To meet the demand-side research goal of recommending a procedure for measuring the joint content of a position, we executed the first four tasks shown in the general approach in Chapter One, asking a series of research questions:

- What are the preferred criteria to measure the joint content of a billet?
- What is the preferred method for using selected criteria to produce a list ordered from most joint content to least joint content?
  From an ordered list, which positions should qualify as JDAs—where could the list be “cut”?
- What are the implications for organizations, grades, and services of applying the preferred method?
- Can an objective approach be developed to identify critical joint billets?
- What are the implications of applying the preferred method for DoD policy and law?

The answers to these questions are delineated in this chapter.

JOINT TIME AND JOB FUNCTION ARE THE MOST IMPORTANT CRITERIA TO MEASURE JOINT CONTENT

To measure a position’s joint content, we started with a review of the Goldwater-Nichols legislation and other important literature—
Identifying and Supporting Joint Duty Assignments: Executive Summary

including follow-on amendments to the law, congressional testimony on the law and its implementation, and various reports and documents that have examined various aspects of the legislation. We also interviewed service personnel organizations, the Joint Staff, various defense agencies, and congressional staffers who were originally involved with the drafting of Goldwater-Nichols. This process identified an initial set of criteria relating to the joint nature of the position:

1. **Joint time**—the proportion of a billet’s time spent on matters involving other services or other nations.
2. **Job function**—what people do in their job, including the areas they work in and the duties they perform.
3. **Number of services**—the number of services a person interacts with in performing his job function.
4. **Organizational level**—the position of a billet within an organization’s hierarchy and the position of an organization within the overall defense hierarchy.
5. **Grade**—the military grade or rank of the billet.

Several group sessions were held with senior personnel from the services and various joint organizations to understand their perspectives on the relative importance of the various candidate criteria for measuring the joint content of a position. The end result was the identification of a set of weighted criteria that would be used for further analysis.

Based on the group sessions, joint time (JT) and job function (JF) turned out to be the most important criteria; together, they had been assigned almost 70 percent of the total weight and their individual weights were approximately equal (32 percent and 36 percent, respectively). Furthermore, the literature review, particularly an earlier General Accounting Office (GAO) report that examined the issue of Joint Duty Assignments,¹ and the interviews suggested that it was important to distinguish a billet’s job function between joint matters

---

(i.e., involving multiple services or other nations) and service matters (involving an officer's own service). Responses from the group sessions indicated that joint job function should have twice the weight as nonjoint job function (NJF).

Organizational level and number of services were weighted about equally (15 percent and 12 percent, respectively), but the former was eliminated because it would be difficult and highly subjective to assign values to it; grade, which was the lowest weighted criterion (5 percent) was eliminated for the same reason (i.e., how much more is an O-5 than an O-4?).

The final criteria selected to measure the joint content of a position included joint time, joint job function, nonjoint job function, and number of services.

A simple additive combination of Joint Time and Joint Job function scores is the preferred method for rank-ordering a list.

Given this set of criteria, a survey instrument was developed to collect the needed data from the identified population of over 15,000 candidate billets. The surveys for these billets were mailed during the first week of March 1994. When approximately 85 percent of the surveys were returned (July 1994), a data set of slightly over 12,000 surveys was prepared for analysis.

The scores for each of the selected criteria were determined by analyzing the appropriate questions in the survey instrument. Our ultimate objective was to produce an algorithm using these scored criteria or a subset of the criteria that was simple yet effective. We wanted to avoid an "overspecified" algorithm, or one that included more criteria (i.e., was more complex) than necessary to measure joint content adequately.

We identified the following four algorithms for measuring a position's joint content:

---

2These positions, identified by the Joint Staff Director for Manpower and Personnel (JS/J-1), included all the billets at the grade of O-3 or higher from the organizations currently represented on the JDAL, plus billets specifically nominated by the various military services. Therefore, the 15,000 candidate billets included all the positions currently on the JDAL plus other positions at the joint and service organizations that might be eligible for joint duty credit.
- Algorithm 1: Score = JT
- Algorithm 2: Score = 0.50JT + 0.50JF
- Algorithm 3: Score = 0.40JT + 0.40JF + 0.20 #Svcs
- Algorithm 4: Score = 0.45JT + 0.30JF + 0.15 NJF + 0.10 #Svcs

where JT = joint time
JF = joint job function
#Svcs = number of services
NJF = nonjoint job function.

Each algorithm produced a score for each of the more than 12,000 surveys processed. Figure 2.1 shows the results for each of the four algorithms described previously, plus the scores based solely on joint job function. The Y-axis in the graph is the joint score indexed from zero to 100. The X-axis corresponds to the number of surveys that
had a given score or higher. For example, all the curves show that approximately 6000 positions had joint index scores of 60 or higher.

