crew Training Research Division with similar work of the Army and Navy at Orlando. This was a case where the MILDEPS had agreed to collocate. We did include Williams AFB in our analysis of Training Systems S&T, and found no rationale for recommending a change to the BRAC '91 decision. The Laboratory Joint Cross Service Group's recommended alternative stated:

> The Air Force Aircrew Training Research Division of Armstrong Lab at Williams AFB is already planned for relocation to the Central Florida Research Park in Orlando to join NAWC Orlando and STRICOM. Further, the collocation of NASA-KSC and approximately 150 contractors in the Center of Excellence in Central Florida allows concentration of resources to accomplish similar missions and tasks, avoids duplication of efforts, promotes technology sharing and produces

cost avoidances in travel and technical synergism between government, industry, and academia.

8. As indicated during the hearing, Dr. Dorman agreed to provide, for the record, what the impact on excess capacity would have been had the Laboratory Joint Cross Service Group's four alternatives been accepted by the separate services within the Department of Defense. Please provide this information for the record.

ANSWER: I must preface this answer by noting that neither lab capacity nor lab requirement are absolute. Capacity consists primarily of current available laboratory workspace, but facilities which could be converted to laboratory workspace and buildable acreage might also be considered when developing closure alternatives. Requirement can be met by both in-house and outsourced work, and is influenced by force structure limits.

Given these caveats, our approach to calculating Excess Capacity (EC) was quite simple. EC was defined as the difference between Functional Capacity (FC) and the projected laboratory workload in the year 2001 (i.e. the goal was to size the infrastructure to meet the workforce projected out to the year when implementation of BRAC '95 recommendations would be complete). FC was defined as the peak workload performed at a laboratory between fiscal years '86 and '93. The laboratories could only certify workload projections or Functional Requirement (FR) through the POM years (at the time of the data call this extended through FY 97). In order to project workload requirement out to FY2001, the LJCSG reduced the FY97 projections from the laboratories by an additional 20%. This 20%, agreed to by all parties, was based on civilian personnel reductions for fiscal years '98 through '01 mandated by the Under Secretary of Defense for Personnel and Readiness. Using these definitions, excess lab capacity is over 47,000 workyears.

The four alternatives provided opportunities for the services to remove a significant portion of the excess capacity by closing installations and filling excess capacity space at receiving sites. If we assume that all recommended moves take advantage of existing or renovated laboratory workspace (as opposed to building new facilities) these four alternatives would remove over 12,000 workyears of excess capacity from the labs. The actual reduction would be somewhat less because some new facilities would have to be built.

The Secretary of Defense's recommendations remove capacity: approximately 4,826 workyears from Air Force (Brooks AFB and Rome Lab; 2,300 from laboratory activities), approximately 4,700 workyears from the Army (ATCOM; 462 from laboratory activities), and over 13,000 workyears from the Navy (17 activities; all laboratory), by closing installations. Not all this capacity will be eliminated due to rehab and new RDT&E military construction at receiving sites: approximately $81 million-Air Force, $24 million-Army, $29 million-Navy.

TEST AND EVALUATION

QUESTIONS FOR THE RECORD

1. Major General Blume, the Joint Cross Service Group stated "electronic combat Test and Evaluation capability at Eglin and China Lake have approximately 85% overlap." One alternative suggested was to move China Lake test assets to Eglin.

Why is the Air Force, in light of this alternative, proposing to move Electronic Combat Testing from Eglin Air Force Base to Nellis Air Force Base?

ANSWER: Analysis showed potential for further consolidation in Electronic Combat (EC). The Air Force pursued this avenue further to include EC open-air range (OAR) consolidation. Since the T&E JCSG had already agreed that the Nellis complex should be filled to capacity before other ranges, the Air Force evaluated realigning the workload from Eglin to Nellis. The results showed this to be a cost-effective relocation.

What will be the cost for the relocation of the Electronics Combat Testing to Nellis Air Force Base?

ANSWER: Current cost is $6.1 million for the relocation of the Electromagnetic Test Environment (EMTE), consisting of 15 threat simulator systems and two EC pod systems. The nine additional threat simulator systems is a product of the site survey conducted by the losing command, HQ AFMC. The current net present value of the costs and savings over 20 years is a savings of $42.1 million.

Will there be a scheduled delay and a negative impact on programs from this proposed move of Electronic Combat Testing to Nellis Air Force Base?

ANSWER: We expect some increase in TDY for collocated units at Eglin to accomplish T&E requiring the full EC OAR capabilities. However, this will be mitigated by leaving EC systems at Eglin to support routine training and armament/weapons. At the same time, there should be less TDY required by units located out West that currently use EMTE at Eglin since they will be able to use Nellis Complex. Even when possible TDY costs for collocated units at Eglin are considered, the realignment provides significant cost savings. Because such a high percentage of the capabilities of the Eglin EC OAR already exists at the Nellis Range Complex, we expect minimal program delays. In addition, the transition plan will ensure that the customer is put first so as to minimize such delays, etc.

Mr. Nemfakos, did the Navy consider the alternative to move China Lake T&E missions primarily to Eglin?

ANSWER: Yes. The Department of the Navy (DoN) considered all recommendations made by the T&E Joint Cross-service Group. Specifically, the movement of T&E functions to Eglin was considered. However, since the China Lake ranges and facilities are used for many other

functions beyond those defined by the T&E JCSG, and since China Lake could not be closed because of its importance to the DoN, the functions remained in place.

2. General Blume, why did the Air Force not implement any of the core alternatives presented by the Joint Cross-Service Group?

ANSWER: The core alternatives were not presented by the T&E JCSG. They were separately proposed by the co-chairs of the JCSG. These alternatives had not been developed jointly and there was no analysis of certified data provided to support them. The Air Force requested the analysis, but none was provided. Without such an analytical basis, the Air Force did not think it appropriate to consider these alternatives. Subsequently, the Air Force completed the T&E JCSG Analysis Plan for the "core" T&E activities, using T&E JCSG certified data and results, which showed only three of the seven proposed alternatives were supported by analysis of certified data.

3. Mr. Nemfakos, why did the Navy not implement any of the core alternatives presented by the Joint Cross-Service Group?

ANSWER: The DoN provided to the Departments of the Army and the Air Force all necessary data to perform timely analyses on core recommendations where Navy sites were losing activities. No further action was requested by the other services. The DoN responded with appropriate information to requests from other services where Navy would be the gaining activity. Analysis on losing sites were to be performed by the losing service. The three "core" DoN sites have the highest Military Value of all DoN technical centers and remain open because of their importance to the DoN.

4. Mr. Nemfakos, did the Navy consider moving the test activities from Pt. Mugu to China Lake or Eglin Air Force Base to eliminate excess test infrastructure?

Would this be the prudent course to follow considering the excess capacity identified by the Joint Cross-Service Group?

ANSWER: Pt. Mugu was already consolidated into China Lake by BRAC-91. While physically separate, the missions of these activities are interdependent, and both the sea range at Point Mugu and the land ranges at China Lake required by the Department. Since the sea range is required for fleet exercises and other functions beyond those defined by the T&E JCSG no workload transfer to Eglin was considered.

5. General Blume, The Joint Cross-Service Group recommended the Air Force Electronic Warfare Evaluation Simulator Activity (AFEWES) at Fort Worth, Texas, and the Real-Time Digitally Controlled Analyzer Processor Activity (REDCAP) at Buffalo, New York (Electronic Combat test simulation systems) be moved to Patuxent River or to Edwards Air Force Base.

The Air Force recommended to move these activities to Edwards Air Force Base. Why?

ANSWER: Realignment of these facilities to Edwards AFB was shown to be more economically feasible then to Patuxent River. For AFEWES, the COBRA analysis showed a return of investment (ROI) period of only 13 years for Edwards vs. 18 years for Pax River. For REDCAP, the ROI for Edwards was only 4 years vs. 6 years for Pax River. Consolidation at Edwards also provides the capability to test bomber-sized aircraft, in addition to fighter-sized aircraft, which is the only capability at Pax River.

Please provide specific information on the methodology the Air Force used for determining projected workloads at the AFEWES and the REDCAP facilities.

ANSWER: The Air Force adopted and used workload projections which had been made by the T&E JCSG in accordance with a jointly developed and approved analysis plan using certified historical workload data submitted by the Services. The JCSG algorithm multiplied the average workload in FY92 and 93 by a workload projection factor. The workload projection factor (0.72) was computed by the OSD comptroller based on the FY95 FYDP.

6. Mr. Coyle, the Joint Cross Service Group on Test and Evaluation put forth the alternative to consolidate Armament/Weapons testing at Eglin Air Force Base eliminating these missions at China Lake and Point Mugu.

Do you still support this alternative?

ANSWER: After reviewing the initial recommendations of the working group that supported the Joint Cross Service Group on Test and Evaluation (JCSG/T&E), we (the JCSG/T&E Co-Chairs) identified several alternatives that appeared to have the potential for further reducing excess capacity. These alternatives were identified without consideration of the potential cost of implementation. The alternative described in Question 6 above was one possible scenario that we identified for reducing excess capacity, principally in Armament/Weapons testing. That scenario was matched with a "counter alternative" scenario to relocate the testing and evaluation workload from Eglin AFB primarily to China Lake and other core sites. These scenarios were identified because the co-Chairmen of the JCSG felt that a significant level of excess capacity continued to exist, and that it was important that the services look at these additional scenarios to determine the cost and benefits of undertaking the added scenarios. Neither scenario was supported as a preferred scenario by the JCSG/T&E -- in fact it was not a foregone conclusion that either scenario would be more cost effective than the status quo even with its excess capacity. Nevertheless, we believed that, because the scenarios offered the potential for significant reductions to excess capacity, they deserved to be more fully analyzed by the services during the analysis and formulation (including costs) of their BRAC recommendations.

7. Mr. Coyle, since you suggested an alternative to consolidate testing at the Eglin Air Force Base Test Range, does the proposed movement by the Air Force of the Electromagnetic Test Environment effort to Nellis Air Force Base eliminate the opportunity to consolidate DoD electronic combat testing?

ANSWER: The Air Force proposal does not eliminate the opportunity to consolidate DoD electronic combat testing. On the contrary, this proposed realignment enhances consolidation of Electronic Combat (EC) testing and training, at Nellis Air Force Base.

As mentioned in response to question 6, the Test and Evaluation Joint Cross-Service Group did not recommend consolidation of testing at Eglin AFB. Rather, we recommended it as one possible scenario worthy of analysis. Electronic combat (EC) testing currently occurs at both Eglin AFB and Nellis AFB (as well as at other locations), and the Air Force recommendation to move the EMTE to Nellis AFB does in fact result in consolidation of EC testing.

8. Mr. Burt, as you indicated during testimony, you agreed to provide, for the record, the percent of excess Test and Evaluation capacity that could be eliminated had the alternatives put forward by the Joint Cross Service Group been adopted. Please provide this information for the record.

ANSWER: The following tables reflect the percentage of excess capacity, by Functional Area and Test Facility Category, under two conditions:

"Baseline" reflects the total excess capacity of existing core and non-core sites prior to any closure or realignment. (Figure 1 at **TAB 7**.)

"Non-Core Realignment" reflects the excess capacity levels which would have resulted from realignment of all the non-core workload to core activities. (Figure 2 at **TAB 7**.)

Four of these non-core sites were included in the Secretary of Defense Recommendations to the Commission: Indianapolis, Warminster, REDCAP, and AFEWES. These represented a reduction of about 49,000 hours of excess capacity from the baseline.

The amount of excess capacity which would have resulted from adoption of one or more of the core alternatives identified by the JCSG co-Chairmen would be dependent on the specific alternative(s) chosen. However, it was not intended that excess capacity in any category be reduced below the level of 25 percent in order to accommodate workload peaks and surge requirements.

LABS, TEST AND EVALUATION
Questions submitted by Representative Smith

1. In studying the catapult and arresting gear testing for aircraft carriers that is performed at Lakehurst, New Jersey, it seems that the Navy concluded that this mission cannot be done today at any other military facility in the world. Having reached that conclusion, why did the Navy decide to move the prototyping and manufacturing of the catapult and arresting gear devices nearly 1,000 miles away to Jacksonville, Florida?

ANSWER: Capacity excess to the planned Force structure requirements exists within the Naval Aviation infrastructure. Critical and unique to carrier aviation is the requirement for Aircraft Launch and Recovery Equipment (ALRE). Initially the Navy considered consolidating the NAWC Lakehurst ALRE capability with existing ALRE capability at NAWC Patuxent River; however, the technical community expressed concern with using the capabilities at NAWC Patuxent River which did not have as extensive testing capabilities and instrumentation. They suggested an enclave be left as a detachment of the parent command at Patuxent River. Based on these technical concerns and the higher costs of replication, a small cantonment was established. The recommendation retains at Lakehurst the critical ALRE engineers with ALRE equipment and testing functions. It does; however, relocate Support equipment full life cycle acquisition functions to NAWC Patuxent River further consolidating Naval Aviation RDT&E and Acquisition and eliminating excess capacity. The Manufacturing and Prototyping functions are transferred to NADEP Jacksonville and consolidated with critical aviation industrial capability, while reducing excess capacity and maintaining critical mass in this functional area.

2. Is it possible that the Navy underestimated the obvious industrial, economic, and performance advantages of manufacturing and prototyping these items where they are tested, as is done today?

ANSWER: The total Naval Aviation infrastructure and requirements were considered. Although some industrial, economic, and performance advantages may be lost by separating ALRE manufacturing and prototyping from the site where they are tested, industrial, economic, and performance advantages are gained by collocating ALRE manufacturing and prototyping within an aviation depot. The closure of NAWC Lakehurst will create efficiencies through the elimination of command and support structure and consolidation of critical aviation functions, and more fully utilizes the capacity and capabilities of major aviation depot activities. The estimated one-time cost to implement this recommendation is $96.9 million, with annual recurring savings after implementation of $37.2 million and a return on investment expected in three years. The net present value of the costs and savings over 20 years is a savings of $358.7 million.

3. One of the alternative recommendations of the Laboratory Cross Service Group was to consolidate the Fixed Flight Subsystems ED work and the Fixed Flight Subsystems ISE work (now done at 9 separate bases) at the Naval Air Warfare Center at Lakehurst. Why were these recommendations made? And why were they not thoroughly explored?

ANSWER: The Laboratory Joint Cross-Service Group (LJCSG) was tasked to provide alternatives to the Military Departments to assist them in their analyses of Common Support Functions (CSFs). Laboratories typically are parts of larger installations, and CSFs represent only a portion of most labs' responsibilities. Therefore, the initial LJCSG recommendations had to be considered by the Military Departments in light of total installation activity (the alternative you reference was among those in this initial set). The LJCSG recognized that only a more macro approach would identify opportunities to eliminate infrastructure through cross-servicing and thus focused efforts on those areas where cross-servicing could be of most benefit. The LJCSG identified a priority set of alternatives for Military Department consideration. It was the intent of the LJCSG that the Military Departments place priority consideration on this set of macro alternatives. These alternatives included the Air Vehicles CSFs. Specifically, the priority alternative concerning Air Vehicles stated:

> Air Vehicles: Both Laboratory and T&E JCSG alternatives retained considerable excess capacity for RDT&E of Air Vehicles. The Military Departments should analyze the consolidation of those laboratory activities and support functions that they are otherwise considering for realignment or closure, on core T&E installations at Edwards Air Force Base (AFB), CA or Naval Air Warfare Center (NAWC), Patuxent River, MD (Fixed Wing Avionics, Flight Subsystems, and Structures); Arnold Engineering Development Center, TN (Propulsion); and Yuma Proving Ground, AZ (Rotary Wing support functions).

This alternative took into consideration the similarity of lab and developmental Test and Evaluation functions and facilities. Further, it recognized that lab functions can often be moved to T&E sites, while the open air range capacity, critical to T&E functions, cannot be moved to lab sites.

Questions submitted by Representative Scarborough

1. The Board of Directors Report of February 1994 addressed the question of consolidating DoD Electronic Combat (EC) Open Air Ranges from three (Eglin, China Lake, and the Nellis complex) to two. The report cited clear financial and capability reasons for closing China Lake's EC open air range and leaving Eglin to complement the Nellis complex. In November 1994, T&E Joint Cross Service Group (JCSG) optimization model output results based upon JCSG-developed functional values, projected workload, and capabilities identified closing China Lake as the DoD alternative to analyze. Similar opportunities appear to exist in Armament/Weapons T&E. These JCSG results were developed by the most knowledgeable individuals in DoD on the T&E issue. It appears that cross-servicing alternatives involving these "core" T&E activities were ground ruled out. Why didn't DoD analyze these cross-service opportunities?

ANSWER: The Board of Directors Report referred to did not constitute certified data for purposes of BRAC, and therefore was not addressed by the JCSG for T&E.

After reviewing the initial recommendations of the working group that supported the Joint Cross Service Group on Test and Evaluation (JCSG/T&E), we (the JCSG/T&E Co-Chairs)

identified several alternatives that appeared to have the potential for further reducing excess capacity. These alternatives were identified without consideration of the potential cost of implementation. This alternative was one possible scenario that we identified for reducing excess capacity. That scenario was matched with an alternative scenario to relocate the testing and evaluation workload from Eglin AFB primarily to China Lake and other core sites. These scenarios were identified because the co-Chairmen of the JCSG felt that a significant level of excess capacity continued to exist, and that it was important that the services look at these additional scenarios to determine the cost and benefits of undertaking the added scenarios. Neither scenario was supported as a preferred scenario by the JCSG/T&E -- in fact it was not a foregone conclusion that either scenario would be more cost effective than the status quo even with its excess capacity. Nevertheless, we believed that, because the scenarios offered the potential for significant reductions to excess capacity, they deserved to be more fully analyzed by the services during the analysis and formulation (including costs) of their BRAC recommendations.

Cross-servicing alternatives for core sites were not, in fact, ground ruled out. Rather, the optimization modelling process was bounded by a number of "policy imperatives" established by the JCSG for T&E, one of which required the process to "Realign / consolidate capabilities, where cost effective, into existing Major Range and Test Facility Base (MRTFB) Activities with open air ranges." Following the formulation of the JCSG's non-core site recommendations, the T&E JCSG co-Chairmen deemed it appropriate to consider still additional reductions in open air range excess capacity, and a series of core site alternatives was developed. One of these was the realignment of all the T&E missions from China Lake to Eglin, while another alternative was the realignment of Eglin's T&E workload primarily to China Lake or other core sites. These alternatives were provided to the Services for consideration in their respective BRAC processes.

2. The 1995 Defense Authorization bill prohibited DoD from spending any money to move Electronic Combat equipment from the Elgin range until DoD delivered an Electronic Combat Master Plan to the Congress. Considering this direction and the JCSG-cited superiority of the Eglin Electromagnetic Test Environment (EMTE) to all other DoD ranges evaluated, why has the Air Force chosen to dismantle the Eglin EMTE and replicate it in the Nellis complex, essentially eliminating forever the opportunity to consolidate DoD EC testing and realize the significant savings the JCSG identified?

ANSWER: The JCSG process did not judge the Eglin Electromagnetic Test Environment (EMTE) as "superior" to all other open air ranges. Neither did it identify significant savings to be realized by consolidating Electronic Combat (EC) testing at Eglin AFB. Eglin achieved a higher activity-level functional value for its overall (i.e. EMTE plus other facilities) capabilities to support EC testing workload. The optimization model was then used to realign workload from non-core sites to MRTFB facilities. Further, as addressed in Question 1, the JCSG co-Chairmen did identify a set of core site scenarios, including the consolidation of testing workload from China Lake primarily to Eglin AFB, as well an as an alternative of realigning testing workload from Eglin primarily to China Lake. These were provided to the military departments for consideration during their processes.

The BRAC 95 recommendation to consolidate certain Electronic Combat test and evaluation activities, including realignment at Eglin AFB, were made pursuant to the requirements of the Defense Base Closure and Realignment Act of 1990, Section 2903. These recommendations, and the consequent elimination of underutilized infrastructure, are expected to generate a relatively high return on the front-end investment needed to implement the recommendations. Including this recommendation in the Secretary of Defense's recommendations to the Base Closure and Realignment Commission does not in itself involve the expenditure of FY95 or prior year funds for the relocation of equipment, and is therefore in compliance with the language of the "Report of the Committee on Armed Services, House of Representatives, National Authorization Act for Fiscal Year 1995." Further, the Department believes that making cost-effective recommendations is consistent with the FY1995 Appropriations Committee Report language requesting the Department to justify any Electronic Combat test facility consolidations on economic grounds.

Questions submitted by Representative Farr

1. As the person responsible for operational testing in DoD, you state in your February 10, 1995 memorandum to the Assistant Secretary of Defense for Economic Security (Economic Reinvestment & BRAC) that the recommendation to realign Fort Hunter Liggett is a "showstopper." Please explain.

ANSWER: To quote from our February 10, 1995 memorandum, our recommendation was that the "Army withdraw (its) proposal to move its test battalion from Fort Hunter-Liggett to Fort Bliss." Perhaps our use of the word "showstopper" was not the best choice. In the theater, a showstopper is applause that is so extended that it stops the show. This was not our meaning. Our memorandum was to convey our feeling that Fort Hunter-Liggett is an especially valuable asset, and that its inclusion on the BRAC list should not be recommended to the Secretary of Defense. Subsequent to our February 10 memorandum, I discussed my concerns with the Army. The Army expressed their view that the operational considerations raised by DOT&E were, in fact, considered in the Army's test planning. In addition, they pointed out that the size of the TEC mission is small and could be realized in the future outside of the BRAC process should the need arise. The recommendation also retains the land at Hunter-Liggett under Army control should the need arise to resume major testing there. I told the Army that I remained skeptical and concerned about the implications of this realignment for future Army testing capability.

2. We understand that there are conditions at Fort Hunter Liggett which enhance it as a site for performing operational testing. These include: a varied terrain, isolation, no artificial light contamination and no radio frequency interference. Do these conditions exist at Fort Bliss? If not, could they be created?

ANSWER: Fort Bliss does not have the quality of terrain, weather, foliage, lack of artificial light contamination, and freedom from radio frequency interference as Fort Hunter-Liggett provide a more realistic environment for Operational Test and Evaluation than that available at Fort Bliss. It would be impractical to "create" these features at Fort Bliss. Instead the testing capabilities from other Army test assets would be used in combination to approximate the

capabilities at Fort Hunter-Liggett. Also the Army proposal provides for future use of Fort Hunter-Liggett when required.

3. From a military value standpoint, is the "laser-safe bowl" (which allows for non-eye safe laser testing in an instrumented valley) at Fort Hunter Liggett a critical component of operational testing?

ANSWER: Yes, modern testing of military systems often involves firing lasers instead of actual bullets or missiles. These laser firings are "paired" with laser receptors on the intended targets to determine if a hit has taken place. Of course, this must be done with the utmost personnel safety. The natural bowl at Fort Hunter-Liggett provides an ideal setting for such tests. Laser firings are conducted at other DoD test ranges but with concomitant restrictions where natural protection is unavailable.

4. Do you think the instrumentation suite (used to monitor and record every player's activity during a test) could be duplicated at Fort Bliss? If so, would it be as effective?

ANSWER: For the right amount of money, the instrumentation at Fort Hunter-Liggett could be duplicated at Fort Bliss. If as good a job were done as has been done at Fort Hunter-Liggett, it could be as effective at Fort Bliss.

5. From a military value standpoint, is Fort Hunter Liggett essential to operational testing to DoD?

ANSWER: Military value was evaluated by the Services, not by the Joint Cross Service Groups (JCSG). Military value -- as determined by the Services -- was considered along with functional values -- determined by the JCSG's -- in the final Service recommendations. Recognizing the special value of Fort Hunter-Liggett, the Army has proposed to continue to test at Fort Hunter-Liggett on a campaign basis. My concern is that moving the test command to Fort Bliss could become a de facto closing from a testing point of view.

Just four years ago, in 1991, the Army consolidated testing activities at Fort Hunter-Liggett because of the higher costs of campaign-style operation. Accordingly, once having moved to Fort Bliss, the Army may find that it is too expensive to return to Fort Hunter-Liggett on a campaign basis.

Questions submitted by Representative Hansen (to Dr. Coyle)

1. Can you explain to the commission your position on the Army's recommendation to realign biological and chemical test and evaluation missions from Dugway Proving Grounds as outlined in the memorandum you signed dated February 10, 1995, to the Assistant Secretary of Defense for Economic Security.

ANSWER: I believe that Dugway is a national asset, in that it is the one place where we currently can conduct comprehensive test and evaluation of chem/bio related items. The Army proposal is to retain this test capability at Dugway.

2. From a military value standpoint, do you feel it is essential to keep chemical, biological, and smoke/obscurant testing at Dugway Proving Grounds rather than moving these missions to Yuma Proving Ground or Aberdeen Maryland?

