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# Expenditures and Manpower Requirements for Selected Federal Programs



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# Expenditures and Manpower Requirements for Selected Federal Programs

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Veterans Administration Health Care  
National Institutes of Health  
Manpower Institutional Training Program  
National Aeronautics and Space Administration  
Space Shuttle

U.S. Department of Labor  
John T. Dunlop, Secretary  
Bureau of Labor Statistics  
Julius Shiskin, Commissioner  
1975

Bulletin 1851



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## Preface

This study presents the manpower requirements, by industry and occupation, of a selected group of programs and agencies which are broadly representative of different types of Federal expenditures. The report was prepared by the Bureau of Labor Statistics with the financial assistance of the U.S. Department of Labor's Manpower Administration, Office of Manpower Research and Development, Howard Rosen, Director.

The Bureau has already published, or is in the process of publishing, a number of other studies of the manpower impact of Federal expenditures. *Manpower Impact of Federal Government Programs: Selected Grants-in-Aid to State and Local Governments* (Report 424, 1973), summarizes earlier BLS work on manpower requirements, provides an overview of the difficulties of tracing the downward flow of Federal monies, and presents the results of studies of two Federal programs—Title I of the Elementary and Secondary Education Act and the National School Lunch Program. Another project, in press, *Factbook for Estimating the Manpower Needs of Federal Programs* (Bulletin 1832), brings together in one publication a set of employment and occupational factors designed to aid agency administrators in estimating the manpower requirements of Federal outlays. A forthcoming study, focusing not only on the demand generated for manpower but also on the supply for 1972 and selected future years, is *Research on the Effects of Federal Programs on Occupational Requirements and Supply: A Demonstration Study of the National Institutes of Health*. Still another BLS research study, sponsored by the National Science Foundation, is *Impact of Federal Pollution Control and Abatement Expenditures on Manpower Requirements* (Bulletin 1836), which uses data collected from primary rather than secondary sources.

Coordination of the studies in this bulletin was provided by Thomas F. Fleming, Jr., of the Bureau's Division of Economic Growth, and Michael F. Crowley, of the Division of Manpower and Occupational Outlook. Participating in the research and the preparation of the report were: Arthur J. Andreassen, Douglas J. Braddock, Virginia A. Broadbeck, Mary S. Carroll, David S. Frank, Richard P. Oliver, Valerie S. Personick, Kenneth W. Rogers, and Marybeth M. Tschetter.

The Bureau gratefully acknowledges the help and cooperation of the many officials in the Federal agencies who provided the data on which these studies are based.

# Contents

	<i>Page</i>
<b>Introduction</b> . . . . .	1
Analytical framework . . . . .	1
Limitations . . . . .	2
 <b>Overview of results</b> . . . . .	 4
Employment requirements per billion dollars . . . . .	4
Employment requirements by industry sector . . . . .	5
Occupational patterns . . . . .	6
 <b>Chapter 1. Veterans Administration health care program</b> . . . . .	 8
Summary . . . . .	8
Program description . . . . .	8
Expenditures . . . . .	8
Employment requirements . . . . .	9
Occupational patterns . . . . .	10
 <b>Chapter 2. National Institutes of Health</b> . . . . .	 12
Summary . . . . .	12
Extramural program . . . . .	13
Direct operations . . . . .	17
 <b>Chapter 3. Manpower institutional training program</b> . . . . .	 19
Summary . . . . .	19
Program description . . . . .	19
Data and sample . . . . .	20
Expenditures . . . . .	20
Employment requirements and occupational patterns . . . . .	20
 <b>Chapter 4. National Aeronautics and Space Administration and the Space Shuttle program</b> . . . . .	 25
Summary . . . . .	25
Program description . . . . .	25
Data and sample . . . . .	25
Expenditures . . . . .	26
Employment requirements . . . . .	28
Occupational patterns . . . . .	30

## Contents—Continued

Tables:	<i>Page</i>
1. Employment requirements per billion dollars of expenditures by program and industry sector . . . . .	5
<b>Veterans Administration health care:</b>	
2. Expenditures by industry sector, fiscal year 1972 . . . . .	9
3. Employment requirements by industry sector, fiscal year 1972 . . . . .	10
4. Employment requirements by occupation, fiscal year 1972 . . . . .	11
<b>National Institutes of Health:</b>	
5. Expenditures and employment requirements by program, fiscal years 1969 and 1972 . . . . .	12
6. Employment requirements by occupation, fiscal year 1969 . . . . .	13
7. Domestic awards (extramural program) by type, fiscal year 1969 . . . . .	14
8. Expenditures and employment requirements, extramural program, fiscal year 1969 . . . . .	15
9. Direct employment requirements, extramural program, by occupation, fiscal year 1969 . . . . .	15
10. Purchases resulting from extramural program by industry sector, fiscal year 1969 . . . . .	16
11. Indirect employment requirements of extramural program by industry sector, fiscal year 1969 . . . . .	17
12. Employment by occupation, direct operations, fiscal year 1969 . . . . .	17
13. Employment generated by purchases, direct operations, fiscal year 1969 . . . . .	18
<b>Manpower Development and Training Act institutional training program:</b>	
14. Employment requirements by occupation, fiscal year 1972 . . . . .	21
15. Direct employment requirements by occupation, fiscal year 1972 . . . . .	22
16. Indirect employment requirements by industry sector, fiscal year 1972 . . . . .	23
17. Indirect employment requirements by occupation, fiscal year 1972 . . . . .	23
<b>National Aeronautics and Space Administration:</b>	
18. NASA purchases, selected industries, fiscal year 1973 . . . . .	27
19. Space Shuttle purchases, selected industries, fiscal year 1973 . . . . .	28
20. NASA indirect employment requirements by industry sector, fiscal year 1973 . . . . .	29
21. NASA indirect employment requirements, selected industries, fiscal year 1973 . . . . .	29
22. Space Shuttle indirect employment requirements by industry sector, fiscal year 1973 . . . . .	29
23. Space Shuttle indirect employment requirements, selected industries, fiscal year 1973 . . . . .	30
24. NASA employment requirements by occupation, fiscal year 1973 . . . . .	30
25. Space Shuttle employment requirements by occupation, fiscal year 1973 . . . . .	31

## Contents—Continued

	<i>Page</i>
Charts:	
1. Relationship of expenditures, employment, and occupational requirements . . . . .	3
2. Occupational patterns of selected Federal programs . . . . .	6
Appendixes:	
A. Technical notes . . . . .	32
B. Detailed tables: . . . . .	38
B-1. Expenditures for goods and services by program and industry . . . . .	39
B-2. Indirect employment requirements by program and industry . . . . .	41
B-3. Employment requirements by program and occupation . . . . .	45



## Introduction

Substantial amounts of Federal dollars flow into the economy each year. Federal expenditures in fiscal 1973 totaled more than \$255 billion, up from \$233.2 billion a year earlier. Just a decade earlier, Federal expenditures, at \$106.3 billion, were less than half their 1972 level. During the intervening 10 years, Federal Government expenditures for goods and services alone increased from \$61.0 billion to \$103.2 billion. Grants-in-aid to State and local governments climbed even faster—more than quadrupling in the period—with an average growth rate of approximately 16 percent. At the same time, transfer payments expanded by more than \$50 billion over the 10 years, for an average annual rate of growth of close to 12 percent.

Since Federal expenditures and policies substantially affect, not only public employment, but also private sector job opportunities, the development of a mechanism to measure their total impact on manpower is essential for assessing the effects of government programs.<sup>1</sup> In this study, and in other related studies, the Bureau of Labor Statistics has adapted techniques and models developed initially for long-term projections of industry and occupational employment needs to measure the current manpower requirements of Federal spending programs.

This report, consisting of five studies, focuses on the manpower requirements by industry and occupation for a selected group of programs and agencies which are broadly representative of different types of Federal expenditures. The Veterans Administration (VA) health care program is primarily an example of one in which the Federal Government is the direct purchaser of goods and services—in this case, the goods and services required for the operation of health facilities and medical programs. Research on the manpower requirements for the National Institutes of Health (NIH) not only studies the government in its role as a purchaser for its own research facility, but also investigates the impact of grants-in-aid or research contracts on other health care and research facilities. The study of the institutional training program under the Manpower Development and Training Act (MDTA), jointly administered by the U.S.

Departments of Labor and of Health, Education, and Welfare, shows the employment requirements of grants-in-aid or contracts to local governments and private organizations to train workers. The National Aeronautics and Space Administration (NASA) manpower impact study centers on the budget of an entire agency, much of which is contracted out to a variety of industrial, research, and academic facilities. In addition, the NASA study provides separate manpower requirements for the Space Shuttle program to demonstrate how requirements of a particular program change as it advances from the design stage through its completion.

### Analytical framework

At the heart of the manpower requirements estimating process are the Bureau's interindustry employment model and its industry-occupational matrix. The input-output tables<sup>2</sup> show what each industry in the economy purchases from every other industry, thereby providing an analytical tool for measuring the total effect on the production system, industry by industry, of a specified amount of demand for a final product. For example, the purchase of a new house requires employment not only in the construction industry but also in such sectors as lumber, heating, and plumbing as well as in supplying industries such as metals and basic mining. In addition, demands are created for a host of other purchases such as energy, packaging, and so on, through the whole cycle of production and distribution. The interindustry model traces the intricate linkages through the economy and measures both the direct and indirect requirements of the output of each of the industries. The production links are translated into employment requirements by use of employment-output ratios for each sector. After industry employment requirements are developed, they become the inputs to the industry-occupational matrix.<sup>3</sup> This matrix distributes total

<sup>2</sup>Appendix A describes the input-output system in more detail. See also appendix A of *The Structure of the U.S. Economy in 1980 and 1985*, Bulletin 1831 (Bureau of Labor Statistics, 1975).

<sup>3</sup>Appendix A describes the occupational matrix in more detail. See also *Occupational Employment Statistics, 1960-70*, Bulletin 1738 (Bureau of Labor Statistics, 1972).

<sup>1</sup>*Manpower Report of the President* (U.S. Department of Labor, March 1972).

national employment into occupations and cross-classifies them by industries. A newly revised matrix, based on the 1970 Census of Population, distributes approximately 400 occupations and cross-classifies them by 200 industries.

In this framework of analysis, where employment in each industry is determined by generated production levels, the estimates of employment requirements would generally be limited to direct Federal purchases of goods and services. This system, however, can be extended to other types of Federal outlays, such as grants-in-aid, transfer payments, and subsidies, by determining the purchases made by the sector receiving the Federal outlay. For example, the employment requirements created by grants to State and local governments can be estimated from studies of the purchases made by State and local governments in carrying out the purpose of the grants. Similarly, transfer payments to persons can be analyzed by considering the impact of these payments on personal consumption expenditures. This of course, involves determining the extent to which transfer payments become disposable income and consumption expenditures and further identifying the pattern of subsequent consumption purchases.<sup>4</sup>

*BLS research methods.* First the amount of direct employment generated in the public sector (and in certain of these studies, the private sector) was obtained from agency personnel records and published sources. The compensation associated with this employment was then subtracted from the expenditures of the program. Next, the balance of purchases formed the primary input into the input-output system. These remaining purchases were then sorted into a "bill of goods" which was developed by distributing a detailed list of purchases for each program or agency among those industry sectors which provide the product or service. Compilation of the bill of goods frequently involved examining an agency's records to determine expenditures for the program studied in the greatest amount of detail available. For studies of the VA health care program and the Space Shuttle program of NASA, data were collected for expenditures covering the whole program or agency. On the other hand, in the NIH, NASA, and MDTA studies, samples of the data were developed since the data sources themselves—grants-in-aid or contracts—were so numerous.

For the programs studied in this report, purchases developed into bills of goods were converted into 1963 dollars so that they would be compatible with the interindustry model for 1970 in which the sector

relationships are stated in 1963 dollars. The bills of goods were used as inputs into the model to produce the requirements for the output of all industries through all stages of production. Output requirements were next converted to the total employment required in each industry. Employment estimates, adjusted to represent price and productivity changes from 1970 to the year for which the programs were studied<sup>5</sup>, were used as inputs into the industry-occupational matrix. The employment data were analyzed before the matrix was used to distribute the jobs into occupational requirements, based on 1970 patterns. Distortions stemming from the use of the 1970 occupational data base are considered to be minimal since the occupational structures of industries change slowly and these variations are not usually significant in the short run. Chart 1 summarizes the process by which occupational requirements are derived.

*Employment definitions.* In this report, employment is classified as direct or indirect. Direct employment is defined as those jobs identified specifically from the payroll of the agency, program, or grant-in-aid examined; it is not a product of the input-output system. Direct employment is usually in the public sector, but may be in the private sector in the case of programs not operated by the government but funded by research contracts or grants-in-aid, such as those found in the NIH and MDTA studies. In contrast, indirect employment is that resulting from the expenditures of the agency or program for all goods and services other than those for the direct compensation of its own personnel. Included are both the primary or first tier of jobs—those required initially in the industry providing the product or service demanded—and the secondary tier, or all remaining jobs which are required in supporting industries. (See chart 1.)

### Limitations

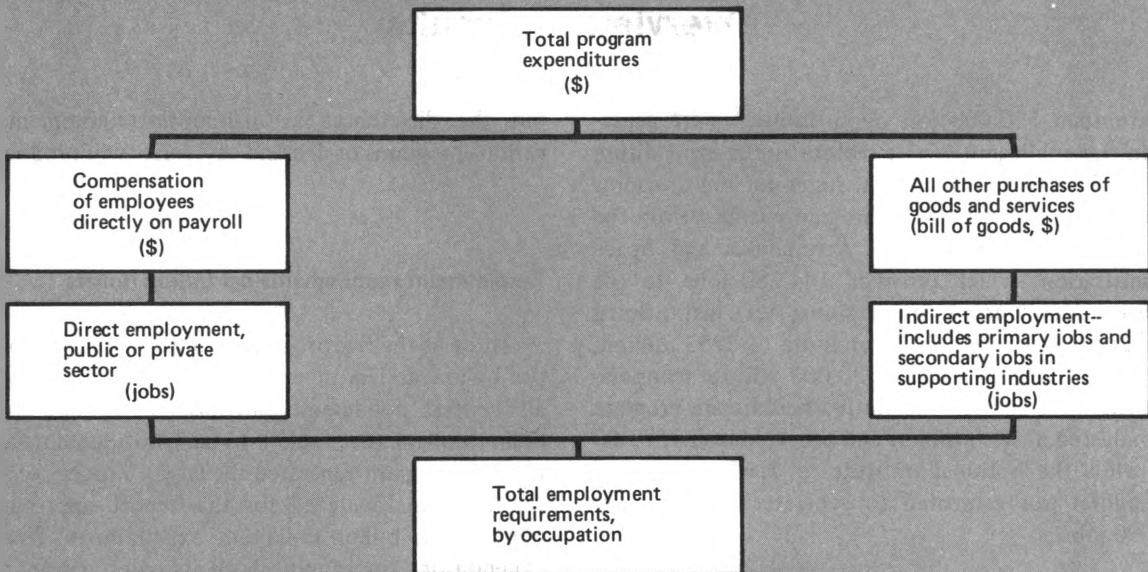
Several qualifications should be noted with respect to use of the interindustry employment model and the occupational matrix. The figures provided in this report refer only to *average* manpower requirements of a Federal program and not to the additional or *incremental* requirements resulting from an increase in the program. In determining the incremental requirements of a program, much depends on the nature of the producing sector and the state of the economy when the addition to demand is made. Since information is currently not available on incremental or marginal productivity ratios it is impossible to specify how many additional workers would actually be hired as a result of an increase in any of the programs covered. The

<sup>4</sup> At present, consumption patterns for differing population groups are available only for 1960-61. BLS expects soon to complete expenditure patterns for 1972-73 which will update and greatly expand this information.

<sup>5</sup> Data for the VA health care and MDTA programs are for fiscal year (FY) 1972. NASA and Space Shuttle data are for FY 1973. The NIH study is based on FY 1969 data, which were updated to 1972.

Chart 1.

### Relationship of Expenditures, Employment, and Occupational Requirements



difference between average and marginal impact on manpower requirements is significant both for individual industries and for the entire economy.<sup>6</sup>

The relative dispersion of the government expenditures also can affect manpower requirements. If a large amount of Federal dollars were spread over a large number of establishments or local governments in broad geographic areas, then the increment to each may be readily absorbed without additions to employment. However, if the same amount were expended in one establishment, industry, or area, then the relative impact of the increment may be such that it would substantially affect manpower requirements.

Another difficulty in assessing manpower requirements arises from the inability to ascertain whether a proposed expenditure by the Federal Government is an addition to, or a substitution for, other expenditures. For example, grants-in-aid to State and local governments may take the place of expenditures that would otherwise be funded by States and localities themselves. The grants would therefore be spent in lieu of the State or local funds. Transfer payments also do not necessarily lead to additional purchases of goods and services.

<sup>6</sup> Even for industries, the averages are only approximately representative, since differences in product-mix and establishment size would be involved in a specified demand change.

Medicare payments may in part substitute for the use of private funds by individuals to purchase health services. In this case, the funds would partially substitute for other expenditures and would also add new expenditures.

A further limitation to the manpower requirements studies is the omission of the multiplier and accelerator effects of the dollars expended. This means that the further employment and occupational effects generated as newly employed workers spend their earnings and consumer goods and services and as businesses invest in plant and equipment to meet increased demand are not included in the estimates.

Nevertheless, while these limitations exist, these five studies, together with other BLS research on manpower requirements, form a useful analytical framework for assessing the manpower requirements stemming from expenditures of Federal dollars. BLS has already started to disaggregate Federal expenditures both by program or agency—NASA, NIH, and so on—and by type—direct purchases or grants-in-aid. As a result, the employment and occupational patterns for individual programs and agencies have been shown to vary considerably. Such information should be useful for the determination of both the manpower requirements and the feasibility of proposed programs.

## Overview of Results

More than 500,000 job opportunities<sup>7</sup> were generated in the public and private sectors by the expenditure of some \$7.5 billion of Federal funds for the programs studied here. The size of the programs ranged from the \$3.3 billion of the National Aeronautics and Space Administration, which provided 194,280 jobs, to the Manpower Development and Training Act's institutional training programs with an expenditure of \$253 million, which required approximately 26,000 jobs for its operation. The Veterans Administration health care program was budgeted at \$1.8 billion and provided over 157,000 jobs, while the National Institutes of Health budget of \$2.1 billion was estimated to generate approximately 154,000 jobs.

	<i>FY 1972 expenditures<sup>8</sup> (millions)</i>
Total .....	\$7,468.8
VA health care .....	1,822.2
NIH .....	2,077.9
MDTA institutional training program .....	253.5
NASA <sup>9</sup> .....	3,315.2
Space Shuttle program .....	230.1

Since the actual employment and occupational patterns of the programs studied will be covered in their respective chapters, only a brief comparison of their relative job-generating characteristics is included here. For this comparison the best method is to state the manpower requirements in terms of the number of jobs generated over a common denominator such as a billion dollars of expenditures.<sup>10</sup> This approach readily points

<sup>7</sup>The concept of employment refers to the number of jobs and therefore is higher than the number of persons employed as measured in labor force surveys because of dual jobholding and other statistical differences.