Algorithm 1 (score based just on joint time) is approximately linear (the score of 100 for the first 2000 positions reflects officers that spend all their time on joint matters). The remaining algorithms, plus the joint function score, produce a different, similarly S-shaped curve compared to algorithm 1. This suggests that there is a marked difference in the results when joint function is added to joint time, but adding other variables to algorithm 2 has little or no effect on the overall distribution of joint score (however, there could be effects on individual billets).

One other method was used to compare the four algorithms. Three different notional-sized lists were extracted from the rank-ordered lists produced by each algorithm. That is, we assumed a new JDAL would be approximately the same size as the current JDAL and “cut” the list at that point. We also examined new lists that were approximately 25 percent smaller and 25 percent larger. Thus, for each of the four algorithms we had three “new” JDALs for comparison. For each of the new lists (i.e., for each “cut point”), we matched the billets on the list across the four algorithms. In each case, there was a significant difference in the content of a “new” JDAL when comparing algorithm 1 to algorithm 2. However, the results from algorithm 3 and algorithm 4 were virtually identical to the results from algorithm 2.

These comparisons across the four algorithms suggest that a relationship including joint time and joint job function is most effective for measuring the joint content of a position and that adding other criteria to this basic relationship does not materially change the resulting rank order of the position. In addition to the analytical rationale for selecting algorithm 2, the choice is also logically appealing. The algorithm has only criteria that are related to the joint aspects of a position. Including only joint time and joint job function in the algorithm keeps the methodology purely in the joint world. Finally, the two criteria in algorithm 2 are the ones that are consistent with the legal and DoD definitions of joint matters and joint duty assignment and with the methodology developed in the earlier GAO study.
STATISTICAL TECHNIQUES SUCH AS CLUSTER ANALYSIS ARE PROMISING WAYS TO CUT A RANK-ORDERED LIST

The selection of algorithm 2 results in a procedure for scoring and ranking the various positions based on their joint content. A second issue is where to “cut” the resulting list, or what minimum score identifies a “significant joint experience,” and therefore results in a position that should receive joint duty credit. This issue obviously helps determine the size of a new JDAL.

We used a statistical procedure termed cluster analysis, a term applied to a range of techniques for determining “natural groups” or clusters in sets of data.3

Because applying cluster-analysis techniques entails a degree of subjectivity, we also considered other techniques for determining potential break points in the rank-ordered list. We first applied the cluster-analysis procedure using various numbers of clusters (from two to ten).4 We then matched the resulting clusters to other statistical techniques. One such technique was to use the median score (the score when half of the positions had higher scores and the other half had lower scores). The median score of 58 corresponded closely to the boundary between the second and third cluster in a five-cluster grouping. We also used the lower inflection point in the curve for algorithm 2 (joint time/joint job function) shown in Figure 2.1. This inflection point, which occurs at a score of approximately 40, corresponds to the boundary between the third and fourth cluster of a five-cluster grouping.

Table 2.1 compares the size of the new JDALs based on the two break points to the size of the current JDAL for both the 12,000 surveys processed and for an extrapolation to the full 15,0005 candidate popu-

---

3A number of texts describe cluster analysis techniques; see, for example, Michael R. Anderberg, Cluster Analysis for Applications, Academic Press, San Diego, Calif., 1973.

4The Logistics Management Institute (LMI) performed the cluster analysis using a K-means cluster analysis heuristic with our algorithm 2 scores.

5For each organization, we calculated the percentage of the billets we processed that were in groups 1, 2, and 3. We used these percentages to estimate the number of unprocessed billets at each organization that might have been in the three groups. The exception to this general rule was for in-service billets where we assumed that the positions that did not return a survey would not be granted joint credit.
Table 2.1
Size of New JDALs Based on Cluster Groups

<table>
<thead>
<tr>
<th>List</th>
<th>Current JDAL</th>
<th>New JDAL Based on Groups 1–2</th>
<th>New JDAL Based on Groups 1–3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total JDAL for current law and policy (12,000 surveys)</td>
<td>7200</td>
<td>4900</td>
<td>7200</td>
</tr>
<tr>
<td>Total JDAL for current law and policy (15,000 surveys)</td>
<td>9100</td>
<td>5900</td>
<td>8700</td>
</tr>
</tbody>
</table>

Although these two potential break points have some theoretical basis, they are still subjective. The billets to the right of each break point (i.e., those with lower scores) do have joint content. In the case of the group 1 and 2 break point, many of the scores to the right have fairly high joint time and/or joint function scores. Because of this concern, it is important that the size of a new JDAL be determined in conjunction with analysis of the ability of the services to support joint duty assignments. This “supportability” analysis is discussed in Chapter Three.