ANSWER: Military value is a service determination. Nevertheless, as stated in my previous response, I believe Dugway represents a national asset from a chem/bioT&E perspective. The Army recommendations retain this capability at Dugway.

3. Can you outline for the Commission the unique features of Dugway Proving Ground which cannot be replicated elsewhere?

ANSWER: Dugway Proving Ground is the only location where we currently can perform open air Chem/Bio simulant testing. No other DoD location has this mission.

4. In your memo dated February 10, 1995, you indicated that since Dugway conducted chem/bio testing for all of the services, that each of the services would have to sign-off and agree that their services' testing needs could still be met under the Army's recommendation for Dugway. To your knowledge, did the Department of Defense or the Army check with the other services prior to the final recommendation coming forward from the Army?

ANSWER: To the best of my knowledge, they have not. The Army BRAC operated within what they believe to be their authority as a Military Department and the public law regarding the BRAC process. The Army proposal retains the test capability at Dugway for all the Services.

Questions submitted by Senators Mikulski and Sarbanes and Representative Wynn (To Dr. Coyle)

1. During testimony before the Commission on March 1, General Shalikashvili expressed concerns about how the proposed closure of the Naval Surface Warfare Center at White Oak, Maryland, would affect the hypervelocity wind tunnel located there. Do you have similar concerns?

ANSWER: Yes, I do. I have recommended that the wind tunnel facility and a few other relatively unique capabilities at White Oak (e.g., the nuclear effects facility) should be considered to remain available to the DoD.

2. Is it your view that this wind tunnel must continue to stay in operation, either by the Navy, or some other agency, at White Oak or some other location.

ANSWER: We are interested in continued access to the facilities, but the location and ownership should be further considered by the BRAC. Our interest goes to the importance of the capability and how to retain it.

3. Just to clarify, the certified data call responses indicate that the US government has no other wind tunnel with the capabilities of the one at White Oak. Is this the case?

ANSWER: The T&E JCSG data call did not request data on all government wind tunnels. Our data call requested data on T&E facilities in three functional areas which were deemed to be common to the three Services. In their certified data submission, White Oak stated that "The combination of Mach number and altitude simulation, long run-times (0.25 to 15 seconds), and large size (5 foot diameter test section) make this facility unique and critical to the nation. There is no Navy, DoD, NASA or industry facility, existing or planned, which can approach Tunnel 9's capability." Considering all the information we have, both certified and uncertified, we have no basis for questioning that statement.

Additional Questions submitted by Senators Mikulski and Sarbanes

4. Were the hypervelocity wind tunnel and the nuclear weapons effects simulation facility at NSWC White Oak considered by the Test and Evaluation or Laboratory Joint Cross Service Groups?

ANSWER: The Laboratory Joint Cross Service Group did not consider these facilities. These facilities were also not considered by the JCSG for T&E as the certified data indicated that the amount of T&E workload performed was less than 5 percent which qualified as an exclusion from our process. Further, there was no duplication of capabilities apparent, based on certified data provided by the services. Consequently, the facilities were regarded as outside the scope of the JCSG (T&E) -- but within the scope of the Navy BRAC process.

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ASSISTANT SECRETARY OF DEFENSE

3300 DEFENSE PENTAGON
WASHINGTON DC 20301-3300

ECONOMIC
SECURITY

November 23, 1994

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
DIRECTOR, DEFENSE RESEARCH AND ENGINEERING
ASSISTANT SECRETARIES OF DEFENSE
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
DIRECTOR, OPERATIONAL TEST AND EVALUATION
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTOR, ADMINISTRATION AND MANAGEMENT
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: 1995 Base Realignments and Closures (BRAC 95) -- Policy Memorandum Two -- Joint Cross-Service Group Functional Analysis Process

This memorandum summarizes the process, involving both Joint Cross-Service Groups (JCSGs) and the individual Military Departments, for developing BRAC alternatives in situations involving such common support functions as labs, depots, test & evaluation, undergraduate pilot training and medical facilities.

JCSGs will determine a functional value for each of the common support functions at each activity within their jurisdiction. These functional values will be independent of the military value of any installation, which is separately determined by the Military Departments. The assessments of functional value and assessments of functional capacity and requirements, using certified data, will then be incorporated into JCSG analyses of possible functional closure or realignment alternatives. The JCSG's (which include representatives from the Military Departments) will use their expertise and judgment to develop these functional closure or realignment alternatives.

To assist them as an analytic tool in this process, the JCSGs will use a linear programming optimization model (documentation attached) to the maximum extent possible. The model provides a basis for further analysis and the application of judgment in developing functional alternatives. While the model has value in assessing alternatives for relocations and consolidations of common support functions, it cannot by itself make recommendations regarding closures or realignments of installations. Those can be made only by the Military Departments or the BRAC 95 Review Group, reflecting judgment concerning the military value of installations, based on the final criteria and the six-year force structure plan.

Each JCSG is currently supported in its evaluations by a Joint Cross-Service Working Group (JCSWG), variously referred to as "sub-groups", "study teams" or "technical and support groups." JCSWGs will adapt the linear programming (optimization) model to assist each JCSG in its analysis and aid in developing alternatives. All JCSGs will be supported by a single Tri-Department BRAC Group consisting of representatives from each Military Department, which will execute runs of the linear programming (optimization) model, using certified data, according to the objective functions and policy imperatives provided by the JCSGs and the management controls required by the internal control plan. JCSG alternatives can be derived from any number of combinations of objective functions and policy imperatives as long as they have been previously approved by the Chairman of the BRAC 95 Steering Group.

The Military Departments will conduct their individual BRAC processes in parallel with the JCSG analyses, to determine the relative military value of their installations. JCSG products such as functional value may be used to assist in determining installation military value. If it is useful to a JCSG in developing its alternatives for analysis, a JCSG may solicit the guidance of the Military Departments concerning the military value of installations. It must be recognized that any such guidance must necessarily be preliminary and will not constitute a final determination of military value or of suitability for closure or realignment.

The JCSGs and the Military Departments will then review the sets of optimization model outputs. Working together, the JCSGs and the Military Departments will apply their collective judgment to develop feasible functional alternatives to facilitate cross-service actions that will strive to maximize infrastructure (overhead) reductions at minimal cost. This cooperative work by the JCSGs and the Military Departments should be completed in time for the BRAC 95 Review Group to consider any issues that may be appropriate and to leave sufficient time for the Military Departments to formulate their recommendations. The JCSGs and Military Departments will continue to interact during November and December as the Military Departments consider cross-service alternatives in their respective BRAC analytical processes.

The Military Departments will present their recommendations for closure and realignment to the Secretary of Defense no later than mid-February, 1995. The Military Departments will provide the Secretary of Defense a status report, to include all preliminary closure and realignment candidates, by January 3, 1995. The Office of the Assistant Secretary of Defense for Economic Security will staff the Military Department recommendations within the Office of the Secretary of Defense. The BRAC 95 Review Group or OSD principals may solicit the opinion of or task the JCSG's during this period, if and as appropriate.

The process described above involves appropriate interaction between JCSG and Military Department analyses and permits consideration of joint functional alternatives to be incorporated within the existing BRAC process of the Military Departments. If you have questions concerning the process, please contact Mr. Robert Bayer, Deputy Assistant Secretary of Defense for Installations, 703-697-1771.

Joshua Gotbaum

Attachment

Executive Summary

Background

The Deputy Secretary of Defense established policy for the Department of Defense 1995 base realignment and closure (BRAC 95) process with strong emphasis on cross-service opportunities. This document describes operations and capabilities of the common analytical tool to assist Joint Cross-Service Groups (users) in the development of cross-service alternatives as part of the BRAC process.

Analytical Tool

A standard tool often used to develop optimal solutions to complex allocation problems is the mixed-integer, linear program (MILP). The cross-service analysis of allocations of common support functional requirements to Military Department sites and activities is a complex allocation problem.

The MILP formulation described in this document can be used to develop cross-service functional alternatives. The data elements required for this tool are derived from the certified data available to the user. Policy imperatives and other constraints and considerations can be incorporated into the model to allow the tailoring of formulations to accommodate functional attributes and perspectives.

The tool provides the capability to vary the objective function for a formulation in order 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 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.

Second and third best alternatives for a given formulation can be obtained using methods described in this document. These alternatives may be considered as additions to the set for further review.

Other objective functions that the user 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 user to explore the sensitivity of the optimal solution for a given formulation to particular model inputs.

The MILP formulation described provides the basic analytical tool to generate cross-service functional alternatives.

Contents

User's Guide Organization

This user's guide provides an overview of the analytical methodology in the next section. That section describes the products of the methodology and discusses terminology relating to what a *site or activity* is relative to a *function.*

Section 2 describes the basic data elements that are used in the methodology. Section 2 also discusses data elements in terms of what these elements are meant to represent.

The different optimization problem formulations that the user may choose to use to explore alternatives are discussed in section 3. 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 user 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.

Section 4 demonstrates the application of each of these formulations to a notional set of data. Section 5 describes the methodology for obtaining the second and third best solutions to a given formulation. Finally, section 6 identifies the commercial software product that was used to solve the optimization example problems. Input files for this solver are included in the appendices.

1. Analytical Methodology 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 needed. Some of the formulations will also require the military values for each site.

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 this 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.

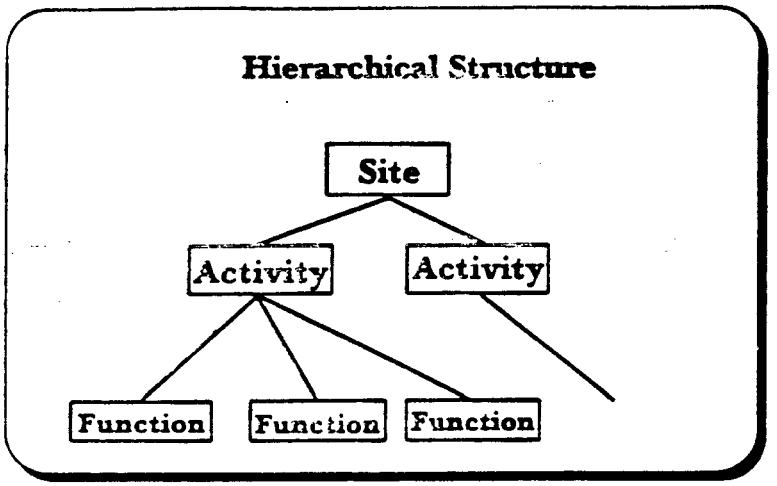
Process Products

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. Provide 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 users. 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.



2. Data Elements

The analytical approach assumes that the following data will be available for all of the sites and functions:

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.

The fv_{sf} functional value for performing function f at site (or activity) s measures the capability and quality of performing work of type f at site (or activity) s. 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.

3. Optimization Formulations

The mixed integer linear programming (MILP) model formulations, that are described below, serve as the basic analytical tools to assist users in the development of cross-service alternatives, allow for modification of formulations, and incorporation of policy imperatives.[1]

[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.

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. 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:

$$Maximize \quad \sum_{s \in S} \sum_{f \in F} l_{sf} \times fv_{sf}/req_f$$
$$l_{sf}$$

subject to :

$\sum_{s \in S} l_{sf} = req_f$: for all functions $f \in F$,

$l_{sf} \le k_{sf} \times cap_{sf}$: for all sites $s \in S$ and $f \in F$,

$o_s \le \sum_{f \in F} k_{sf}$: for all sites $s \in S$,

$k_{sf} \le o_s$: for all sites $s \in S$ and $f \in F$,

$k_{sf} \le \frac{l_{sf}}{\alpha \times cap_{sf}}$: 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;

$o_s =$ 1 if any functional requirement is assigned to the site, and 0 otherwise;

$\alpha =$ 0.01. No assignment of less than one percent of capacity will be allowed.

Decision variable

$l_{sf} =$ amount of the DoD requirement for function f to be assigned to site s.

$k_{sf} =$ 1 if any amount of function f is assigned to site s, 0 otherwise.

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.

The k_{sf} variables that are structural variables that indicate whether or not any functional workload of type f has been assigned to site s. The α parameter can be used to prevent small functional workload assignments. If α is set to 0.01, then the minimum workload assignment of a function to a site, given that any functional workload for this function is made to this site, would be one percent of that site's capacity to perform that function. The α parameter may be adjusted as required to meet the requirements of the particular user.

Primary Formulations

These formulations 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.

$$\textit{Minimize } f(o_s, l_{tg}, k_{uh})$$
$$o_s, l_{tg}, k_{uh}$$

subject to

$\Sigma_{s \in S} l_{sf} = req_f$: for all functions $f \in F$,

$o_s \leq \Sigma_{f \in F} k_{sf}$: for all sites $s \in S$,

$0 \leq l_{sf} \leq k_{sf} \times cap_{sf}$: for all functions $f \in F$ and sites $s \in S$,

$k_{sf} \leq o_s$: for all sites $s \in S$ and $f \in F$,

$k_{sf} \leq \frac{l_{sf}}{\alpha \times cap_{sf}}$: for all functions $f \in F$ and sites $s \in S$,

$0 \leq o_s \leq 1$, *integer* : for all sites $s \in S$,

$0 \leq k_{sf} \leq 1$, *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;

$\alpha =$ 0.01. No assignment of less than one percent of capacity will be allowed.

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 that vary only in the specification of the objective function are discussed next.

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:

$$\underset{o_s, l_{lg}}{Minimize}\ f(o_s, l_{lg}, k_{uh}) = \left(\frac{w}{u_1}\right) \times \Sigma_{s \in S}\, o_s \times nmv_s - \left(\frac{100-w}{u_2}\right) \times \Sigma_{l \in S} \Sigma_{g \in F}\, l_{lg} \times fv_{lg}/req_g$$

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, $-\Sigma_{l \in S} \Sigma_{g \in F}\, l_{lg} \times fv_{lg}/req_g$.) 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 $4 - mv_s \geq 1$ 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:

$$Minimize\ f(o_s, l_{tg}, k_{uh}) = \left(\frac{w}{u_1}\right) \times \Sigma_{s \in S}\, o_s \times (\Sigma_{f \in F}\, cap_{sf}/req_f) - \left(\frac{100-w}{u_2}\right) \times \Sigma_{t \in S} \Sigma_{g \in F}\, l_{tg} \times fv_{tg}/req_g$$
$$o_s, l_{tg}, k_{uh}$$

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:

$$Minimize\ f(o_s, l_{tg}, k_{uh}) = \left(\frac{w}{u_1}\right) \times \Sigma_{s \in S}\, o_s - \left(\frac{100-w}{u_2}\right) \times \Sigma_{t \in S} \Sigma_{g \in F}\, l_{tg} \times fv_{tg}/req_g$$
$$o_s, l_{tg}, k_{uh}$$

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:

$$Maximize\ f(o_s, l_{tg}, k_{uh}) = \left(\frac{w}{u_1}\right) \times \Sigma_{s \in S}(o_s \times \Sigma_{f \in F} fv_{sf}) + \left(\frac{100-w}{u_2}\right) \times \Sigma_{t \in S} \Sigma_{g \in F}\, l_{tg} \times fv_{tg}/req_g$$
$$o_s, l_{tg}, k_{uh}$$

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 users may be combined into a single formulation. In the event that two users obtain solutions that are inconsistent (e.g., 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.

4. 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 user 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 user with table 5 before him 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

5. Generating Alternatives

Alternative solutions, in terms of the retained sites or activities, may be obtained by excluding a set of retained or open sites from a formulation. For example, the optimal solution obtained from the **MINNMV** formulation (see table 3) retains sites XA, XC, XD, ZA, ZB, and ZD. To find another optimal solution with the same objective function value or the next best solution, we define the set $\Delta_1 = \{XA, XC, XD, ZA, ZB, ZD\}$ and add the following constraints to the **MINNMV** formulation:

$\Sigma_{s \in \Delta_1} o_s \leq |\Delta_1| - \alpha$ (condition 1)

$\Sigma_{s \in S - \Delta_1} o_s \geq \beta$ (condition 2)

$\alpha + \beta \geq 1$

$\alpha = 0, 1$ and $\beta = 0, 1$.

A solution that satisfies either condition 1 ($\alpha = 1$) or condition 2 ($\beta = 1$) will be different from the original optimal solution. The formulation given above guarantees that at least one of these two conditions will hold at the optimal solution. The second best solution to the MINNMV formulation is given in table 10. The second-best solution retains sites XC, XD, YC, ZA, ZB, ZD. This solution actually has weighted functional values that are superior to those of the original optimal solution for some of the functions. Comparing values in tables 3 and 10, it would be difficult to argue that the optimal solution is clearly superior to the solution given in table 10.

If we define the set $\Delta_2 = \{XC, XD, YC, ZA, ZB, ZD\}$, then the following formulation can be used to find the third best solution:

$\Sigma_{s \in \Delta_1 \cap \Delta_2} o_s \leq |\Delta_1 \cap \Delta_2| - \alpha$ (condition 1)

$\Sigma_{s \in \Delta_1 \cap \Delta_2} o_s \geq \beta$ (condition 2)

$\left.\begin{array}{l} \Sigma_{s \in \Delta_1 - \Delta_2} o_s \geq \gamma \\ \Sigma_{s \in \Delta_2 - \Delta_1} o_s \geq \gamma \end{array}\right\rangle$ (condition 3)

$\alpha + \beta + \gamma \geq 1$

$\alpha = 0, 1$, $\beta = 0, 1$, and $\gamma = 0, 1$.

Any solution that satisfies any one of the three conditions will be different from the first two solutions. Table 11 shows the third best solution. Comparing table 11 to tables 3 and 10 results in a less compelling case for the strength of the third best alternative. Based upon this type of comparison, the first two solutions would be subjected to further analysis before selecting one as a recommendation.

6. 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. This file contains the code required to generate the second and third best alternatives. The AMPL-format data file for the

[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.

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 Analysis Example
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	66	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	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	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		
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	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	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

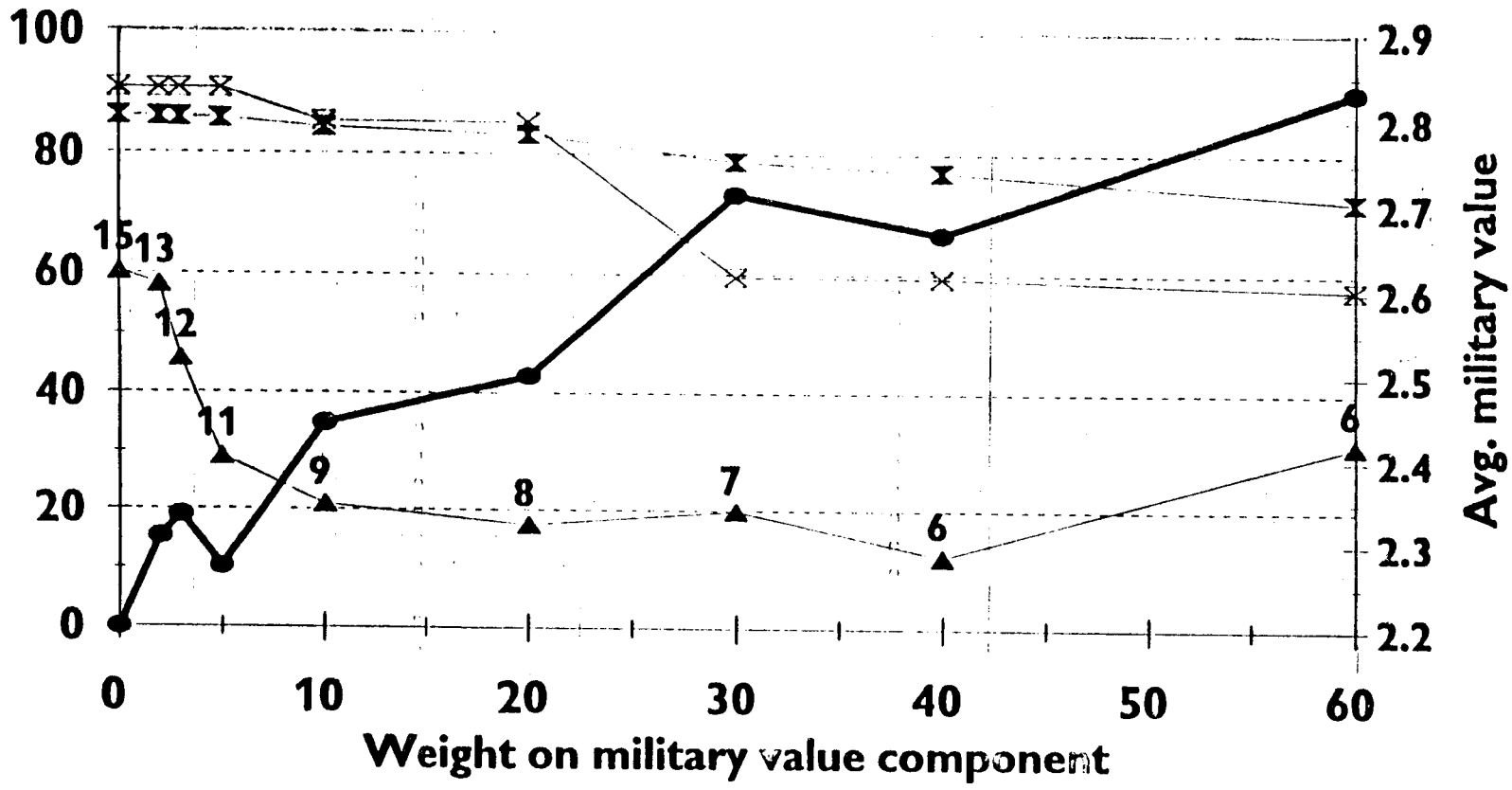
Function	Department X A	X B	X C	X D	X E	Y A	Y B	Y C	Y D	Y E	Z A	Z B	Z C	Z D	Z E	Retained totals	Percent excess
Retain=1, Close=0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	6	
Department Mil. Val.	3	3	3	2	1	2	1	3	2	1	3	3	2	3	1		
Capacities																	
Air vehicles	0	7000	0	0	0	0	0	0	0	0	3000	0	0	2857	0	12857	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	84.2	84.2
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



Number of sites open are shown as labels on the excess capacity plot.