<sup>8</sup>Annual references in this report are to fiscal years unless otherwise noted.

<sup>9</sup>The NASA study used FY 1973 data rather than FY 1972. To a limited extent the comparison with other programs could be affected by this time difference.

<sup>10</sup>This approach forms the basis for the manpower factors presented in detail in the *Factbook for Estimating the Manpower Needs of Federal Programs*, Bulletin 1832 (Bureau of Labor Statistics, 1975).

out the differences in manpower requirements that various programs or demand categories will produce.

### Employment requirements per billion dollars

Three of the five programs studied required more jobs per billion dollars of expenditures than the average for all Federal nondefense purchases of 66,600 jobs per billion dollars. (See table 1.) The institutional manpower training program generated the largest number of jobs of the programs analyzed for this report—approximately 136,500 per billion dollars of expenditures. Total NIH expenditures for running both its own facilities and its grants-in-aid activities generated about 83,700 jobs per billion dollars in 1972. NASA expenditures for 1973 generated job requirements equaling 58,600 jobs for each billion dollars spent. The Space Shuttle program of NASA considered alone required 57,000 jobs on the same billion-dollars basis.

Differences in the mix of public and private employees accounted for a substantial amount of the variance among the programs studied. For Federal nondefense purchases of goods and services as a whole, the number of employees on Federal payrolls constituted 55 percent of the jobs required. NASA contracts out a substantial share of its budget and has only 17 percent of its jobs within the agency. Similarly, the Space Shuttle program has only 19 percent of its jobs on its own payroll. The other three programs studied (NIH, VA, and MDTA programs) each had a much higher proportion of the employment generated by their expenditures on their own payrolls—reaching about 70 percent in the case of the VA health care program. Although this difference may reflect the labor intensiveness of some public programs as compared to others, it also reflects the fact that the system used in this analysis accounts for all dollars expended in the public sector, while in the private sector the procedures used do not reflect the manpower impact of depreciation, rental income, or corporate profits. Inclusion of these would narrow the differences between the private and public sectors in the number of jobs required.

**Table 1. Employment requirements per billion dollars of expenditures by program and industry sector**

Sector	Average, Federal nondefense programs <sup>1</sup>	Veterans Administration health care (VA)	National Institutes of Health (NIH)	Manpower Development and Training Act (MDTA) institution program	National Aeronautics and Space Administration (NASA)	Space Shuttle
	(calendar year 1972)	(fiscal year 1972)	(fiscal year 1972)	(fiscal year 1972)	(fiscal year 1973)	(fiscal year 1973)
Total .....	66,592	88,955	83,735	136,464	58,603	57,013
Direct employment .....	36,678	62,434	47,601	70,270	10,214	10,618
Indirect employment .....	29,914	26,521	36,134	66,194	48,389	46,395
Agriculture .....	193	824	2,262	3,996	234	209
Mining .....	393	240	311	567	343	352
Construction .....	2,742	1,722	1,508	1,021	954	648
Manufacturing .....	10,596	8,311	9,973	15,490	26,584	31,043
Transportation, communication, and public utilities .....	2,729	2,481	2,439	8,373	2,656	2,173
Trade .....	2,559	2,544	7,311	18,264	2,650	2,473
Finance, insurance, and real estate .....	742	592	1,285	3,689	1,006	895
Services .....	8,692	9,147	10,313	12,661	13,120	7,832
Government enterprises .....	1,268	660	732	2,133	912	769
Percent distribution						
Total .....	100.0	100.0	100.0	100.0	100.0	100.0
Direct employment .....	55.1	70.2	56.8	51.5	17.4	18.6
Indirect employment .....	44.9	29.8	43.2	48.5	82.6	81.4
Agriculture .....	.3	.9	2.7	2.9	.4	.4
Mining .....	.6	.3	.4	.4	.6	.6
Construction .....	4.1	1.9	1.8	.7	1.6	1.1
Manufacturing .....	15.9	9.3	11.9	11.4	45.4	54.5
Transportation, communication, and public utilities .....	4.1	2.8	2.9	6.1	4.5	3.8
Trade .....	3.8	2.9	8.7	13.4	4.4	4.3
Finance, insurance, and real estate .....	1.1	.7	1.5	2.7	1.7	1.6
Services .....	13.1	10.3	12.3	9.3	22.4	13.7
Government enterprises .....	1.9	.7	.9	1.6	1.6	1.4

<sup>1</sup> Based on factors given in the *Factbook for Estimating the Manpower Needs of Federal Programs*, Bulletin 1832 (Bureau of Labor Statistics, in press), p. 12.

SOURCE: Bureau of Labor Statistics.

**Employment requirements by industry sector**

In terms of job opportunities by major industry sector, the programs studied varied considerably among themselves and also differed from the pattern of total Federal nondefense purchases. Looking at the indirect jobs, the sectors affected most substantially were usually manufacturing, services, and trade, but the variations from one program to another were sizable. Manufacturing showed a range of 8,311 job opportunities (VA) to 26,584 (NASA) for a billion dollars expended compared to 10,596 per billion for total Federal nondefense purchases. With the exception of NASA, all programs studied purchased fewer goods on the average than the typical government program, and the types of purchases made were less likely to require large numbers of indirect jobs in supporting industries.

Services accounted for 8,692 jobs or 13.1 percent of the employment generated by a billion dollars of Federal nondefense spending. The five programs generated service jobs in a range of 9,147 (VA) to 13,120 (NASA) jobs per billion dollars. As a proportion of all the jobs generated by a particular program, services were highest for NASA, at 22.4 percent. This high percentage of service jobs is due to the greater than average reliance of the space agency on outside contractors for services.

Among the other major sectors, between 2,544 jobs (VA) and 18,264 (MDTA) in trade were required per billion dollars worth of expenditures compared to 2,559 for all Federal nondefense purchases. The very large number of trade sector job opportunities provided by the MDTA program reflected the allowances provided trainees which were used to purchase consumer goods in

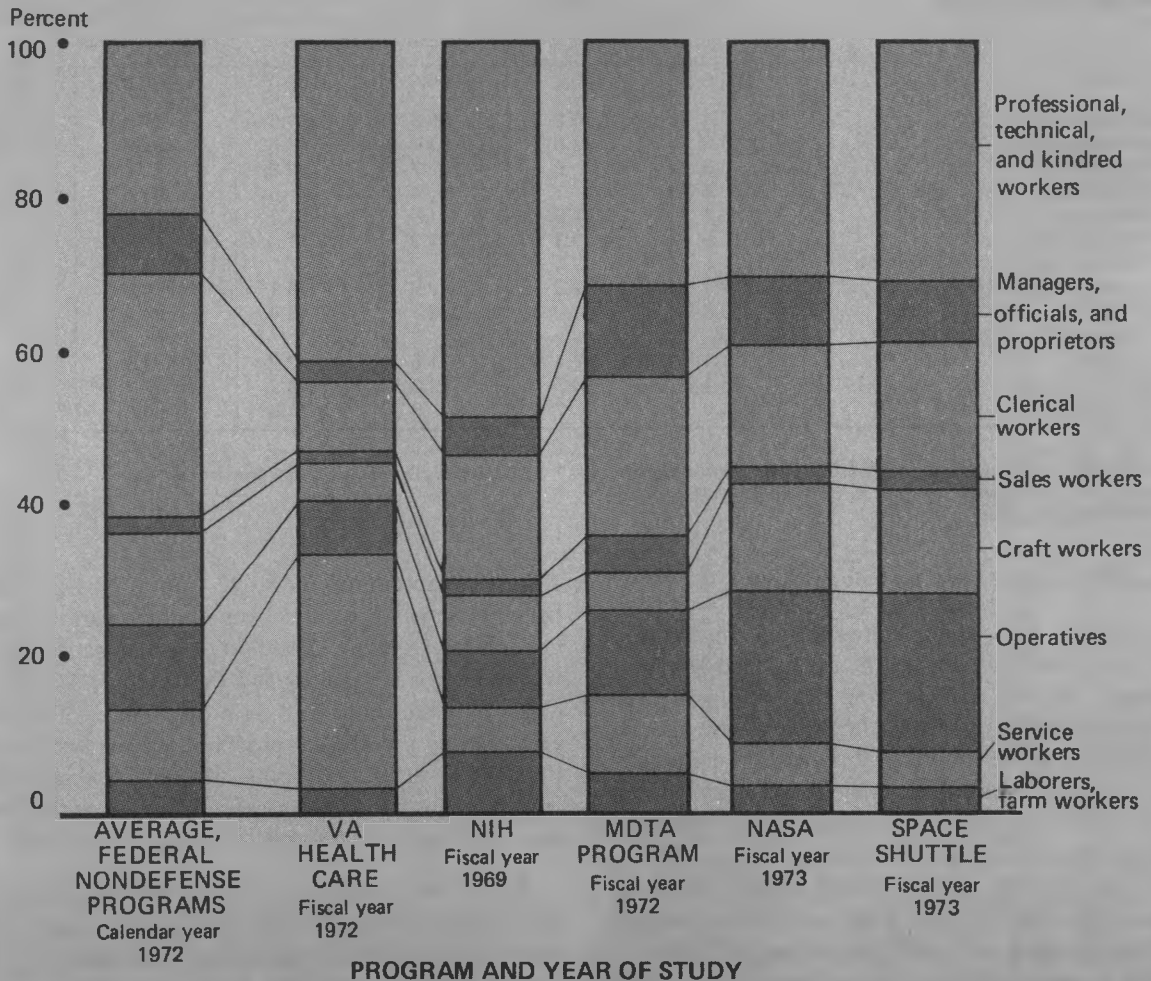
the retail trade sector. Similarly, the MDTA program's allowances for personal living expenses generated the highest number of jobs in the agriculture sector (food purchases), with transportation and utilities also affected. All the programs studied, however, required fewer jobs in construction than the average of 2,742 jobs per billion dollars for all Federal nondefense purchases. The VA health care program, which included hospital and extended care facility construction, generated the greatest number of construction jobs per billion dollars—1,722—of the five programs studied.

### Occupational patterns

Only in a very broad way do the major occupational groupings of the five studies resemble the pattern for total Federal nondefense expenditures. As in the sector as a whole, more than half of the occupations in these studies were classified as white collar; only a very small proportion were in the sales worker, laborer, or farm worker categories. Considerable variation was evident, however, in the proportion of jobs classified as operatives, craft workers, and service workers (chart 2).

Chart 2.

### Occupational Patterns of Selected Federal Programs



Source: Bureau of Labor Statistics.

Nevertheless, the mixture of white-collar jobs and other specific occupational requirements for the programs varied significantly from that for total Federal Government (nondefense). Although approximately 24 percent of all Federal nondefense jobs were classified as professional and technical, the share of these jobs for the programs studied ranged from a low of about 30 percent (NASA) to a high of more than 48 percent (NIH). The high proportion of professional and technical occupations reflected the more extensive scientific and technical missions of the programs studied than found in the government as a whole. In the case of NASA and the Space Shuttle program, substantial numbers of engineers are required both directly on government payrolls and in the aerospace and electronics industries which hold many of the NASA contracts. The large numbers of physicians, scientists, nurses, and other health-related occupations required for the health care and medical research programs of VA and NIH accounted for their high proportion of professional and technical occupations.

Twenty-three percent of the jobs required for all Federal nondefense expenditures were found in the craft and operative classifications. Unlike the total Federal nondefense sector, however, where the jobs were split fairly evenly between the two broad occupational groups, the programs studied displayed wide variations in their shares of the total. Both NASA and the Space Shuttle program had a higher proportion of their jobs in both the craft and operative categories than either the average of all Federal nondefense or any of the other

programs studied. The nature of the contracted-out expenditures for the space mission of NASA was the major factor accounting for its larger proportion of operatives and craft workers.

The programs in this study have a far smaller share of their jobs classified as clerical than does the Federal Government as a whole. Sales workers accounted for roughly the same percentage of all occupations for the Federal Government as a whole and the individual programs, with one exception—the MDTA institutional training program. Due primarily to the impact of living allowances paid to trainees, which, for the purposes of determining manpower requirements, were distributed through a personal consumption expenditures pattern, the MDTA study showed 4 percent of its jobs in the sales category—more than double the proportion in the other programs studied.

In four of the five studies laborers accounted for somewhat fewer jobs than the average for the Federal nondefense sector. In the NIH program, however, laborers accounted for 6.6 percent of the jobs because of the large number of caretakers needed for research animals. Farm workers amounted to less than 1 percent of the workers for the Federal nondefense sector as a whole and for most of the programs studied. The MDTA institutional training program, however, had a somewhat larger percentage of its jobs in farming, again due to the requirements generated by food purchases in the personal consumption expenditure pattern applied to the trainees' living allowances.

# Chapter 1. Veterans Administration Health Care Program

## Summary

Expenditures for health care by the Veterans Administration (VA) totaled slightly more than \$1.8 billion in 1972. Roughly 60 percent of the VA budget was allocated to meet the payroll costs of its 111,000 full- and part-time employees. The remainder of its monies generated 47,450 indirect jobs in supporting industries and services. Although the majority of employees directly on VA's payroll were health professionals—physicians, dentists, nurses, and medical and dental technicians—no single occupational group accounted for as much as one-fifth of the employment. Nearly two-thirds of the employment generated outside of VA occurred in the services and manufacturing sectors. The bulk of these jobs were in the transportation, communication, public utilities, trade, and construction sectors of the economy.

## Program description

The Veterans Administration was established in 1930 to serve the country's veterans and their immediate families. By 1972, the VA was spending nearly \$11 billion on various programs to aid 98.3 million beneficiaries—veterans, their families, and the dependents of deceased veterans. This study focuses on the VA health care program, which includes funding for 167 general and psychiatric hospitals, 77 nursing homes, 18 domiciliarys, and 8 restoration centers throughout the Nation. In addition, the VA engages in various types of medical and prosthetic research, postgraduate and in-service training, outpatient care in 200 clinics, and the construction of hospitals and other operating facilities. The VA provides services to approximately 950,000 patients through this nationwide network of hospitals, clinics, and other health facilities. These services include mental hygiene, speech pathology, spinal cord injury centers, nuclear medicine, drug dependence treatment centers, open heart surgery, clinics for the blind, and many others.

## Expenditures

From 1962 to 1972, total VA expenditures increased

rapidly, at an average annual rate of 7.1 percent. Medical care expenditures, however, advanced at an even faster pace during this period—at an annual rate of 8.6 percent. After attaining the \$1 billion mark in the early 1960's, these expenditures reached more than \$1.8 billion in 1972. Nearly 60 percent of this amount was direct compensation for the VA health care program's 111,000 full- and part-time employees. The remaining \$73 million was spent in 73 of the 134 industries delineated in the input-output model used in this study. VA health care expenditures were coded to the industries in the BLS interindustry model system, based on the goods and services actually purchased, in order to provide a bill of goods for the health care program.<sup>11</sup>

The manufacturing industries constituted the largest economic sector for VA health care purchases (table 2). They accounted for more than 46 percent of spending aside from compensation, and close to one-fourth of the total expenditures for the program. Of the 46 manufacturing industries that sold their products to the VA, 7 accounted for about 83 percent of the total expenditures for manufactured goods. Well over \$100 million was spent on food and drugs alone, and another \$60 million was used for medical, dental, and scientific instruments. Photographic equipment, electrical machinery, paper products, and miscellaneous textile products were the other major purchases from this sector.

Service industries received less than half as much money as the manufacturing industries. In this sector, medical services was the most important producing industry. The VA buys medical services such as medical and dental examinations, nursing services, contract hospitalization, outpatient treatment, and therapy. Accounting for one-half of the service expenditures, the medical services industry received more money than any other with the exception of the drug industry.

Within the transportation, communication, and public utilities sector, the significant industries for VA purchases were local transit and intercity bus transportation; electric utilities; and communications other than

<sup>11</sup> In addition, by reviewing the records of the Baltimore and Washington area VA hospitals, a distribution for capital assets was developed for use in estimating the manpower impact of these purchases. All assets purchased were amortized over their estimated service lives on a straight-line depreciation basis.



**Table 2. Expenditures for VA health care, by industry sector, fiscal year 1972**

Sector	Expenditures (thousands)	Percent of total	Percent, excluding compensation
Total .....	\$1,822,213	100.0	—
Compensation of Veterans Administration employees .....	1,091,197	59.9	—
Total, excluding compensation <sup>1</sup> .....	731,016	40.1	100.0
Construction .....	130,563	7.2	17.9
Manufacturing .....	340,313	18.7	46.6
Transportation, communication, and public utilities .....	64,753	3.6	8.9
Trade .....	734	3.1	.1
Finance, insurance, and real estate .....	1,525	.1	.2
Services .....	186,478	10.2	25.5
Government enterprises .....	2,680	.1	.4
All other <sup>2</sup> .....	3,970	.2	.5

<sup>1</sup>No VA health care expenditures are included for the agriculture or mining sectors.

<sup>2</sup>Includes three dummy industries: business travel, entertainment, and gifts; office supplies; and scrap, used and secondhand. For explanation, see

appendix A to the *Structure of the U.S. Economy in 1980 and 1985*, Bulletin 1831 (Bureau of Labor Statistics, 1975).

SOURCE: Bureau of Labor Statistics.

radio and television. Much of the money spent on local transportation was for payment to beneficiaries for travel to and from medical treatment centers. Telephone usage made up the major part of the communications expenditures.

Construction expenditures were for new hospital construction (which accounted for the bulk of the money spent in this sector) and for maintenance and repair. Virtually all of the expenditures in the trade sector were for goods handled by wholesalers. Less than \$1 million, a very small portion of VA's health care expenditures<sup>12</sup>, was spent in the retail trade sector and in the remaining economic sectors, which include government enterprises, finance, insurance, and real estate.

#### Employment requirements

A little more than a half billion dollars of expenditures on goods and services from the private sector generated close to 47,500 jobs in addition to those found directly on VA payrolls in 1972.<sup>13</sup> These manpower requirements were distributed over nearly all of the private industry sectors in the BLS interindustry model. While no single industry accounted for more than 12 percent of the total indirect employment, nearly

<sup>12</sup>In the input-output framework, goods are considered to be bought from the producer, that is, drugs are bought from the drug manufacturer and not from a wholesaler or retailer. However, at the time a purchase is assumed to be made, transportation costs are assumed to be incurred.

<sup>13</sup>The detailed purchases for VA health care and the resulting employment by detailed industry are shown in appendix tables B-1 and B-2.

three-fourths of the generated jobs fell into 25 industries.