APPLYING THE PREFERRED METHOD CHANGES THE CURRENT 100 PERCENT/50 PERCENT RULE

As mentioned in Chapter One, the current implementation procedures for the Goldwater-Nichols legislation result in 100 percent of the positions in some organizations (the Office of the Secretary of Defense [OSD], Joint Staff, and unified commands) and 50 percent of the positions in each defense agency being placed on the JDAL. Figure 2.2 shows for each organizational grouping the percentage of billets we processed (excluding all O-3 billets) that would be on a new JDAL using the preferred method for determining joint content (algorithm 2). The leftmost bar in each group shows the percentage of the processed billets (above the grade of O-3) that are currently on the JDAL. These percentages closely match the current 100 per-
Figure 2.2—Organizational Composition of a JDAL Based on Algorithm 2

The middle bar in each group is based on the break point containing the first three groups (scores of 40 or higher). The rightmost bar in each group is based on a JDAL composed from the first two groups (scores of 58 or higher).

For the new list that is approximately the same size as the current list (i.e., the larger list based on the first three groups), the 100 percent organizations such as the Joint Staff and the unified commands all lose positions on the JDAL. Many defense agencies and some other current 50 percent organizations gain positions. For the smaller list, all organizations lose positions on the JDAL, with the current 100 percent organizations feeling the largest impact.

**AN OBJECTIVE APPROACH SHOULD BE USED TO IDENTIFY CRITICAL BILLETS**

Another of the Goldwater-Nichols implementation procedures requires the Secretary of Defense to “designate not fewer than 1,000
joint duty assignment positions as critical joint duty assignment positions. Currently, all critical positions must be filled by JSOs, unless the Secretary of Defense or the Chairman of the Joint Chiefs of Staff grants a waiver on a case-by-case basis.

One of our research objectives was to develop an objective approach for identifying joint critical positions and to apply the approach to the survey data. The first step was to define some “filters” or attributes a position or the person in the position must possess before the position can be further considered as a candidate for a critical position. We identified four such filters—completion of Joint Professional Military Education (JPME), completion of a previous joint duty tour, a grade of O-5 or higher, and the elimination of certain functional duties (e.g., administrative)—that serve to narrow our list of all positions we surveyed to those that may qualify as critical positions.

After applying the filters to the survey data, a set of positions remains for further evaluation. We judge these remaining positions based on their joint content using the previously determined two most important attributes for determining joint content—joint time and joint function. Because JSOs must fill critical billets, and because JSOs have a broad perspective and a degree of continuity in the joint arena from their joint training and prior experience, we believe critical billets should involve some degree of data synthesis and decisionmaking. We, therefore, also include a third measure of joint content in our methodology for determining critical billets—joint decisionmaking.7

The filters identified previously were of an “either-or” nature. That is, the attributes of a position had to satisfy the stated conditions to pass through and become a candidate for a critical billet. These three measures of joint content—joint time, joint function, and joint decisionmaking—are more like “dials” than “filters.”

---


7We based the score for this measure on responses to Question 15 in our survey questionnaire. See MR-574-JS, Who Is Joint? Reevaluating the Joint Duty Assignment List, for a copy of the questionnaire.
By setting the joint content “dials” at different values, fewer or more billets will be identified as critical. As an example, Table 2.2 shows the resulting number of critical billets after the various filters and specific settings for the joint content “dials” are applied.

The results of our analysis of critical billets suggest that a systematic approach for determining which joint billets are designated as critical is preferred to the subjective methods currently used. Using reasonable filters and values for the appropriate criteria could result in fewer critical billets than the 1000 figure stated in Goldwater-Nichols.

**APPLYING PREFERRED METHOD MAY WARRANT POLICY/LAW CHANGES**

**Some O-3 Positions Have Significant Joint Content**

As mentioned in Chapter One, although the law includes O-3s as candidates for joint duty credit, current DoD policy restricts O-3 billets from being on the JDAL. Table 2.3 shows the results if the DoD policy were changed to allow O-3s to receive joint credit where appropriate.