Avg. percent excess capacity

Average military value

Average FV

Missile/rocket FV

Table 6. MINNMV Model Output with Weight = 20

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	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					-18.7					-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 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	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																	
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	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	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**

Table 10. MINNMV Model Output: Alternative 1

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	0	1	1	0	0	0	1	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	0	0	4500	0	0	0	0	2000	0	0	1000	0	0	0	0	7500	36.3
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	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	200	0	0	3000	700	0	300	0	4400	17.6
Satelites	0	0	300	4000	0	0	0	500	0	0	250	50	0	300	0	5400	117.7
																Wgt. avg.	34.41
Workload assigned																Totals	
Air vehicles	0	0	2406	0	0	0	0	0	0	0	3000	1200	0	2857	0	9463	
Munitions	0	0	2503	0	0	0	0	2000	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	0	3500	0	0	0	0	0	0	0	275	0	0	0	3775	
Conv. missiles/rockets	0	0	200	0	0	0	0	200	0	0	2343	700	0	300	0	3743	
Satelites	0	0	300	1080	0	0	0	500	0	0	250	50	0	300	0	2480	
Department avg. MV			2.5					3.0					3.0				
Percent change			4.2					66.7					25.0				
DoD average MV								2.83									
Percent change								28.8									

DoD weighted FVs	
Function	Wgt FV
Air vehicles	80.6
Munitions	71.4
Electronic combat	64.4
Fixed-wing avionics	93.9
Conv. missiles/rockets	57.8
Satelites	65.4
Average FV	72.3
Weighted avg. FV	74.4

Table 11. MINNMV Model Output: Alternative 2

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	1	1	1	0	0	0	0	0	0	1	1	0	0	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	1200	0	0	0	11200	18.4
Munitions	850	200	4500	0	0	0	0	0	0	0	1000	0	0	0	0	6550	19.0
Electronic combat	3000	0	0	0	0	0	0	0	0	0	2000	0	0	0	0	5000	54.6
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	0	0	3900	4.2
Satelites	0	0	300	4000	0	0	0	0	0	0	250	50	0	0	0	4600	85.5
																Wgt. avg.	37.42
Workload assigned																Totals	
Air vehicles	0	5263	0	0	0	0	0	0	0	0	3000	1200	0	0	0	9463	
Munitions	850	200	3453	0	0	0	0	0	0	0	1000	0	0	0	0	5503	
Electronic combat	3000	0	0	0	0	0	0	0	0	0	234	0	0	0	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	2843	700	0	0	0	3743	
Satelites	0	0	300	1880	0	0	0	0	0	0	250	50	0	0	0	2480	
Department avg. MV			2.8					0.0					3.0				
Percent change			14.6					-100.0					25.0				
DoD average MV								2.83									
Percent change								28.8									

DoD weighted FVs	
Function	Wgt FV
Air vehicles	76.3
Munitions	65.7
Electronic combat	65.9
Fixed-wing avionics	93.9
Conv. missiles/rockets	56.9
Satelites	62.4
Average FV	70.2
Weighted avg. FV	71.6

Appendix A

AMPL Model Input File

```
# JCSG Model Example

# Ronald H. Nickel, Ph.D.
# LTC Roy Rice, USAF

# 8-3-94

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 EXCLD1 within SITE default {};  # A solution to be excluded.

set EXCLD2 within SITE default {};  # A solution to be excluded.

set EXCLD_INTER := if card(EXCLD2) > 0 then (EXCLD1 inter EXCLD2)
                        else EXCLD1;

set EXCLD_1DIFF2 := EXCLD1 diff EXCLD2;   # Sites in EXCLD1 but not
                                          # in EXCLD2.

set EXCLD_2DIFF1 := EXCLD2 diff EXCLD1;   # Sites in EXCLD2 but not
                                          # in EXCLD1.

set EXCLD_COMPLEMENT := SITE diff (EXCLD1 union EXCLD2);
                # The set of sites not in EXCLD1 or EXCLD2.

param excld_num := max(0,card(EXCLD_INTER)-1);

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.

param min_assign default 0.001; # Cannot assign less than
                                # min_assign * CAPAC[s,f] of
                                # function f to site s.

#
# 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.

# The following variables, ALPHA, BETA,and GAMMA, are used to find
# alternative solutions.
```

```
var ALPHA binary; # At least one site from the intersection is excluded
                  # from the solution.

var BETA binary;  # At least one site from the complement of the union
                  # is included is included in the solution.

var GAMMA binary; # At least one site from
                  #   EXCLD1 - (EXCLD1 intersect EXCLD2)
                  # and at least one site from
                  #   EXCLD2 - (EXCLD1 intersect EXCLD2)
                  # are included in the solution.

#
# 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 in SITE}:
    sum {(s,f) in SITE_CAP} SITE_FUNC[s,f] <= OPEN[s] * no_func;

# SITE_FUNC variables are set to 0 if little or no functional
# workload is assigned to a site.

subject to site_func_0 {(s,f) in SITE_CAP}:
    SITE_FUNC[s,f] <= SITE_LOAD[s,f]/(min_assign * CAPAC[s,f]);

# 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;

#
# Exclude solutions defined by the sets EXCLD1 and EXCLD2.
#

subject to alt_opt_cond_1:
    sum {s in EXCLD_INTER} OPEN[s] <= excld_num + 1 - ALPHA;

subject to alt_opt_cond_2:
   sum {s in EXCLD_COMPLEMENT} OPEN[s] >= BETA;

subject to alt_opt_cond_3a:
   sum {s in EXCLD_1DIFF2} OPEN[s] >= GAMMA;
```

```
subject to alt_opt_cond_3b:
   sum {s in EXCLD_2DIFF1} OPEN[s] >= GAMMA;

subject to alt_opt_cond_123:
   ALPHA + BETA + GAMMA >= 1;
```

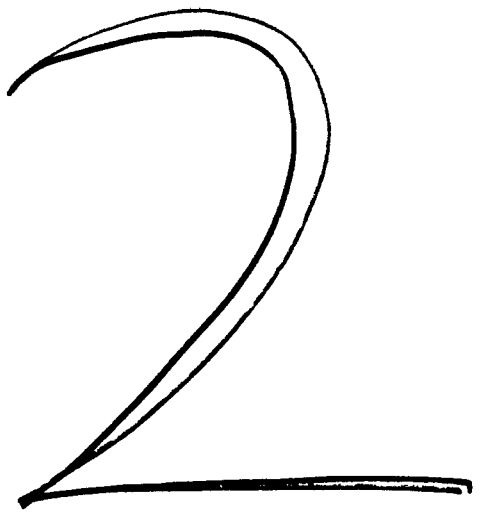
Appendix B

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 EXCLD1 := X_A X_C X_D Z_A Z_B Z_D;

set EXCLD2 := X_C X_D Y_C Z_A Z_B Z_D;