Among the major sectors of the economy, manufacturing and services shared about two-thirds of the indirect employment (table 3). More than one-half of the remaining jobs were generated in transportation, communication, and public utilities, and in wholesale and retail trade. The construction sector accounted for 6.5 percent of the generated indirect employment, while agriculture, finance, insurance, real estate, and government enterprises together accounted for 8 percent. The mining sector was affected only marginally, with less than 1 percent of the indirect employment generated.

The manufacturing sector was by far the largest provider of the goods and services purchased for VA health care. Services, however, are more labor intensive than the manufacturing sector; employment per unit of output is higher than in manufacturing. This explains why more jobs were generated in the service industries, despite the fact that VA expenditures for manufactured goods were more than one-half of total spending except for payrolls.

Most of the manufacturing employment occurred in the production of medical and dental instruments, drugs, scientific and controlling instruments, and processed foods. Combined, these industries accounted for about 36 percent of the jobs generated in this sector, and for nearly 12 percent of all the indirect employment. Two of these sectors—medical and dental instruments, and scientific and controlling instruments—are characterized by high ratios of employment to output. Consequently, even though they received considerably less VA money than the drug and food products industries, their share of the generated employment was greater. None of the

**Table 3. Employment requirements of VA health care by industry sector, fiscal year 1972**

Sector	Number of jobs	Percent of total employment	Percent of indirect employment
Total .....	159,151	100.0	—
Direct employment (Veterans Administration) . . .	111,702	70.2	—
Indirect employment .....	47,449	29.8	100.0
Agriculture .....	1,475	.9	3.1
Mining .....	429	.3	.9
Construction .....	3,081	1.9	6.5
Manufacturing .....	14,869	9.3	31.3
Transportation, communication, and public utilities .....	4,438	2.8	9.4
Trade .....	4,551	2.9	9.6
Finance, insurance, and real estate .....	1,059	.7	2.2
Services .....	16,366	10.3	34.5
Government enterprises .....	1,181	.7	2.5

SOURCE: Bureau of Labor Statistics.

other manufacturing industries accounted for as much as 2 percent of the total indirect manpower impact.

The services sector is not nearly as large as manufacturing—it accounted for only 10.6 percent of total final demand and 9.4 percent of total output for the entire U.S. economy in 1970.<sup>14</sup> But, while VA's spending for health care in the services sector was a little more than half of the expenditure total for manufactured goods, about 1,500 more jobs were generated in service industries than in manufacturing (due mainly to the more labor-intensive characteristics of the services sector). Six industries within this sector shared about 30 percent of the total generated employment and more than 86 percent of the service-related jobs.

Due to the large expenditures for nursing services, medical and dental examinations, hospital services, outpatient care, and research, the greatest employment effects in the services sector were for doctors, dentists, and other medical services and for nonprofit organizations. The professional services accounted for over three-fifths of the service employment. Contractual services, equipment rental, maintenance and repair, as well as various other services including laundry and cleaning, janitorial, and burial services, were largely responsible for the remaining service-generated jobs.

In FY 1972, the trade sector received \$734 million in VA health care expenditures, with the vast bulk of these funds going to the wholesale sector. Even though the employment/output ratio in the retail trade industry was nearly three times as high as in the wholesale sector, it could not offset the huge difference in the amounts

spent in each industry. Only 1,234 jobs were generated in retail trade, which was little more than a third of the employment that occurred in wholesale trade.

Slightly more than 4,400 jobs were generated in the industries making up the transportation, communication, and public utilities sector. A relatively small sector of the economy, this group of industries gained only about 30 percent as much employment as the manufacturing sector as a result of VA spending. Most of the expenditures in this sector were concentrated in local transportation, communications (largely telephone usage), and electric utilities. Local transportation, truck transportation, and communications as a group accounted for two-thirds of the employment generated in this sector, but for only 6.5 percent of the total indirect employment. The remaining jobs in this area were distributed mainly among railroad and air transportation and gas and electric utilities.

Of the remaining sectors of the economy, construction was the most important in terms of manpower impact. In this sector, expenditures of \$130.6 million generated 3,081 jobs—two-thirds in maintenance and repair construction and the remainder in new hospital construction. Agricultural employment was generated by the large amount of VA expenditures for processed food products, which in turn generated jobs in basic agricultural production. The small amount of indirect employment in the mining sector hinged on the demand for crude petroleum, gasoline, and other fuels. Employment was equally distributed among the finance, insurance, and real estate sectors.

#### Occupational patterns

In 1972, the manpower requirements of the VA health care program totaled slightly more than 159,000

<sup>14</sup>In this context, finance, insurance, and real estate; transportation, communication, and public utilities; and wholesale and retail trade are classified outside the services sector. Services include medical, legal, educational, business, and other professional services.

jobs. Of this number, well over 111,000 represented employees directly on VA payrolls. Reflecting the purpose of the VA health care program, the occupational pattern was oriented heavily toward medical occupations (table 4). Approximately one-half of those employed by the VA in its health care program were registered nurses, physicians and surgeons, or other medical and dental workers. Practical nurses accounted for more than another quarter of VA employment. Clerical workers were the only nonmedical or non-scientific occupational group with significant representation.

The indirect employment generated by VA health care spending was distributed among 421 detailed occupations in the BLS industry-occupational matrix.<sup>15</sup> These jobs were fairly evenly dispersed among the nine major occupational categories, with no single category containing less than 1,000 or more than 9,000 jobs. The largest group, operatives, accounted for about 19 percent of the occupational employment while the smallest,

<sup>15</sup>Detailed occupational data for the VA employment requirements are shown in appendix table B-3.

farmers and farm workers, made up about 3 percent of the total. The "other operatives" subgroup (excluding transportation operators) contained close to one-half of all the operatives required. Most of these workers were machine operators, assemblers, sewers, or stitchers. Truck and bus drivers represented the next largest group, accounting for more than one-fourth of the total number of operatives. Their employment was generated by the transportation expenditures for which recipients of VA medical care are reimbursed.

Professional and technical workers made up 18 percent of the total indirect employment. The largest subgroup within this category were the medical workers, reflecting the relatively heavy purchases of medical services. Dentists constituted about one-half of this group, while most of the remainder consisted of physicians, osteopaths, and registered nurses. The "other professional and technical workers" were primarily accountants, research workers, personnel and labor relations workers, and psychologists, while "health technologists and technicians" were largely prosthetic device repairers, clinical lab technicians, and dental hygienists.

**Table 4. Employment requirements of VA health care by occupation, fiscal year 1972**

Occupation	Total employment		Direct employment		Indirect employment	
	Number of jobs	Percent	Number of jobs	Percent	Number of jobs	Percent
Total .....	159,150	100.0	111,700	100.0	47,450	100.0
Professional, technical, and kindred workers .....	66,050	41.5	57,440	51.4	8,610	18.1
Medical workers, except technicians .....	51,361	32.3	49,361	44.2	2,000	4.2
Dentists .....	2,110	1.3	1,100	1.0	1,010	2.1
Physicians .....	14,650	9.2	14,200	12.7	450	1.0
Registered nurses .....	20,530	12.9	20,150	18.0	380	.8
Health technologists and technicians .....	8,590	5.4	7,490	6.7	1,100	2.3
Other professional and technical workers .....	7,000	4.4	5,390	4.8	1,610	3.4
Psychologists .....	1,800	1.1	1,800	1.6	—	—
Managers, officials, and proprietors .....	4,720	3.0	830	.7	3,890	8.2
Sales workers .....	1,530	1.0	—	—	1,530	3.2
Clerical workers .....	14,810	9.3	6,360	5.7	8,450	17.8
Stenographers, typists, and secretaries .....	7,100	4.5	4,190	3.8	2,910	6.1
Craft and kindred workers .....	7,520	4.7	450	.4	7,070	14.9
Operatives .....	9,210	5.8	220	.2	8,990	18.9
Service workers .....	51,630	32.4	46,000	41.7	5,630	11.9
Practical nurses .....	31,100	19.5	30,840	27.6	260	.5
Laborers, except farm .....	2,430	1.5	450	.4	1,980	4.2
Farmers and farm workers .....	1,310	.8	—	—	1,310	2.8

NOTE: Items may not add to totals because of rounding.

SOURCE: Bureau of Labor Statistics.

## Chapter 2. National Institutes of Health

### Summary

The National Institutes of Health (NIH), the Federal Government's chief biomedical research agency, funds an extensive program of health research, training, construction, and dissemination of medical information. This is accomplished primarily through grant and contract awards to individuals for medical and related projects, but also through the operation of its own laboratories and clinical center.

Since 1960, grants and other awards have typically represented over 85 percent of the total NIH budget. In fiscal year 1969, the year selected for the manpower impact study, grants and awards, or the extramural program, accounted for almost \$1.3 billion of total NIH expenditures of \$1.5 billion. The extramural program supported slightly over 112,000 jobs throughout the economy that year, nearly 57,000 full-time equivalent jobs directly supported by the award funds and over 55,000 full- and part-time jobs generated indirectly by

the purchases made by the grantees and contractors.<sup>16</sup>

Fiscal year 1969 was selected for study on the basis of data availability. Since that time the budget of the National Institutes of Health has topped the \$2 billion mark, with the extramural program rising to \$1.8 billion in 1972. By using the data developed in the 1969 study, it was estimated that the 1972 awards program supported over 77,000 direct full-time equivalent jobs and generated an additional 61,000 jobs through purchases, for a total of about 138,000.<sup>17</sup> The direct operations of NIH resulted in 12,300 jobs on its own payroll in FY 1972 and an estimated 6,000 jobs in indirect employment.

As summarized in table 5, NIH expenditures for all

<sup>16</sup>These manpower requirements for NIH extramural operations exclude the manpower requirements for overhead costs of institutions performing the grants or contracts.

<sup>17</sup>To estimate the 1972 employment figures, expenditures on grants and other awards in 1972 were scaled to the totals for 1969, with adjustments made for productivity and price changes.

**Table 5. NIH expenditures and employment requirements by program, fiscal years 1969 and 1972**

Program	1969		1972	
	Expenditures (thousands)	Employment	Expenditures (thousands)	Employment
Total .....	\$1,479,695	( <sup>1</sup> )	\$2,077,908	( <sup>1</sup> )
Total less grant overhead .....	1,333,054	128,984	1,841,572	154,204
Awards (extramural program) .....	1,291,075	( <sup>1</sup> )	1,815,098	( <sup>1</sup> )
Awards less grant overhead .....	1,144,435	112,027	1,578,762	137,983
Fellowships and loans .....	132,071	13,239	211,599	14,878
Construction grants .....	172,955	10,773	73,819	4,480
Other grants and contracts .....	986,049	( <sup>1</sup> )	1,529,680	( <sup>1</sup> )
Personnel .....	<sup>2</sup> 471,099	<sup>3</sup> 56,914	<sup>4</sup> 759,453	<sup>3</sup> 77,390
Purchases .....	<sup>2</sup> 331,190	31,101	533,892	41,235
Overhead .....	<sup>2</sup> 146,640	( <sup>1</sup> )	<sup>4</sup> 236,336	( <sup>1</sup> )
Direct operations .....	188,620	16,957	262,810	16,221
Personnel (NIH staff) .....	123,484	<sup>5</sup> 11,605	178,268	<sup>5</sup> 10,270
Purchases .....	65,136	5,352	84,542	5,951

<sup>1</sup> Data on employment resulting from overhead expenditures not available.

<sup>2</sup> Represents sample results and therefore does not add precisely to total.

<sup>3</sup> Full-time equivalent jobs; all other employment figures are a count of both full- and part-time jobs. Full-time equivalent

equals the total number of hours worked on a job in 1 year divided by 2,080, the total number of hours worked on a full-time job in a regular work year.

<sup>4</sup> Estimated.

<sup>5</sup> Full-time only.

SOURCE: Bureau of Labor Statistics.

programs generated total employment requirements of over 154,000 jobs in 1972. Table 6 summarizes the occupational composition of this employment. Although these data are for FY 1969, the proportions in the occupational groups would not be significantly different for 1972.

### Extramural program

Under the BLS system of determining manpower impact, the expenditures for grants and awards might be considered purchases of services and be applied to the appropriate industry sector in the bill of goods to determine the employment indirectly supported in the educational services and other industry sectors receiving these funds. However, this technique would not give very enlightening results because of the specialized nature of the employment requirements and the magnitude of the extramural awards program. Instead, the extramural awards program was examined separately, in much the same manner as if it were a separate Federal

program. Thus, there are direct and indirect employment requirements for the awards program as well as for the direct NIH operations.

The direct awards program employment consists of those who work directly on the grants and contracts. They are not Federal employees, as would be the case with the direct employment in other programs. The indirect employment is the employment supported throughout the economy by the contractors' and grantees' expenditures for goods and services used in fulfilling the grants and contracts.

There were two parts of the extramural awards program which had no direct employment; these were examined separately. The fellowships, scholarships, and loans program, which involves direct payments to students, generated indirect employment when the students spent these funds for goods and services. Funds for construction generated indirect employment in the construction and other industries. There was also a portion of the contractors' and grantees' expenditures for goods and services, the "overhead" portion, for which no employment estimate was available.

**Table 6. NIH employment requirements by occupation, fiscal year 1969**

Occupation	Total (except fellowships and loans)	Extramural program			Direct operations	
		Direct employment	Indirect employment		NIH staff	Employment generated by purchases
			Generated by construction grants	Generated by purchases		
Total .....	115,745	56,914	10,773	31,101	11,605	5,352
Professional, technical, and kindred workers .....	56,646	44,736	858	5,119	5,213	720
Managers, officials, and proprietors .....	5,691	179	1,060	2,845	1,149	458
Sales workers .....	2,554	—	414	1,916	—	224
Clerical workers .....	18,746	7,229	1,438	6,002	3,039	1,038
Craft and kindred workers .....	8,357	323	3,370	3,558	371	735
Operatives .....	8,724	9	2,070	5,309	330	1,006
Service workers .....	6,583	896	380	4,075	706	526
Laborers, except farm .....	7,604	3,542	1,118	1,750	797	397
Farmers and farm workers .....	840	—	65	527	—	248
Percent distribution						
Total .....	100.0	100.0	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers .....	48.9	78.6	8.0	16.5	44.9	13.5
Managers, officials, and proprietors .....	4.9	—	9.8	9.2	9.9	8.6
Sales workers .....	2.2	—	3.8	6.2	—	4.2
Clerical workers .....	16.2	12.7	13.4	19.3	26.2	19.4
Craft and kindred workers .....	7.2	.6	31.3	11.4	3.2	13.7
Operatives .....	7.5	—	19.2	17.1	2.8	18.8
Service workers .....	5.7	1.6	3.5	13.1	6.1	9.8
Laborers, except farm .....	6.6	6.2	10.4	5.6	6.9	7.4
Farmers and farm workers .....	.7	—	.6	1.7	—	4.6

NOTE: Direct jobs of the extramural program are full-time equivalent jobs (see footnote 3, table 5). NIH staff jobs are full-time jobs only. All other job measures are a count of both full- and part-time jobs.

SOURCE: Bureau of Labor Statistics.

**Program description.** Research grants, the largest grant category in terms of both number and dollar amount, support a wide variety of projects. These range from the funding of discrete, specified research projects requiring less than \$5,000 to the support of entire centers engaged in health research, amounting in some cases to more than \$1 million.

While research grants are geared primarily toward the support of basic research, research contracts are used mainly to test or develop new products or procedures for use by the scientific community. This form of award for research has grown more rapidly than grants in the last few years: in 1963 contracts accounted for about 9 percent of total research award funds; by 1969 they were 14 percent; and in 1972 about 21 percent.

Medical training grants are awarded by the Bureau of Health Manpower Education, a division which has since been transferred out of NIH to another part of the Department of Health, Education, and Welfare. These grants support programs training a wide variety of health professions personnel.

Loans, fellowships, and related awards make up a relatively small share of the extramural program compared to grants and contracts. In 1969, \$132 million was awarded for loans and fellowships, about 10 percent of total awards. To derive the employment impact of loans and fellowships, a standard expenditure pattern for personal consumption expenditures was applied to the total sum of loans and fellowships in lieu of any actual expenditure data.<sup>18</sup> These expenditures generated employment requirements equaling slightly more than 13,000 jobs.

Construction grants support the building of research facilities, medical and nursing schools, hospitals, and related health facilities. These grants were not included in the sample studied because of the lack of data on actual construction materials purchased and labor employed. Rather, the employment impact of these construction grants was estimated using existing BLS studies on the employment generated by hospital construction.<sup>19</sup> Although the grants were not specifically for hospitals, it was felt that the hospital data more closely approximated the actual manpower requirements of the construction grants than any other data available.

It should be noted in connection with the construction grants that although the study is based on funds awarded in 1969, the actual expenses for construction occurred over a period of a few years, beginning with

<sup>18</sup>The use of a standard personal consumption expenditure pattern is not accurate to the extent that the consumption pattern of recipients of these loans or fellowships differs from that of the average consumer.

<sup>19</sup>See *Factbook*.

1970. However, the figure of almost 10,800 jobs associated with 1969 construction funds is an estimate assuming that the funds had been spent in one year; in reality these 10,800 jobs would result over several years.

**Data and sample.** Over 25,000 individual awards were made in 1969. Each award recipient submitted a record of expenditures to NIH, and these records served as the data base for the manpower impact study. It was found, in a pretest of several records, that detailed reporting of expenditures, itemizing personnel and purchases, was discontinued in 1970. Hence 1969 was selected as the fiscal year for this study. A sample was drawn to collect expenditures and employment data, stratified by type and dollar amount, since the spending and employment patterns of the awards were expected to vary depending upon these characteristics. Table 7 shows the number of each type of award included in the sample and the total amount of funds awarded for each of the various types in 1969.

The proportion of grants selected for the sample increased as the dollar size of the grants increased—all awards of \$1 million or more were included in the sample, while for grants of less than \$10,000 only one out of every 254 was chosen. Research grants constituted the largest proportion of grants sampled—226 out of the total of 368 in the sample—since they accounted for the largest share of total award money (about half). Research and medical training grants and research contracts each had about the same number of grants in the sample (43 to 49) since they all represented roughly the same proportion of total award funds (8 to 11 percent). Construction grants and fellowships, scholarships, and loans were not included in the sample.

Almost 80 percent of all grants and contract awards were received by persons affiliated with institutions of higher education, which implies that most of the direct

**Table 7. Domestic awards made by NIH (extramural program) by type, fiscal year 1969**

Type of award	Number of awards	Sample	Amount (thousands)
Total .. . . . . .	25,124	368	\$1,291,075
Research grants . . . . .	12,088	226	622,111
Research training . . . . .	2,382	48	140,121
Medical training . . . . .	1,848	49	117,881
Research contracts . . . . .	948	43	101,776
Medical libraries . . . . .	395	2	4,160
Construction grants . . . . .	75	—	172,955
Loans, fellowships, and scholarships . . . . .	7,388	—	132,071

SOURCE: National Institutes of Health, U.S. Department of Health, Education and Welfare.

manpower requirements of the NIH award program were met by universities and medical schools. Other types of institutions receiving support were hospitals not affiliated with medical schools, about 8 percent of total NIH awards, and research institutes, about 7 percent.