---

**Table 2.2**

*Example of Critical Billet Methodology (Based on 12,000 billets processed)*

<table>
<thead>
<tr>
<th>Rule</th>
<th>Number of Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of billets processed</td>
<td>12,026</td>
</tr>
<tr>
<td>Require JPME II</td>
<td>5,246(^a)</td>
</tr>
<tr>
<td>Require previous joint tour</td>
<td>3,011</td>
</tr>
<tr>
<td>Grade O-5 or higher</td>
<td>1,892</td>
</tr>
<tr>
<td>Eliminate certain types of positions</td>
<td>1,735</td>
</tr>
<tr>
<td>Joint time ≥ 50%</td>
<td>1,184</td>
</tr>
<tr>
<td>Joint function ≥ 50%</td>
<td>892</td>
</tr>
<tr>
<td>Joint decisionmaking ≥ 25%</td>
<td>502</td>
</tr>
</tbody>
</table>

\(^a\)The values for number of positions are the billets remaining after each filter is applied successively. That is, of the 12,026 surveys processed, 5,246 passed through the first filter. Of those 5,246, 3,011 passed through the second filter, and so forth.
Table 2.3

Size of New JDALs Based on Scoring Algorithm, Including O-3 Billets
(Based on 12,000 surveys processed)

<table>
<thead>
<tr>
<th>Restriction</th>
<th>Current JDAL</th>
<th>New JDAL Based on Groups 1–2</th>
<th>New JDAL Based on Groups 1–3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current law and policy</td>
<td>7200</td>
<td>4900</td>
<td>7200</td>
</tr>
<tr>
<td>Including O-3 billets</td>
<td>—</td>
<td>850</td>
<td>1300</td>
</tr>
<tr>
<td>Total JDAL</td>
<td>7200</td>
<td>5750</td>
<td>8500</td>
</tr>
</tbody>
</table>

Figure 2.3 shows the number of O-3 billets that fall within the two potential new JDALs. The larger of the two new JDALs (based on the first three groups) is shown on the left and the JDAL based on the first two groups is shown on the right.8

Figure 2.3—Number of Positions by Organization Including Grade O-3

8The Joint Staff and OSD do not appear in Figure 2.3 because they have no or very few O-3 billets assigned.
Certain In-Service Billets Have Significant Joint Content

Current law restricts in-service billets from receiving joint credit. Table 2.4, which builds off of Table 2.3, shows the impact of allowing certain in-service billets to receive joint credit.

Figure 2.4 shows the distribution of the 800 and 350 (from the two groups) in-service billets by service. Most of the in-service billets with high joint scores are in the O-4 to O-6 grades.

<table>
<thead>
<tr>
<th>Restriction</th>
<th>Current JDAL (Groups 1–2)</th>
<th>New JDAL Based on Groups 1–2</th>
<th>New JDAL Based on Groups 1–3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current law and policy</td>
<td>7200</td>
<td>4900</td>
<td>7200</td>
</tr>
<tr>
<td>Including O-3 billets</td>
<td>—</td>
<td>850</td>
<td>1300</td>
</tr>
<tr>
<td>Including in-service billets</td>
<td>—</td>
<td>350</td>
<td>800</td>
</tr>
<tr>
<td>Total JDAL</td>
<td>7200</td>
<td>6100</td>
<td>9300</td>
</tr>
</tbody>
</table>

Figure 2.4—In-Service Positions Added to JDAL by Service
CONCLUSIONS AND RECOMMENDATIONS

From the demand-side analysis, we conclude that the joint content of billets can be adequately and sufficiently measured using a combination of joint time and joint job function. Regardless of where a list ordered on joint content is “cut” to form a new JDAL, the following statements can be made:

• Virtually all the candidate billets have some joint content associated with them.

• Based purely on the joint content algorithm, no organization will have all its positions on a new JDAL (i.e., there will be no 100 percent organizations unless a policy decision dictates that all the applicable billets in specific organizations be granted joint duty credit).

• Defense agencies will not uniformly have 50 percent of their positions on a new JDAL, as is the case with the current implementation of Goldwater-Nichols. Some defense agencies will have a far lower percentage, while others will have a much higher percentage of their positions indicated as JDAs.

• Some O-3 and in-service positions have significant joint content. Including these positions on a new JDAL would require changing the law and current DoD policy.

• Using a systematic approach to determining which positions are “critical joint billets” is preferred to the subjective approach currently used by organizations. Based on reasonable criteria values, there are likely to be fewer critical billets than the 1000 figure stated in the Goldwater-Nichols legislation.

Based on these findings, we make the following recommendations:

• Rank-order billets based upon their joint content as determined by using the joint time/joint function algorithm.

• Determine the size of a new JDAL (i.e., where to “cut” the ordered list) based on the number of joint positions the services can support. Our analysis indicates that almost all positions surveyed have some joint content.

• Employ a specific methodology for identifying critical billets.
• Change the DoD policy to allow O-3s to receive joint credit. There are advantages and disadvantages associated with allowing O-3 positions on the JDAL, but our analysis does identify O-3 billets with significant joint content.9

• Request changes to Goldwater-Nichols to allow in-service billets for grades of O-4 to O-6.

---

9Potential problems that might result from granting O-3s joint credit in meeting the promotion policy objectives are addressed in Chapter Three.