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.
```

```
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;
```



13:23 4/26/95

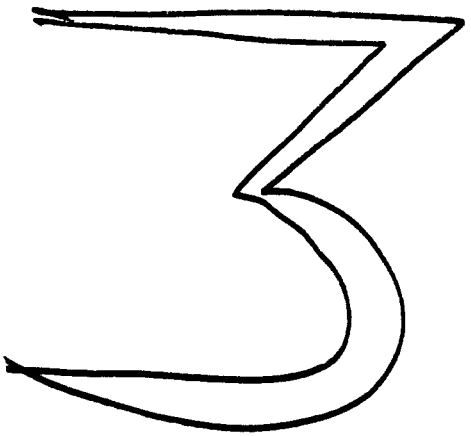
Workload - Certified Data

Code	Commodity Group	ANAD	CCAD	LEAD	NRAD	TOAD	Army	ALC-OC	ALC-OO	ALC-SA	ALC-SM	ALC-WR	AMARC	Air Force
1A	Air Frames - Rotary		1,871,000				1,871,000							
1B	Air Frames - VSTO													
1C1	Air Frames-Tn/Tk/Bmb							2,023,204	543,465	821,402	441,201	1,348,994		5,178,266
1C2	Air Frames - Cmd&Ctl							512,342						512,342
1C3	Air Frames - Tac Cbt								880,933		906,583	1,267,168		2,864,685
1C4	AirFrames - Adm/Tng									82				82
1D	Air Frames - Other													
1	Aircraft Airframes		1,871,000				1,871,000	2,535,546	1,224,398	821,484	1,347,784	2,616,162		8,556,366
2A	Comp - Dynamic Comp		861,000				861,000							
2B	Comp - Acft Struct		32,000				32,000	333,754	241,310	19,200	156,963	476,671		1,227,799
2C	Comp - Hydraulic/Pneu		114,000				114,000	181,180	13,298	2,979	356,703	133		554,271
2D	Comp - Instruments		18,000				18,000	263,820	124,268	4,965	192,664	299,206		885,123
2E	Comp - Landing Gear		11,000				11,000		487,904	4,164		904		492,972
2F	Comp - Avn Ordnance		1,000				1,000		104,219			607		104,826
2G	Comp - Avionics/Elec		7,000			271,000	278,000	82,618	429,591	30,506	333,038	1,279,888		2,166,541
2H	Comp - APUs		5,000				5,000		28,836	102,322				131,158
2I	Comp - Other		22,000				22,000	131,280	180,280	93,138		279,962		684,620
2	Aircraft Comp		1,071,000			271,000	1,342,000	1,008,712	1,600,794	257,274	1,040,398	2,337,362		6,247,300
3A	Engines - Aircraft		206,000				206,000	2,307,836	102,400	2,625,971				5,036,015
3B	Engines - Ship													
3C	Engines - Tank	207,000					207,000							
3D	Engines - Blade/Vnes							76,386						76,386
3	Engines (Gas Turb)	207,000	206,000				413,000	2,384,021	102,400	2,626,971				5,112,401
4A	Missiles - Strategic								673,626	57,467				731,093
4B	Missiles - Tact/MLRS			523,000	48,000	69,000	640,000		180,915			13,144		194,058
4	Missiles & Comp			523,000	48,000	69,000	640,000		854,541	57,467		13,144		925,152
5A	Amphibians - Vehicle													
5B	Amphibians - Cmponts													
5	Amphibians													
6A	Gnd Cbt Veh - SlfPrp			416,000			416,000							
6B	Gnd Cbt Veh - Tanks	1,058,000			1,142,000		2,200,000							
6C	Gnd Cbt Veh - Towed			42,000			42,000							
6D	Gnd Cbt Veh - Comp				106,000		106,000							
6	Gnd Cbt Vehicles	1,058,000		458,000	1,248,000		2,764,000							
7A	Commo - Radar					79,000	79,000				430,410	1,125		431,535
7B	Commo - Radio					667,000	667,000				177,156	31		177,187
7C	Commo - Wire					118,000	118,000				118,283	46		118,329
7D	Commo - EW					371,000	371,000							
7E	Commo - Nav Aids					8,000	8,000				184,644	104		184,748
7F	Commo - ElOp/NtVis										108,115	63		108,178
7G	Commo - Satelite										32,271			32,271
7H	Commo - Crypto					168,000	168,000							
7	Comm & Electr					1,411,000	1,411,000				1,051,879	1,370		1,053,249
8	Automotive/Const				17,000		17,000							
8	Auto/Constr Equip				17,000		17,000							
9A	Tact Veh - Automotive													
9B	Tact Veh - Componts													
9	Tactical Vehicles													
10A	GP - Grnd Spt Eq													
10B	GP - Small Arms	232,000					232,000							
10C	GP - Munitions/Ord									1,820				1,820
10D	GP - Grd Generators										61,624			61,624
10E	GP - Other								118,718					118,718
10	Gnd Gen Purp Items	232,000					232,000		118,718	1,820	61,824			182,362
11A	Sea Sys - Ships													
11B	Sea Sys - Wpns Sys													
11C	Sea Sys - Ship Spt													
11D	Sea Sys - ShipYd Spt													
11E	Sea Sys - Ship Dsgn													
11	Sea Systems													
12A	Software - Tact Sys					8,000	8,000	326,418	652,524	14,178	210,728	898,187		2,081,046
12B	Software - Spt Equip							299,880	341,381	184,891	183,698	592,131		1,470,579
12	Software					8,000	8,000	625,[illegible]	993,[illegible]	199,[illegible]	394,[illegible]	1,490,328		3,551,[illegible]
13A	Spec Int - Bearings		34,000				34,000	18,202	4,918					20,020
13B	Spec Int - Calibratn													
13C	Spec Int - TMDE					43,000	43,000	30		409,939				409,969
13	Spec Interest Items		34,000			43,000	77,000	18,232	4,918	409,939				429,989
14	Other Commodity										399		108,932	109,331
14	Other Commodity										399		108,932	109,331
15.	Assoc Fabric/Manufct					512,000	512,000	96,850	75,940	119,870	354,278	314,861		961,800
15	Assoc Fabric/Mfg					512,000	512,000	96,850	75,940	119,870	354,278	314,861		961,800
16A	Flt Spt - Prod Spt													
16B	Flt Spt - Voyage Rpr													
16C	Flt Spt - Cust Svc													
16	Fleet Support													
	TOTAL	1,497,000	3,182,000	981,000	1,323,000	2,304,000	9,287,000	6,656,340	4,896,412	4,482,600	4,230,616	6,763,218	108,932	27,118,288

Code	Commodity Group	MCLB-A	MCLB-B	Marines	NAD-CH	NAD-JX	NAD-NI
1A	Air Frames - Rotary				196,442		
1B	Air Frames - VSTO				19,112		
1C1	Air Frames-Tn/Tk/Bmb						
1C2	Air Frames - Cmd&Ctl						
1C3	Air Frames - Tac Cbt				364,580	356,644	424,219
1C4	AirFrames - Adm/Tng						
1D	Air Frames - Other				131,744	465,486	482,370
1	Aircraft Airframes				711,858	822,130	906,589
2A	Comp - Dynamic Comp				90,882		31,550
2B	Comp - Acft Struct				27,519	51,929	36,729
2C	Comp - Hydraulic/Pneu				38,565	20,198	23,738
2D	Comp - Instruments				10,848	5,675	88,510
2E	Comp - Landing Gear				8,572	35,549	25,253
2F	Comp - Avn Ordnance				249	21,438	2,770
2G	Comp - Avionics/Elec				6,148	95,782	157,268
2H	Comp - APUs				72,474		
2I	Comp - Other				218,208	97,473	138,914
2	Aircraft Comp				473,466	328,04[illegible]	504,733
3A	Engines - Aircraft				261,412	370,628	
3B	Engines - Ship						98,390
3C	Engines - Tank						
3D	Engines - Blade/Vnes				29,300		
3	Engines (Gas Turb)				290,712	370,628	98,390
4A	Missiles - Strategic						
4B	Missiles - Tact/MLRS						
4	Missiles & Comp						
5A	Amphibians - Vehicle	114,300	140,800	255,100			
5B	Amphibians - Cmponts	12,100	3,800	15,900			
5	Amphibians	126,400	144,600	271,000			
6A	Gnd Cbt Veh - SlfPrp						
6B	Gnd Cbt Veh - Tanks	37,300	16,800	54,100			
6C	Gnd Cbt Veh - Towed		74,700	74,700			
6D	Gnd Cbt Veh - Comp	12,300	1,800	14,100			
6	Gnd Cbt Vehicles	49,600	93,300	142,900			
7A	Commo - Radar	29,700	41,400	71,100			
7B	Commo - Radio	109,200	63,300	172,500			
7C	Commo - Wire	9,100	100	9,200			
7D	Commo - EW						
7E	Commo - Nav Aids						
7F	Commo - ElOp/NtVis		76,200	76,200			
7G	Commo - Satelite						
7H	Commo - Crypto						
7	Comm & Electr	148,000	181,000	329,000			
8	Automotive/Const	154,700	109,300	264,000			
8	Auto/Constr Equip	154,700	109,300	264,000			
9A	Tact Veh - Automotive	322,000	297,000	619,000			
9B	Tact Veh - Componts	11,900	2,400	14,300			
9	Tactical Vehicles	333,900	299,400	633,300			
10A	GP - Grnd Spt Eq						
10B	GP - Small Arms	246,900	2,500	249,400			
10C	GP - Munitions/Ord						
10D	GP - Grd Generators						
10E	GP - Other	1,300		1,300			
10	Gnd Gen Purp Items	248,200	2,500	250,700			
11A	Sea Sys - Ships		5,000	5,000			
11B	Sea Sys - Wpns Sys						
11C	Sea Sys - Ship Spt						
11D	Sea Sys - ShipYd Spt						
11E	Sea Sys - Ship Dsgn						
11	Sea Systems		5,000	5,000			
12A	Software - Tact Sys						
12B	Software - Spt Equip						
12	Software						
13A	Spec Int - Bearings						29,448
13B	Spec Int - Calibratn						40,000
13C	Spec Int - TMDE				81,700	87,730	98,020
13	Spec Interest Items				81,700	87,730	182,468
14	Other Commodity		800	800	104,955	136,140	308,262
14	Other Commodity		800	800	104,955	136,140	308,262
15.	Assoc Fabric/Manufct				45,400	483,904	495,500
15	Assoc Fabric/Mfg				45,400	483,904	495,500
16A	Flt Spt - Prod Spt				503,244	733,358	588,019
16B	Flt Spt - Voyage Rpr					122,700	98,000
16C	Flt Spt - Cust Svc					7,856	170,813
16	Fleet Support				503,244	863,914	856,832
	TOTAL	1,080,000	838,000	1,[illegible]	3,211,334	3,892,560	3,332,774

Code	Commodity Group	NSY-LB	NSY-MF	NSY-PH	NSY-PM	NSY-PS	NSW-CR	NSW-LO	NUW-KP	Navy	TOTAL
1A	Air Frames - Rotary									196,442	2,067,442
1B	Air Frames - VSTO									19,112	19,112
1C1	Air Frames-Tn/Tk/Bmb										5,178,266
1C2	Air Frames - Cmd&Ctl										512,342
1C3	Air Frames - Tac Cbt									1,145,423	4,010,108
1C4	AirFrames - Adm/Tng										82
1D	Air Frames - Other									1,079,600	1,079,600
1	Aircraft Airframes									2,440,577	12,868,862
2A	Comp - Dynamic Comp									122,432	983,432
2B	Comp - Acft Struct									116,177	1,375,975
2C	Comp - Hydraulic/Pneu									82,501	750,772
2D	Comp - Instruments									105,033	1,008,156
2E	Comp - Landing Gear									69,374	573,346
2F	Comp - Avn Ordnance									24,457	130,283
2G	Comp - Avionics/Elec						222,[illegible]			482,187	2,926,728
2H	Comp - APUs									72,474	208,632
2I	Comp - Other									454,595	1,161,215
2	Aircraft Comp						222,[illegible]			1,529,230	9,118,539
3A	Engines - Aircraft									632,040	5,874,055
3B	Engines - Ship									98,390	98,390
3C	Engines - Tank										207,000
3D	Engines - Blade/Vnes									29,300	105,686
3	Engines (Gas Turb)									798,730	6,326,131
4A	Missiles - Strategic										731,093
4B	Missiles - Tact/MLRS						37,[illegible]			37,800	871,858
4	Missiles & Comp						37,[illegible]			37,800	1,562,952
5A	Amphibians - Vehicle										255,100
5B	Amphibians - Cmponts										15,900
5	Amphibians										271,000
6A	Gnd Cbt Veh - SlfPrp										416,000
6B	Gnd Cbt Veh - Tanks										2,254,100
6C	Gnd Cbt Veh - Towed										116,700
6D	Gnd Cbt Veh - Comp										120,100
6	Gnd Cbt Vehicles										[illegible]
7A	Commo - Radar	12,208	7,340	7,488						27,036	608,670
7B	Commo - Radio	3,988		10,483		9,008				29,480	1,046,167
7C	Commo - Wire										245,529
7D	Commo - EW	59,932		340,378						400,308	771,308
7E	Commo - Nav Aids	4,438		18,933	66,979	36,034	[illegible]			125,226	297,877
7F	Commo - ElOp/NtVis	370			34,718	45,042	107,[illegible]			187,926	373,306
7G	Commo - Satelite	370								370	32,641
7H	Commo - Crypto										168,000
7	Comm & Electr	87,318	7,340	376,270	101,696	90,084	182,[illegible]			770,308	3,243,[illegible]
8	Automotive/Const										281,000
8	Auto/Constr Equip										281,000
9A	Tact Veh - Automotive										619,000
9B	Tact Veh - Componts										14,300
9	Tactical Vehicles										633,300
10A	GP - Grnd Spt Eq										0
10B	GP - Small Arms										481,400
10C	GP - Munitions/Ord										1,820
10D	GP - Grd Generators										61,624
10E	GP - Other										121,018
10	Gnd Gen Purp Items										666,062
11A	Sea Sys - Ships	2,428,408	6,283,532	2,322,044	2,878,830	8,214,896	5,613			22,241,3[illegible]	22,246,320
11B	Sea Sys - Wpns Sys	263,471	136,856	120,198			800,2[illegible]	1,228,240	733,988	2,780,758	2,780,758
11C	Sea Sys - Ship Spt		861,873	107,457	9,083	458,866				1,428,279	1,438,279
11D	Sea Sys - ShipYd Spt	431,088	483,800	191,320	86,020	447,964				1,850,006	1,860,002
11E	Sea Sys - Ship Dsgn		1,234,000		19,926	891,758				2,245,684	2,245,684
11	Sea Systems	3,122,978	9,000,061	2,790,[illegible]	3,003,961	10,114,481	801,[illegible]	1,228,240	733,[illegible]	30,3[illegible]	30,361,[illegible]
12A	Software - Tact Sys										2,081,046
12B	Software - Spt Equip										1,470,579
12	Software										3,551,[illegible]
13A	Spec Int - Bearings	9,715								33,163	87,183
13B	Spec Int - Calibratn									40,000	40,000
13C	Spec Int - TMDE	1,919		55,038		45,436				367,703	920,728
13	Spec Interest Items	7,334		55,038		45,465				440,905	947,811
14	Other Commodity									549,357	659,588
14	Other Commodity									549,357	659,588
15.	Assoc Fabric/Manufct			31,481		448,604				1,504,919	2,978,726
15	Assoc Fabric/Mfg			31,481		448,604				1,504,919	2,978,726
16A	Flt Spt - Prod Spt									1,824,622	1,824,622
16B	Flt Spt - Voyage Rpr									220,700	220,700
16C	Flt Spt - Cust Svc									178,[illegible]	178,[illegible]
16	Fleet Support									2,223,[illegible]	2,223,[illegible]
	TOTAL	3,2[illegible],316	9,016,801	3,211,793	3,198,656	10,690,624	676,[illegible]	1,228,240	733,989	40,612,887	76,918,948

ATTACHMENT 2



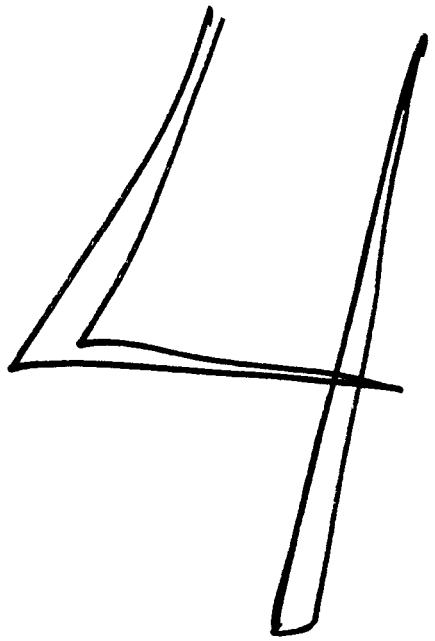
Excess Capacity (DLH)
Certified Data

Commodity Group		ANAD	CCAD	LEAD	RRAD	TOAD	Army
1A	A-Frames - Rotary		50 000				50 000
1B	A-Frames - VSTOL						
1C1	Ai-Frames-Trn/Tk/Bmb						
1C2	A-Frames - Cmd&Cr						
1C3	A-Frames - Lt Cbt						
1C4	A-Frames - Adm Tng						
1D	Air Frames - Other						
1	Aircraft Airframes		50,000				50,000
2A	Comp - Dynamic Comp		535 000				535 000
2B	Comp - Acft Struct		2 000				2 000
2C	Comp - Hydraulic/Pneu		-5 000				-5 000
2D	Comp - Instruments		17 000				17 000
2E	Comp - Landing Gear		4 000				4 000
2F	Comp - Avn Ordnance				80 000		80 000
2G	Comp - Avionics/Elec		8 000			119 000	174 000
2H	Comp - APUs		2 000				2 000
2I	Comp - Other		37 000				37 000
2	Aircraft Comp		697,000		80,000	119,000	796,000
3A	Engines - Aircraft		184 000				184 000
3B	Engines - Ship						
3C	Engines - Tank	109 056					109 056
3D	Engines - Blade/Vnes						
3	Engines (Gas Turb)	109,056	184,000				273,056
4A	Missiles - Strategic						
4B	Missiles - Tact/MLRS	88 794		848,346	202 000	34 000	1 273 140
4	Missiles & Comp	88,794		848,346	202,000	34,000	1,273,140
5A	Amphibians - Vehicle						
5B	Amphibians - Cmponts						
5	Amphibians						
6A	Gnd Cbt Veh - SP			452 384			452 384
6B	Gnd Cbt Veh - Tanks	1,422 829			1 000 000		2 422 829
6C	Gnd Cbt Veh - Towed			43 918			43 918
6D	Gnd Cbt Veh - Comp				10,000		10,000
6	Gnd Cbt Vehicles	1,422,829		496,302	1,010,000		2,928,131
7A	Commo - Radar					31 000	31 000
7B	Commo - Radio					390 000	390 000
7C	Commo - Wire					189 000	189 000
7D	Commo - EW					220 000	220 000
7E	Commo - Nav Aids					11 000	11 000
7F	Commo - ElOp/NtVis					8 000	8 000
7G	Commo - Satellite					242 000	242 000
7H	Commo - Crypto					189 000	189 000
7	Comm & Electr					1,340,000	1,340,000
8	Automotive/Constr				86,000		86,000
8	Auto/Constr Equip				86,000		86,000
9A	Tact Veh - Automotive				276 000		276 000
9B	Tact Veh - Componts				123 000		123 000
9	Tactical Vehicles				399,000		399,000
10A	GP - Grnd Spt Eq						
10B	GP - Small Arms	48 700					48 700
10C	GP - Munitions/Ord	9 000		22 246			31 246
10D	GP - Grd Generators			22 247			22 247
10E	GP - Other	20 000		15 343	89,000	300,000	424 343
10	Gnd Gen Purp Items	77,700		59,836	89,000	300,000	526,536
11A	Sea Sys - Ships						
11B	Sea Sys - Wpns Sys						
11C	Sea Sys - Ship Spt						
11D	Sea Sys - ShipYd Spt						
11E	Sea Sys - Ship Dsgn						
11	Sea Systems						
12A	Software - Tact Sys					2 000	2 000
12B	Software - Spt Equip						
12	Software					2,000	2,000
13A	Spec Int - Bearings		16 000				16 000
13B	Spec Int - Calibratn	5 000			8 000		13 000
13C	Spec Int - TMDE					125,000	125,000
13	Spec Interest Items	5,000	16,000		8,000	125,000	154,000
14	Other Commodity					127 000	127 000
14	Other Commodity					127,000	127,000
15	Assoc Fabric/Manufct					362 000	362 000
15	Assoc Fabric/Mfg					362,000	362,000
16A	Flt Spt - Prod Spt						
16B	Flt Spt - Voyage Rpr						
16C	Flt Spt - Cust Svc						
16	Fleet Support						
	TOTAL	1,703,[illegible]	[illegible]	1,[illegible]	1,[illegible]	2,[illegible]	8,373,[illegible]

Commodity Group		ALC-OC	ALC-OO	ALC-SA	ALC-SM	ALC-WR	AMARC	Air Force	MCLB-A	MCLB-B	Marines
1A	A-Frames - Rotary										
1B	A-Frames - VSTOL										
1C1	Ai-Frames-Trn/Tk/Bmb	255 876	-73 984	752,086	377,707	754 980		2 066 665			
1C2	A-Frames - Cmd&Cr	-223 563						-223 563			
1C3	A-Frames - Lt Cbt		889,992		553,049	-183,304		1,059 637			
1C4	A-Frames - Adm Tng			13				13			
1D	Air Frames - Other										
1	Aircraft Airframes	32,313	816,008	752,099	930,756	571,676		2,902,752			
2A	Comp - Dynamic Comp										
2B	Comp - Acft Struct	89 854	70 143	71 241	72 218	179 908		483 362			
2C	Comp - Hydraulic/Pneu	96 571	28 129	546	135 145	40		260 429			
2D	Comp - Instruments	-36 478	67 493	7 531	88 879	112 980		240 207			
2E	Comp - Landing Gear		540 042	4 133		343		544 518			
2F	Comp - Avn Ordnance	1,171	314 631			230		316 032			
2G	Comp - Avionics/Elec	126 676	81,314	88,788	123 084	483,166		880 008			
2H	Comp - APUs		80 151	165 754				245 905			
2I	Comp - Other	463,193	312 234	194 538		107 877		1,077 810			
2	Aircraft Comp	719,990	1,474,137	530,909	419,126	884,542		4,029,271			
3A	Engines - Aircraft	188 877	-1 148	2 374 847				2 562 576			
3B	Engines - Ship										
3C	Engines - Tank										
3D	Engines - Blade/Vnes	78,571						78,571			
3	Engines (Gas Turb)	267,448	-1,148	2,374,847				2,641,147			
4A	Missiles - Strategic		72 020	51 267				123 287			
4B	Missiles - Tact/MLRS		388,272			4,981		393 253		14,400	14,400
4	Missiles & Comp		460,312	51,267		4,981		516,540		14,400	14,400
5A	Amphibians - Vehicle								16 600	48 200	64 800
5B	Amphibians - Cmponts								1,800	1,200	3,000
5	Amphibians								18,400	49,400	67,800
6A	Gnd Cbt Veh - SP										
6B	Gnd Cbt Veh - Tanks								5,400	2,200	7,600
6C	Gnd Cbt Veh - Towed									14 000	14 000
6D	Gnd Cbt Veh - Comp								1,800	200	2,000
6	Gnd Cbt Vehicles								7,200	16,400	23,600
7A	Commo - Radar				271,999	425		272 424	4 300	5 700	10 000
7B	Commo - Radio				163 150	12		163 162	15,900	7,500	23,400
7C	Commo - Wire				95,251	17		95 268	1,300		1,300
7D	Commo - EW										
7E	Commo - Nav Aids				114 410	40		114 450			
7F	Commo - ElOp/NtVis				71 019	24		71 043		10,300	10,300
7G	Commo - Satellite				140 545			140 545			
7H	Commo - Crypto										
7	Comm & Electr				886,374	518		886,892	21,500	23,500	45,000
8	Automotive/Constr								22 500	43 900	66 400
8	Auto/Constr Equip								22,500	43,900	66,400
9A	Tact Veh - Automotive								46 800	35 700	82 500
9B	Tact Veh - Componts								1,700	300	2,000
9	Tactical Vehicles								48,500	36,000	84,500
10A	GP - Grnd Spt Eq									4 800	4 800
10B	GP - Small Arms								35 900	400	36 300
10C	GP - Munitions/Ord			1,383				1,383		200	200
10D	GP - Grd Generators				39 257			39 257		1,700	1,700
10E	GP - Other		-10,923		61,305			44,462	-1,300	5,900	4,600
10	Gnd Gen Purp Items		-10,923	1,383	100,562			86,182	34,600	13,000	47,600
11A	Sea Sys - Ships									400	400
11B	Sea Sys - Wpns Sys										
11C	Sea Sys - Ship Spt										
11D	Sea Sys - ShipYd Spt										
11E	Sea Sys - Ship Dsgn										
11	Sea Systems									400	400
12A	Software - Tact Sys	-87,348	102 327	8,082	180 735	-82 893		118 903			
12B	Software - Spt Equip	188,018	71,636	82,333	144,814	-61,828		383,971			
12	Software	[illegible]	173,963	[illegible]	325,549	-144,721		[illegible]			
13A	Spec Int - Bearings	-5,872	15 127					9,455			
13B	Spec Int - Calibratn										
13C	Spec Int - TMDE	3,444		275,000				278,444			
13	Spec Interest Items	-2,428	15,127	275,000				287,899			
14	Other Commodity				36,673		708 823	745 496	1,800	4,000	5,800
14	Other Commodity				36,673		708,823	745,496	1,800	4,000	5,800
15	Assoc Fabric/Manufct	88,483	-2,285	297,140	158,566	116,664		635,550			
15	Assoc Fabric/Mfg	88,483	-2,285	297,140	158,566	116,664		635,550			
16A	Flt Spt - Prod Spt										
16B	Flt Spt - Voyage Rpr										
16C	Flt Spt - Cust Svc										
16	Fleet Support										
	TOTAL	1,152,323	2,719,091	4,340,845	2,837,086	1,423,340	708,823	13,182,[illegible]	164,300	201,800	366,100

Commodity Group		NAD-CH	NAD-JX	NAD-NI	NSY-LB	NSY-HP	NSY-PH	NSY-PM	NSY-PS	NSW-CH	NSW-LO	NUW-KP	Navy	TOTAL
1A	A-Frames - Rotary	269 970											269 970	319 970
1B	A-Frames - VSTOL	1 422											1 422	1 422
1C1	Ai-Frames-Trn/Tk/Bmb													2 066 665
1C2	A-Frames - Cmd&Cr													-223 563
1C3	A-Frames - Lt Cbt	235,332	304,274	321,211									860 817	1 920 454
1C4	A-Frames - Adm Tng			73 695									73 695	73 708
1D	Air Frames - Other	115,180	548,088	388,908									1,052 176	1,052 176
1	Aircraft Airframes	621,914	852,362	783,904									2,258,180	5,210,932
2A	Comp - Dynamic Comp	18,050		5,291									23 341	558 341
2B	Comp - Acft Struct	98	1,394	4,145									5 597	470 959
2C	Comp - Hydraulic/Pneu	5,926	7,085	3,910									16 923	272 352
2D	Comp - Instruments	1,314	2,827	10,689									14 830	272 037
2E	Comp - Landing Gear	902	170	2,138									3,210	551 728
2F	Comp - Avn Ordnance	2,439	2,591	857									5 887	401 919
2G	Comp - Avionics/Elec	2 983	8,273	4,303						59,314			75,553	1,079 561
2H	Comp - APUs	56,403											56 403	304 308
2I	Comp - Other	186,634	38,828	20,007									245 469	1 360 279
2	Aircraft Comp	274,631	61,728	51,340						59,314			447,313	5,271,484
3A	Engines - Aircraft	96,810	57,378										154 288	2 880 864
3B	Engines - Ship			5,193									5 193	5 193
3C	Engines - Tank													109 055
3D	Engines - Blade/Vnes	2,179											2 179	80 750
3	Engines (Gas Turb)	99,089	57,378	5,193									161,660	3,076,862
4A	Missiles - Strategic									22 193			22,193	145 480
4B	Missiles - Tact/MLRS													1 680 793
4	Missiles & Comp									22,193			22,193	1,826,273
5A	Amphibians - Vehicle													64 800
5B	Amphibians - Cmponts													3 000
5	Amphibians													67,800
6A	Gnd Cbt Veh - SP													452 384
6B	Gnd Cbt Veh - Tanks													2 490 429
6C	Gnd Cbt Veh - Towed													57 918
6D	Gnd Cbt Veh - Comp													20 000
6	Gnd Cbt Vehicles													3,029,731
7A	Commo - Radar				61,881	-1,518	5,411						65,757	379 181
7B	Commo - Radio				80,614		7,876		1,299				89 469	615 022
7C	Commo - Wire													289 568
7D	Commo - EW				303,683		246,018						549 701	769 701
7E	Commo - Nav Aids				22,464		12,238	12,063	5,072	29,484			80 342	205 792
7F	Commo - ElOp/NtVis				1,873			976	6,341	48,200			57 392	143 735
7G	Commo - Satellite				1,879								1 879	384 420
7H	Commo - Crypto													189 000
7	Comm & Electr				442,463	-1,518	271,243	13,029	12,681	76,684			814,527	2,864,418
8	Automotive/Constr													132 400
8	Auto/Constr Equip													132,400
9A	Tact Veh - Automotive													358 500
9B	Tact Veh - Componts													125 000
9	Tactical Vehicles													483,500
10A	GP - Grnd Spt Eq													4 800
10B	GP - Small Arms													85 000
10C	GP - Munitions/Ord													32 829
10D	GP - Grd Generators													63 204
10E	GP - Other													473 405
10	Gnd Gen Purp Items													659,308
11A	Sea Sys - Ships				529,280	3,042,889	1,678,317	3,143,567	2,224,955	11,468			10 629 271	10 629 671
11B	Sea Sys - Wpns Sys				86,490	65,584	93,301			123,714	527,873	275 851	1,142 953	1,142 953
11C	Sea Sys - Ship Spt					-178,583	77,067	29,972	72,186				244	244
11D	Sea Sys - ShipYd Spt				582,380	-145,291	130,285	-9,080	89,024				572,356	572 356
11E	Sea Sys - Ship Dsgn					-296 089		9,263	80,324				-158 488	-158 468
11	Sea Systems				1,197,15[illegible]	[illegible]	[illegible]	[illegible]	2,463,461	[illegible]	527,873	275,851	12,188,[illegible]	12,188,[illegible]
12A	Software - Tact Sys													120 88[illegible]
12B	Software - Spt Equip													383 971
12	Software													[illegible]
13A	Spec Int - Bearings			10	43,73[illegible]								43,752	69 207
13B	Spec Int - Calibratn			854									854	13 854
13C	Spec Int - TMDE	10,379	16,880	25,124	5,512		30,791		6,840				104,585	508 044
13	Spec Interest Items	10,379	16,880	25,798	49,26[illegible]		30,791		6,840				149,081	650,905
14	Other Commodity	16 484	118,414	56,962						4,880			196 878	1 074 874
14	Other Commodity	16,484	118,414	56,962						4,880			196,878	1,074,874
15	Assoc Fabric/Manufct	4 022	73,726	5,501			22,733		68,450				174 434	1,171 984
15	Assoc Fabric/Mfg	4,022	73,726	5,501			22,733		68,450				174,434	1,171,984
16A	Flt Spt - Prod Spt	384 456	914,841	526,601									1,825 998	1 825 998
16B	Flt Spt - Voyage Rpr		11,949	1,121									13 070	13 070
16C	Flt Spt - Cust Svc	4,801	4,740	27,464									37,001	37 001
16	Fleet Support	389,257	931,530	[illegible]									1,876,069	1,876,069
	TOTAL	1,415,772	2,111,[illegible]	1,464,292	1,890,797	[illegible]	2,321,408	3,186,771	2,541,430	[illegible]	527,873	275,851	19,299,491	40,180,139

ATTACHMENT 3



DEPOT MAINTENANCE

SUPPLEMENTAL INFORMATION PROVIDED BY THE DEPARTMENT OF THE NAVY

6. Please provide the capacity charts that describe excess capacity with implementation of this BRAC by service, and by depot?

Supplemental Answer:

The excess capacity remaining at NADEP Jacksonville was not determined at this time due to three specific factors. These factors preclude a simple arithmetic determination of remaining excess capacity.

a) After the Joint Cross Service Group-Depot Maintenance data base was locked, two additional sources of core workload were identified: 30,000 DLMHs of F-117 F404 engine workload interserviced from the Air Force; and 48,000 DLMHs of mobile causeways and side warping tugs workload supporting the Maritime Prepositioned Ship (MPS) Program from NAVSEA.

b) The mix of workload being transferred from NAWC Lakehurst, approximately 316,000 DLMHs, consumes the most excess. However, the aircraft launch and recovery, manufacturing and overhaul equipment occupies a greater amount of space with significantly fewer available work positions than the aircraft, engine, and component workload that it replaces. Therefore, a significant amount of additional capacity will be eliminated over and above the additional workload received. The precise impacts will not be determined until specific implementation planning is finalized.

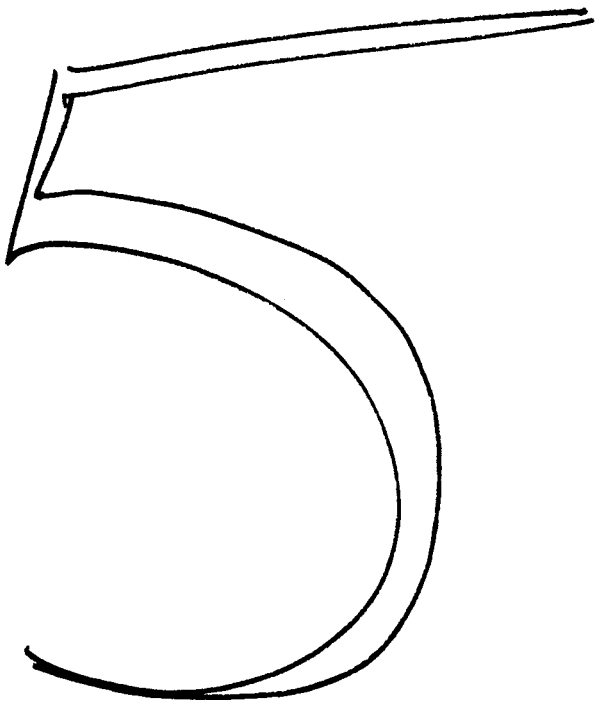
c) Finally, two large hangers included in NADEP Jacksonville's initial capacity calculations are not required and are being returned to the host air station, another divestiture of excess capacity.

7. Cross Service Alternative Two proposes the closure of Naval Shipyards Long Beach and either Pearl Harbor or Portsmouth. Did the Joint Cross Service Group view Pearl Harbor and Portsmouth as equivalent in terms of capability as well as capacity?

No. The JCSG-DM did not have visibility into the capabilities of individual shipyards. All Category #11.a (Sea Systems-Ships) workload was grouped together with no breakout as to ship type, dry dock capability, nuclear versus non-nuclear capability, etc. This alternative, DM2, was generated by the optimization model to minimize excess capacity, and these two shipyards had similar capacity indexes.

8. In both alternatives DM1 and DM2, specific workload transfers are identified for each commodity group except for sea systems. In that case, the alternative states, "Consolidate as possible within the Department of the Navy." Why was the sea systems commodity area proposal not specific concerning workload distribution?

These sea systems commodity areas, unique to the Department of the Navy, offered no interservicing potential. The JCSG-DM was aware that significant differences existed between the individual shipyards, for example, ship type, drydock capability, strategic location, nuclear versus non-nuclear capability, etc., which were beyond the level of detail of the Joint analyses. The JCSG-DM determined that the Department of the Navy was in the best position to reallocate that workload in the most efficient manner based on their future force structure and operational requirements.