About half of all nonconstruction grant and contract money awarded in 1969—\$471 million out of \$986 million—was for compensation and benefit payments to personnel directly employed on the grants (table 8). An additional 35 percent was spent on the purchases of goods and services such as equipment, supplies, travel, hospitalization, and related items.

The remaining 15 percent represented payments to the institutions receiving grants to cover indirect costs such as administration, utilities, use of facilities and, in the case of profit firms, a fee. Indirect costs are based upon a fixed rate for each recipient institution, which is set through negotiation between the institution and the Department of Health, Education, and Welfare (HEW). This rate applies to all grants awarded to that institution by any of the agencies of HEW. The specific indirect (or overhead) costs associated with each grant are usually not itemized, so developing a distribution for these costs by type for each grant was not possible. In light of this difficulty, and also because the costs were rather general and were not unique to health research and training, a thorough analysis of the manpower effects of these costs was not undertaken.

*Direct employment requirements.* The largest share of the 1969 extramural funds—that allocated to employee

**Table 8. Expenditures and employment requirements of NIH extramural program, fiscal year 1969**

Program	Expenditures		Employment	
	Total (thousands)	Percent	Total	Percent
Total . . .	\$1,291,075	—	112,027	—
Fellowships and loans . . . . .	132,071	—	13,239	—
Construction grants . . . . .	172,955	—	10,773	—
Other grants and contracts . . . . .	<sup>1</sup> 948,929	100.0	88,015	100.0
Personnel . . .	471,099	49.6	<sup>2</sup> 56,914	64.7
Purchases . . .	331,190	34.9	31,101	35.3
Overhead . . .	146,640	15.5	( <sup>3</sup> )	—

<sup>1</sup> Sample result and does not add to total. Universe total for other grants and contracts equals \$986,049,000.

<sup>2</sup> Full-time equivalent jobs; all other employment figures are a count of both full- and part-time jobs. Full-time equivalent is the total number of hours worked in 1 year divided by 2,080 hours, the total number of man-hours in a full work year.

<sup>3</sup> Not available.

SOURCE: Bureau of Labor Statistics.

**Table 9. Direct employment requirements of NIH extramural program,<sup>1</sup> by occupation, fiscal year 1969**

Occupation	Full-time equivalent jobs <sup>2</sup>	
	Number	Percent
Total . . . . .	56,914	100.0
Professional, technical, and kindred workers . . . . .	44,736	78.6
Life and physical scientists . . . . .	22,741	40.0
Other health workers . . . . .	4,179	7.3
Technicians (except medical) . . . . .	14,306	25.1
Other professional or technical workers . . . . .	3,510	6.2
Clerical workers . . . . .	7,229	12.7
Laborers, except farm . . . . .	3,542	6.2
All other . . . . .	1,407	2.5

<sup>1</sup> Excludes construction grants, fellowships, and loan programs.

<sup>2</sup> Full-time equivalent is the total number of hours worked in a year divided by 2,080 hours, the total number of man-hours in a full work year. This measure differs from a total job count measure used elsewhere in the report, which counts the number of both full and part-time jobs.

SOURCE: Bureau of Labor Statistics.

compensation—supported a total of 56,914 full-time equivalent jobs.<sup>20</sup> These jobs encompassed a wide variety of occupations ranging from professional research workers to technical and clerical personnel. As noted earlier, approximately 80 percent of the grants were directed to universities and medical schools; hence most of the employment occurred at these institutions.

It should be noted that the full-time equivalent jobs total of 56,914 actually represents substantially more individuals, because of the large number of graduate students and others who usually work only part time on a grant. Also, the job count includes only workers who received compensation from the grant funds and excludes those who were paid entirely from other sources but who nevertheless may have participated in the research.

Over three-fourths of the jobs related directly to the extramural program were in the professional or technical field. About half of these jobs, 22,741 full-time equivalents, were held by life and physical scientists (table 9). Among the scientists, those in the area of clinical medicine were the largest group (7,413 full-time equivalent jobs), followed by biological sciences (7,219 jobs) and basic medicine (5,016 jobs).<sup>21</sup> The individual specialties in the medical science field with the greatest representation were biochemistry, pathology, pediatrics,

<sup>20</sup> For definition of a full-time equivalent job, see table 8, footnote 2.

<sup>21</sup> Detailed occupational data for the NIH employment requirements are shown in appendix table B-3.

physiology, and biophysics. According to the study, at least 65 percent of all the medical scientists supported by NIH grants and contracts held M.D.s (35 percent) or Ph.Ds (29 percent) or both (1.4 percent).

Second to medical scientists in numbers were non-medical technicians, 14,306 full-time equivalents or about one-quarter of the total number of jobs. Most of these technicians were classified as laboratory technicians, with a small number of research assistants and animal technicians making up the balance.

**Purchases.** In addition to the \$471 million for employee compensation, NIH grantees and contractors purchased \$331 million of goods and services from FY 1969 award funds—about 35 percent of the total money awarded.

The manufacturing sector was the largest source of these purchases, representing more than half of all expenditures (table 10). Two industries in particular accounted for over 16 percent of total expenditures—chemicals, and scientific and controlling instruments (laboratory equipment). Over \$25 million was spent in each of these two sectors. The food industry also ranked high as a percent of the total, reflecting the payments of living expenses to students under training grants to which a personal consumption expenditure distribution was applied. Other manufactured goods purchased in large quantities directly by grantees and contractors

included drugs, computer equipment, glassware, optical equipment, photographic equipment, and medical and surgical instruments.

Service industries received slightly less than one-quarter of grantee expenditures, about \$79 million. Within the services sector, the largest sum went for hospital costs, followed closely by the purchase of miscellaneous business services such as building services (janitorial, for example), equipment maintenance and repair, and computer time. Educational services, reflecting training grant tuition payments, and medical services were the two other major service industries receiving NIH funds.

The other major industrial sectors had much smaller shares of total purchases. Retail trade accounted for only about 4 percent of all expenditures, again mostly attributable to trainee stipends. The wholesale trade margin on goods which were purchased by NIH grantees or contractors represented only about 1 percent of total purchases.

Construction accounted for almost 3 percent of all expenditures, chiefly maintenance and repair construction. The agriculture and livestock component received \$11 billion, or about 3 percent of the total, primarily reflecting the purchase of laboratory animals by researchers. Transportation, in particular air transport, made up about 3 percent of all grant and contract expenses as well, representing travel by scientific investigators supported by NIH funds.

**Table 10. Purchases resulting from NIH extramural program<sup>1</sup> by industry sector, fiscal year 1969**

Sector	Amount (thousands)	Percent
Total .....	\$331,190	100.0
Agriculture .....	10,657	3.2
Mining .....	12	—
Construction .....	8,930	2.7
Manufacturing .....	186,577	56.3
Chemicals .....	28,475	8.6
Scientific and controlling instruments .....	26,426	8.0
Transportation, communication, and public utilities .....	15,274	4.6
Trade .....	17,119	5.2
Wholesale .....	4,095	1.2
Retail .....	13,024	3.9
Finance, insurance, and real estate .....	13,964	4.2
Services .....	78,657	23.8
Hospitals .....	23,594	7.1
Miscellaneous business services .....	23,152	7.0
Educational services .....	18,579	5.6
Government enterprises .....	982	.3

<sup>1</sup> Excludes construction grants, fellowships, and loan programs.

SOURCE: Bureau of Labor Statistics.

**Indirect employment requirements.** The purchases by NIH grantees or contractors, totaling \$331 million in 1969, supported 31,100 full- and part-time jobs throughout the economy that year (table 11). About 30 percent of these jobs were in the services sector, particularly in hospitals, educational services, and business services. These three industries accounted for almost one-fourth of all generated jobs, reflecting the large outlays for hospitalization, computer time, equipment maintenance, and tuition payments.

The manufacturing sector also had about 30 percent of the generated employment. About half of the 9,300 jobs in manufacturing were generated by the program purchases described earlier and about half were generated indirectly through other industries' requirements for manufactured products.

Within the manufacturing sector, industries affected by the NIH extramural program included scientific and controlling instruments (4 percent of total generated employment), chemicals (2.3 percent), and printing, glass, computer equipment, publishing, optical equipment, electronic components, food products, and medical instruments (each 1.7 to 1.0 percent of total



**Table 11. Indirect employment requirements of NIH extramural program<sup>1</sup> by industry sector, fiscal year 1969**

Sector	Full-and part-time jobs	
	Number	Percent
Total .....	31,101	100.0
Agriculture .....	1,917	6.2
Mining .....	226	.7
Construction .....	675	2.2
Manufacturing .....	9,300	29.9
Scientific and controlling instruments .....	1,245	4.0
Chemical products .....	715	2.3
Printing .....	519	1.7
Glass .....	516	1.7
Transportation, communication, and public utilities .....	1,889	6.1
Trade .....	5,989	19.3
Wholesale .....	1,887	6.1
Retail .....	4,102	13.2
Finance, insurance, and real estate .....	943	3.0
Services .....	9,532	30.7
Hospitals .....	2,651	8.5
Educational services .....	2,477	8.0
Miscellaneous business services .....	2,248	7.2
Government enterprises .....	630	2.0

<sup>1</sup> Excludes construction grants, fellowships, and loans programs.

NOTE: Items may not add to totals due to rounding.

SOURCE: Bureau of Labor Statistics.

generated jobs).<sup>22</sup>

The trade sector accounted for nearly 6,000 jobs or 19 percent of the total, while 6.2 percent were in agriculture. More than half of the jobs in agriculture, which also includes the livestock industry, reflected the large demand for laboratory animals on the part of NIH researchers.

The largest occupational group affected by NIH grantee and contractor purchases was clerical workers, 6,000 out of the total of 31,100 generated jobs (table 6). Operatives constituted the second largest category, with 5,300 jobs or 17.1 percent of the total, while the professional and technical component accounted for 5,100 jobs or 16.5 percent. Within the professional and technical category, medical workers such as nurses and teachers were the largest occupations. Service workers, in services including food, cleaning, and health services, also constituted a sizable share of total jobs, 13.1 percent.<sup>23</sup>

<sup>22</sup> The purchases and resulting requirements by detailed industry for all of NIH are shown in appendix tables B-1 and B-2.

<sup>23</sup> The occupational requirements for NIH by detailed occupation are shown in appendix table B-3.

## Direct operations

The expenditures of NIH for its direct operations were tabulated directly from data covering all NIH operations and thus did not involve the use of a sample. For the direct employment of NIH, totaling 11,605 full-time employees in 1969, a listing of all jobs by occupation was obtained and summarized by major occupational group. Since NIH directly operates research laboratories and a clinical center, a large number of NIH employees were life and physical scientists, about 19 percent of the total; science technicians, 8.8 percent; and medical workers, 6.1 percent. Together with other related occupations, the professional and technical group accounted for almost half of all the jobs at NIH in 1969 (table 12).

Clerical personnel were the second largest category, about one-fourth of the total. In addition to secretaries, typists, and stenographers, this group also included a large number of grants-processing personnel, reflecting the magnitude of the NIH award program.

Information on purchases of supplies, equipment, services, and all other items was obtained from NIH's accounting and procurement offices. It was found that expenditures for NIH direct operations and resulting employment closely resembled the pattern of expenditures of grantees and contractors, since both programs are involved in medical research.

**Table 12. Employment by occupation, NIH direct operations, fiscal year 1969**

Occupation	Full-time jobs	
	Number	Percent
Total .....	11,605	100.0
Professional, technical, and kindred workers .....	5,213	44.9
Life and physical scientists .....	2,203	19.0
Biologists .....	613	5.3
Chemists .....	581	5.0
Other .....	1,009	8.7
Science technicians .....	1,017	8.8
Biological technicians .....	697	6.0
Other .....	320	2.8
Medical workers .....	712	6.1
Nurses .....	381	3.3
Other .....	331	2.9
Other .....	1,281	11.0
Managers, officials, and proprietors .....	1,149	9.9
Clerical workers .....	3,039	26.2
Craft and kindred workers .....	371	3.2
Operatives .....	330	2.8
Service workers .....	706	6.1
Laborers, except farm .....	797	6.9

SOURCE: National Institutes of Health, U.S. Department of Health, Education, and Welfare. Compiled by Bureau of Labor Statistics.

Principal expenditures of NIH in 1969 were for the direct purchase of doctors', dentists', and medical workers' services on a contract basis to supplement NIH's own staff. This industry received \$7.6 million of the \$65 million total, or 11.6 percent. Almost \$4.5 million was spent for scientific and controlling instruments, while miscellaneous business services received \$3.8 million and chemicals received \$3.6 million. Other industries with purchases of over \$2 million were maintenance construction, drugs, air transportation, optical equipment, printing, communications, and food products.

The employment generated by these purchases occurred primarily in manufacturing and service industries, mirroring the employment generated by the extramural program expenditures. Within the manufacturing sector, however, employment resulting from NIH purchases was more evenly distributed than that resulting from the extramural purchases, with no single industry accounting for more than 5 percent of total jobs. In the services sector, medical services represented 10.3 percent of all jobs and business services 6.5 percent. The trade category constituted another 10.1 percent of all jobs, agriculture 8.8 percent, and transportation 6.6 percent. (See table 13.)

Major occupations affected by NIH purchases included clerical workers and operatives, as was true in the

extramural program. The third largest occupational group was craft workers, including skilled construction workers, mechanics, and repairers.

**Table 13. Employment generated by purchases of NIH direct operations, by industry sector, fiscal year 1969**

Sector	Full- and part-time jobs	
	Number	Percent
Total .....	5,352	100.0
Agriculture .....	471	8.8
Mining .....	62	1.1
Construction .....	194	3.6
Manufacturing .....	1,877	35.1
Scientific and controlling instruments .....	219	4.1
Printing .....	175	3.3
Transportation, communication, and public utilities .....	569	10.6
Trade .....	538	10.1
Wholesale .....	341	6.4
Retail .....	197	3.7
Finance, insurance, and real estate .....	129	2.4
Services .....	1,354	25.3
Medical services .....	552	10.3
Miscellaneous business services .....	349	6.5
Government enterprises .....	158	3.0

SOURCE: Bureau of Labor Statistics.

## Chapter 3. Manpower Institutional Training Program

### Summary

The program of institutional manpower training authorized by the Manpower Development and Training Act of 1962 (MDTA) required 26,160 direct and indirect jobs to supply program needs (including training allowances) in 1972. The direct employment, which is the total number of jobs located at the training sites, was estimated to be 12,300 or 47 percent of total program requirements. Over half of these jobs at the training sites were in the professional and technical category, including teachers and counselors. The indirect employment, which was the employment generated in the private sector by all program expenditures except compensation, was concentrated in the trade, service, and manufacturing industries, chiefly retail trade, personal services, food, and apparel. Forty percent of the total indirect employment was concentrated in the operative and clerical occupations, specifically bus and truck drivers, machine operators, secretaries, and cashiers. Craft and kindred workers constituted 12 percent of the generated employment; these workers were in a wide range of occupations, but a large proportion were mechanics. No other major occupational group made up as much as 10 percent of the indirect employment.

### Program description

Since the early 1960's the Federal Government has been strongly committed to the development of the Nation's manpower resources. In the past decade, nearly a dozen manpower training programs have been created to upgrade the skills of the labor force. The national program of institutional manpower training, the oldest Federal manpower program, was created under the authority of the Manpower Development and Training Act of 1962.<sup>24</sup> In its first decade, more than 1.2 million

<sup>24</sup>The Comprehensive Employment and Training Act of 1973 incorporated into one piece of legislation the Federal manpower training and support services which had been provided under the Manpower Development and Training Act, the Economic Opportunity Act, and the Emergency Employment Act. In the future, State and local governments will receive annually one Federal appropriation for all job training activities and will determine the mix of programs to best meet local needs.

trainees had enrolled in the institutional program and over \$2 billion in Federal funds were required to support program activities.

The program provided grants to States and territories for classroom occupational training. Its purpose was to equip the disadvantaged, unemployed, and underemployed 16 years of age and older with marketable occupational skills and to reduce labor shortages in local areas. Training was provided through State and local education agencies and was restricted to occupational skills in short supply. A living allowance equivalent to the State's average unemployment compensation benefit and a transportation allowance were provided to trainees. Although the length of training varied with the individual trainee's needs, the maximum period of time for providing trainee allowances was 104 weeks. The average length of training projects was from 6 to 9 months, although most projects were continuously funded and repeated each year.

The program, introduced in a time of high unemployment, initially emphasized short training periods and rapid job placement. At first most trainees were heads of households, with 3 years' work experience, whose jobs had been eliminated by automation, foreign competition, or other economic dislocations. In the late 1960's the program's orientation shifted to disadvantaged jobless youth. As a result of this shift, the training curriculum was expanded to include remedial education, communication skills, and supportive services such as job counseling and placement.

Originally, training took place only in groups organized for training in a single occupation. Later, skill centers were introduced which offered multioccupational training and supportive services. Training could also be carried out by individual referral whereby a student was enrolled in an ongoing vocational program operated by a public or private institution. In this situation, tuition was paid out of manpower training funds.

A wide variety of occupational training was offered under the program, ranging from technical training in drafting and practical nursing to bench and structural work in machine operation and welding. The training courses with the largest enrollments were for the

secretarial, auto mechanic, welding, and practical nursing occupations.

The program was administered jointly at the Federal level by the Department of Labor (DOL)—responsible for determining the Nation’s manpower and training needs, trainee selection, and allowances—and the Department of Health, Education, and Welfare (HEW)—charged with establishing and funding individual training projects. Federal funds were apportioned among the States and territories according to an allocation formula established in the 1962 legislation, and they reached the local training agencies through State employment security offices and State boards of education. The States were required to match up to 10 percent of their total Federal allocation to offset program expenses.

**Data and sample**

This study was based on data submitted to HEW in the statement of proposed expenditures required for each training project as part of the application for Federal funding. The following list briefly states the types of data provided:

- Facility costs (rents, utilities, remodeling)
- Administrative salaries (administrator, clerical, custodian, employee fringe and travel expenses)
- Instructional salaries (instructors, guidance counselors)
- Equipment (major, minor, repair and servicing, rental)
- Instruction materials (audiovisual, textbooks, workbooks)

Although the data supplied are for proposed rather than actual expenditures, they constitute the most complete and detailed source of information currently available.

In 1972, over 1,500 institutional training projects were funded under MDTA. The BLS Office of Survey Design constructed a weighted sample of 259 grants from this total.<sup>25</sup> Data on the sample members were gathered and coded according to the appropriate producing industry in the input-output system and the occupational definitions used in the industry occupational matrix.

Program totals developed from the sample will vary from other published figures for the MDTA program. This may be due to changes in planned expenditures, to the lack of complete data on a project which may have been renewed during the fiscal year, or to the difference between obligated funds and outlays. Nevertheless, the results of the study are not weakened since the interpretation of the results depends primarily on the

percent distributions of the bill of goods, employment, and occupational requirements.

**Expenditures**

The results of the study sample for the MDTA institutional training program, broken down into the major categories of expenditure and their proportion of the program total, are shown below for fiscal year 1972:

	<i>Amount (millions)</i>	<i>Percent</i>
Total .....	\$253.5	100.0
Cost of training (HEW) .....	125.3	49.4
Compensation of employees at training sites .....	74.6	29.4
Purchases of goods and services ....	50.7	20.0
Allowances (DOL) .....	128.2	50.6
Training .....	119.8	47.3
Transportation .....	8.4	3.3

The cost of training, including compensation and purchases of goods and services in the private sector, amounted to slightly less than half of the total program expenditures. Of this amount, 60 percent went directly to compensation of teachers and other employees at the training site. The remaining \$50.7 million represented the amount spent on equipment, books, utilities, rentals, and other goods and services.

A bill of goods was developed from these expenditures for further analysis within the input-output framework. This analysis provides the numbers of jobs in each industry required to produce the goods and services purchased. The allowances, which amounted to \$128.2 million, were considered as a transfer payment. Since there was no detail available on how trainees spent these funds, it was assumed that the expenditure pattern for this segment of the program would resemble the personal consumption expenditure (PCE) pattern of a low-income family. Such a PCE pattern was approximated and applied to the total for training allowances generated by the sample and in turn was analyzed within the input-output system. A separate bill of goods based on the PCE pattern was constructed for the \$119.8 million in trainee allowances estimated in the sample. The \$8.4 million in transportation allowances was added into the railroad and local and intercity bus transportation sectors of this bill of goods. The complete bill of goods for the PCE distribution and for program purchases of goods and services is provided in appendix table B-1.

**Employment requirements and occupational patterns**

It is estimated that a total of 26,160 full- and

<sup>25</sup> Excluded from the sample are projects funded in Hawaii and U.S. territories, and experimental and demonstration grants.

part-time jobs was generated directly and indirectly from the MDTA institutional program expenditures of \$253.5 million in 1972 (table 14).<sup>26</sup> Employment directly on the payrolls of the grantees constituted approximately 47 percent of the total jobs generated. Jobs generated directly in the State and local government sector, representing 4.3 percent of the program's manpower requirements, were not part of the training project staffs, but were generated as a result of the tuition paid under the individual referral type of training. The indirect employment generated in the private sector accounted for 48.5 percent of the program's employment impact.

*Direct employment at training sites.* The direct employment data summarized in the first column in table 15 were taken directly from the "Cost of Occupational Training" forms submitted to HEW by each of the sample members. The forms supplied the number of jobs, occupational titles, total number of hours required for each job during the project, and hourly wage for

<sup>26</sup>Detailed occupational data for the MDTA employment requirements are shown in appendix table B-3.

each position. The number of jobs by occupational group in table 15 is derived from the sample members and weighted to provide an estimate of the program's total direct employment and full-time equivalents. Due to the extensive part-time nature of the direct employment in this program, it is useful to look at some occupations in terms of the number of full-time equivalent jobs. The full-time equivalent, as noted earlier, is the total number of hours a person worked on a job in 1 year, divided by 2,080 hours, the total number of hours worked on a full-time job in a regular work year. Most of the projects sampled operated for less than a full year, which accounts in part for the large differences between the number of jobs and the full-time equivalents.

Professional and technical workers, especially in the teaching and counseling professions, accounted for 51 percent of the approximately 12,350 directly generated jobs. The managers, officials, and proprietors group made up 14 percent of the total jobs and comprised those jobs involved in the administration of the projects, which were usually on a part-time basis. Clerical workers made up 24 percent of the total direct employment; almost half of these workers were secretaries. Service

**Table 14. Employment requirements of MDTA institutional training program by occupation, fiscal year 1972**

Occupation	Full- and part-time jobs			
	Total employment	Direct employment at training sites	Direct employment generated by tuition costs	Indirect employment <sup>1</sup>
Total .....	26,160	12,347	1,125	12,688
Professional, technical, and kindred workers .....	8,220	6,337	753	1,130
Managers, officials, and proprietors .....	3,077	1,736	61	1,280
Sales workers .....	1,080	—	—	1,080
Clerical workers .....	5,313	2,954	109	2,250
Craft and kindred workers .....	1,520	—	( <sup>2</sup> )	1,520
Operatives .....	2,808	—	( <sup>2</sup> )	2,808
Service workers .....	2,823	1,320	173	1,330
Laborers, except farm .....	600	—	( <sup>2</sup> )	600
Farmers and farm workers .....	690	—	—	690
	Percent distribution			
Total .....	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers .....	31.5	51.3	67.0	8.9
Managers, officials, and proprietors .....	11.8	14.1	5.4	10.1
Sales workers .....	4.1	—	—	8.5
Clerical workers .....	20.3	23.9	9.7	17.8
Craft and kindred workers .....	5.8	—	—	12.0
Operatives .....	10.7	—	—	22.1
Service workers .....	10.8	10.7	15.4	10.5
Laborers, except farm .....	2.3	—	—	4.7
Farmers and farm workers .....	2.6	—	—	5.4

<sup>1</sup> Includes indirect employment generated by tuition costs.

<sup>2</sup> Less than 50.

SOURCE: Bureau of Labor Statistics.

**Table 15. Direct employment requirements of MDTA institutional training program by occupation, fiscal year 1972**

Occupation	Full- and part-time jobs		Full-time equivalent jobs <sup>1</sup>	
	Number	Percent	Number	Percent
Total .....	12,347	100.0	6,179	100.0
Professional, technical, and kindred workers .....	6,337	51.3	3,799	61.5
Teachers .....	5,117	41.4	3,250	52.6
Counselors .....	1,027	8.3	483	7.8
Others .....	193	1.6	66	1.1
Managers, officials, and proprietors .....	1,736	14.1	554	9.0
Administrators .....	1,736	14.1	554	9.0
Clerical workers .....	2,954	23.9	1,322	21.4
Secretaries .....	1,307	10.6	606	9.8
Bookkeepers .....	425	3.4	131	2.1
Clerks .....	361	2.9	114	1.8
Teaching aides .....	585	4.7	282	4.6
Others .....	276	2.2	189	3.1
Service workers .....	1,320	10.7	504	8.2
Janitors .....	1,320	10.7	504	8.2

<sup>1</sup> Full-time equivalent is the total number of hours worked in 1 year divided by 2,080 hours, the total number of man-hours in a full work year. For example, if a teacher works 40 hours a

week for 26 weeks, the full-time equivalent of that job is 0.5 (1,040 hours ÷ 2,080 hours).

SOURCE: Bureau of Labor Statistics.

workers accounted for 11 percent of the jobs directly generated.

As seen in table 15, professional and technical workers, particularly teachers, constituted a greater percentage of the total full-time equivalent employment than of the total jobs generated, indicating that teachers were the most likely to be employed full time. For all other groups, their share of full-time equivalent employment was smaller than their share of total jobs.

*Employment generated by tuition costs.* As previously stated, occupational skill training under the MDTA institutional program is carried out in manpower training centers, in small groups organized by local school systems and by individual referral. Training by individual referral means that a trainee is placed in an ongoing training program operated by a public or private institution and the tuition costs incurred are paid out of MDTA funds. Detail on how tuition receipts were spent by the institutions was not available; instead, the results of prior research on State and local education expenditures (less construction) were used to develop the direct and indirect employment impact of these expenditures. The distribution in table 14 includes estimates of the direct employment impact of these expenditures at the State and local level. Purchases of goods and services made with these funds were incorporated into the bill of goods for program purchases and the indirect employment effects of the tuition payments were combined with the indirect employment effects discussed in the following section.

*Indirect employment.* The total indirect employment generated under the MDTA institutional training program in 1972 amounted to about 12,700 full- and part-time jobs. More than 10,000 of these resulted from the trainee allowances; the remainder were generated by program purchases of goods and services, including the purchases arising from tuition costs, as discussed in the previous section. Although about 85 percent of the jobs generated by each of the bills of goods were in the manufacturing, transportation, trade, and service industries, the distribution of jobs among the industries was very different for the two bills of goods (table 16).

Obviously, the impact of the training allowances dominated the program's indirect employment requirements. The resulting employment fell largely in the trade industries since most consumer purchases are made from the retail trade industry. Manufacturing industries most affected by allowances were food and apparel; employment was also high in the service industries, reflecting not only the demand for services but also the labor-intensive nature of this sector.

The employment requirements generated by program purchase were concentrated in the manufacturing and service industry sectors. Manufacturing jobs made up 38 percent of total employment. Four industries—paper, printing, publishing, and “other” fabricated metal products—had the largest employment requirements, reflecting this program's high demand for paper supplies, textbooks, and equipment. Seventy-six percent of the employment in the services group was in educational and

**Table 16. Indirect employment requirements of MDTA institutional training program by industry sector, fiscal year 1972**

Sector	Full- and part-time jobs					
	Jobs generated by total bills of goods		Jobs generated by trainee allowances		Jobs generated by program purchases	
	Number	Percent	Number	Percent	Number	Percent
Total .....	12,688	100.0	10,238	100.0	2,450	100.0
Agriculture .....	766	6.0	729	7.1	37	1.5
Mining .....	108	.9	77	.8	31	1.3
Construction .....	195	1.5	148	1.4	47	1.9
Manufacturing .....	2,970	23.4	2,036	19.9	934	38.1
Transportation, communication, and public utilities .....	1,606	12.7	1,360	13.3	246	10.0
Trade .....	3,502	27.6	3,239	31.6	263	10.7
Finance, insurance, and real estate .....	707	5.6	579	5.7	128	5.2
Services .....	2,426	19.1	1,762	17.2	664	27.2
Government enterprises .....	408	3.2	308	3.0	100	4.1

SOURCE: Bureau of Labor Statistics.

miscellaneous business services, due to such program expenses as educational testing and counseling services, equipment rental, repair, and duplicating services.

Table 17 provides the program's indirect employment requirements distributed among major occupational groups. It should be noted that the requirements by

**Table 17. Indirect employment requirements of MDTA institutional training by occupation, fiscal year 1972**

Occupation	Full- and part-time jobs		Occupation	Full- and part-time jobs	
	Number	Percent		Number	Percent
Total .....	<sup>1</sup> 12,680	100.0	Operatives .....	2,800	22.1
Professional, technical, and kindred workers .....	1,130	8.9	Semiskilled packing and inspecting .....	260	2.1
Engineers .....	220	1.7	Sewers and stitchers .....	250	2.0
Technical .....	120	1.0	Miscellaneous machine operatives .....	220	1.7
Scientific technicians .....	100	.8	Other operatives, not transport .....	1,040	8.2
Medical workers .....	160	1.3	Transport equipment operatives .....	1,030	8.1
All other professional and technical workers .....	750	5.9	Bus drivers .....	310	2.4
Managers, officials, and proprietors .....	1,280	10.1	Taxicab drivers .....	220	1.7
Sales workers .....	1,080	8.5	Truck drivers .....	230	1.8
Clerical workers .....	2,250	17.8	Other transport operatives .....	270	2.1
Stenographers, typists, and secretaries .....	590	4.7	Service workers .....	1,330	10.5
Office machine operators .....	100	.8	Cleaning service workers .....	310	2.4
Other clerical workers .....	1,560	12.3	Food service workers .....	520	4.1
Craft and kindred workers .....	1,520	12.0	Health service workers .....	150	1.2
Construction crafts .....	250	2.0	Personal service workers .....	280	2.2
Blue-collar worker supervisors .....	220	1.7	Protective service workers .....	70	.6
Metalworking crafts .....	120	1.0	Laborers, except farm .....	600	4.7
Mechanics .....	490	3.9	Farmers and farm workers .....	690	5.4
All other craft and kindred workers .....	440	3.5			

<sup>1</sup> Total differs from table 16 due to rounding.

SOURCE: Bureau of Labor Statistics.

occupation reflect in large part the spending by trainees of the allowances provided them. The largest share of the jobs generated in the private sector was in the operative occupations, which provided 2,800 jobs or approximately 22 percent of the total indirect employment. Within this group, the occupations most greatly affected were bus and truck drivers, semiskilled packers and inspectors, sewers and stitchers, and miscellaneous machine operators. The clerical occupations commanded 18 percent of the generated employment, or 2,250 jobs. This group contains the largest of the detailed occupations—stenographers, typists, and secretaries. The third largest occupational group affected by the program was craft and kindred workers, which absorbed over 1,500 jobs. Auto mechanics and heavy equipment mechanics

were the occupations most called for in this group. Managers, officials, and proprietors and service workers both held approximately 10 percent of the total jobs. In the service group, cleaning and food service workers accounted for the largest specific occupations. Professional and technical workers absorbed 9 percent of the total. This category has a small number of jobs distributed over a large number of specific occupations, which in table 17 are combined into “all other professional and technical workers.” Nonfarm laborers and farmers and farm workers constituted 4.7 percent and 5.4 percent of the total indirect employment. (A more detailed occupational breakdown of the employment is available in appendix B.)



## Chapter 4. National Aeronautics and Space Administration and the Space Shuttle Program

### Summary

The total National Aeronautics and Space Administration (NASA) program in fiscal year 1973, with outlays of about \$3.3 billion, is estimated to have generated over 194,000 jobs in both the public and private sectors, or about 58,600 jobs per billion dollars. Most of these jobs were in the manufacturing and services sectors, and, as might be expected, aerospace and research-oriented industries accounted for most of the employment. Professional and technical employees, including engineers, and equipment operatives were the occupational groups most affected.

The Space Shuttle program, NASA's major new program, spent an estimated \$230 million in 1973 and generated a little more than 13,000 jobs, or about 57,000 jobs per billion dollars. While these jobs were also highly concentrated in manufacturing and services, a somewhat higher proportion was in manufacturing than was the case for total NASA. Also, these jobs showed a heavier concentration in the aerospace industries than did NASA jobs as a whole. Professional and technical workers were by far the largest occupational group affected—about 83 percent of the private employment attributable to Space Shuttle was in this category.

### Program description

The NASA study covered 1) employment requirements generated by all NASA functions and 2) requirements of the Space Shuttle program specifically. The total NASA phase of the study covers all outlays made by the agency in fiscal year 1973, the latest year for which complete data were available. NASA activities in this year were marked by the end of the Apollo program, with the last of the manned flights to the moon, and a consequent dip in manned space flight program outlays. This year also saw the first use of the Skylab space station in which man demonstrated a capability to perform various tasks in space for an extended period. NASA's launch activities in 1973 included two manned missions and 15 unmanned mis-

sions, including the Pioneer II launch to Jupiter.

This year also marked the beginning of more substantial outlays on the Space Shuttle program, the largest new program of NASA, which was scheduled to continue over the next few years. In 1973 this program moved out of the definitional phase into more advanced development. The Space Shuttle is a flyable orbiter, to be launched into a low earth orbit by two solid rocket boosters and its own main engines. The solid rocket boosters will detach at an altitude of about 25 miles and will then be recovered and reused. The orbiter, under its own power and using fuel from an expendable drop tank, will perform its tasks in low earth orbit and subsequently be flown back to earth for an unpowered aircraft type of landing. Since many of the components are reusable, the Space Shuttle is expected to provide a cheaper way of launching satellites and servicing and retrieving them, as well as provide a number of other space services not currently feasible.

### Data and sample

For the purpose of this study, it was necessary to identify purchases by specific product or service. Also, purchases were desired in terms of expenditures or costs incurred rather than obligations, which imply varying time lapses before employment actually takes place. Purchases in this form provide the initial input into the model system used to estimate employment requirements.

NASA records were first examined to determine the availability of detailed information on purchases. The most useful sources of information were computer tapes provided by NASA containing details of all prime contracts (approximately 9,500) and subcontracts. These records identified contract purchases of \$1,000 and greater by product or service bought and by company. They also provided, not only the total amount obligated under the contract, but total expenditures and costs incurred during 1973. In the case of large contracts, the service or product identification was sometimes highly aggregated and could not be coded to

a specific producing industry. In these cases, subcontracts provided useful additional information.

NASA obligations by budget object class provided another source of data. For the most part, this information was also too aggregated to be useful, but in some cases products and services were sufficiently detailed for industry identification. This source of data was particularly helpful in providing good descriptions in a number of areas not adequately covered by the contract data. On the other hand, use of these data required making assumptions about the time lag between obligations and actual expenditures.

Control totals were available for total NASA expenditures and for three major functional groupings. NASA funds are earmarked by use for eight different functions which conveniently collapse into the three major activities of administration, research and development, and construction. These sources of funding were also identified in the contract and budget object class data. As a result, both of these data sources could be organized according to type of funding, providing finer control totals and a basis for cross-referencing in coding.

Of the 9,500 contracts, a sample of 401 was taken (along with their subcontracts where available). All 301 contracts that totaled \$1 million or more were included; approximately 77 percent of total contract value was in this category. The remaining 100 contracts were determined by the relative dollar amount of the contracts in the universe. Several contracts selected could not be identified by type of purchase and contracts of like magnitude were substituted.

The sample of prime contracts and their subcontracts next was coded by 4-digit Standard Industrial Classification (SIC) codes. The amounts used were costs incurred, which were considered to be most representative of their employment impact. These were then expanded to represent the universe of contract values. Budget object class obligations were also coded to 4-digit SIC codes where possible. These were used as a check on contract results where appropriate, and more importantly, they were used to estimate noncontract outlays.

Sampling procedures were not used in estimating Space Shuttle purchases. Instead, all Space Shuttle prime contracts and their subcontracts were coded and used. Some 832 Space Shuttle prime contract actions were considered and all costs incurred on these contracts were coded. Contracts cancelled under the definitional phase of Space Shuttle with funds shifted to developmental Space Shuttle programs were coded to the costs incurred in the new program areas. In addition to contract values, the Space Shuttle program was credited with a percentage of NASA's administrative costs, supplies, and

services based upon the number of NASA employees working on Space Shuttle.

Direct NASA employment of Federal workers was obtained from NASA personnel records. NASA employment assigned to the Space Shuttle program was estimated with the assistance of NASA.

## Expenditures

The total NASA program in fiscal year 1973 amounted to \$3.3 billion, slightly higher than in 1972. Most of this money, about 77 percent, was channelled to development and ongoing space programs, while about 22 percent went to salaries and program administration.

NASA's activities affect the economy largely through contract outlays for research, operations, and administrative support. These amounted to about 80 percent of all NASA expenditures in 1973. Contract outlays went largely to business firms, which received about 90 percent of total contract value. The remainder of the contracts went to educational and nonprofit institutions and to other government agencies.