CHAPTER 3. AIRPORT CAPACITY AND AIRCRAFT DELAY CALCULATIONS

3-1. GENERAL. This chapter contains instructions for calculating hourly capacity, ASV, and aircraft delay for a wide range of runway-use configurations and operational alternatives.

a. Capacity Calculations.

(1) Hourly capacity of the runway component.
(2) Hourly capacity of the taxiway component.
(3) Hourly capacity of gate group components.
(4) Airport hourly capacity.
(5) ASV.

b. Delay Calculations.

(1) Hourly delay.
(2) Daily delay.
(3) Annual delay.

Figure 3-1 provides a checklist of the data required for these calculations. Appendix 2 contains examples of these calculations.

3-2. HOURLY CAPACITY OF THE RUNWAY COMPONENT. Except for situations involving PVC conditions, an absence of radar coverage or ILS, and airports with parallel runways when one runway is limited to use by small aircraft (all of which are covered in chapter 4), calculate the runway component hourly capacity as follows:

a. Select the runway-use configuration in figure 3-2 which best represents the use of the airport during the hour of interest. To adjust for staggered thresholds, see paragraph 4-6.

b. Identify from figure 3-2 the figure number for capacity (for C^*, T, and E).

c. Determine the percentage of Class C and D aircraft operating on the runway component and calculate the mix index.

d. Determine percent arrivals (PA).

e. Determine hourly capacity base (C^*).

f. Determine the percentage of touch and go operations during VFR operations and determine the touch and go factor (T). During IFR operations, T will be 1.00.

g. Determine the location of exit taxiways (measured from the threshold at the approach end of the runway) and determine the exit factor (E).

h. Calculate the hourly capacity of the runway component by the following equation:

$$\text{Hourly capacity of the runway component} = C^* \cdot T \cdot E$$

c. Calculate the component quotients by dividing each components capacity by its demand ratio.

d. Identify the airport hourly capacity, i.e., the lowest quotient calculated in c above.

3-6. ANNUAL SERVICE VOLUME (ASV). Calculate the ASV as follows:

a. Calculate the weighted hourly capacity (C_w) for the runway component as follows:

(1) Identify the different runway-use configurations used over the course of a year.

(2) Determine the percent of time each runway-use configuration is in use (P_1 through P_n). Include those times when the hourly capacity is zero, i.e., the weather conditions are below airport minimums or the airport is closed for other reasons. If a runway-use configuration is used less than 2 percent of the time, that time may be credited to another runway-use configuration.

(3) Calculate the hourly capacity for each runway-use configuration (C_1 through C_n). See section 3-5.

(4) Identify the runway-use configuration that provides the maximum capacity. Generally, this configuration is also the configuration most frequently used.

(5) Divide the hourly capacity of each runway-use configuration by the hourly capacity of the runway-use configuration that provides the maximum capacity.

(6) Determine the ASV weighting factor (W_1 through W_n) for each runway-use configuration from Table 3-1.

Table 3-1. ASV Weighting Factors

Percent of Maximum Capacity	Weighting Factors			
	VFR	IFR		
		Mix Index (0-20)	Mix Index (21-50)	Mix Index (51-180)
91+	1	1	1	1
81-90	5	1	3	5
66-80	15	2	8	15
51-65	20	3	12	20
0-50	25	4	16	25

(7) Calculate the weighted hourly capacity (C_w) of the runway component by the following equation:

$$C_w = \frac{(P_1 \cdot C_1 \cdot W_1) + (P_2 \cdot C_2 \cdot W_2) + \ldots + (P_n \cdot C_n \cdot W_n)}{(P_1 \cdot W_1) + (P_2 \cdot W_2) + \ldots + (P_n \cdot W_n)}$$

b. Calculate the ratio of annual demand to average daily demand during the peak month (D). Typical annual demand to average daily demand ratios are provided in table 3-2.

c. Calculate the ratio of average daily demand to average peak hour demand during the peak month (H). Typical average daily to average peak hour demand ratios are provided in table 3-2.

Table 3-2. Typical Demand Ratios

Mix Index	Daily (D)	Hourly (H)
0-20	290-310	7-11
21-50	300-320	10-13
51-180	310-350	11-15

d. Calculate ASV by the following equation:

$$ASV = C_w \cdot D \cdot H$$

3-7. HOURLY DELAY TO AIRCRAFT ON THE RUNWAY COMPONENT. Hourly delay calculations described in this paragraph apply to those hours when the hourly demand does not exceed the hourly capacity of the runway component. For those hours when the hourly demand exceeds the hourly capacity of the runway component, paragraph 3-9 calculations apply. Calculate hourly delay as follows:

a. Calculate the hourly capacity of the runway component for the specific hour of interest.

b. Identify from figure 3-2 the figure number for delay (for the arrival delay index (ADI) and the departure delay index (DDI)).

c. Identify the hourly demand (HD) and the peak 15 minute demand (Q) on the runway component.

d. Calculate the ratio of hourly demand to hourly capacity (D/C).

e. Determine the arrival delay index (ADI) and departure delay index (DDI).

EXAMPLE 5. Determine the ASV of the example airport assuming there are 219,750 annual operations, 690 average day operations and 39 peak hour operations.

SOLUTION: The work sheet on page 12 illustrates one method of recording data.

1. Calculate C_n.

a. Runway-use Configuration. Identify the different runway-use conditions used over the course of a year and the mix index for each use. Enter in columns 1 through 4.

b. Percent of Use (P). Identify the percent of the time each configuration is used and enter in column 5. The figures shown on the work sheet in column 5 are hypothetical.

c. Runway Hourly Capacity (C). Calculate the hourly capacities of operating conditions as in example 1 and enter in column 6. Example 1 data are used for operating conditions 1 and 2.

d. Maximum Capacity Configuration. Identify the runway-use configuration that provides the maximum capacity.

e. Percent of Maximum Capacity. Divide the hourly capacity of each runway-use configuration by the capacity of the configuration that provides the maximum capacity and enter in column 7.

Operating condition	1	89/89	= 100
"	2	51/89	= 57
"	3	62/89	= 70
"	4	52/89	= 58
"	5	59/89	= 66
"	6	46/89	= 52

f. ASV Weighting Factor (W). From Table 3-1, identify the weighting factor (W) for each operating condition and enter in column 8.

Table 3-1. ASV weighting factors

Percent of Maximum Capacity	Weighting Factors			
	VFR	IFR		
		Mix Index (0-20)	Mix Index (21-50)	Mix Index (51-180)
91+	1	1	1	1
81-90	3	1	2	3
66-80	15	2	8	13
51-65	20	3	11	20
0-50	25	4	16	25

Figure A2-5. Annual service volume

AC 150/5060
Appendix 2

9/23/83

Operating Condition No.	Weather	Runway Pattern	Mix Index	Percent of Year (%)	Hourly Capacity (C)	Percent Maximum Capacity	Weighting Factor (W)
1	VFR		62	74	89	100	1
2	IFR		91	3	51	57	20
3	VFR		62	5	62	70	15
4	IFR		91	5	52	58	20
5	VFR		62	4	59	66	15
6	IFR		91	4	46	52	20
7	IFR	Below Minimums		5		-	85

Work sheet for ASV factors.

g. Weighted Hourly Capacity (C_w). Calculate the weighted hourly capacity using the following equation:

$$C_w = \frac{(P_1C_1W_1) + (P_2C_2W_2) + \cdots (P_nC_nW_n)}{(P_1W_1) + (P_2W_2) + \cdots (P_nW_n)}$$

$$C_w = \frac{(.74 \cdot 89 \cdot 1) + (.05 \cdot 51 \cdot 20) + (.05 \cdot 62 \cdot 15) + (.05 \cdot 52 \cdot 20) + (.04 \cdot 59 \cdot 15) + (.04 \cdot 46 \cdot 20) + (.03 \cdot 0 \cdot 25)}{(.74 \cdot 1) + (.05 \cdot 20) + (.05 \cdot 15) + (.05 \cdot 20) + (.04 \cdot 15) + (.04 \cdot 29) + (.03 \cdot 25)}$$

$C_w = \frac{287.56}{5.64}$ or 51 operations per hour. ← variable of interest

2. Daily Demand Ratio (D). Calculate D using the equation:

$$D = \frac{\text{Annual}}{\text{Average Day—peak month}} = \frac{219,750}{690} = 318$$

3. Hourly Demand Ratio (H). Calculate H from the equation:

$$H = \frac{\text{Average Day—peak month}}{\text{Average Peak Hour—peak month}} = \frac{690}{80} = 14$$

4. Calculate ASV. ASV is calculated from the equation $ASV = C_w \cdot D \cdot H$

ASV = 51·318·14 = 227,052 operations per year.

5. Conclusion. ASV is an indicator of the annual operational capability of an airport adjusted for differences in hourly capacities which occur over the course of a year. In this example, the airport theoretically could have accommodated and additional 7,302 operations during the year.

Figure A2-5. Annual service volume (cont.)

f. Demand. Demand is the magnitude of aircraft operations to be accommodated in a specified time period.

g. Gate. A gate is an aircraft parking position used by a single aircraft loading or unloading passengers, mail, cargo, etc. A parking position which is regularly used by two aircraft at the same time is two gates for capacity calculations.

(1) Gate type is the size of the gate. A Type 1 gate is capable of accommodating all aircraft, including widebodies such as the A-300, B-747, B-767, DC-10, L-1011. A Type 2 gate will accommodate only non-widebodied aircraft.

(2) Gate mix is the percent of non-widebodied aircraft accommodated by the gate group.

(3) Gate occupancy time is the length of time required to cycle an aircraft through the gate.

h. Mix Index. Mix index is a mathematical expression. It is the percent of Class C aircraft plus 3 times the percent of Class D aircraft, and is written: %(C+3D).

i. Percent Arrivals (PA). The percent of arrivals is the ratio of arrivals to total operations and is computed as follows:

$$\text{Percent arrivals} = \frac{A+\frac{1}{2}(T\&G)}{A+DA+(T\&G)} \times 100, \text{ where}$$

A = number of arriving aircraft in the hour
DA = number of departing aircraft in the hour
T&G = number of touch and go's in the hour

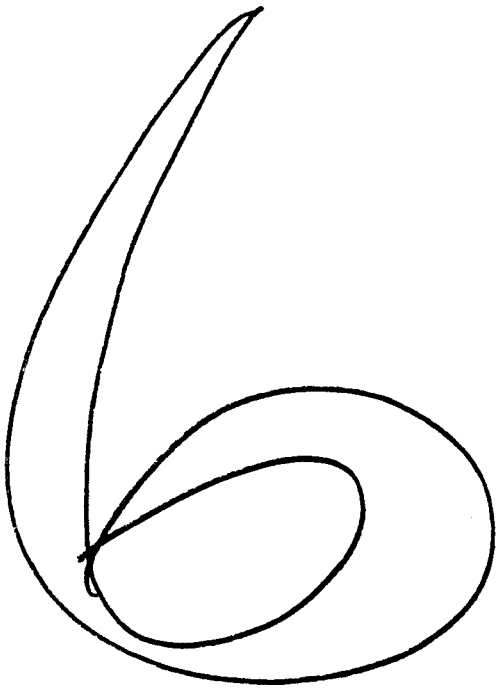
j. Percent Touch and Go's. The percent touch and go's is the ratio of landings with an immediate takeoff to total operations and is computed as follows:

$$\text{Percent touch and go's} = \frac{(T\&G)}{A+DA+(T\&G)} \times 100, \text{ where}$$

A = number of arriving aircraft in the hour
DA = number of departing aircraft in the hour
T&G = number of touch and go's in the hour

Touch and go operations are normally associated with flight training. The number of these operations usually decreases as the number of air carrier operations increase, as demand for service approaches runway capacity, or as weather conditions deteriorate.

k. Runway-use Configuration. Runway-use configuration is the number, location, and orientation of the active runway(s), the type and direction of operations, and the flight rules in effect at a particular time.



COBRA REALIGNMENT SUMMARY (COBRA v5.04) - Page 1/2
Data As Of 09.24 12/29/1994. Report Created 11:30 12/29/1994

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUX.CBR
Std Fctrs File : C:\COBRA504\NEWCOD1.SFF

Starting Year : 1996
Final Year : 2001
ROI Year : 2012 (11 Years)

NPV in 2015($K): -2,591
1-Time Cost($K): 15,357

Net Costs ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	3,351	1,748	2,331	3,205	1,603	2,331	14,570	0
Person	0	-23	-45	-43	-41	-40	-192	-40
Overhd	11	-123	-345	-524	-783	-1,118	-2,883	-1,379
Moving	30	89	152	182	152	32	638	0
Missio	0	0	0	0	0	0	0	0
Other	0	2	3	4	3	3	15	0
TOTAL	3,393	1,693	2,096	2,824	933	1,208	12,148	-1,419

	1996	1997	1998	1999	2000	2001	Total
POSITIONS ELIMINATED							
Off	0	0	0	0	0	0	0
Enl	0	0	0	0	0	0	0
Civ	0	1	0	0	0	0	1
TOT	0	1	0	0	0	0	1
POSITIONS REALIGNED							
Off	0	0	1	1	1	2	5
Enl	0	1	2	3	2	2	10
Stu	0	0	0	0	0	0	0
Civ	1	2	5	6	5	4	23
TOT	1	3	8	10	8	8	38

Summary

CE MILCON numbers used -- 12/29/94
Mesa screen 4 calculated based on Brooks AFB.
No PE data available -- standard 6% cut applied
Used MAJCOM unique/moving costs -- no recurring costs for Luke

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEMOCD1.SFF

Costs ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	3.351	1.748	2.331	3.205	1.603	2.331	14.570	0
Person	3	0	1	3	5	7	17	7
Overhd	11	35	55	78	97	117	394	66
Moving	30	89	152	182	152	32	638	0
Missio	0	0	0	0	0	0	0	0
Other	0	2	3	4	3	3	15	0
TOTAL	3.393	1.875	2.543	3.474	1.860	2.490	15.634	94

Savings ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	0	0	0	0	0	0	0	0
Person	0	23	47	47	47	47	210	47
Overhd	0	158	400	603	880	1.235	3.276	1.467
Moving	0	0	0	0	0	0	0	0
Missio	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0
TOTAL	0	182	446	649	927	1.282	3.486	1.514

TOTAL ONE-TIME COST REPORT (COBRA v5.04) - Page 1/3
Date As Of 09:24 12/29/1994. Report Created 11:30 12/29/1994

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAHAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

(All values in Dollars)

Category	Cost	Sub-Total
Construction		
Military Construction	14,570,000	
Family Housing Construction	0	
Information Management Account	0	
Land Purchases	0	
Total - Construction		14,570,000
Personnel		
Civilian RIF	0	
Civilian Early Retirement	0	
Civilian New Hires	0	
Eliminated Military PCS	0	
Unemployment	0	
Total - Personnel		0
Overhead		
Program Planning Support	33,867	
Mothball / Shutdown	100,000	
Total - Overhead		133,867
Moving		
Civilian Moving	0	
Civilian PPS	28,800	
Military Moving	0	
Freight	9,509	
One-Time Moving Costs	600,000	
Total - Moving		638,309
Other		
HAP / RSE	840	
Environmental Mitigation Costs	0	
One-Time Unique Costs	14,000	
Total - Other		14,840
Total One-Time Costs		15,357,016
One-Time Savings		
Military Construction Cost Avoidances	0	
Family Housing Cost Avoidances	0	
Military Moving	0	
Land Sales	0	
One-Time Moving Savings	0	
Environmental Mitigation Savings	0	
One-Time Unique Savings	0	
Total One-Time Savings		0
Total Net One-Time Costs		15,357,016

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEMDCD1.SFF

Base: WILLIAMS, TX
(All values in Dollars)

Category	Cost	Sub-Total
Construction		
Military Construction	0	
Family Housing Construction	0	
Information Management Account	0	
Land Purchases	0	
Total - Construction		0
Personnel		
Civilian RIF	0	
Civilian Early Retirement	0	
Civilian New Hires	0	
Eliminated Military PCS	0	
Unemployment	0	
Total - Personnel		0
Overhead		
Program Planning Support	33.867	
Mothball / Shutdown	100.000	
Total - Overhead		133.867
Moving		
Civilian Moving	0	
Civilian PPS	28.800	
Military Moving	0	
Freight	9.509	
One-Time Moving Costs	600.000	
Total - Moving		638.309
Other		
MAP / PSE	840	
Environmental Mitigation Costs	0	
One-Time Unique Costs	14.000	
Total - Other		14.840
Total One-Time Costs		**787.016**
One-Time Savings		
Military Construction Cost Avoidances	0	
Family Housing Cost Avoidance	0	
Military Moving	0	
Land Sales	0	
One-Time Moving Savings	0	
Environmental Mitigation Savings	0	
One-Time Unique Savings	0	
Total One-Time Savings		**0**
Total Net One-Time Costs		**787.016**

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

Base: LUKE, AZ
(All values in Dollars)

Category	Cost	Sub-Total
Construction		
Military Construction	14,570,000	
Family Housing Construction	0	
Information Management Account	0	
Land Purchases	0	
Total - Construction		14,570,000
Personnel		
Civilian RIF	0	
Civilian Early Retirement	0	
Civilian New Hires	0	
Eliminated Military PCS	0	
Unemployment	0	
Total - Personnel		0
Overhead		
Program Planning Support	0	
Mothball / Shutdown	0	
Total - Overhead		0
Moving		
Civilian Moving	0	
Civilian PPS	0	
Military Moving	0	
Freight	0	
One-Time Moving Costs	0	
Total - Moving		0
Other		
HAP / RSE	0	
Environmental Mitigation Costs	0	
One-Time Unique Costs	0	
Total - Other		0
Total One-Time Costs		14,570,000
One-Time Savings		
Military Construction Cost Avoidances	0	
Family Housing Cost Avoidances	0	
Military Moving	0	
Land Sales	0	
One-Time Moving Savings	0	
Environmental Mitigation Savings	0	
One-Time Unique Savings	0	
Total One-Time Savings		0
Total Net One-Time Costs		14,570,000

INPUT DATA REPORT (COBRA v5.04)
Data As Of 09.24 12/29/1994. Report Created 11.39 12/29/1994

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESANAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

INPUT SCREEN ONE - GENERAL SCENARIO INFORMATION

Model Year One : FY 1996

Model does Time-Phasing of Construction/Shutdown: No

Base Name	Strategy:
WILLIAMS, TX	Closes in FY 2001
LUKE, AZ	Realignment

Summary:

CE MILCON numbers used -- 12/29/94
Mesa screen 4 calculated based on Brooks AFB.
No PE data available -- standard 6% cut applied.
Used MAJCON unique/moving costs -- no recurring costs for Luke

INPUT SCREEN TWO - DISTANCE TABLE

From Base:	To Base:	Distance:
WILLIAMS, TX	LUKE, AZ	49 mi

INPUT SCREEN THREE - MOVEMENT TABLE

Transfers from WILLIAMS, TX to LUKE, AZ

	1996	1997	1998	1999	2000	2001
Officer Positions:	0	0	1	1	1	2
Enlisted Positions:	2	1	2	3	2	2
Civilian Positions:	1	2	5	6	5	4
Student Positions:	0	0	0	0	0	0
Mission Eqpt (tons):	0	0	0	0	0	0
Suppt Eqpt (tons):	0	0	0	0	0	0
Military Light Vehicles:	0	0	0	0	0	0
Heavy/Special Vehicles:	0	0	0	0	0	0

INPUT SCREEN FOUR - STATIC BASE INFORMATION

Name: WILLIAMS, TX

Total Officer Employees:	5	PPMA Non-Payroll ($K/Year):	157
Total Enlisted Employees:	10	Communications ($K/Year):	2
Total Student Employees:	0	BOS Non-Payroll ($K/Year):	103
Total Civilian Employees:	24	BOS Payroll ($K/Year)	0
Mil Families Living On Base:	0.0%	Family Housing ($K/Year):	1,205
Civilians Not Willing To Move:	10.0%	Area Cost Factor:	1.00
Officer Housing Units Avail:	0	CHAMPUS In-Pat ($/Visit):	0
Enlisted Housing Units Avail:	0	CHAMPUS Out-Pat ($/Visit):	0
Total Base Facilities(KSF):	80	CHAMPUS Shift to Medicare:	20.9%
Officer VHA ($/Month):	106	Activity Code:	9
Enlisted VHA ($/Month):	80		
Per Diem Rate ($/Day)	97	Homeowner Assistance Program:	Yes
Freight Cost ($/Ton/Mile):	0.10	Unique Activity Information:	No

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEMDOD1.SFF

INPUT SCREEN FOUR - STATIC BASE INFORMATION

Name: LUKE, AZ

Total Officer Employees:	647	RPMA Non-Payroll ($K/Year):	3.459
Total Enlisted Employees:	5.039	Communications ($K/Year):	1.458
Total Student Employees:	0	BOS Non-Payroll ($K/Year):	11.722
Total Civilian Employees:	1.146	BOS Payroll ($K/Year):	0
Mil Families Living On Base:	23.8%	Family Housing ($K/Year):	4.950
Civilians Not Willing To Move:	10.0%	Area Cost Factor:	1.00
Officer Housing Units Avail:	0	CHAMPUS In-Pat ($/Visit):	0
Enlisted Housing Units Avail:	0	CHAMPUS Out-Pat ($/Visit):	0
Total Base Facilities(KSF):	4.273	CHAMPUS Shift to Medicare:	20.9%
Officer VHA ($/Month):	177	Activity Code:	52
Enlisted VHA ($/Month):	126		
Per Diem Rate ($/Day):	108	Homeowner Assistance Program:	No
Freight Cost ($/Ton/Mile):	0.10	Unique Activity Information:	No

INPUT SCREEN FIVE - DYNAMIC BASE INFORMATION

Name: WILLIAMS, TX

	1996	1997	1998	1999	2000	2001
1-Time Unique Cost ($K):	0	1	3	4	3	3
1-Time Unique Save ($K):	0	0	0	0	0	0
1-Time Moving Cost ($K):	30	60	150	100	150	30
1-Time Moving Save ($K):	0	0	0	0	0	0
Env Non-MilCon Reqd($K):	0	0	0	0	0	0
Activ Mission Cost ($K):	0	0	0	0	0	0
Activ Mission Save ($K):	0	0	0	0	0	0
Misc Recurring Cost($K):	0	0	0	0	0	0
Misc Recurring Save($K):	0	0	0	0	0	0
Land (+Buy/-Sales) ($K):	0	0	0	0	0	0
Construction Schedule(%):	23%	12%	16%	22%	11%	16%
Shutdown Schedule (%):	0%	23%	12%	16%	22%	27%
MilCon Cost Avoidnc($K):	0	0	0	0	0	0
Fam Housing Avoidnc($K):	0	0	0	0	0	0
Procurement Avoidnc($K):	0	0	0	0	0	0
CHAMPUS In-Patients/Yr:	0	0	0	0	0	0
CHAMPUS Out-Patients/Yr:	0	0	0	0	0	0
Facil ShutDown(KSF):	80	Perc Family Housing ShutDown:				100.0%

Name: LUKE, AZ

	1996	1997	1998	1999	2000	2001
1-Time Unique Cost ($K):	0	0	0	0	0	0
1-Time Unique Save ($K):	0	0	0	0	0	0
1-Time Moving Cost ($K):	0	0	0	0	0	0
1-Time Moving Save ($K):	0	0	0	0	0	0
Env Non-MilCon Reqd($K):	0	0	0	0	0	0
Activ Mission Cost ($K):	0	0	0	0	0	0
Activ Mission Save ($K):	0	0	0	0	0	0
Misc Recurring Cost($K):	0	0	0	0	0	0
Misc Recurring Save($K):	0	0	0	0	0	0
Land (+Buy/-Sales) ($K):	0	0	0	0	0	0
Construction Schedule(%):	23%	12%	16%	22%	11%	16%
Shutdown Schedule (%):	0%	23%	12%	16%	22%	27%
MilCon Cost Avoidnc($K):	0	0	0	0	0	0
Fam Housing Avoidnc($K):	0	0	0	0	0	0
Procurement Avoidnc($K):	0	0	0	0	0	0
CHAMPUS In-Patients/Yr:	0	0	0	0	0	0
CHAMPUS Out-Patients/Yr:	0	0	0	0	0	0
Facil ShutDown(KSF):	0	Perc Family Housing ShutDown:				0.0%

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

INPUT SCREEN SIX - BASE PERSONNEL INFORMATION

Name: WILLIAMS, TX

	1996	1997	1998	1999	2000	2001
Off Force Struc Change:	0	0	0	0	0	0
Enl Force Struc Change:	0	0	0	0	0	0
Civ Force Struc Change:	0	0	0	0	0	0
Stu Force Struc Change:	0	0	0	0	0	0
Off Scenario Change:	0	0	0	0	0	0
Enl Scenario Change:	0	0	0	0	0	0
Civ Scenario Change:	0	-1	0	0	0	0
Off Change(No Sal Save):	0	0	0	0	0	0
Enl Change(No Sal Save):	0	0	0	0	0	0
Civ Change(No Sal Save):	0	0	0	0	0	0
Caretakers - Military:	0	0	0	0	0	0
Caretakers - Civilian:	0	0	0	0	0	0

INPUT SCREEN SEVEN - BASE MILITARY CONSTRUCTION INFORMATION

Name: LUKE, AZ

Description	Categ	New MilCon	Rehab MilCon	Total Cost($K)
APMC MILCON	OTHER	64.042	0	14.570

Assumed all new construction -- possible reduction available

STANDARD FACTORS SCREEN ONE - PERSONNEL

Percent Officers Married:	76.00%	Civ Early Retire Pay Factor:	9.00%
Percent Enlisted Married:	60.00%	Priority Placement Service:	50.00%
Enlisted Housing MilCon:	80.00%	PPS Actions Involving PCS:	90.00%
Officer Salary($/Year):	78,668.00	Civilian PCS Costs ($):	28,000.00
Off BAQ with Dependents($):	7,073.00	Civilian New Hire Cost($):	4,000.00
Enlisted Salary($/Year):	36,148.00	Mat Median Home Price($):	114,600.00
Enl BAQ with Dependents($):	5,162.00	Home Sale Reimburse Rate:	10.00%
Avg Unemploy Cost($/Week):	174.00	Max Home Sale Reimburs($):	22,385.00
Unemployment Eligibility(Weeks):	18	Home Purch Reimburse Rate:	5.00%
Civilian Salary($/Year):	46,642.00	Max Home Purch Reimburs($):	11,191.00
Civilian Turnover Rate:	15.00%	Civilian Homeowning Rate:	64.00%
Civilian Early Retire Rate:	10.00%	MAP Home Value Reimburse Rate:	22.90%
Civilian Regular Retire Rate:	5.00%	MAP Homeowner Receiving Rate:	5.00%
Civilian PIF Pay Factor:	39.00%	RSE Home Value Reimburse Rate.	0.00%
SF File Desc:		PSE Homeowner Receiving Rate:	0.00%

STANDARD FACTORS SCREEN TWO - FACILITIES

PPMA Building SF Cost Index:	0.93	Rehab vs. New MilCon Cost:	0.00%
BOS Index (RPMA vs population):	0.54	Info Management Account:	0.00%
(Indices are used as exponents)		MilCon Design Rate:	0.00%
Program Management Factor:	10.00%	MilCon SIOH Rate:	0.00%
Caretaker Admin(SF/Care):	162.00	MilCon Contingency Plan Rate:	0.00%
Mothball Cost ($/SF):	1.25	MilCon Site Preparation Rate:	0.00%
Avg Bachelor Quarters(SF):	256.00	Discount Rate for NPV,RFT/ROI:	2.75%
Avg Family Quarters(SF):	1,320.00	Inflation Rate for NPV,RFT/ROI:	0.00%

APPDET.PFT Inflation Rates:
1996: 0.00% 1997: 2.90% 1998: 3.00% 1999: 3.00% 2000: 3.00% 2001: 3.00%

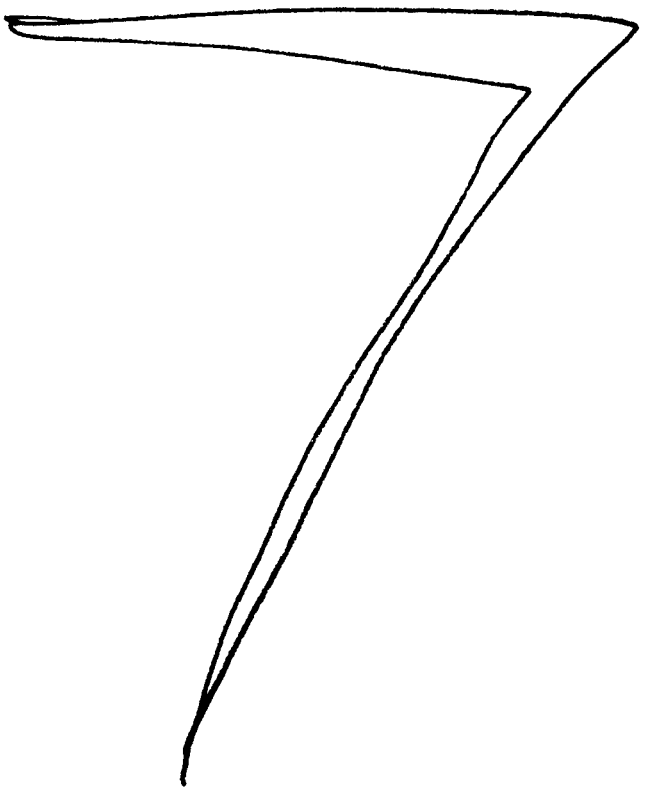
Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEWCOD1.SFF

STANDARD FACTORS SCREEN THREE - TRANSPORTATION

Material/Assigned Person(Lb):	710	Equip Pack & Crate($/Ton):	284.20
HHG Per Off Family (Lb):	14.398.00	Mil Light Vehicle($/Mile):	0.43
HHG Per Enl Family (Lb):	9.909.00	Heavy/Spec Vehicle($/Mile):	1.40
HHG Per Mil Single (Lb):	6.408.00	POV Reimbursement($/Mile):	0.18
HHG Per Civilian (Lb):	18.808.00	Avg Mil Tour Length (Years):	4.10
Total HHG Cost ($/100Lb):	35.00	Routine PCS($/Pers/Tour):	6.437.00
Air Transport ($/Pass Mile):	0.20	One-Time Off PCS Cost($):	9.142.00
Misc Exp ($/Direct Employ):	709.00	One-Time Enl PCS Cost($):	5.761.00

STANDARD FACTORS SCREEN FOUR - MILITARY CONSTRUCTION

Category	UM	$/UM	Category	UM	$/UM
Horizontal	(SY)	0	OTHER	(SF)	0
Waterfront	(LF)	0	Optional Category B	( )	0
Air Operations	(SF)	0	Optional Category C	( )	0
Operational	(SF)	0	Optional Category D	( )	0
Administrative	(SF)	0	Optional Category E	( )	0
School Buildings	(SF)	0	Optional Category F	( )	0
Maintenance Shops	(SF)	0	Optional Category G	( )	0
Bachelor Quarters	(SF)	0	Optional Category H	( )	0
Family Quarters	(EA)	0	Optional Category I	( )	0
Covered Storage	(SF)	0	Optional Category J	( )	0
Dining Facilities	(SF)	0	Optional Category K	( )	0
Recreation Facilities	(SF)	0	Optional Category L	( )	0
Communications Facil	(SF)	0	Optional Category M	( )	0
Shipyard Maintenance	(SF)	0	Optional Category N	( )	0
RDT & E Facilities	(SF)	0	Optional Category O	( )	0
POL Storage	(BL)	0	Optional Category P	( )	0
Ammunition Storage	(SF)	0	Optional Category Q	( )	0
Medical Facilities	(SF)	0	Optional Category R	( )	0
Environmental	( )	0			



T&E Activity Profile
Non Core Sites Realigned
Workload, Capacity, Excess Capacity
by
Functional Area & Test Facility Category

AIR VEHICLES SUMMARY
Core and Non-Core Sites

TFC	Workload	Capacity	Rev Excess	Percent Excess
DMS Total	1,273	1,987	714	36%
HITL Total	114,171	163,371	49,200	30%
IL Total	81,806	123,879	42,073	34%
ISTF Total	9,674	16,087	6,413	40%
MF-A Total	2,631	6,155	3,524	57%
MF-C Total	1,136	2,091	955	46%
MF-E Total	23,158	28,420	5,262	19%
MF-EM Total	943	943	0	0%
MF-G Total	30,719	47,487	16,768	35%
MF-P Total	25,854	37,155	11,301	30%
MF-ST Total	170	614	444	72%
OAR Total	27,578	39,704	* 12126	31%
AV Total	*319,113*	*467,893*	*148,780*	*32%*

* Total closure of Non-Core capacity would have reduced excess cap to 11,507. However, addtl. cap. of 619 was added to accomodate relocated wkld - -resulting in a final excess of 12,126

ARMAMENT / WEAPONS SUMMARY
Core and Non-Core Sites

TFC	Workload	Capacity	Rev Excess	Percent Excess
DMS Total	55,305	93,574	38,269	41%
HITL Total	52,667	76,680	24,013	31%
IL Total	13,368	26,854	13,486	50%
ISTF Total	792	1,374	582	42%
MF-E Total	56,129	125,973	69,844	55%
MF-EM Total	2,096	2,615	519	20%
MF-G Total	44,228	56,007	11,779	21%
MF-GO Total	14,296	25,124	10,828	43%
MF-P Total	6,801	15,312	8,511	56%
MF-ST Total	2,608	5,944	3,336	56%
OAR Total	31,742	67,669	35,927	53%
AW Total	*280,032*	*497,126*	*217,094*	*44%*

ELECTRONIC COMBAT SUMMARY
Core and Non-Core Sites

TFC	Workload	Capacity	Rev Excess	Percent Excess
DM&S Total	246	1,010	764	76%
HITL Total	2,833	420	** -2413	0%
IL Total	5,317	8,434	3,117	37%
ISTF Total	3,604	6,752	3,148	47%
MF-C Total	298	1,226	928	76%
MF-E Total	2,174	5,431	3,257	60%
MF-EM Total	4,929	4,929	0	0%
MF-G Total	1,728	2,400	672	28%
MF-RCS Total	6,674	13,763	7,089	52%
MF-Sig Total	826	1,516	690	46%
OAR Total	2,771	5,860	3,089	53%
EC Total	*31,400*	*51,741*	*20,341*	*39%*

** The JCSG analysis assumed the excess HITL wkld could be accomplished using the ISTF excess capacity of 3,148 hours.

Test Facility Category Legend

DMS	Digital Modelling/Simulation
HITL	Hardware-in-the-Loop
IL	Integration Lab
ISTF	Installed System Test Facility
MF	Measurement Facility (various)
MF-A	Avionics & A/C Subsystems
MF-C	Comm/Nav/Antenna
MF-E	Environmental
MF-EM	Electro Magnetic Env Effects
MF-G	Guidance/Seeker/Sensor/Sig
MF-GO	Guns/Ordnance/Warheads
MF-P	Propulsion
MF-ST	Sled Tracks
MF-RCS	Radar Cross Section
MF-Sig	Signature
OAR	Open Air Range

```
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 in SITE}:
    sum {(s,f) in SITE_CAP} SITE_FUNC[s,f] <= OPEN[s] * no_func;

# SITE_FUNC variables are set to 0 if little or no functional
# workload is assigned to a site.

subject to site_func_0 {(s,f) in SITE_CAP}:
    SITE_FUNC[s,f] <= SITE_LOAD[s,f]/(min_assign * CAPAC[s,f]);

# 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;

#
# Exclude solutions defined by the sets EXCLD1 and EXCLD2.
#

subject to alt_opt_cond_1:
    sum {s in EXCLD_INTER} OPEN[s] <= excld_num + 1 - ALPHA;

subject to alt_opt_cond_2:
   sum {s in EXCLD_COMPLEMENT} OPEN[s] >= BETA;

subject to alt_opt_cond_3a:
   sum {s in EXCLD_1DIFF2} OPEN[s] >= GAMMA;
```

```
subject to alt_opt_cond_3b:
   sum {s in EXCLD_2DIFF1} OPEN[s] >= GAMMA;

subject to alt_opt_cond_123:
   ALPHA + BETA + GAMMA >= 1;
```

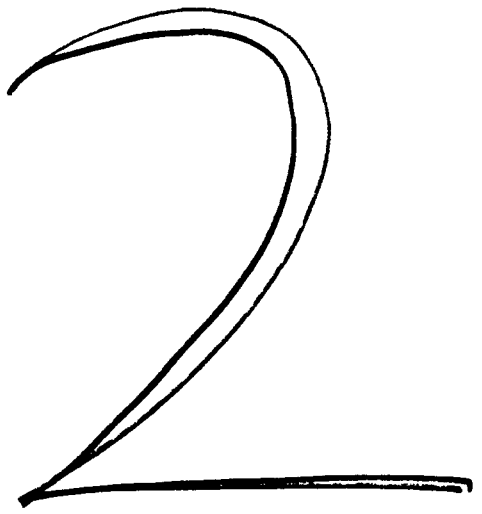
Appendix B

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 EXCLD1 := X_A X_C X_D Z_A Z_B Z_D;

set EXCLD2 := X_C X_D Y_C Z_A Z_B Z_D;

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.
```

```
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;
```



13.23 4/26/95

Workload - Certified Data

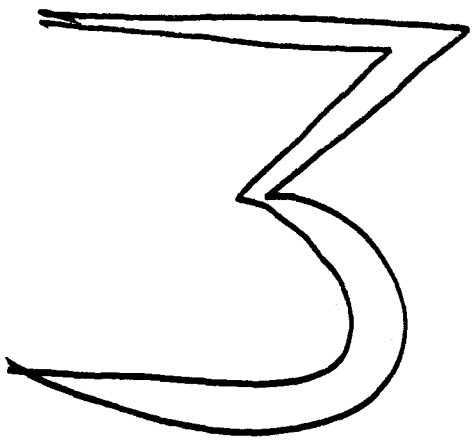
Commodity Group	ANAD	CCAD	LEAD	RRAD	TOAD	Army
1A Air Frames - Rotary		1 871 000				1 871 000
1B Air Frames - VSTOL						
1C1 Air Frames - Trn/Tk/Bmb						
1C2 Air Frames - Cgo&Cll						
1C3 Air Frames - Ftr/Cbt						
1C4 AirFrames - Adm/Trng						
1D Air Frames - Other						
1 Aircraft Airframes		1,871,000				1,871,000
2A Comp - Dynamic Comp		861 000				861 000
2B Comp - Acft Struct		32 000				32 000
2C Comp - Hydraulic/Pneu		114 000				114 000
2D Comp - Instruments		18 000				18 000
2E Comp - Landing Gear		11 000				11 000
2F Comp - Avn Ordnance		1 000				1 000
2G Comp - Avionics/Elec		7 000			271 000	278 000
2H Comp - APUs		5 000				5 000
2I Comp - Other		22 000				22 000
2 Aircraft Comp		1,071,000			271,000	1,342,000
3A Engines - Aircraft		206 000				206 000
3B Engines - Ship						
3C Engines - Tank	207 000					207 000
3D Engines - Blade/Vnes						
3 Engines (Gas Turb)	207,000	206,000				413,000
4A Missiles - Strategic						
4B Missiles - Tact/MLRS			523 000	58,000	59 000	640 000
4 Missiles & Comp			523,000	58,000	59,000	640,000
5A Amphibians - Vehicle						
5B Amphibians - Cmponts						
5 Amphibians						
6A Gnd Cbt Veh - SlfPrp			418 000			418 000
6B Gnd Cbt Veh - Tanks	1,058,000			1,142,000		2 200 000
6C Gnd Cbt Veh - Towed			42 000			42 000
6D Gnd Cbt Veh - Comp				106 000		106 000
6 Gnd Cbt Vehicles	1,058,000		460,000	1,248,000		2,766,000
7A Commo - Radar					79 000	79 000
7B Commo - Radio					667 000	667 000
7C Commo - Wire					118 000	118 000
7D Commo - EW					371 000	371 000
7E Commo - Nav Aids					8 000	8 000
7F Commo - ElOp/NtVis						
7G Commo - Satellite						
7H Commo - Crypto					168 000	168 000
7 Comm & Electr					1,411,000	1,411,000
8A Automotive/Constr				17,000		17 000
8 Auto/Constr Equip				17,000		17,000
9A Tact Veh - Automotive						
9B Tact Veh - Components						
9 Tactical Vehicles						
10A GP - Grnd Spt Eq						
10B GP - Small Arms	232 000					232 000
10C GP - Munitions/Ord						
10D GP - Gnd Generators						
10E GP - Other						
10 Gnd Gen Purp Items	232,000					232,000
11A Sea Sys - Ships						
11B Sea Sys - Wpns Sys						
11C Sea Sys - Ship Sot						
11D Sea Sys - ShipYd Spt						
11E Sea Sys - Ship Dsgn						
11 Sea Systems						
12A Software - Tact Sys					8,000	8,000
12B Software - Spt Equip						
12 Software					8,000	8,000
13A Spec Int - Bearings		34 000				34 000
13B Spec Int - Calibration						
13C Spec Int - TMDE					43 000	43,000
13 Spec Interest Items		34,000			43,000	77,000
14 Other Commodity						
14 Other Commodity						
15 Assoc Fabric/Manufct					512,000	512,000
15 Assoc Fabric/Mfg					512,000	512,000
16A Flt Spt - Prod Spt						
16B Flt Spt - Voyage Rpr						
16C Flt Spt - Cust Svc						
16 Fleet Support						
TOTAL	1,497,000	3,182,000	981,000	1,322,000	2,304,000	9,287,000

Commodity Group	ALC-OC	ALC-OO	ALC-SA	ALC-SM	ALC-WR	AMARC	Air Force
1A Air Frames - Rotary							
1B Air Frames - VSTOL							
1C1 Air Frames - Trn/Tk/Bmb	2,023,204	543 465	821 402	441,201	1,348,994		5,178,266
1C2 Air Frames - Cgo&Cll	512 342						512,342
1C3 Air Frames - Ftr/Cbt		690,933		906,583	1,267,169		2 864 685
1C4 AirFrames - Adm/Trng			82				82
1D Air Frames - Other							
1 Aircraft Airframes	2,535,546	1,234,398	821,484	1,347,784	2,616,163		8,555,375
2A Comp - Dynamic Comp							
2B Comp - Acft Struct	333 754	241 310	19 200	156 863	476,571		1,227,698
2C Comp - Hydraulic/Pneu	181 160	13 296	2 979	356 703	133		554 271
2D Comp - Instruments	263 820	124 288	4 965	192 664	299 286		885 123
2E Comp - Landing Gear		487 904	4 164		904		492 972
2F Comp - Avn Ordnance		104 219			607		104 826
2G Comp - Avionics/Elec	92 619	429 591	30 506	333 836	1,279,989		2 166 541
2H Comp - APUs		28 636	102 322				131 158
2I Comp - Other	131 280	180 260	93 130		279 952		684 620
2 Aircraft Comp	1,002,719	1,609,794	267,274	1,040,206	2,337,362		6,247,366
3A Engines - Aircraft	2 307 635	102 409	2 625 971				5 036 015
3B Engines - Ship							
3C Engines - Tank							
3D Engines - Blade/Vnes	79,386						79,386
3 Engines (Gas Turb)	2,384,021	102,409	2,625,971				5,112,401
4A Missiles - Strategic		673 626	57 467				731 093
4B Missiles - Tact/MLRS		180 915			13 144		194 059
4 Missiles & Comp		854,541	57,467		13,144		925,152
5A Amphibians - Vehicle							
5B Amphibians - Cmponts							
5 Amphibians							
6A Gnd Cbt Veh - SlfPrp							
6B Gnd Cbt Veh - Tanks							
6C Gnd Cbt Veh - Towed							
6D Gnd Cbt Veh - Comp							
6 Gnd Cbt Vehicles							
7A Commo - Radar				430 410	1,125		431 535
7B Commo - Radio				177,156	31		177,187
7C Commo - Wire				118 283	46		118 329
7D Commo - EW							
7E Commo - Nav Aids				184 644	105		184,749
7F Commo - ElOp/NtVis				109 115	63		109,178
7G Commo - Satellite				32,271			32,271
7H Commo - Crypto							
7 Comm & Electr				1,051,879	1,370		1,053,249
8A Automotive/Constr							
8 Auto/Constr Equip							
9A Tact Veh - Automotive							
9B Tact Veh - Components							
9 Tactical Vehicles							
10A GP - Grnd Spt Eq							
10B GP - Small Arms							
10C GP - Munitions/Ord			1,820				1,820
10D GP - Gnd Generators				61,824			61,824
10E GP - Other		119,716					119,716
10 Gnd Gen Purp Items		119,716	1,820	61,824			183,360
11A Sea Sys - Ships							
11B Sea Sys - Wpns Sys							
11C Sea Sys - Ship Sot							
11D Sea Sys - ShipYd Spt							
11E Sea Sys - Ship Dsgn							
11 Sea Systems							
12A Software - Tact Sys	325,416	652,524	14,178	210,728	866,197		2,081,046
12B Software - Spt Equip	298,560	341,351	184,891	183,660	562,131		1 470 579
12 Software	623,976	993,875	199,069	394,388	1,428,328		3,551,625
13A Spec Int - Bearings	15 202	4 818					20 020
13B Spec Int - Calibration							
13C Spec Int - TMDE	30		409 936				409 966
13 Spec Interest Items	15,232	4,818	409,936				429,986
14 Other Commodity				399		108 932	109 331
14 Other Commodity				399		108,932	109,331
15 Assoc Fabric/Manufct	96 860	75,949	118,670	354,278	314,881		961 606
15 Assoc Fabric/Mfg	96,860	75,949	118,670	354,278	314,881		961,606
16A Flt Spt - Prod Spt							
16B Flt Spt - Voyage Rpr							
16C Flt Spt - Cust Svc							
16 Fleet Support							
TOTAL	6,088,340	4,885,412	4,482,990	4,238,010	6,763,218	108,932	27,118,208

Commodity Group	MCLB-A	MCLB-B	Marines	NAD-CH	NAD-JX	NAD-NI
1A Air Frames - Rotary				196 442		
1B Air Frames - VSTOL				19 112		
1C1 Air Frames - Trn/Tk/Bmb						
1C2 Air Frames - Cgo&Cll						
1C3 Air Frames - Ftr/Cbt				364 560	356 644	424 218
1C4 AirFrames - Adm/Trng						
1D Air Frames - Other				131 744	465 486	482 370
1 Aircraft Airframes				711 858	822,130	906,588
2A Comp - Dynamic Comp				90 882		31 550
2B Comp - Acft Struct				27 519	51 929	36 729
2C Comp - Hydraulic/Pneu				38 565	20 198	23,738
2D Comp - Instruments				10 848	5,675	88 510
2E Comp - Landing Gear				8 572	35 548	25 253
2F Comp - Avn Ordnance				249	21 438	2 770
2G Comp - Avionics/Elec				6,148	95,782	157 260
2H Comp - APUs				72 474		
2I Comp - Other				218 208	97 473	138 914
2 Aircraft Comp				473 465	328,043	504,733
3A Engines - Aircraft				261 412	370 628	
3B Engines - Ship						98 390
3C Engines - Tank						
3D Engines - Blade/Vnes				29 300		
3 Engines (Gas Turb)				290 712	370,628	98,390
4A Missiles - Strategic						
4B Missiles - Tact/MLRS						
4 Missiles & Comp						
5A Amphibians - Vehicle	114 300	140 800	255 100			
5B Amphibians - Cmponts	12 100	3 800	15 900			
5 Amphibians	126,400	144,600	271,000			
6A Gnd Cbt Veh - SlfPrp						
6B Gnd Cbt Veh - Tanks	37,300	16,800	54 100			
6C Gnd Cbt Veh - Towed		74,700	74 700			
6D Gnd Cbt Veh - Comp	12,300	1 800	14 100			
6 Gnd Cbt Vehicles	49,600	93,300	142,900			
7A Commo - Radar	29,700	41,400	71,100			
7B Commo - Radio	109,200	63,300	172,500			
7C Commo - Wire	9,100	100	9 200			
7D Commo - EW						
7E Commo - Nav Aids						
7F Commo - ElOp/NtVis		78,200	78 200			
7G Commo - Satellite						
7H Commo - Crypto						
7 Comm & Electr	148,000	181,000	329,000			
8A Automotive/Constr	154,700	109 300	264 000			
8 Auto/Constr Equip	154,700	109,300	264,000			
9A Tact Veh - Automotive	322,000	297,000	619 000			
9B Tact Veh - Components	11 900	2 400	14 300			
9 Tactical Vehicles	333,900	299,400	633,300			
10A GP - Grnd Spt Eq						
10B GP - Small Arms	246 900	2,500	249 400			
10C GP - Munitions/Ord						
10D GP - Gnd Generators						
10E GP - Other	1,300		1,300			
10 Gnd Gen Purp Items	248,200	2,500	250,700			
11A Sea Sys - Ships		5,000	5,000			
11B Sea Sys - Wpns Sys						
11C Sea Sys - Ship Sot						
11D Sea Sys - ShipYd Spt						
11E Sea Sys - Ship Dsgn						
11 Sea Systems		5,000	5,000			
12A Software - Tact Sys						
12B Software - Spt Equip						
12 Software						
13A Spec Int - Bearings						28,448
13B Spec Int - Calibration						40,000
13C Spec Int - TMDE				81,700	87,730	98 020
13 Spec Interest Items				81,700	87,730	166,468
14 Other Commodity		800	800	104 955	136,140	308 262
14 Other Commodity		800	800	104,955	136,140	308,262
15 Assoc Fabric/Manufct				45 400	483 904	495 500
15 Assoc Fabric/Mfg				45,400	483,904	495,500
16A Flt Spt - Prod Spt				503,244	733,359	588,019
16B Flt Spt - Voyage Rpr					122,700	98,000
16C Flt Spt - Cust Svc					7,856	170,812
16 Fleet Support				503,244	863,914	856,832
TOTAL	1,080,000	698,800	1,778,800	2,211,334	3,092,560	3,332,774

Commodity Group	NSY-LB	NSY-NF	NSY-PH	NSY-PM	NSY-PS	NSW-CR	NSW-LO	NUW-KP	Navy	TOTAL
1A Air Frames - Rotary									196 442	2 067 442
1B Air Frames - VSTOL									19 112	19 112
1C1 Air Frames - Trn/Tk/Bmb										5 178 266
1C2 Air Frames - Cgo&Cll										512,342
1C3 Air Frames - Ftr/Cbt									1,145 422	4 010 107
1C4 AirFrames - Adm/Trng										82
1D Air Frames - Other									1 079 600	1 079 600
1 Aircraft Airframes									2,440,576	12,866,951
2A Comp - Dynamic Comp									122 432	983 432
2B Comp - Acft Struct									116 177	1,375,875
2C Comp - Hydraulic/Pneu									82 501	750 772
2D Comp - Instruments									105 033	1 008 156
2E Comp - Landing Gear									69 374	573 346
2F Comp - Avn Ordnance									24 457	130,283
2G Comp - Avionics/Elec						222,[illegible]			482,187	2 926 728
2H Comp - APUs									72 474	208 632
2I Comp - Other									454 595	1 161 215
2 Aircraft Comp						222,[illegible]			1,529,239	9,118,539
3A Engines - Aircraft									632 040	5 874 055
3B Engines - Ship									98 390	98 390
3C Engines - Tank										207 000
3D Engines - Blade/Vnes									29 300	108 686
3 Engines (Gas Turb)									759,730	6,285,131
4A Missiles - Strategic										731 093
4B Missiles - Tact/MLRS						37,[illegible]			37 600	871 659
4 Missiles & Comp						37,[illegible]			37,600	1,602,752
5A Amphibians - Vehicle										255 100
5B Amphibians - Cmponts										15 900
5 Amphibians										271,000
6A Gnd Cbt Veh - SlfPrp										418 000
6B Gnd Cbt Veh - Tanks										2,254,100
6C Gnd Cbt Veh - Towed										116 700
6D Gnd Cbt Veh - Comp										120 100
6 Gnd Cbt Vehicles										2,908,900
7A Commo - Radar	12,200	7,340	7,400						27,035	608 670
7B Commo - Radio	3,389		10,483		8,008				29 480	1,046 167
7C Commo - Wire										245 529
7D Commo - EW	59,930		340,378						400,308	771 308
7E Commo - Nav Aids	4,430		16,933	66,879	38 034	[illegible]			125,228	297,977
7F Commo - ElOp/NtVis	370			34,718	45,042	107,[illegible]			187 928	373,306
7G Commo - Satellite	370								370	32,641
7H Commo - Crypto										168 000
7 Comm & Electr	87,218	7,340	375,270	101,600	90,084	162,[illegible]			779,[illegible]	3,573,[illegible]
8A Automotive/Constr										281 000
8 Auto/Constr Equip										281,000
9A Tact Veh - Automotive										619 000
9B Tact Veh - Components										14 300
9 Tactical Vehicles										633,300
10A GP - Grnd Spt Eq										0
10B GP - Small Arms										481,400
10C GP - Munitions/Ord										1,820
10D GP - Gnd Generators										61,824
10E GP - Other										121,016
10 Gnd Gen Purp Items										666,060
11A Sea Sys - Ships	2,426,408	6,283,632	2,322,044	2,978,930	8,214,886	8,513			22,241,3[illegible]	22,246,3[illegible]
11B Sea Sys - Wpns Sys	283,471	136 658	129 196			800,250	1,220,240	733,300	2,780,7[illegible]	2,780,7[illegible]
11C Sea Sys - Ship Sot		661,873	107,457	9,083	450 866				1,429,279	1,429,279
11D Sea Sys - ShipYd Spt	431,082	493 800	181,326	66,020	447 964				1,850,003	1,850,003
11E Sea Sys - Ship Dsgn		1,234,000		19,829	991,756				2,245,594	2,245,594
11 Sea Systems	3,122,979	8,869,981	2,760,023	3,093,891	10,114,481	809,[illegible]	1,220,240	733,300	30,5[illegible]	30,5[illegible]
12A Software - Tact Sys										2,089,046
12B Software - Spt Equip										1 470 579
12 Software										3,559,625
13A Spec Int - Bearings	4,715								33 163	87 183
13B Spec Int - Calibration									40 000	40 000
13C Spec Int - TMDE	1,919		85 030		45 456				399,7[illegible]	820 72[illegible]
13 Spec Interest Items	6,634		85,030		45,455				472,9[illegible]	947,911
14 Other Commodity									549 357	659 588
14 Other Commodity									549,357	659,588
15 Assoc Fabric/Manufct			31,461		448 604				1 504 869	2,978,720
15 Assoc Fabric/Mfg			31,461		448,604				1,504,869	2,978,720
16A Flt Spt - Prod Spt									1,824,622	1,824,622
16B Flt Spt - Voyage Rpr									220,700	220,700
16C Flt Spt - Cust Svc									178,668	178,668
16 Fleet Support									2,223,990	2,223,990
TOTAL	3,272,918	8,916,081	3,211,793	3,196,656	10,646,624	875,1[illegible]	1,220,240	733,300	40,612,837	78,916,846