The Space Shuttle program in 1973 is estimated to have cost about \$230 million, or almost 7 percent of total NASA outlays. This figure was derived by totaling the costs incurred under all Space Shuttle contracts during the year. To this was added an estimate of the compensation and benefits received by NASA employees working on this program as well as a proportion of total NASA administrative support costs, such as the purchase of supplies and travel services.

*Total NASA.* In examining NASA outlays to determine their employment requirements, it was first necessary to determine which group ultimately spent NASA funds and how the funds were generally spent. Most NASA outlays, of course, were spent by NASA directly for the hire of personnel and for outside purchases of goods and services. However, some NASA outlays went to other Federal Government agencies and to State and local government institutions, which ultimately used the money to hire other government workers and to make purchases of goods and services in the private sector.

Aggregate NASA outlays to other Federal agencies and to State and local institutions were estimated by sampling NASA contracts and expanding the results. Where a Federal agency provided a product for NASA, it was assumed that the purchase was made during FY 1973 and it was treated as a direct purchase by NASA from the private economy. Where a service was purchased from another Federal agency, this amount was lumped into a Federal purchase sector and later distributed to other Federal compensation and purchases

from the private sector. Similarly, contracts to a State or locally controlled university were coded to an overall State and local sector on education and ultimately distributed to State and local government compensation and to specific State and local purchases.

Total NASA outlays for FY 1973 were first distributed as follows:

	<i>(thousands)</i>
Total .....	\$3,315,220
Direct NASA compensation .....	563,800
Direct NASA purchases .....	2,586,318
Payments to other Federal agencies .....	122,651
Payments to State and local institutions .....	42,451

With further refinement, these became:

	<i>(thousands)</i>
Total .....	\$3,315,220
<b>Purchases from the private sector:</b>	
NASA .....	2,586,318
Other Federal agencies .....	70,573
State and local institutions .....	12,065
<b>Compensation:</b>	
NASA employees .....	563,800
Other Federal employees .....	52,078
State and local employees .....	30,386

The total of NASA purchases from the private sector was translated into specific purchases through the use of the sample of contract costs, obligations by object class detail, and other sources. In cases where large prime contracts had a general function and could not be reasonably coded to a single product or service, the amount was allocated to the performing establishment and to its subcontractors. Purchases by other Federal agencies and State and local institutions were estimated by using previous studies of purchases by these sectors.

Total NASA purchases from the private sector in FY 1973 were made largely from the manufacturing sector, which accounted for about 76 percent of the total. Purchases of services amounted to about 17 percent. Industry purchases showed a marked concentration, as might be expected from NASA's functions. In the manufacturing sector, the space vehicle and aircraft industries received almost half of the outlays made in the private economy. The space vehicle industry, which includes only completely assembled space vehicles, accounted for almost 29 percent of outlays from the private sector. (See table 18.) Purchases from the aircraft industry were high, accounting for about 19 percent, since this industry is defined to include space vehicle engines and vehicle components. Electronics and communications received about 13 percent. Major purchases

**Table 18. NASA purchases, selected industries, fiscal year 1973**

Industry	Amount (millions)	Percent of total NASA purchases
<b>Manufacturing:</b>		
Completed space vehicles .....	\$763	28.6
Aircraft and space components .....	496	18.6
Communications equipment .....	300	11.2
Electronic components .....	45	1.7
Computers .....	106	4.0
<b>Services:</b>		
Educational services .....	213	8.0
Miscellaneous business services .....	131	4.9

SOURCE: Bureau of Labor Statistics.

in the services sector were made from the educational services industry, which includes research and development performed by private universities, and from miscellaneous business services, which includes computer programming and other computer services.

*Space Shuttle.* Total Space Shuttle costs in 1973 had to be derived from several sources since a comprehensive estimate was not available. Total expenditures were obtained from contract values, outside contract management costs, compensation expenditures, and administrative purchases. Purchases from the private economy were obtained by totaling all costs incurred in 1973 under all contracts with a Space Shuttle designation. Negative contract amounts, used to indicate a shift of contract funds from a definitional to a developmental program, were not used to offset other contract amounts, since this would result in an understatement of employment requirements. Other purchases from the private economy were estimated by prorating a part of NASA's administrative and overhead purchases to the Space Shuttle based on the number of NASA employees assigned to this program. Compensation of NASA employees was estimated by first determining the number of workers assigned, and then using average NASA compensation per worker to determine the amount of total NASA compensation that should be attributed to Space Shuttle. The amount of Space Shuttle outlays going to other Federal agencies and to State and local institutions was obtained by simply totaling all contracts with these organizations. In addition, contract administration, representing payments to the Defense Contract Audit Agency, was added to outlays going to all other Federal agencies.

Outlays on Space Shuttle in 1973, on this basis, were

estimated to amount to about \$230 million, as follows:

	(thousands)
Total .....	\$230,069
Direct NASA compensation .....	45,726
Direct NASA purchases .....	178,813
Payments to other Federal agencies .....	4,595
Payments to State and local institutions .....	934

For use with the employment model, these outlays were rearranged as follows:

	(thousands)
Total .....	\$230,069
Purchases from the private sector .....	181,726
NASA .....	178,813
Other Federal agencies .....	2,647
State and local institutions .....	266
Compensation .....	48,343
NASA employees .....	45,726
Other Federal employees .....	1,948
State and local employees .....	669

NASA purchases for Space Shuttle were distributed to specific industries by coding all Space Shuttle prime contracts and their subcontracts to an industry. Outlays received by other Federal and State and local organizations were again distributed to compensation and to specific industries based upon past purchasing patterns for these sectors.

Space Shuttle purchases from the private sector were more concentrated than in the case of total NASA.

**Table 19. Space Shuttle purchases, selected industries, fiscal year 1973**

Industry	Amount (millions)	Percent of total Space Shuttle purchases
<b>Manufacturing:</b>		
Completed space vehicles .....	\$67.4	37.1
Aircraft and space components .....	67.4	37.1
Communications equipment .....	5.5	3.0
Electronic components .....	3.6	2.0
Computers .....	4.0	2.2
Professional and scientific instruments .....	4.5	2.6
<b>Services:</b>		
Educational services .....	1.0	.6
Miscellaneous business services .....	9.5	5.2
Nonprofit organizations .....	3.1	1.7

SOURCE: Bureau of Labor Statistics.

Some 86 percent of these purchases were from manufacturing establishments in 1973 while about 9 percent were from services. Purchases were concentrated in the aerospace industries, which received more than three-quarters of total private outlays. The space vehicle and aircraft industries together received about 74 percent of the purchases from the private sector (table 19). Communications equipment and electronic components accounted for 5 percent.

### Employment requirements

NASA employment requirements were estimated on the same basis as the other programs reported on here. They were calculated through the use of an interindustry employment model and have the characteristic strengths and weaknesses of this system.

*Total NASA.* Total NASA outlays in 1973 generated requirements for about 194,000 jobs. Of these jobs, 160,000 or almost 83 percent were in the private sector, with nearly 34,000 or 17 percent in the public sector. Of the public sector employees, almost 28,000 were NASA employees:

Total NASA-related employment .....	194,280
Private sector .....	160,417
NASA purchases .....	155,763
Other purchases .....	4,654
Public sector .....	33,863
NASA direct employees .....	27,745
Other Federal employees .....	3,768
State and local employees .....	2,350

The job requirements generated by NASA in the private sector did not show as heavy a concentration in manufacturing and the aerospace industries as appeared in expenditures. This occurred because expenditures represent the initial impact on the system while employment is the result of tracing this impact through the more basic stages of supplying industries. Manufacturing accounted for about 55 percent of the employment in the private sector required by NASA (table 20). Various business and professional services accounted for about 27 percent.

The largest employment impact occurred in the aircraft industry, which includes space vehicle engines and components. This industry accounted for 15 percent of all private jobs required, while completed space vehicles accounted for 9 percent. (See table 21.) This occurred in spite of the fact that initial NASA outlays were heavier in the completed space vehicles industry. However, jobs in the aircraft and components industry were created not only by direct purchases for space vehicle components but also by the indirect require-

**Table 20. Total NASA indirect employment requirements by industry sector, fiscal year 1973**

Sector	Number	Percent of NASA indirect employment
Total .....	160,417	100.0
Agriculture .....	774	.5
Mining .....	1,137	.7
Construction .....	3,163	2.0
Manufacturing .....	88,133	54.9
Transportation, communication, and public utilities .....	8,804	5.5
Trade .....	8,554	5.3
Finance, insurance, and real estate .....	3,335	2.1
Services .....	43,494	27.1
Government enterprises .....	3,024	1.9

SOURCE: Bureau of Labor Statistics.

ments generated by the purchase of completed space vehicles. About 11 percent of total private employment requirements were generated in educational services, reflecting heavy NASA purchases of research and development services from institutions of higher learning. Employment requirements in machine shops were relatively high, with 2.1 percent of private employment requirements. This resulted from strong direct and indirect demand for specialized machine shop products.

*Space Shuttle.* The Space Shuttle program in 1973 created requirements for more than 13,000 jobs in both the public and private sectors, as shown in the following tabulation. About 81 percent or almost 11,000 of these were in the private sector, and the remaining 19 percent—about 2,400 jobs—were in the public sector. Some 2,250 direct NASA employees were estimated to

**Table 21. Total NASA indirect employment requirements, selected industries, fiscal year 1973**

Industry	Number	Percent of NASA indirect employment
Aircraft and space vehicle components .....	24,373	15.2
Educational services .....	18,254	11.4
Completed space vehicles .....	14,354	9.0
Miscellaneous business services .....	12,122	7.6
Communications equipment .....	9,015	5.6
Miscellaneous professional services .....	5,300	3.3
Electronic components .....	4,891	3.1
Machine shop products .....	3,382	2.1
Computers .....	3,345	2.1
Nonprofit organizations .....	3,191	2.0
Professional and scientific instruments .....	2,960	1.9

SOURCE: Bureau of Labor Statistics.

be working on the Space Shuttle program. NASA employment on the Space Shuttle was estimated by taking the people directly allocated to the Shuttle project at NASA headquarters and at the Johnson, Kennedy, and Marshall Space Centers. In addition, a proportion of the administrative and clerical personnel in these locations was included, based upon the extent of Space Shuttle employment.

Total Space Shuttle-related employment .....	13,117
Private sector .....	10,674
NASA purchases .....	10,516
Other purchases .....	158
Public sector .....	2,443
NASA direct employees .....	2,250
Other Federal employees .....	141
State and local employees .....	52

Job requirements generated by the Space Shuttle program were also less concentrated than indicated by Space Shuttle outlays. The manufacturing sector accounted for two-thirds of the private jobs generated, higher than the total NASA proportion. (See table 22.) Business and professional services accounted for about 17 percent.

Space Shuttle employment requirements in 1973 were more concentrated in the aerospace industries than was the case with total NASA. The aircraft and space vehicle components industry accounted for almost 26 percent of the job impact in the private sector. (See table 23.) This industry, along with the completed space vehicles industry, accounted for 38 percent of the total indirect employment generated by the Space Shuttle program, as compared to 24 percent for all of NASA. However, the effect of Space Shuttle outlays on employment in education was much less than that of NASA as a

**Table 22. Space Shuttle indirect employment requirements by industry sector, fiscal year 1973**

Sector	Number	Percent of Space Shuttle indirect employment
Total .....	10,674	100.0
Agriculture .....	48	.5
Mining .....	81	.8
Construction .....	149	1.4
Manufacturing .....	7,142	66.9
Transportation, communication, and public utilities .....	500	4.7
Trade .....	569	5.3
Finance, insurance, and real estate .....	206	1.9
Services .....	1,802	16.9
Government enterprises .....	177	1.7

SOURCE: Bureau of Labor Statistics.

**Table 23. Space Shuttle indirect employment requirements, selected industries, fiscal year 1973**

Industry	Number	Percent of Space Shuttle indirect employment
Aircraft and space vehicle components .....	2,750	25.8
Completed space vehicles .....	1,323	12.4
Miscellaneous business services .....	898	8.4
Machine shop products .....	373	3.5
Nonprofit organizations .....	338	3.2
Communications equipment .....	319	3.0
Electronic components .....	268	2.5
Professional and scientific instruments .....	250	2.3
Miscellaneous professional services .....	204	2.0
Computers .....	127	1.2
Educational services .....	110	1.0

SOURCE: Bureau of Labor Statistics.

whole. Total NASA job requirements in education amounted to over 11 percent of indirect requirements while Space Shuttle requirements in this industry were only 1 percent. This reflects the fact that much of Space Shuttle development work occurred in industrial facilities rather than in university research centers.

**Occupational patterns**

*Total NASA direct employment.* NASA employed 27,745 Federal workers in 1973, on the average. About two-thirds of these employees were professional and technical workers. (See table 24.) More than 10,000 were engineers, principally aero-astronautical and electrical. Some 4,000, or almost 15 percent, were nonmedical technicians. Clerical workers were the second largest occupational group, with almost 4,000 employees or about 14 percent in this classification.

*Total NASA indirect employment.* NASA's purchases from the private economy generated requirements for some 160,400 employees in various occupational groups. Professional and technical workers were the largest occupational group, accounting for almost 24 percent of the total. In this group, engineers represented the largest occupation, with about 9 percent of all indirect employment generated by NASA, or about 14,000 workers. About one-third of these were aero-astronautical engineers. Transportation and other equipment operatives were the next largest occupational group, accounting for almost 22 percent of indirect employment requirements. Clerical workers, the third largest group, made up about one-fifth of indirect employment.

*Space Shuttle direct employment.* About 2,250 NASA employees were assigned to the Space Shuttle program in 1973. About 83 percent of these workers were classified as professional or technical (table 25). About 1,300, or some 58 percent, were engineers. About half of these were aero-astronautical engineers. Clerical workers and managers largely accounted for the remaining 17 percent.

*Space Shuttle indirect employment.* Space Shuttle purchases from the private economy in 1973 were estimated to have generated almost 11,000 jobs. The occupational pattern of these jobs is similar to that for total NASA outlays, with a somewhat higher proportion of operatives and craft workers and a slightly lower share of professional and technical and clerical workers. Operatives, principally metalworkers and assemblers, accounted for about one-quarter of Space Shuttle employment requirements. Professional and technical workers accounted for one-fifth, with engineers representing about 7 percent of total indirect employment requirements.

**Table 24. Total NASA employment requirements by occupation, fiscal year 1973**

Occupation	Total employment		Direct employment		Indirect employment	
	Number	Percent	Number	Percent	Number	Percent
Total .....	188,145	100.0	27,745	100.0	160,400	100.0
Professional, technical, and kindred workers .....	56,761	30.2	18,696	67.4	38,065	23.7
Managers, officials, and proprietors .....	15,483	8.2	3,238	11.7	12,245	7.6
Clerical workers .....	34,783	18.5	3,840	13.8	30,943	19.3
Sales workers .....	3,973	2.1	6	—	3,967	2.5
Craft and kindred workers .....	26,269	14.0	1,535	5.5	24,734	15.4
Operatives .....	35,093	18.7	315	1.1	34,778	21.7
Service workers .....	10,368	5.5	40	.1	10,328	6.4
Laborers .....	4,803	2.6	75	.3	4,728	3.0
Farmers and farm workers .....	619	.3	—	—	619	.4

NOTE: Items may not add to totals because of rounding.

SOURCE: Bureau of Labor Statistics.

**Table 25. Space Shuttle employment requirements by occupation, fiscal year 1973**

Occupation	Total employment		Direct employment		Indirect employment	
	Number	Percent	Number	Percent	Number	Percent
Total .....	12,924	100.0	2,250	100.0	10,674	100.0
Professional, technical, and kindred workers .....	3,962	30.7	1,861	82.7	2,101	19.7
Managers, officials, and proprietors .....	997	7.7	176	7.8	821	7.7
Clerical workers .....	2,205	17.1	209	9.8	1,996	18.7
Sales workers .....	265	2.0	—	—	265	2.5
Craft and kindred workers .....	1,888	14.6	—	—	1,888	17.7
Operatives .....	2,643	20.4	3	.1	2,640	24.7
Service workers .....	599	4.6	—	—	599	5.6
Laborers .....	327	2.5	1	—	326	3.0
Farmers and farm workers .....	38	.3	—	—	38	.4

NOTE: Items may not add to totals because of rounding.

SOURCE: Bureau of Labor Statistics.

## Appendix A. Technical Notes

This appendix describes in fuller detail the interindustry employment model, the national industry occupational matrix, and the procedures used to develop the employment and occupational requirements estimates for the five studies. It is designed to supplement the brief descriptions of method and limitations provided in the introduction.

### Interindustry employment model

The 1970 employment table was constructed from a 1970 interindustry model of 134 industry sectors. Each sector represents a group of industries classified by Standard Industrial Classification (SIC) codes as shown in table A-1. An interindustry model, in its most basic form, distributes the transaction value of the sales that each industry sector makes to itself, to each of the other industry sectors, and to final purchasers.

In an interindustry model, intermediate goods are sold to other industries where further fabrication occurs before a finished good is produced. Finished products are sold to the final demand or product sectors of the national income accounts—personal consumption expenditures, gross private domestic investment, net exports of goods and services, Federal Government purchases, and State and local government purchases. Intermediate sales provide the basic structure of an interindustry model while final sales, or final demand, represent the usual input to a model of this type.

Each of the 134 rows in the interindustry model shows the *sales* made by an industry to itself, to other industries, and to the final demand sectors. Each of the 134 columns shows an industry's *purchases* from each industry, including itself, which were required to produce its own output. The sum of all purchases in a column plus that industry's value added<sup>1</sup> is equal to the total value of production for that industry. When the purchases in a column are divided individually by the total production of that industry, they form ratios that

define the amount of input required from each industry in order to produce a unit of output (usually stated in dollar terms) of the purchasing industry. For example, these ratios, or coefficients, would show how much the automobile industry would have to buy from such industries as rubber, textiles, steel, aluminum, advertising, business services, plastics, transportation, and trade in order to produce a unit value of output.

These purchases represent the requirements from the immediate or first tier of supplying industries. Each of these supplying industries would also require inputs in order to manufacture its product. The steel industry would need coal and iron ore to make steel. The coal and iron ore industries, in turn, would need fuel and other products and services to produce their outputs. Each final purchase would require a chain of purchases back through the more basic supplying industries. An interindustry model provides a way of solving simultaneously all of the interrelated requirements created in the economy by purchases of the various final demand sectors or programs.

The elements of this model can be transformed from production requirements to employment requirements by applying employment-output ratios to each industry's total output. The interindustry employment table which results from this process shows the total employment attributable to deliveries to final demand. Total employment generated by a given type of final demand using an interindustry model consists of the employment in the industry producing the final product or service, as well as the employment in all the supporting industries.

It should be noted that the interindustry employment table reflects 1970 industry technology and productivity and is expressed in 1963 prices. Also, the transactions in 1963 dollars are in terms of producers' values and not purchasers' values. Producers' values are purchasers' values minus trade and transportation costs—put another way, producers' values are values stated at the site of production. The trade margins and transportation costs associated with all of these transactions appear as direct purchases from the trade and transportation industries. Use of this table, therefore, requires the conversion of purchases to 1963 producers' prices.

<sup>1</sup>The value added of a sector includes compensation of employees, depreciation, profits, and other payments to the factors of production.



## Using the employment table for manpower requirements studies

After initial research indicates the feasibility of a manpower requirements study, the first step toward using the employment table is to separate program expenditures into direct Federal purchases of goods and services, grants, transfers, and subsidy outlays. These amounts are then allocated to the appropriate purchasing sectors. For example, grants represent purchases of goods and services by State and local governments, whereas transfers are considered personal consumption expenditures, and so on. This grouping of program expenditures by purchasing sector provides the totals for the separate bills of goods or lists of purchases required in order to use the employment model. Each total must then be broken down into the purchases made from each of the 134 industry sectors of the model. These sectors consist of industry groupings defined by SIC codes. These aggregate and functional expenditures have to be broken down into the actual purchases made, a step which requires familiarity with the program and its reporting procedures.

Detail on program purchases usually appears as obligations rather than expenditures. In some cases, obligated amounts will equal or approximate actual expenditures in a given period. This is usually the case for employee compensation and other administrative overhead costs. However, where long-leadtime purchases are involved, such as construction, research and development, or the production of ships and weapon systems, obligated funds may not be completely spent for several years. Expenditures in a given year will include funds that were obligated in several previous years. These amounts must be summed to arrive at expenditures for a given year.

The list of purchases, or bill of goods, for each purchasing sector is adjusted to 1963 prices before it can be used with the employment table. In addition, the amount of trade and transportation costs included in the purchases from each industry must be determined and subtracted from these purchases. Individual trade and transportation costs are totaled and added to the total purchases from the trade and transportation sectors. The direct purchases from each industry and the trade and transportation costs associated with each product purchased comprise the total bill of goods for a program.

Use of these bills of goods with the 1970 employment table involves multiplying the table, considered as a matrix, by each of the bills of goods, considered as column vectors. Since each column provides the employment required for each billion dollars of purchases, this calculation would yield the employment generated by

each program. The amount of employment generated within the same industry as the producing industry in each row is considered the *first tier* or primary employment requirements, while the employment totals of the other industries in each row constitute the *second tier*, or secondary employment requirements.

## National industry-occupational matrix

The employment generated in each industry is disaggregated into occupations using the national industry-occupational employment matrix. This matrix is a table which presents for total U.S. employment the percent distribution of 422 detailed occupations in each of 201 industries. By applying an industry's occupational pattern to total employment in that industry, estimates are developed of the industry's employment by occupation. To arrive at total national requirements for each occupation, the estimates for all the industries are summed across each row in the table or matrix.

Currently, industry-occupational matrices are available for 1970, 1980, and 1985.<sup>2</sup> The 1970 matrix is based primarily on data from the 1970 Census of Population, supplemented by data from other sources. These supplemental data include annual averages from the Current Population Survey (CPS) and:

- Employment estimates for teachers and librarians based on data collected by the Office of Education;
- Occupational employment data collected by regulatory agencies for regulated sectors such as railroads, airlines, and telephone and telegraph communications;
- Employment data collected by professional societies, especially for medical and health occupations;
- Federal Civil Service Commission statistics on employment by occupation in Federal Government agencies;
- Occupational employment information compiled by the Postal Service on its employees.

The 1980 and 1985 matrices were projected using currently available data and independently projected estimates for total national employment, employment in occupational groups and selected occupations, and total employment by industry.<sup>3</sup>

<sup>2</sup> Matrices based on the classification of occupations in the 1960 Census of Population are available for 1960, 1967, 1970, and 1980, but these are not comparable to the ones used in this study because they only show the distribution of 160 occupations in 116 industries.

The 1970 matrix was used to prepare 1972 occupational employment estimates since each industry's occupational structure changes slowly and is relatively stable over the short run.

A number of adjustments had to be made to the occupational matrix in order to use it in conjunction with the interindustry model system for the studies presented in this report, since the industry classifications differ in the two systems. The restructuring of industries in the occupational matrix (201 industries) to conform to the industries in the interindustry model (134 industries) was accomplished by comparing the industries in terms of codes and making necessary adjustments. While many of the industries in both models matched exactly by SIC code, there were various differences that had to be reconciled.

In some areas, there was greater industry detail in the occupational matrix than in the interindustry model. In these cases, the matrix industries were aggregated. Where the industry-occupational matrix industries were less

<sup>3</sup>For a discussion of the methodology used to project occupational matrices see *Tomorrow's Manpower Needs, Volume IV, Revised*, Bulletin 1737 (Bureau of Labor Statistics, 1971).

detailed than those in the interindustry model, the employment of the matrix industry was distributed according to the proportion of its SIC content. Thus, if a matrix industry was composed of two SIC industries, the total employment of each SIC industry as found in *Employment and Earnings* was added together, then divided by the total to calculate a percent distribution for the matrix industry in terms of its SIC content. This distribution was used to adjust each cell of the matrix industry, and these adjusted cells were used to form the inter-industry model sector or were added to corresponding adjusted cells from other matrix industries to form the input-output sector. For example, if a SIC industry was found to represent 30 percent of the total employment of a matrix industry, each cell of the matrix industry was multiplied by 30 percent to form the corresponding cell for the inter-industry model sector or was added to similarly adjusted cells from other matrix industries to form the interindustry model sector's cell. These operations were performed on private wage and salary, self-employed, and unpaid family worker occupational cells for each industry. Government workers were placed in three input-output sectors based on independent information.

**Table A-1. Interindustry model sectoring plan**

Sector number and name		1963 input-output number	SIC code <sup>1</sup>	Sector number and name		1963 input-output number	SIC code <sup>1</sup>
<b>Agriculture, forestry, and fisheries:</b>				<b>Manufacturing—Continued</b>			
1	Livestock and livestock products . . . . .	1.01-1.03	01	23	Miscellaneous textiles and floor coverings . . . . .	17.01-17.10	227 and 229
2	Crops and other agricultural products . . . . .	2.01-2.07	01	24	Hosiery and knit goods . . . . .	18.01-18.03	225
3	Forestry and fisheries . . . . .	3	074, 08, and 091	25	Apparel . . . . .	18.04	23 (except 239), 3992
4	Agriculture, forestry, and fishery services . . . . .	4	071, 0723, pt. 0729, 073, 085, and 098	26	Miscellaneous fabricated textile products . . . . .	19.01-19.03	239
<b>Mining:</b>				27	Logging, sawmills, and planing mills . . . . .	20.01-20.04	241 and 242
5	Iron ore mining . . . . .	5	101, 106	28	Millwork, plywood, and other wood products . . . . .	20.05-20.09 and 21	243, 244, and 249
6	Copper ore mining . . . . .	6.01	102	29	Household furniture . . . . .	22.01-22.04	251
7	Other nonferrous metal ore mining . . . . .	6.02	103-109, except 106	30	Other furniture . . . . .	23.01-23.07	25 except 251
8	Coal mining . . . . .	7	11, 12	31	Paper products . . . . .	24.01-24.07	26 except 265
9	Crude petroleum . . . . .	8	1311, 1321, 138	32	Paperboard . . . . .	25	265
10	Stone and clay mining and quarrying . . . . .	9	141-145, 148, and 149	33	Publishing . . . . .	26.01-26.04	271, 272, 273, and 274
11	Chemical and fertilizer mining . . . . .	10	147	34	Printing . . . . .	26.05-26.08	275, 276, 277, 278, and 279
<b>Construction:</b>				35	Chemical products . . . . .	27.01 and 27.04	281 (except 28195), 286, and 289
12	New residential buildings . . . . .	11.01	} 15, 16, and 17	36	Agricultural chemicals . . . . .	27.02-27.03	287
13	New nonresidential buildings . . . . .	11.02		37	Plastic materials and synthetic rubber . . . . .	28.01-28.02	2821, 2822
14	New public utilities . . . . .	11.03		38	Synthetic fibers . . . . .	28.03-28.04	2823, 2824
15	New streets and highways . . . . .	11.04		39	Drugs . . . . .	29.01	283
16	All other new construction . . . . .	11.05		40	Cleaning and toilet preparations . . . . .	29.02-29.03	284
17	Maintenance and repair . . . . .	12.01-12.02		41	Paint . . . . .	30	285
<b>Manufacturing:</b>				42	Petroleum products . . . . .	31.01-31.03	29
18	Guided missiles and space vehicles . . . . .	13.01	1925	43	Rubber products . . . . .	32.01-32.03	30 except 307
19	Other ordnance . . . . .	13.02-13.07	19 except 1925	44	Plastic products . . . . .	32.04	307
20	Food products . . . . .	14.01-14.32	20	45	Leather, footwear, and leather products . . . . .	33, 34.01, and 34.03	31
21	Tobacco manufacturing . . . . .	15.01-15.02	21	46	Glass . . . . .	35.01-35.02	321, 322, and 323
22	Fabric, yarn, and thread mills . . . . .	16.01-16.04	221, 222, 223, 224, 226, and 228	47	Cement, clay, and concrete products . . . . .	36.01-36.05 and 36.10-36.14	324, 325, and 327

See footnotes at end of table.

**Table A-1. Interindustry model sectoring plan—Continued**

Sector number and name		1963 input-output number	SIC code <sup>1</sup>	Sector number and name		1963 input-output number	SIC code <sup>1</sup>
<b>Manufacturing—Continued</b>				<b>Manufacturing—Continued</b>			
48	Miscellaneous stone and clay products . . . . .	36.06-36.09 and 36.15-36.22	326, 328, and 329	69	General industrial machinery . . . . .	49.01-49.07	356
49	Blast furnaces and basic steel products . . . . .	37.01	331	70	Machine shop products . . . . .	50	359
50	Iron and steel foundries and forgings . . . . .	37.02-37.04	332, 3391, and 3399	71	Computers and peripheral equipment . . . . .	51.01	3573, 3574
51	Primary copper metals . . .	38.01	3331	72	Typewriters and other office machines . . . . .	51.02-51.04	357, except 3573 and 3574
52	Primary aluminum . . . . .	38.04	3334 and 28195	73	Service industry machines . . . . .	52.01-52.05	358
53	Other primary and secondary nonferrous metal products . . . . .	38.02-38.03 and 38.05-38.06	3332, 3333, 3339, and 334	74	Electric transmission equipment . . . . .	53.01-53.03	361
54	Copper rolling and drawing . . . . .	38.07	3351	75	Electrical industrial apparatus . . . . .	53.04-53.08	362
55	Aluminum rolling and drawing . . . . .	38.08	3352	76	Household appliances . . . .	54.01-54.07	363
56	Other nonferrous rolling and drawing . . . . .	38.09-38.10	3356 and 3357	77	Electric lighting and wiring . . . . .	55.01-55.03	364
57	Miscellaneous nonferrous metal products . . . . .	38.11-38.14	336 and 3392	78	Radio and television sets . . . . .	56.01-56.02	365
58	Metal containers . . . . .	39.01-39.02	341 and 3491	79	Telephone and telegraph apparatus . . . . .	56.03	3661
59	Heating apparatus and plumbing fixtures . . . . .	40.01-40.03	343	80	Other electronic communication equipment . . . . .	56.04	3662
60	Fabricated structural metal . . . . .	40.04-40.09	344	81	Electronic components . . .	57.01-57.03	367
61	Screw machine products . .	41.01-41.02	345 and 346	82	Other electrical machinery . . . . .	58.01-58.05	369
62	Other fabricated metal products . . . . .	42.01-42.11	342, 347, 348, and 349 except 3491	83	Motor vehicles . . . . .	59.01-59.03	371
63	Engines, turbines, and generators . . . . .	43.01-43.02	351	84	Aircraft . . . . .	60.01-60.04	372
64	Farm machinery . . . . .	44	352	85	Ship and boat building and repair . . . . .	61.01-61.02	373
65	Construction, mining, and oil field machinery . . . . .	45.01-45.03	3531, 3532, and 3533	86	Railroad and other transportation equipment . . . . .	61.03-61.05	374 and 375
66	Material handling equipment . . . . .	46.01-46.04	3534, 3535, 3536, and 3537	87	Miscellaneous transportation equipment . . . . .	61.06-61.07	379
67	Metalworking machinery . . . . .	47.01-47.04	354	88	Scientific and controlling instruments . . . . .	62.01-62.03 and 62.07	381, 382, and 387
68	Special industry machinery . . . . .	48.01-48.06	355	89	Medical and dental instruments . . . . .	62.04-62.06	384
				90	Optical and ophthalmic equipment . . . . .	63.01-63.02	383 and 385
				91	Photographic equipment and supplies . . . . .	63.03	386

See footnotes at end of table.

**Table A-1. Interindustry model sectoring plan—Continued**

Sector number and name	1963 input-output number	SIC code <sup>1</sup>	Sector number and name	1963 input-output number	SIC code <sup>1</sup>
<b>Manufacturing—Continued</b>			<b>Services—Continued</b>		
92 Miscellaneous manufac- tured products . . . . .	64.01-64.12	39 (except 3992)	114 Miscellaneous professional services . . . . .	73.03 and 74	81 and 89 except 892, nonprofit research
<b>Transportation, communication, and public utilities:</b>			115 Automobile repair . . . . .	75	75
93 Railroad transportation . . . . .	65.01	40 and 474	116 Motion pictures . . . . .	76.01	78
94 Local transit and intercity bus . . . . .	65.02	41	117 Other amusements . . . . .	76.02	79
95 Truck transportation . . . . .	65.03	42 and 473	118 Health services except hospitals . . . . .	77.01 and 77.03	80 (except 806), 0722
96 Water transportation . . . . .	65.04	44	119 Hospitals . . . . .	77.02	806
97 Air transportation . . . . .	65.05	45	120 Educational services . . . . .	77.04	82
98 Other transportation . . . . .	65.06-65.07	46, 47 (except 473 and 474)	121 Nonprofit organizations . . . . .	77.05	84, 86, and 892
99 Communications, except radio and TV . . . . .	66	48 except 483	<b>Government enterprises:</b>		
100 Radio and TV broad- casting . . . . .	67	483	122 Post Office . . . . .	78.01	(2)
101 Electric utilities . . . . .	68.01	491 and part 493	123 Commodity Credit Corporation . . . . .	78.03	(2)
102 Gas utilities . . . . .	68.02	492 and part 493	124 Other Federal enterprises . . . . .	78.02 and 78.04	(2)
103 Water and sanitary services . . . . .	68.03	494, 495, 496, 497, and part 493	125 State and local government enterprises . . . . .	79.01-79.03	(2)
<b>Wholesale and retail trade:</b>			<b>Imports:</b>		
104 Wholesale trade . . . . .	69.01	50	126 Directly allocated im- ports . . . . .	80.01	(2)
105 Retail trade . . . . .	69.02	52, 53, 54, 55, 56, 57, 58, and 59	127 Transferred imports . . . . .	80.02	(2)
<b>Finance, insurance, and real estate:</b>			<b>Dummy industries:</b>		
106 Finance . . . . .	70.01-70.03	60, 61, 62, and 67	128 Business travel, entertain- ment, and gifts . . . . .	81	(2)
107 Insurance . . . . .	70.04-70.05	63 and 64	129 Office supplies . . . . .	82	(2)
108 Owner-occupied dwellings . . . . .	70.01	(2)	130 Scrap, used and second- hand goods . . . . .	83	(2)
109 Other real estate . . . . .	71.02	65 and 66	<b>Special industries:</b>		
<b>Services:</b>			131 Government industry . . . . .	84	(2)
110 Hotels and lodging places . . . . .	72.01	70	132 Rest of the world industry . . . . .	85	(2)
111 Other personal services . . . . .	72.02-72.03	72 and 76	133 Households . . . . .	86	(2)
112 Miscellaneous business services . . . . .	73.01	73 except 731	134 Inventory valuation adjustment . . . . .	87	(2)
113 Advertising . . . . .	73.02	731			

<sup>1</sup> Standard Industrial Classification Manual, 1967 edition, Bureau of the Budget (now Office of Management and Budget).

<sup>2</sup> No comparable industry.