ATTACHMENT 2



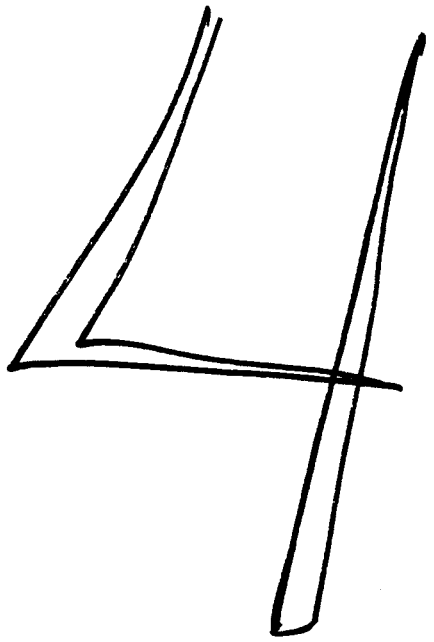
13:29 4/26/95

Excess Capacity (DLH)
Certified Data

Commodity Group	ANAD	CCAD	LEAD	RRAD	TOAD	Army	ALC-OC	ALC-OO	ALC-SA	ALC-SM	ALC-WR	AMARC	Air Force
1A A-Frames - Rotary		50 000				50 000							
1B A-Frames - VSTOL													
1C1 Air Frames-Trn/Tk/Bmr							255 876	-73 984	752 088	377,707	754,980		2 086 865
1C2 A-Frames - Cmd&Ctr							-223 563						-223 563
1C3 Air Frames - Lt Cbt								689,892		553,049	-183,304		1,059 837
1C4 A-Frames - Adm Trg									13				13
1D Air Frames - Other													
1 Aircraft Airframes		50,000				50,000	32,313	615,908	752,099	930,756	571,676		2,902,752
2A Comp - Dynamic Comp		535 000				535 000							
2B Comp - Acft Struct		2 000				2 000	99 854	70,143	71,241	72,218	179,906		463 362
2C Comp - Hydraulic/Pneu		-5 000				-5 000	96 571	28 129	546	135,145	40		260 429
2D Comp - Instruments		17 000				17 000	-38 478	67 493	7 531	88 679	112 980		240 207
2E Comp - Landing Gear		4 000				4 000		540,042	4,133		343		544,518
2F Comp - Avn Ordnance				80 000		80 000	1,171	314 631			230		316.032
2G Comp - Avionics/Elec		5 000			119 000	124 000	129 078	81,314	88 788	123 084	483,166		880,006
2H Comp - APUs		2 000				2 000		60,151	185,754				245 905
2I Comp - Other		37 000				37 000	463,183	312,234	194 538		107,877		1,077 810
2 Aircraft Comp		597,000		80,000	119,000	796,000	710,960	1,474,137	538,809	419,124	884,842		4,028,271
3A Engines - Aircraft		184 000				184 000	188 877	-1,148	2 374 847				2 562,576
3B Engines - Ship													
3C Engines - Tank	109,058					109 058							
3D Engines - Blade/Vnes							78,871						78,871
3 Engines (Gas Turb)	109,058	184,000				273,058	267,448	-1,148	2,374,847				2,641,147
4A Missiles - Strategic								72 020	51,267				123,287
4B Missiles - Tact/MLRS	88,794		948,346	202,000	34 000	1,273,140		388,292			4,961		393,253
4 Missiles & Comp	88,794		948,346	202,000	34,000	1,273,140		460,312	51,267		4,961		516,540
5A Amphibians - Vehicle													
5B Amphibians - Cmponts													
5 Amphibians													
6A Gnd Cbt Veh - SP/Prp			452 384			452 384							
6B Gnd Cbt Veh - Tanks	1,422 829			1 068 000		2 490 829							
6C Gnd Cbt Veh - Towed			43 918			43 918							
6D Gnd Cbt Veh - Comp				10,000		10,000							
6 Gnd Cbt Vehicles	1,422,829		496,302	1,080,000		3,000,131							
7A Commo - Radar					31 000	31,000				271,998	425		272 424
7B Commo - Radio					380 000	380 000				183,150	12		183 162
7C Commo - Wire					189 000	189 000				95,251	17		95,268
7D Commo - EW					220 000	220,000							
7E Commo - Nav Aids					11 000	11 000				114,410	40		114,450
7F Commo - EIOp/NtVis					5 000	5 000				71,019	24		71,043
7G Commo - Satellite					342 000	342 000				140,545			140,545
7H Commo - Crypto					169 000	169,000							
7 Comm & Electr					1,340,000	1,340,000				885,374	518		886,892
8 Automotive/Const				88,000		88.000							
8 Auto/Constr Equip				88,000		88,000							
9A Tact Veh - Automotive				276 000		276 000							
9B Tact Veh - Components				123 000		123 000							
9 Tactical Vehicles				399,000		399,000							
10A GP - Grnd Spt Eq													
10B GP - Small Arms	48 788					48,788							
10C GP - Munitions/Ord	9.000		22,248			31,248			1,383				1,383
10D GP - Gnd Generators			22,247			22,247				39,257			39,257
10E GP - Other	20,000		15,343	88,000	300,000	424,343		-16,923		61,385			44,462
10 Gnd Gen Purp Items	77,788		59,838	88,000	300,000	525,838		-16,923	1,383	100,642			85,102
11A Sea Sys - Ships													
11B Sea Sys - Wpns Sys													
11C Sea Sys - Ship Spt													
11D Sea Sys - ShipYd Spt													
11E Sea Sys - Ship Dsgn													
11 Sea Systems													
12A Software - Tact Sys					2 000	2 000	-87,348	102.327	6 082	190,735	-92 893		118 983
12B Software - Spt Equip							180,918	71,636	82 333	144,814	-91,928		383,971
12 Software					2,000	2,000	99,000	173,963	88,998	335,549	-184,821		492,884
13A Spec Int - Bearings		16 000				16.000	-5,872	15,127					9,455
13B Spec Int - Calibratn	5 000			8 000		13 000							
13C Spec Int - TMDE					125,000	125,000	3,444		275,000				278,444
13 Spec Interest Items	5,000	16,000		8,000	125,000	154,000	-2,428	15,127	275,000				287,904
14 Other Commodity					127 000	127,000				36,673		708,823	745 496
14 Other Commodity					127,000	127,000				36,673		708,823	745,496
15 Assoc Fabric/Manufct					382 000	382,000	66,463	-2,205	297,140	158,588	116,664		635.550
15 Assoc Fabric/Mfg					382,000	382,000	66,463	-2,205	297,140	158,588	116,664		635,550
16A Flt Spt - Prod Spt													
16B Flt Spt - Voyage Rpr													
16C Flt Spt - Cust Svc													
16 Fleet Support													
TOTAL	1,703,446	827,000	1,504,484	1,918,000	2,399,000	8,373,930	1,152,523	2,719,901	4,340,345	2,837,698	1,423,540	708,823	13,182,880

Commodity Group	MCLB-A	MCLB-B	Marines	NAD-CH	NAD-JX	NAD-NI	NSY-LB	NSY-NF	NSY-PH	NSY-PM	NSY-PS	NSW-CR	NSW-LO	NUW-KP	Navy	TOTAL
1A A-Frames - Rotary				269 970											269 970	319 970
1B A-Frames - VSTOL				1 422											1 422	1 422
1C1 Air Frames-Trn/Tk/Bmr																2 086 865
1C2 A-Frames - Cmd&Ctr																-223 563
1C3 Air Frames - Lt Cbt				235,332	304,274	321,211									860 817	1 920 454
1C4 A-Frames - Adm Trg						73 695									73 695	73 708
1D Air Frames - Other				115,190	548,088	388,898									1,052,176	1,052 176
1 Aircraft Airframes				621,914	852,362	783,804									2,258,080	5,210,832
2A Comp - Dynamic Comp				18 050		5,291									23 341	558 341
2B Comp - Acft Struct				98	1,354	4,145									5 597	470 959
2C Comp - Hydraulic/Pneu				5 926	7,085	3,910									16 921	272 352
2D Comp - Instruments				1,314	2,827	10,669									14 810	272 037
2E Comp - Landing Gear				902	170	2,138									3 210	551 728
2F Comp - Avn Ordnance				2 439	2,501	857									5 807	401 919
2G Comp - Avionics/Elec				2 063	8,273	4,303						60,914			75 553	1 079 561
2H Comp - APUs				56 403											56 403	304 308
2I Comp - Other				186,834	38,628	20,007									245 469	1 360 279
2 Aircraft Comp				274,631	61,728	51,540						60,914			447,213	5,271,484
3A Engines - Aircraft				96,910	57,378										154 288	2 880 864
3B Engines - Ship						5,193									5 193	5 193
3C Engines - Tank																109 058
3D Engines - Blade/Vnes				2,179											2 179	80 750
3 Engines (Gas Turb)				99,089	57,378	5,193									161,660	3,075,862
4A Missiles - Strategic												22 193			22 193	145 480
4B Missiles - Tact/MLRS		14,400	14,400													1 680 793
4 Missiles & Comp		14,400	14,400									22,193			22,193	1,826,273
5A Amphibians - Vehicle	16,600	48,200	64,800													64 800
5B Amphibians - Cmponts	1,800	1,200	3,000													3 000
5 Amphibians	18,400	49,400	67,800													67,800
6A Gnd Cbt Veh - SP/Prp																452 384
6B Gnd Cbt Veh - Tanks	5,400	2,200	7,600													2 498 429
6C Gnd Cbt Veh - Towed		14 000	14,000													57 918
6D Gnd Cbt Veh - Comp	1,800	200	2,000													20 000
6 Gnd Cbt Vehicles	7,200	16,400	23,600													3,029,731
7A Commo - Radar	4,300	5,700	10,000				61,961	-1,519	5,411						65 757	379 181
7B Commo - Radio	15,900	7,500	23,400				80,814		7,578		1,200				89 460	615 022
7C Commo - Wire	1,300		1,300													289 568
7D Commo - EW							303,693		246,015						549 701	769 701
7E Commo - Nav Aids							22,484		12,238	12 063	5,072	28,484			80 342	205 792
7F Commo - EIOp/NtVis		10,300	10,300				1,873			878	6,341	48,200			57,392	143 735
7G Commo - Satellite							1,875								1 875	384 420
7H Commo - Crypto																169 000
7 Comm & Electr	21,000	23,500	45,000				442,463	-1,519	271,242	13,029	12,861	76,684			814,827	2,964,419
8 Automotive/Const	22 500	43 900	66 400													132 400
8 Auto/Constr Equip	22,500	43,900	66,400													132,400
9A Tact Veh - Automotive	46 800	35 700	82 500													358 500
9B Tact Veh - Components	1,700	300	2,000													125 000
9 Tactical Vehicles	48,500	36,000	84,500													483,500
10A GP - Grnd Spt Eq		4,800	4 800													4 800
10B GP - Small Arms	35,900	400	36,300													85 088
10C GP - Munitions/Ord		200	200													32 829
10D GP - Gnd Generators		1,700	1,700													63 704
10E GP - Other	-1,300	5,900	4,600													473 405
10 Gnd Gen Purp Items	34,600	13,000	47,600													660,380
11A Sea Sys - Ships		400	400				520,280	3,042,000	1,078,317	3,143,567	2,224,955	11,480			10 029 271	10 029 671
11B Sea Sys - Wpns Sys							86,450	85,904	93,301			123,714	527,973	275 851	1,142 953	1,142 953
11C Sea Sys - Ship Spt								-170,583	77,087	29,072	72,190				244	244
11D Sea Sys - ShipYd Spt							882,380	-146,291	130,285	-9,080	80,024				972,356	972 356
11E Sea Sys - Ship Dsgn								-288,000		9,263	80,324				-156,468	-156 468
11 Sea Systems		400	400				1,187,13[illegible]	2,520,384	1,007,000	3,172,742	2,483,461	135,194	527,973	275,851	12,109,384	12,104,784
12A Software - Tact Sys																120 983
12B Software - Spt Equip																383 971
12 Software																494,884
13A Spec Int - Bearings						18	43,734								43 752	69 207
13B Spec Int - Calibratn						654									654	13 654
13C Spec Int - TMDE				10,379	16,880	23,124	5,513		30,781		6,840				104 595	508 044
13 Spec Interest Items				10,379	16,880	23,796	49,264		30,781		6,840				149,001	590,909
14 Other Commodity	1,600	4,000	5,600	16 484	110,414	66,992						4,989			196 878	1,074 974
14 Other Commodity	1,600	4,000	5,600	16,484	110,414	66,992						4,989			196,878	1,074,974
15 Assoc Fabric/Manufct				4 022	73,728	5,801			22,733		68 450				174 434	1,171 984
15 Assoc Fabric/Mfg				4,022	73,728	5,801			22,733		68,450				174,434	1,171,984
16A Flt Spt - Prod Spt				384 456	914,641	526,891									1,825 988	1 825 988
16B Flt Spt - Voyage Rpr					11,949	1,121									13 070	13 070
16C Flt Spt - Cust Svc				4,801	4,749	27,494									37,001	37 001
16 Fleet Support				389,257	931,339	555,469									1,876,059	1,876,059
TOTAL	154,300	201,900	356,300	1,415,772	2,111,890	1,484,202	1,899,787	2,520,830	2,321,488	3,198,771	2,541,430	299,290	527,973	275,851	18,209,401	40,180,139

ATTACHMENT 3



DEPOT MAINTENANCE

SUPPLEMENTAL INFORMATION PROVIDED BY THE DEPARTMENT OF THE NAVY

6. Please provide the capacity charts that describe excess capacity with implementation of this BRAC by service, and by depot?

Supplemental Answer:

The excess capacity remaining at NADEP Jacksonville was not determined at this time due to three specific factors. These factors preclude a simple arithmetic determination of remaining excess capacity.

a) After the Joint Cross Service Group-Depot Maintenance data base was locked, two additional sources of core workload were identified: 30,000 DLMHs of F-117 F404 engine workload interserviced from the Air Force; and 48,000 DLMHs of mobile causeways and side warping tugs workload supporting the Maritime Prepositioned Ship (MPS) Program from NAVSEA.

b) The mix of workload being transferred from NAWC Lakehurst, approximately 316,000 DLMHs, consumes the most excess. However, the aircraft launch and recovery, manufacturing and overhaul equipment occupies a greater amount of space with significantly fewer available work positions than the aircraft, engine, and component workload that it replaces. Therefore, a significant amount of additional capacity will be eliminated over and above the additional workload received. The precise impacts will not be determined until specific implementation planning is finalized.

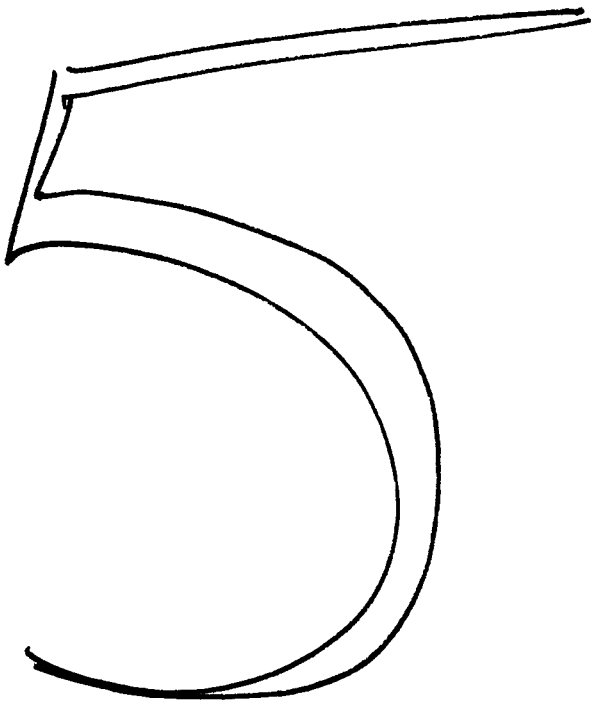
c) Finally, two large hangers included in NADEP Jacksonville's initial capacity calculations are not required and are being returned to the host air station, another divestiture of excess capacity.

7. Cross Service Alternative Two proposes the closure of Naval Shipyards Long Beach and either Pearl Harbor or Portsmouth. Did the Joint Cross Service Group view Pearl Harbor and Portsmouth as equivalent in terms of capability as well as capacity?

No. The JCSG-DM did not have visibility into the capabilities of individual shipyards. All Category #11.a (Sea Systems-Ships) workload was grouped together with no breakout as to ship type, dry dock capability, nuclear versus non-nuclear capability, etc. This alternative, DM2, was generated by the optimization model to minimize excess capacity, and these two shipyards had similar capacity indexes.

8. In both alternatives DM1 and DM2, specific workload transfers are identified for each commodity group except for sea systems. In that case, the alternative states, "Consolidate as possible within the Department of the Navy." Why was the sea systems commodity area proposal not specific concerning workload distribution?

These sea systems commodity areas, unique to the Department of the Navy, offered no interservicing potential. The JCSG-DM was aware that significant differences existed between the individual shipyards, for example, ship type, drydock capability, strategic location, nuclear versus non-nuclear capability, etc., which were beyond the level of detail of the Joint analyses. The JCSG-DM determined that the Department of the Navy was in the best position to reallocate that workload in the most efficient manner based on their future force structure and operational requirements.



CHAPTER 3. AIRPORT CAPACITY AND AIRCRAFT DELAY CALCULATIONS

3-1. GENERAL. This chapter contains instructions for calculating hourly capacity, ASV, and aircraft delay for a wide range of runway-use configurations and operational alternatives.

a. Capacity Calculations.

(1) Hourly capacity of the runway component.
(2) Hourly capacity of the taxiway component.
(3) Hourly capacity of gate group components.
(4) Airport hourly capacity.
(5) ASV.

b. Delay Calculations.

(1) Hourly delay.
(2) Daily delay.
(3) Annual delay.

Figure 3-1 provides a checklist of the data required for these calculations. Appendix 2 contains examples of these calculations.

3-2. HOURLY CAPACITY OF THE RUNWAY COMPONENT. Except for situations involving PVC conditions, an absence of radar coverage or ILS, and airports with parallel runways when one runway is limited to use by small aircraft (all of which are covered in chapter 4), calculate the runway component hourly capacity as follows:

a. Select the runway-use configuration in figure 3-2 which best represents the use of the airport during the hour of interest. To adjust for staggered thresholds, see paragraph 4-6.

b. Identify from figure 3-2 the figure number for capacity (for C^*, T, and E).

c. Determine the percentage of Class C and D aircraft operating on the runway component and calculate the mix index.

d. Determine percent arrivals (PA).

e. Determine hourly capacity base (C^*).

f. Determine the percentage of touch and go operations during VFR operations and determine the touch and go factor (T). During IFR operations, T will be 1.00.

g. Determine the location of exit taxiways (measured from the threshold at the approach end of the runway) and determine the exit factor (E).

h. Calculate the hourly capacity of the runway component by the following equation:

$$\text{Hourly capacity of the runway component} = C^* \cdot T \cdot E$$

c. Calculate the component quotients by dividing each components capacity by its demand ratio.

d. Identify the airport hourly capacity, i.e., the lowest quotient calculated in c above.

3-6. ANNUAL SERVICE VOLUME (ASV). Calculate the ASV as follows:

a. Calculate the weighted hourly capacity (C_w) for the runway component as follows:

(1) Identify the different runway-use configurations used over the course of a year.

(2) Determine the percent of time each runway-use configuration is in use (P_1 through P_n). Include those times when the hourly capacity is zero, i.e., the weather conditions are below airport minimums or the airport is closed for other reasons. If a runway-use configuration is used less than 2 percent of the time, that time may be credited to another runway-use configuration.

(3) Calculate the hourly capacity for each runway-use configuration (C_1 through C_n). See section 3-5.

(4) Identify the runway-use configuration that provides the maximum capacity. Generally, this configuration is also the configuration most frequently used.

(5) Divide the hourly capacity of each runway-use configuration by the hourly capacity of the runway-use configuration that provides the maximum capacity.

(6) Determine the ASV weighting factor (W_1 through W_n) for each runway-use configuration from Table 3-1.

Table 3-1. ASV Weighting Factors

Percent of Maximum Capacity	Weighting Factors			
	VFR	IFR		
		Mix Index (0-20)	Mix Index (21-50)	Mix Index (51-180)
91+	1	1	1	1
81-90	5	1	3	5
66-80	15	2	8	15
51-65	20	3	12	20
0-50	25	4	16	25

(7) Calculate the weighted hourly capacity (C_w) of the runway component by the following equation:

$$C_w = \frac{(P_1 \cdot C_1 \cdot W_1) + (P_2 \cdot C_2 \cdot W_2) + \ldots + (P_n \cdot C_n \cdot W_n)}{(P_1 \cdot W_1) + (P_2 \cdot W_2) + \ldots + (P_n \cdot W_n)}$$

b. Calculate the ratio of annual demand to average daily demand during the peak month (D). Typical annual demand to average daily demand ratios are provided in table 3-2.

c. Calculate the ratio of average daily demand to average peak hour demand during the peak month (E). Typical average daily to average peak hour demand ratios are provided in table 3-2.

Table 3-2. Typical Demand Ratios

Mix Index	Daily (D)	Hourly (E)
0-20	290-310	7-11
21-50	300-320	10-13
51-180	310-350	11-15

d. Calculate ASV by the following equation:

$$ASV = C_w \cdot D \cdot E$$

3-7. HOURLY DELAY TO AIRCRAFT ON THE RUNWAY COMPONENT. Hourly delay calculations described in this paragraph apply to those hours when the hourly demand does not exceed the hourly capacity of the runway component. For those hours when the hourly demand exceeds the hourly capacity of the runway component, paragraph 3-9 calculations apply. Calculate hourly delay as follows:

a. Calculate the hourly capacity of the runway component for the specific hour of interest.

b. Identify from figure 3-2 the figure number for delay (for the arrival delay index (ADI) and the departure delay index (DDI)).

c. Identify the hourly demand (HD) and the peak 15 minute demand (Q) on the runway component.

d. Calculate the ratio of hourly demand to hourly capacity (D/C).

e. Determine the arrival delay index (ADI) and departure delay index (DDI).

EXAMPLE 5. Determine the ASV of the example airport assuming there are 219,750 annual operations, 690 average day operations and 30 peak hour operations.

SOLUTION: The work sheet on page 12 illustrates one method of recording data.

1. Calculate C_n.

a. Runway-use Configuration. Identify the different runway-use conditions used over the course of a year and the mix index for each use. Enter in columns 1 through 4.

b. Percent of Use (P). Identify the percent of the time each configuration is used and enter in column 5. The figures shown on the work sheet in column 5 are hypothetical.

c. Runway Hourly Capacity (C). Calculate the hourly capacities of operating conditions as in example 1 and enter in column 6. Example 1 data are used for operating conditions 1 and 2.

d. Maximum Capacity Configuration. Identify the runway-use configuration that provides the maximum capacity.

e. Percent of Maximum Capacity. Divide the hourly capacity of each runway-use configuration by the capacity of the configuration that provides the maximum capacity and enter in column 7.

Operating condition	1	89/89	= 100
"	2	51/89	= 57
"	3	62/89	= 70
"	4	52/89	= 58
"	5	59/89	= 66
"	6	46/89	= 52

f. ASV Weighting Factor (W). From Table 3-1, identify the weighting factor (W) for each operating condition and enter in column 8.

Table 3-1. ASV Weighting Factors

Percent of Maximum Capacity	Weighting Factors			
	VFR	IFR		
		Mix Index (0-20)	Mix Index (21-80)	Mix Index (81-180)
91+	1	1	1	1
81-90	3	1	3	3
66-80	15	2	8	15
51-65	20	3	12	20
0-50	25	4	16	25

Figure A2-5. Annual service volume

Operating Condition No.	Weather	Runway Pattern	Mix Index	Percent of Year	Hourly Capacity	Percent Maximum Capacity	Weighting Factor
1	VFR		62	74	59	100	1
2	IFR		91	5	31	57	20
3	VFR		82	5	52	70	15
4	IFR		91	5	32	58	20
5	VFR		62	6	59	66	15
6	IFR		91	6	46	52	20
7	IFR	Below Minimums		5		-	25

Work sheet for ASV factors.

g. Weighted Hourly Capacity (C_w). Calculate the weighted hourly capacity using the following equation:

$$C_w = \frac{(P_1C_1W_1) + (P_2C_2W_2) + \cdots (P_nC_nW_n)}{(P_1W_1) + (P_2W_2) + \cdots (P_nW_n)}$$

$$C_w = \frac{(.74 \cdot 89 \cdot 1) + (.05 \cdot 51 \cdot 20) + (.05 \cdot 62 \cdot 15) + (.05 \cdot 52 \cdot 20) + (.04 \cdot 59 \cdot 15) + (.04 \cdot 46 \cdot 20) + (.03 \cdot 0 \cdot 25)}{(.74 \cdot 1) + (.05 \cdot 20) + (.05 \cdot 15) + (.05 \cdot 20) + (.04 \cdot 15) + (.04 \cdot 20) + (.03 \cdot 25)}$$

$C_w = \frac{287.56}{5.64}$ or 51 operations per hour. ← Variable of interest

2. Daily Demand Ratio (D). Calculate D using the equation:

$$D = \frac{\text{Annual}}{\text{Average Day—peak month}} = \frac{219,750}{690} = 318$$

3. Hourly Demand Ratio (H). Calculate H from the equation:

$$H = \frac{\text{Average Day—peak month}}{\text{Average Peak Hour—peak month}} = \frac{690}{50} = 14$$

4. Calculate ASV. ASV is calculated from the equation $ASV = C_w \cdot D \cdot H$

ASV = 51·318·14 = 227,052 operations per year.

5. Conclusion. ASV is an indicator of the annual operational capability of an airport adjusted for differences in hourly capacities which occur over the course of a year. In this example, the airport theoretically could have accommodated and additional 7,302 operations during the year.

Figure A2-5. Annual service volume (cont.)

f. Demand. Demand is the magnitude of aircraft operations to be accommodated in a specified time period.

g. Gate. A gate is an aircraft parking position used by a single aircraft loading or unloading passengers, mail, cargo, etc. A parking position which is regularly used by two aircraft at the same time is two gates for capacity calculations.

(1) Gate type is the size of the gate. A Type 1 gate is capable of accommodating all aircraft, including widebodies such as the A-300, B-747, B-767, DC-10, L-1011. A Type 2 gate will accommodate only non-widebodied aircraft.

(2) Gate mix is the percent of non-widebodied aircraft accommodated by the gate group.

(3) Gate occupancy time is the length of time required to cycle an aircraft through the gate.

h. Mix Index. Mix index is a mathematical expression. It is the percent of Class C aircraft plus 3 times the percent of Class D aircraft, and is written: %(C+3D).

i. Percent Arrivals (PA). The percent of arrivals is the ratio of arrivals to total operations and is computed as follows:

$$\text{Percent arrivals} = \frac{A+\frac{1}{2}(T\&G)}{A+DA+(T\&G)} \times 100, \text{ where}$$

A = number of arriving aircraft in the hour
DA = number of departing aircraft in the hour
T&G = number of touch and go's in the hour

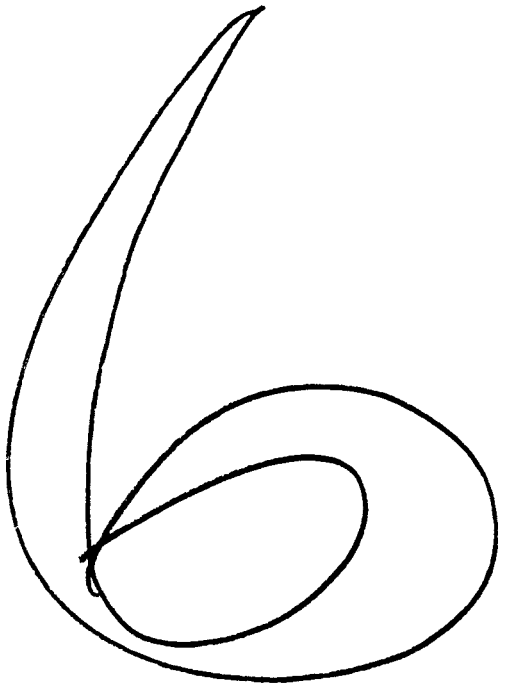
j. Percent Touch and Go's. The percent touch and go's is the ratio of landings with an immediate takeoff to total operations and is computed as follows:

$$\text{Percent touch and go's} = \frac{(T\&G)}{A+DA+(T\&G)} \times 100, \text{ where}$$

A = number of arriving aircraft in the hour
DA = number of departing aircraft in the hour
T&G = number of touch and go's in the hour

Touch and go operations are normally associated with flight training. The number of these operations usually decreases as the number of air carrier operations increase, as demand for service approaches runway capacity, or as weather conditions deteriorate.

k. Runway-use Configuration. Runway-use configuration is the number, location, and orientation of the active runway(s), the type and direction of operations, and the flight rules in effect at a particular time.



Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWCOD1.SFF

Starting Year : 1996
Final Year : 2001
ROI Year : 2012 (11 Years)

NPV in 2015($K): -2,531
1-Time Cost($K): 15,357

Net Costs ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	3,351	1,748	2,331	3,205	1,603	2,331	14,570	0
Person	0	-23	-45	-43	-41	-40	-192	-40
Overhd	11	-123	-345	-524	-783	-1,118	-2,883	-1,379
Moving	30	89	152	182	152	32	636	0
Missio	0	0	0	0	0	0	0	0
Other	0	2	3	4	3	3	15	0
TOTAL	3,393	1,693	2,096	2,824	933	1,208	12,148	-1,419

	1996	1997	1998	1999	2000	2001	Total
POSITIONS ELIMINATED							
Off	0	0	0	0	0	0	0
Enl	0	0	0	0	0	0	0
Civ	0	1	0	0	0	0	1
TOT	0	1	0	0	0	0	1
POSITIONS REALIGNED							
Off	0	0	1	1	1	2	5
Enl	0	1	2	3	2	2	10
Stu	0	0	0	0	0	0	0
Civ	1	2	5	6	5	4	23
TOT	1	3	8	10	8	8	38

Summary

CE MILCON numbers used -- 12/29/94
Mesa screen 4 calculated based on Brooks AFB.
No FE data available -- standard 6% cut applied
Used MAJCOM unique/moving costs -- no recurring costs for Luke

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEMOCD1.SFF

Costs ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	3,351	1,748	2,331	3,305	1,603	2,331	14,670	0
Person	0	0	1	3	5	7	17	7
Overhd	11	35	55	78	97	117	394	66
Moving	30	89	152	182	152	32	636	0
Missio	0	0	0	0	0	0	0	0
Other	0	2	3	4	3	3	15	0
TOTAL	3,393	1,875	2,543	3,474	1,860	2,490	15,634	94

Savings ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	0	0	0	0	0	0	0	0
Person	0	23	47	47	47	47	210	47
Overhd	0	158	400	603	880	1,235	3,276	1,467
Moving	0	0	0	0	0	0	0	0
Missio	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0
TOTAL	0	182	446	649	927	1,282	3,486	1,514

TOTAL ONE-TIME COST REPORT (COBRA v5.04) - Page 1/3
Date As Of 09:24 12/29/1994. Report Created 11:30 12/29/1994

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

(All values in Dollars)

Category	Cost	Sub-Total
Construction		
Military Construction	14,570,000	
Family Housing Construction	0	
Information Management Account	0	
Land Purchases	0	
Total - Construction		14,570,000
Personnel		
Civilian RIF	0	
Civilian Early Retirement	0	
Civilian New Hires	0	
Eliminated Military PCS	0	
Unemployment	0	
Total - Personnel		0
Overhead		
Program Planning Support	33,867	
Mothball / Shutdown	100,000	
Total - Overhead		133,867
Moving		
Civilian Moving	0	
Civilian PPS	28,800	
Military Moving	0	
Freight	9,509	
One-Time Moving Costs	600,000	
Total - Moving		638,309
Other		
HAP / RSE	840	
Environmental Mitigation Costs	0	
One-Time Unique Costs	14,000	
Total - Other		14,840
Total One-Time Costs		15,357,016
One-Time Savings		
Military Construction Cost Avoidances	0	
Family Housing Cost Avoidances	0	
Military Moving	0	
Land Sales	0	
One-Time Moving Savings	0	
Environmental Mitigation Savings	0	
One-Time Unique Savings	0	
Total One-Time Savings		0
Total Net One-Time Costs		15,357,016

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEMDCD1.SFF

Base: WILLIAMS, TX
(All values in Dollars)

Category	Cost	Sub-Total
Construction		
Military Construction	0	
Family Housing Construction	0	
Information Management Account	0	
Land Purchases	0	
Total - Construction		0
Personnel		
Civilian RIF	0	
Civilian Early Retirement	0	
Civilian New Hires	0	
Eliminated Military PCS	0	
Unemployment	0	
Total - Personnel		0
Overhead		
Program Planning Support	33.867	
Mothball / Shutdown	100.000	
Total - Overhead		133.867
Moving		
Civilian Moving	0	
Civilian PPS	28.800	
Military Moving	0	
Freight	9.509	
One-Time Moving Costs	600.000	
Total - Moving		638.309
Other		
MAP / PSE	840	
Environmental Mitigation Costs	0	
One-Time Unique Costs	14.000	
Total - Other		14.840
Total One-Time Costs		787.016
One-Time Savings		
Military Construction Cost Avoidances	0	
Family Housing Cost Avoidances	0	
Military Moving	0	
Land Sales	0	
One-Time Moving Savings	0	
Environmental Mitigation Savings	0	
One-Time Unique Savings	0	
Total One-Time Savings		0
Total Net One-Time Costs		787.016

ONE-TIME COST REPORT (COBRA v5.04) - Page 3/3
Data As Of 09:24 12/29/1994. Report Created 11:38 12/29/1994

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

Base: LUKE, AZ
(All values in Dollars)

Category	Cost	Sub-Total
Construction		
Military Construction	14,570,000	
Family Housing Construction	0	
Information Management Account	0	
Land Purchases	0	
Total - Construction		14,570,000
Personnel		
Civilian RIF	0	
Civilian Early Retirement	0	
Civilian New Hires	0	
Eliminated Military PCS	0	
Unemployment	0	
Total - Personnel		0
Overhead		
Program Planning Support	0	
Mothball / Shutdown	0	
Total - Overhead		0
Moving		
Civilian Moving	0	
Civilian PPS	0	
Military Moving	0	
Freight	0	
One-Time Moving Costs	0	
Total - Moving		0
Other		
HAP / RSE	0	
Environmental Mitigation Costs	0	
One-Time Unique Costs	0	
Total - Other		0
Total One-Time Costs		14,570,000
One-Time Savings		
Military Construction Cost Avoidances	0	
Family Housing Cost Avoidances	0	
Military Moving	0	
Land Sales	0	
One-Time Moving Savings	0	
Environmental Mitigation Savings	0	
One-Time Unique Savings	0	
Total One-Time Savings		0
Total Net One-Time Costs		14,570,000

INPUT DATA REPORT (COBRA v5.04)
Data As Of 09.24 12/29/1994. Report Created 11.39 12/29/1994

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESANAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\MEMCOD1.SFF

INPUT SCREEN ONE - GENERAL SCENARIO INFORMATION

Model Year One : FY 1996

Model does Time-Phasing of Construction/Savings: No

Base Name	Strategy:
WILLIAMS, TX	Closes in FY 2001
LUKE, AZ	Realignment

Summary:

CE MILCON numbers used -- 12/29/94
Mesa screen 4 calculated based on Brooks AFB.
No PE data available -- standard 6% cut applied.
Used MAJCON unique/moving costs -- no recurring costs for Luke

INPUT SCREEN TWO - DISTANCE TABLE

From Base:	To Base:	Distance:
WILLIAMS, TX	LUKE, AZ	49 mi

INPUT SCREEN THREE - MOVEMENT TABLE

Transfers from WILLIAMS, TX to LUKE, AZ

	1996	1997	1998	1999	2000	2001
Officer Positions:	0	0	1	1	1	2
Enlisted Positions:	0	1	2	3	2	2
Civilian Positions:	1	2	5	6	5	4
Student Positions:	0	0	0	0	0	0
Mission Eqpt (tons):	0	0	0	0	0	0
Suppt Eqpt (tons):	0	0	0	0	0	0
Military Light Vehicles:	0	0	0	0	0	0
Heavy/Special Vehicles:	0	0	0	0	0	0

INPUT SCREEN FOUR - STATIC BASE INFORMATION

Name: WILLIAMS, TX

Total Officer Employees:	5	PPMA Non-Payroll ($K/Year):	157
Total Enlisted Employees:	10	Communications ($K/Year):	2
Total Student Employees:	0	BOS Non-Payroll ($K/Year):	103
Total Civilian Employees:	24	BOS Payroll ($K/Year)	0
Mil Families Living On Base:	0.0%	Family Housing ($K/Year):	1,205
Civilians Not Willing To Move:	10.0%	Area Cost Factor:	1.00
Officer Housing Units Avail:	0	CHAMPUS In-Pat ($/Visit):	0
Enlisted Housing Units Avail:	0	CHAMPUS Out-Pat ($/Visit):	0
Total Base Facilities(KSF):	80	CHAMPUS Shift to Medicare:	20.9%
Officer VHA ($/Month):	106	Activity Code:	9
Enlisted VHA ($/Month):	80		
Per Diem Rate ($/Day):	97	Homeowner Assistance Program:	Yes
Freight Cost ($/Ton/Mile):	0.10	Unique Activity Information:	No

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWCOD1.SFF

INPUT SCREEN FOUR - STATIC BASE INFORMATION

Name: LUKE, AZ

Total Officer Employees:	647	BPHA Non-Payroll ($K/Year):	3.459
Total Enlisted Employees:	5.039	Communications ($K/Year):	1.458
Total Student Employees:	0	BOS Non-Payroll ($K/Year):	11.722
Total Civilian Employees:	1.146	BOS Payroll ($K/Year):	0
Mil Families Living On Base:	23.8%	Family Housing ($K/Year):	4.950
Civilians Not Willing To Move:	10.0%	Area Cost Factor:	1.00
Officer Housing Units Avail:	0	CHAMPUS In-Pat ($/Visit):	0
Enlisted Housing Units Avail:	0	CHAMPUS Out-Pat ($/Visit):	0
Total Base Facilities(KSF):	4.273	CHAMPUS Shift to Medicare:	20.9%
Officer VHA ($/Month):	177	Activity Code:	52
Enlisted VHA ($/Month):	126		
Per Diem Rate ($/Day):	108	Homeowner Assistance Program:	No
Freight Cost ($/Ton/Mile):	0.10	Unique Activity Information:	No

INPUT SCREEN FIVE - DYNAMIC BASE INFORMATION

Name: WILLIAMS, TX

	1996	1997	1998	1999	2000	2001
1-Time Unique Cost ($K):	0	1	3	4	3	3
1-Time Unique Save ($K):	0	0	0	0	0	0
1-Time Moving Cost ($K):	30	60	150	180	150	30
1-Time Moving Save ($K):	0	0	0	0	0	0
Env Non-MilCon Reqd($K):	0	0	0	0	0	0
Activ Mission Cost ($K):	0	0	0	0	0	0
Activ Mission Save ($K):	0	0	0	0	0	0
Misc Recurring Cost($K):	0	0	0	0	0	0
Misc Recurring Save($K):	0	0	0	0	0	0
Land (+Buy/-Sales) ($K):	0	0	0	0	0	0
Construction Schedule(%):	23%	12%	16%	22%	11%	16%
Shutdown Schedule (%):	0%	23%	12%	16%	22%	27%
MilCon Cost Avoidnc($K):	0	0	0	0	0	0
Fam Housing Avoidnc($K):	0	0	0	0	0	0
Procurement Avoidnc($K):	0	0	0	0	0	0
CHAMPUS In-Patients/Yr:	0	0	0	0	0	0
CHAMPUS Out-Patients/Yr:	0	0	0	0	0	0
Facil ShutDown(KSF):	80	Perc Family Housing ShutDown:				100.0%

Name: LUKE, AZ

	1996	1997	1998	1999	2000	2001
1-Time Unique Cost ($K):	0	0	0	0	0	0
1-Time Unique Save ($K):	0	0	0	0	0	0
1-Time Moving Cost ($K):	0	0	0	0	0	0
1-Time Moving Save ($K):	0	0	0	0	0	0
Env Non-MilCon Reqd($K):	0	0	0	0	0	0
Activ Mission Cost ($K):	0	0	0	0	0	0
Activ Mission Save ($K):	0	0	0	0	0	0
Misc Recurring Cost($K):	0	0	0	0	0	0
Misc Recurring Save($K):	0	0	0	0	0	0
Land (+Buy/-Sales) ($K):	0	0	0	0	0	0
Construction Schedule(%):	23%	12%	16%	22%	11%	16%
Shutdown Schedule (%):	0%	23%	12%	16%	22%	27%
MilCon Cost Avoidnc($K):	0	0	0	0	0	0
Fam Housing Avoidnc($K):	0	0	0	0	0	0
Procurement Avoidnc($K):	0	0	0	0	0	0
CHAMPUS In-Patients/Yr:	0	0	0	0	0	0
CHAMPUS Out-Patients/Yr:	0	0	0	0	0	0
Facil ShutDown(KSF):	0	Perc Family Housing ShutDown:				0.0%

Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESA\MAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

INPUT SCREEN SIX - BASE PERSONNEL INFORMATION

Name: WILLIAMS, AZ

	1996	1997	1998	1999	2000	2001
Off Force Struc Change:	0	0	0	0	0	0
Enl Force Struc Change:	0	0	0	0	0	0
Civ Force Struc Change:	0	0	0	0	0	0
Stu Force Struc Change:	0	0	0	0	0	0
Off Scenario Change:	0	0	0	0	0	0
Enl Scenario Change:	0	0	0	0	0	0
Civ Scenario Change:	0	-1	0	0	0	0
Off Change(No Sal Save):	0	0	0	0	0	0
Enl Change(No Sal Save):	0	0	0	0	0	0
Civ Change(No Sal Save):	0	0	0	0	0	0
Caretakers - Military:	0	0	0	0	0	0
Caretakers - Civilian:	0	0	0	0	0	0

INPUT SCREEN SEVEN - BASE MILITARY CONSTRUCTION INFORMATION

Name: LUKE, AZ

Description	Categ	New MilCon	Rehab MilCon	Total Cost($K)
APMC MILCON	OTHER	64.042	0	14.570

Assumed all new construction -- possible reduction available

STANDARD FACTORS SCREEN ONE - PERSONNEL

Percent Officers Married:	76.00%	Civ Early Notice Pay Factor:	9.00%
Percent Enlisted Married:	66.00%	Priority Placement Service:	50.00%
Enlisted Housing MilCon:	80.00%	PPS Actions Involving PCS:	50.00%
Officer Salary($/Year):	78,668.00	Civilian PCS Costs ($):	28,800.00
Off BAQ with Dependents($):	7,073.00	Civilian New Hire Cost($):	4,000.00
Enlisted Salary($/Year):	36,148.00	Nat Median Home Price($):	114,600.00
Enl BAQ with Dependents($):	5,162.00	Home Sale Reimburse Rate:	10.00%
Avg Unemploy Cost($/Week):	174.00	Max Home Sale Reimburs($):	22,385.00
Unemployment Eligibility(Weeks):	18	Home Purch Reimburse Rate:	5.00%
Civilian Salary($/Year):	46,642.00	Max Home Purch Reimburs($):	11,191.00
Civilian Turnover Rate:	15.00%	Civilian Homeowning Rate:	64.00%
Civilian Early Retire Rate:	10.00%	HAP Home Value Reimburse Rate:	22.90%
Civilian Regular Retire Rate:	5.00%	HAP Homeowner Receiving Rate:	5.00%
Civilian PIF Pay Factor:	39.00%	RSE Home Value Reimburse Rate:	0.00%
SF File Desc:		RSE Homeowner Receiving Rate:	0.00%

STANDARD FACTORS SCREEN TWO - FACILITIES

PPMA Building SF Cost Index:	0.93	Rehab vs. New MilCon Cost:	0.00%
BOS Index (RPMA vs population):	0.54	Info Management Account:	0.00%
(Indices are used as exponents)		MilCon Design Rate:	0.00%
Program Management Factor:	10.00%	MilCon SIOH Rate:	0.00%
Caretaker Admin(SF/Care):	162.00	MilCon Contingency Plan Rate:	0.00%
Mothball Cost ($/SF):	1.25	MilCon Site Preparation Rate:	0.00%
Avg Bachelor Quarters(SF):	256.00	Discount Rate for NPV.RPT/ROI:	2.75%
Avg Family Quarters(SF):	1,320.00	Inflation Rate for NPV.RPT/ROI:	0.00%

APPDET.FFT Inflation Rates:
1996: 0.00% 1997: 2.90% 1998: 3.00% 1999: 3.00% 2000: 3.00% 2001: 3.00%

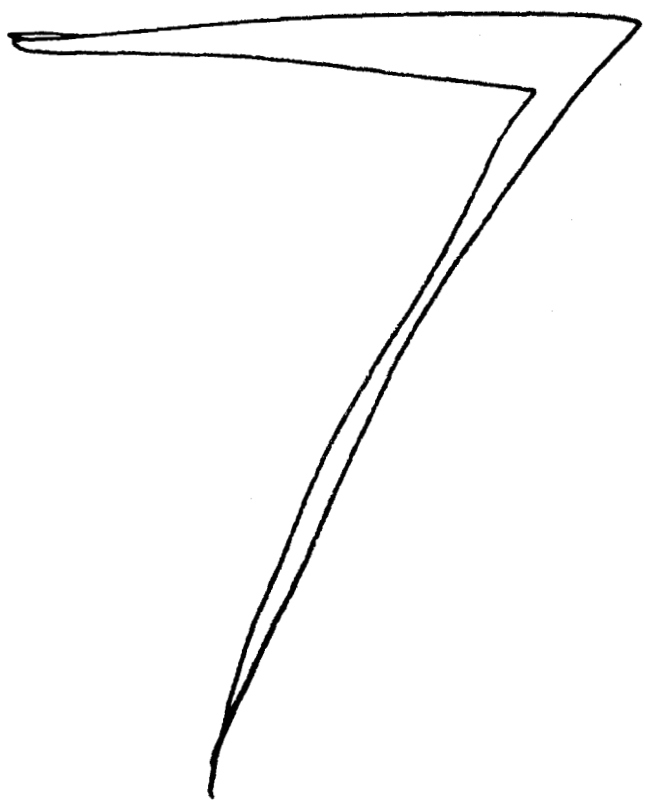
Department : Air Force
Option Package : Mesa to Luke
Scenario File : C:\COBRA504\LABS\MESA\MESAMAJ\MESA-LUK.CBR
Std Fctrs File : C:\COBRA504\NEWDOD1.SFF

STANDARD FACTORS SCREEN THREE - TRANSPORTATION

Material/Assigned Person(Lb):	710	Equip Pack & Crate($/Ton):	284.00
HHG Per Off Family (Lb):	14,590.00	Mil Light Vehicle($/Mile):	0.43
HHG Per Enl Family (Lb):	9,909.00	Heavy/Spec Vehicle($/Mile):	1.40
HHG Per Mil Single (Lb):	6,409.00	POV Reimbursement($/Mile):	0.18
HHG Per Civilian (Lb):	18,000.00	Avg Mil Tour Length (Years):	4.10
Total HHG Cost ($/100Lb):	35.00	Routine PCS($/Pers/Tour):	6,437.00
Air Transport ($/Pass Mile):	0.20	One-Time Off PCS Cost($):	9,142.00
Misc Exp ($/Direct Employ):	700.00	One-Time Enl PCS Cost($):	5,761.00

STANDARD FACTORS SCREEN FOUR - MILITARY CONSTRUCTION

Category	UM	$/UM	Category	UM	$/UM
Horizontal	(SY)	0	OTHER	(SF)	0
Waterfront	(LF)	0	Optional Category B	( )	0
Air Operations	(SF)	0	Optional Category C	( )	0
Operational	(SF)	0	Optional Category D	( )	0
Administrative	(SF)	0	Optional Category E	( )	0
School Buildings	(SF)	0	Optional Category F	( )	0
Maintenance Shops	(SF)	0	Optional Category G	( )	0
Bachelor Quarters	(SF)	0	Optional Category H	( )	0
Family Quarters	(EA)	0	Optional Category I	( )	0
Covered Storage	(SF)	0	Optional Category J	( )	0
Dining Facilities	(SF)	0	Optional Category K	( )	0
Recreation Facilities	(SF)	0	Optional Category L	( )	0
Communications Facil	(SF)	0	Optional Category M	( )	0
Shipyard Maintenance	(SF)	0	Optional Category N	( )	0
RDT & E Facilities	(SF)	0	Optional Category O	( )	0
POL Storage	(BL)	0	Optional Category P	( )	0
Ammunition Storage	(SF)	0	Optional Category Q	( )	0
Medical Facilities	(SF)	0	Optional Category R	( )	0
Environmental	( )	0			



T&E Activity Profile
Non Core Sites Realigned
Workload, Capacity, Excess Capacity
by
Functional Area & Test Facility Category

AIR VEHICLES SUMMARY Core and Non-Core Sites				
TFC	Workload	Capacity	Rev Excess	Percent Excess
DMS Total	1,273	1,987	714	36%
HITL Total	114,171	163,371	49,200	30%
IL Total	81,806	123,879	42,073	34%
ISTF Total	9,674	16,087	6,413	40%
MF-A Total	2,631	6,155	3,524	57%
MF-C Total	1,136	2,091	955	46%
MF-E Total	23,158	28,420	5,262	19%
MF-EM Total	943	943	0	0%
MF-G Total	30,719	47,487	16,768	35%
MF-P Total	25,854	37,155	11,301	30%
MF-ST Total	170	614	444	72%
OAR Total	27,578	39,704	* 12126	31%
AV Total	*319,113*	*467,893*	*148,780*	*32%*

* Total closure of Non-Core capacity would have reduced excess cap to 11,507. However, addtl. cap. of 619 was added to accomodate relocated wkld - -resulting in a final excess of 12,126

ELECTRONIC COMBAT SUMMARY Core and Non-Core Sites				
TFC	Workload	Capacity	Rev Excess	Percent Excess
DM&S Total	246	1,010	764	76%
HITL Total	2,833	420	** -2413	0%
IL Total	5,317	8,434	3,117	37%
ISTF Total	3,604	6,752	3,148	47%
MF-C Total	298	1,226	928	76%
MF-E Total	2,174	5,431	3,257	60%
MF-EM Total	4,929	4,929	0	0%
MF-G Total	1,728	2,400	672	28%
MF-RCS Total	6,674	13,763	7,089	52%
MF-Sig Total	826	1,516	690	46%
OAR Total	2,771	5,860	3,089	53%
EC Total	*31,400*	*51,741*	*20,341*	*39%*

** The JCSG analysis assumed the excess HITL wkld could be accomplished using the ISTF excess capacity of 3,148 hours.

ARMAMENT / WEAPONS SUMMARY Core and Non-Core Sites				
TFC	Workload	Capacity	Rev Excess	Percent Excess
DMS Total	55,305	93,574	38,269	41%
HITL Total	52,667	76,680	24,013	31%
IL Total	13,368	26,854	13,486	50%
ISTF Total	792	1,374	582	42%
MF-E Total	56,129	125,973	69,844	55%
MF-EM Total	2,096	2,615	519	20%
MF-G Total	44,228	56,007	11,779	21%
MF-GO Total	14,296	25,124	10,828	43%
MF-P Total	6,801	15,312	8,511	56%
MF-ST Total	2,608	5,944	3,336	56%
OAR Total	31,742	67,669	35,927	53%
AW Total	*280,032*	*497,126*	*217,094*	*44%*

Test Facility Category Legend	
DMS	Digital Modelling/Simulation
HITL	Hardware-in-the-Loop
IL	Integration Lab
ISTF	Installed System Test Facility
MF	Measurement Facility (various)
MF-A	Avionics & A/C Subsystems
MF-C	Comm/Nav/Antenna
MF-E	Environmental
MF-EM	Electro Magnetic Env Effects
MF-G	Guidance/Seeker/Sensor/Sig
MF-GO	Guns/Ordnance/Warheads
MF-P	Propulsion
MF-ST	Sled Tracks
MF-RCS	Radar Cross Section
MF-Sig	Signature
OAR	Open Air Range