## **Appendix B. Detailed Tables**

**Table B-1. Expenditures for goods and services by program and industry**

(Thousands of dollars)

PRODUCING INDUSTRY	VETERANS ADMINIS- TRATION HEALTH CARE <sup>1</sup>	NATIONAL INSTITUTES OF HEALTH <sup>2</sup>			MDTA INSTITUTIONAL TRAINING <sup>3</sup>			NATIONAL AERONAUTICS AND SPACE ADMINISTRATION <sup>4</sup>	
		TOTAL	EXTRAMURAL PROGRAM	DIRECT OPERATIONS	TOTAL	PROGRAM PURCHASES	ALLOWANCES	TOTAL PROGRAM	SPACE SHUTTLE
TOTAL.....	\$731,018	\$396,326	\$331,190	\$65,136	\$122,796	\$27,337	\$95,459	\$2,669,028	\$181,725
LIVESTOCK AND LIVESTOCK PRODUCTS.....	-	9,996	9,996	-	630	3	627	50	2
CROPS AND OTHER AGRICULTURAL PRODUCTS.....	-	128	527	-	549	7	542	71	2
FORESTRY AND FISHERIES.....	-	131	131	-	102	-	102	25	1
AGRICULTURE, FORESTRY, AND FISHERY SERVICES.....	-	2,101	3	2,098	-	-	-	41	2
IRON ORE MINING.....	-	2,101	3	2,098	-	-	-	41	2
COPPER ORE MINING.....	-	-	-	-	-	-	-	-	-
OTHER NONFERROUS METAL ORE MINING.....	-	-	-	-	-	-	-	61	2
COAL MINING.....	-	4	4	-	4	4	-	908	12
CRUDE PETROLEUM.....	-	24	-	24	-	-	-	-	-
STONE AND CLAY MINING AND QUARRYING.....	-	115	7	108	-	-	-	61	2
CHEMICAL AND FERTILIZER MINING.....	-	-	-	-	-	-	-	-	-
NEW RESIDENTIAL BUILDING CONSTRUCTION.....	-	-	-	-	-	-	-	-	-
NEW NONRESIDENTIAL BUILDING CONSTRUCTION.....	82,662	457	430	27	-	-	-	29,164	734
NEW PUBLIC UTILITIES CONSTRUCTION.....	-	-	-	-	-	-	-	290	89
NEW HIGHWAY CONSTRUCTION.....	-	229	-	229	-	-	-	1,700	49
ALL OTHER NEW CONSTRUCTION.....	-	-	-	-	-	-	-	39,110	684
MAINTENANCE AND REPAIR CONSTRUCTION.....	47,901	11,712	8,500	3,212	268	268	-	21,854	2,036
GUIDED MISSILES AND SPACE VEHICLES.....	-	-	-	-	-	-	-	763,137	67,400
OTHER ORDNANCE.....	-	1	-	1	-	-	-	1,914	3
FOOD PRODUCTS.....	45,640	23,583	21,282	2,301	16,007	423	15,584	2,917	104
TOBACCO MANUFACTURING.....	-	1,049	1,049	-	1,403	-	1,403	-	-
FABRIC, YARN, AND THREAD MILLS.....	-	2,116	155	-	159	56	103	185	1
MISCELLANEOUS TEXTILES AND FLOOR COVERINGS.....	1,076	22	22	-	54	54	-	59	4
HOSIERY AND KNIT GOODS.....	-	25	25	-	4	4	-	-	-
APPAREL.....	1,362	4,220	3,375	845	4,784	332	4,452	453	16
MISCELLANEOUS FABRICATED TEXTILE PRODUCTS.....	9,441	320	148	172	294	85	209	133	6
LOGGING, SAWMILLS, AND PLANING MILLS.....	-	187	21	166	-	-	-	10	-
MILLWORK, PLYWOOD, AND OTHER WOOD PRODUCTS.....	128	1,260	1,156	104	157	157	-	482	34
HOUSEHOLD FURNITURE.....	96	288	268	20	377	22	355	169	6
OTHER FURNITURE.....	1,202	1,283	997	286	427	427	-	1,387	59
PAPER PRODUCTS.....	9,528	2,532	1,710	822	904	724	180	1,942	38
PAPERBOARD.....	2,999	96	86	10	28	28	-	122	3
PUBLISHING.....	2,141	4,358	3,463	895	1,673	1,673	-	1,254	32
PRINTING.....	1,809	6,634	4,025	2,609	873	873	-	6,042	250
CHEMICAL PRODUCTS.....	372	32,074	28,475	3,599	443	443	-	15,935	1,663
AGRICULTURAL CHEMICALS.....	-	25	7	18	11	11	-	177	6
PLASTIC MATERIALS AND SYNTHETIC RUBBER.....	-	92	25	67	-	-	-	912	840
SYNTHETIC FIBERS.....	-	-	-	-	-	-	-	-	-
DRUGS.....	84,752	14,859	11,977	2,882	899	19	880	772	28
CLEANING AND TOILET PREPARATIONS.....	3,030	2,885	2,700	185	2,562	376	2,186	704	22
PAINT.....	-	154	15	139	110	110	-	158	9
PETROLEUM PRODUCTS.....	5,529	3,687	2,057	1,630	2,610	775	1,835	14,996	166
RUBBER PRODUCTS.....	1,581	364	319	45	408	63	345	322	47
PLASTIC PRODUCTS.....	2,500	2,678	2,556	122	196	63	133	606	451
LEATHER, FOOTWEAR, AND LEATHER PRODUCTS..	-	459	459	-	644	33	611	12	1
GLASS.....	24	12,390	11,452	938	113	38	75	487	73
CEMENT, CLAY, AND CONCRETE PRODUCTS.....	-	111	17	94	51	51	-	381	119
MISCELLANEOUS STONE AND CLAY PRODUCTS.....	1,610	239	150	89	91	91	-	394	20
BLAST FURNACES AND BASIC STEEL PRODUCTS..	-	132	43	89	305	305	-	1,417	1,257
IRON AND STEEL FOUNDRIES AND FORGINGS...	-	27	3	24	58	58	-	1,299	222
PRIMARY COPPER METALS.....	-	-	-	-	-	-	-	229	8
PRIMARY ALUMINUM.....	-	-	-	-	-	-	-	80	40
OTHER PRIMARY AND SECONDARY NONFERROUS METAL PRODUCTS.....	-	-	-	-	-	-	-	1,764	121
COPPER ROLLING AND DRAWING.....	-	12	1	11	75	75	-	79	2
ALUMINUM ROLLING AND DRAWING.....	67	107	104	3	24	24	-	64	16
OTHER NONFERROUS ROLLING AND DRAWING.....	-	63	45	18	119	119	-	1,667	42
MISCELLANEOUS NONFERROUS METAL PRODUCTS..	-	37	30	7	46	46	-	1,338	1,148
METAL CONTAINERS.....	-	27	3	24	39	39	-	-	-
HEATING APPARATUS AND PLUMBING FIXTURES..	-	121	59	62	39	39	-	486	27
FABRICATED STRUCTURAL METAL.....	-	356	15	341	78	78	-	2,895	244
SCREW MACHINE PRODUCTS.....	-	77	41	36	56	56	-	322	153
OTHER FABRICATED METAL PRODUCTS.....	831	3,320	2,800	520	862	862	-	2,105	674
ENGINES, TURBINES, AND GENERATORS.....	-	2	2	-	41	41	-	969	32
FARM MACHINERY.....	73	52	37	15	9	9	-	46	1

SEE FOOTNOTES AT END OF TABLE.

**Table B-1. Expenditures for goods and services by program and industry—Continued**

(Thousands of dollars)

PRODUCING INDUSTRY	VETERANS ADMINIS- TRATION HEALTH CARE <sup>1</sup>	NATIONAL INSTITUTES OF HEALTH <sup>2</sup>			MDTA INSTITUTIONAL TRAINING <sup>3</sup>			NATIONAL AERONAUTICS AND SPACE ADMINISTRATION <sup>4</sup>	
		TOTAL	EXTRAMURAL PROGRAM	DIRECT OPERATIONS	TOTAL	PROGRAM PURCHASES	ALLOWANCES	TOTAL PROGRAM	SPACE SHUTTLE
CONSTRUCTION, MINING, AND OIL FIELD									
MACHINERY.....	-	129	-	129	7	7	-	42	1
MATERIAL HANDLING EQUIPMENT.....	801	317	17	300	41	41	-	437	22
METALWORKING MACHINERY.....	99	345	242	103	411	411	-	577	288
SPECIAL INDUSTRY MACHINERY.....	566	83	34	49	159	159	-	2,456	18
GENERAL INDUSTRIAL MACHINERY.....	199	235	80	155	166	166	-	2,787	674
MACHINE SHOP PRODUCTS.....	-	425	398	27	118	118	-	4,241	609
COMPUTERS AND PERIPHERAL EQUIPMENT.....	1,393	12,814	11,491	1,323	56	56	-	106,125	3,963
TYPEWRITERS AND OTHER OFFICE MACHINES.....	4,487	995	618	377	647	647	-	1,561	24
SERVICE INDUSTRY MACHINES.....	2,900	723	301	422	237	237	-	417	19
ELECTRIC TRANSMISSION EQUIPMENT.....	2,135	2,653	2,321	332	205	205	-	36,999	300
ELECTRIC INDUSTRIAL APPARATUS.....	234	984	873	111	386	386	-	3,236	123
HOUSEHOLD APPLIANCES.....	396	1,119	1,057	62	1,017	44	973	228	14
ELECTRIC LIGHTING AND WIRING.....	164	240	150	90	156	156	-	874	48
RADIO AND TELEVISION SETS.....	5,844	1,733	1,695	38	982	282	700	629	22
TELEPHONE AND TELEGRAPH APPARATUS.....	63	505	482	23	-	-	-	2,249	17
OTHER ELECTRONIC COMMUNICATION EQUIPMENT.....	4,109	3,924	3,266	658	37	37	-	299,749	5,477
ELECTRONIC COMPONENTS.....	24	3,492	3,232	260	199	199	-	44,697	3,585
OTHER ELECTRICAL MACHINERY.....	25,177	3,277	2,822	455	131	59	72	2,910	5
MOTOR VEHICLES.....	494	1,572	1,374	198	2,072	390	1,682	9,864	80
AIRCRAFT.....	-	-	-	-	-	-	-	495,656	61,439
SHIP AND BOAT BUILDING AND REPAIR.....	-	-	-	-	-	-	-	1,040	14
RAILROAD AND OTHER									
TRANSPORTATION EQUIPMENT.....	-	1	-	1	-	-	-	-	-
MISCELLANEOUS TRANSPORTATION EQUIPMENT.....	774	14	-	14	3	3	-	47	2
SCIENTIFIC AND CONTROLLING INSTRUMENTS.....	24,754	30,894	26,426	4,468	187	187	-	53,659	4,540
MEDICAL AND DENTAL INSTRUMENTS.....	65,189	9,292	7,479	1,813	162	162	-	8,465	13
OPTICAL AND OPHTHALMIC EQUIPMENT.....	7,108	11,555	8,943	2,612	89	89	-	26,710	32
PHOTOGRAPHIC EQUIPMENT AND SUPPLIES.....	14,701	9,158	7,485	1,673	332	332	-	8,108	111
MISCELLANEOUS MANUFACTURED PRODUCTS.....	797	477	336	141	685	475	210	832	135
RAILROAD TRANSPORTATION.....	77	1,425	1,397	28	2,750	179	2,571	2,780	103
LOCAL TRANSIT AND INTERCITY BUS.....	21,273	2,285	1,813	472	7,604	404	7,200	2,497	140
TRUCK TRANSPORTATION.....	3,267	1,559	882	677	804	197	607	4,454	190
WATER TRANSPORTATION.....	-	396	396	-	861	46	815	454	8
AIR TRANSPORTATION.....	2,921	7,598	4,956	2,642	163	159	4	26,237	785
OTHER TRANSPORTATION.....	-	2	2	-	5	5	-	72	1
COMMUNICATIONS, EXCEPT RADIO AND TV.....	11,282	4,847	2,431	2,416	2,897	803	2,094	47,145	1,190
RADIO AND TV BROADCASTING.....	-	8	8	-	15	15	-	1,080	1
ELECTRIC UTILITIES.....	14,232	3,158	1,778	1,380	3,290	1,022	2,268	20,418	1,374
GAS UTILITIES.....	6,573	1,128	1,123	5	897	731	166	7,723	245
WATER AND SANITARY SERVICES.....	5,130	889	491	398	857	372	485	3,440	155
WHOLESALE TRADE.....	-	4,141	4,095	46	1,326	2,110	11,159	2,901	97
RETAIL TRADE.....	734	15,310	13,024	13,808	15,468	158	158	2,661	200
FINANCE.....	-	-	-	-	-	-	-	258	10
INSURANCE.....	50	1,860	1,742	118	2,158	364	1,794	402	11
OWNER-OCCUPIED DWELLINGS.....	-	2,098	2,098	-	3,857	-	3,857	-	-
OTHER REAL ESTATE.....	1,475	10,339	10,124	215	12,096	1,994	10,102	2,151	74
HOTELS AND LODGING PLACES.....	907	2,765	1,873	892	291	48	243	3,987	248
OTHER PERSONAL SERVICES.....	7,814	2,315	2,255	60	2,907	100	2,807	9,583	259
MISCELLANEOUS BUSINESS SERVICES.....	9,175	26,968	23,152	3,816	2,024	2,024	-	131,392	9,539
ADVERTISING.....	1	34	13	21	3	3	-	8	-
MISCELLANEOUS PROFESSIONAL SERVICES.....	18,698	2,082	1,929	153	187	187	-	50,390	100
AUTOMOBILE REPAIR.....	3,067	848	797	51	231	148	83	6,549	30
MOTION PICTURES.....	203	304	298	6	399	255	144	4,513	18
OTHER AMUSEMENTS.....	-	197	197	-	271	21	250	12	-
HEALTH SERVICES EXCEPT HOSPITALS.....	93,463	12,139	4,564	7,575	1,662	4	1,658	896	2
HOSPITALS.....	4,595	23,602	23,594	8	1,900	-	1,900	797	3
EDUCATIONAL SERVICES.....	6,260	18,904	18,579	361	1,829	1,829	-	213,115	103
NONPROFIT ORGANIZATIONS.....	42,297	2,366	1,408	958	1,360	3	1,357	28,036	314
POST OFFICE.....	2,680	1,496	981	515	502	187	315	2,227	1
COMMODITY CREDIT CORPORATION.....	-	-	-	-	-	-	-	-	-
OTHER FEDERAL ENTERPRISES.....	-	-	-	-	-	-	-	1,200	-
STATE AND LOCAL GOVERNMENT ENTERPRISES...	-	-	-	-	55	55	-	3,317	12
DIRECTLY ALLOCATED IMPORTS.....	-	525	525	-	673	-	673	43,309	349
TRANSFERRED IMPORTS.....	-	-	-	-	-	-	-	-	-
BUSINESS TRAVEL, ENTERTAINMENT, AND GIFTS	-	-	-	-	-	-	-	-	-
OFFICE SUPPLIES.....	397	3,441	2,773	678	106	106	-	10,905	25

<sup>1</sup> FY 1972. SEE TEXT FOR DETAILS OF STUDY.<sup>2</sup> FY 1969. SEE TEXT FOR DETAILS OF STUDY.<sup>3</sup> FY 1972. SEE TEXT FOR DETAILS OF STUDY.<sup>4</sup> FY 1973. SEE TEXT FOR DETAILS OF STUDY.

- DENOTES NO EXPENDITURES.



**Table B-2. Indirect employment requirements by industry and program**

PRODUCING INDUSTRY	VETERANS ADMINISTRATION HEALTH CARE	NATIONAL INSTITUTES OF HEALTH EXTRAMURAL PROGRAMS					DIRECT OPERATIONS
		TOTAL EXTRAMURAL AND DIRECT	TOTAL	PROGRAM PURCHASES	CONSTRUCTION GRANTS <sup>1</sup>	LOANS AND FELLOWSHIPS <sup>2</sup>	
TOTAL.....	47,450	60,465	55,113	31,101	10,773	13,239	5,352
LIVESTOCK AND LIVESTOCK PRODUCTS.....	628	1,939	1,880	1,541	16	323	59
CROPS AND OTHER AGRICULTURAL PRODUCTS....	688	847	735	299	48	388	112
FORESTRY AND FISHERIES.....	53	50	42	18	8	16	8
AGRICULTURE, FORESTRY, AND FISHERY SERVICES.....	106	414	121	59	14	48	293
IRON ORE MINING.....	19	29	27	10	14	3	2
COPPER ORE MINING.....	22	31	28	16	9	3	3
OTHER NONFERROUS METAL ORE MINING.....	22	31	28	16	10	2	3
COAL MINING.....	99	100	89	43	25	21	11
CRUDE PETROLEUM.....	170	203	174	91	29	54	29
STONE AND CLAY MINING AND QUARRYING.....	79	143	132	30	94	8	11
CHEMICAL AND FERTILIZER MINING.....	14	30	27	20	4	3	3
NEW RESIDENTIAL BUILDING CONSTRUCTION....	-	-	-	-	-	-	-
NEW NONRESIDENTIAL BUILDING CONSTRUCTION..	977	3,863	3,862	16	3,846	-	1
NEW PUBLIC UTILITIES CONSTRUCTION.....	-	-	-	-	-	-	-
NEW HIGHWAY CONSTRUCTION.....	-	6	-	-	-	-	6
ALL OTHER NEW CONSTRUCTION.....	-	-	-	-	-	-	-
MAINTENANCE AND REPAIR CONSTRUCTION.....	2,104	1,072	885	658	51	176	187
GUIDED MISSILES AND SPACE VEHICLES.....	5	8	7	5	1	1	1
OTHER ORDNANCE.....	12	12	11	6	2	3	1
FOOD PRODUCTS.....	897	807	743	298	19	426	64
TOBACCO MANUFACTURING.....	1	33	33	14	-	19	-
FABRIC, YARN, AND THREAD MILLS.....	469	303	274	122	20	132	29
MISCELLANEOUS TEXTILES AND FLOOR COVERINGS.....	86	67	61	18	18	25	6
HOSIERY AND KNIT GOODS.....	31	106	98	37	3	58	8
APPAREL.....	118	633	577	262	13	302	56
MISCELLANEOUS FABRICATED TEXTILE PRODUCTS.....	299	74	65	20	7	38	9
LOGGING, SAWMILLS, AND PLANING MILLS.....	183	226	195	109	51	35	31
MILLWORK, PLYWOOD, AND OTHER WOOD PRODUCTS.....	110	250	232	109	944	29	18
HOUSEHOLD FURNITURE.....	34	108	105	31	3	71	3
OTHER FURNITURE.....	45	66	54	45	5	4	12
PAPER PRODUCTS.....	564	480	410	265	59	86	70
PAPERBOARD.....	263	194	171	104	24	43	23
PUBLISHING.....	429	597	522	367	34	121	75
PRINTING.....	532	839	664	519	37	108	175
CHEMICAL PRODUCTS.....	361	951	847	715	75	57	104
AGRICULTURAL CHEMICALS.....	18	31	28	16	2	10	3
PLASTIC MATERIALS AND SYNTHETIC RUBBER...	102	118	106	62	28	16	12
SYNTHETIC FIBERS.....	69	61	55	24	8	23	6
DRUGS.....	1,590	375	310	278	1	31	65
CLEANING AND TOILET PREPARATIONS.....	66	91	86	55	2	29	5
PAINT.....	57	61	52	27	16	9	9
PETROLEUM PRODUCTS.....	89	129	111	58	18	35	18
RUBBER PRODUCTS.....	174	155	143	64	27	52	12
PLASTIC PRODUCTS.....	384	427	395	203	147	45	32
LEATHER, FOOTWEAR, AND LEATHER PRODUCTS..	99	142	139	48	7	84	3
GLASS.....	180	621	573	516	27	30	48
CEMENT, CLAY, AND CONCRETE PRODUCTS.....	145	375	363	35	318	10	12
MISCELLANEOUS STONE AND CLAY PRODUCTS....	154	198	186	53	117	16	12
BLAST FURNACES AND BASIC STEEL PRODUCTS..	361	574	537	166	317	54	37
IRON AND STEEL FOUNDRIES AND FORGINGS...	93	161	147	64	60	23	14
PRIMARY COPPER METALS.....	8	11	10	6	3	1	1
PRIMARY ALUMINUM.....	19	34	32	11	18	3	2
OTHER PRIMARY AND SECONDARY NONFERROUS METAL PRODUCTS.....	39	37	33	20	10	3	4
COPPER ROLLING AND DRAWING.....	22	30	27	16	8	3	3
ALUMINUM ROLLING AND DRAWING.....	35	72	68	19	44	5	4
OTHER NONFERROUS ROLLING AND DRAWING.....	51	67	61	36	20	5	6
MISCELLANEOUS NONFERROUS METAL PRODUCTS..	50	72	64	42	14	8	8
METAL CONTAINERS.....	63	56	50	28	4	18	6
HEATING APPARATUS AND PLUMBING FIXTURES..	58	145	140	13	122	5	5
FABRICATED STRUCTURAL METAL.....	195	580	559	38	509	12	21
SCREW MACHINE PRODUCTS.....	173	220	199	112	47	40	21
OTHER FABRICATED METAL PRODUCTS.....	260	554	507	206	250	51	47
ENGINES, TURBINES, AND GENERATORS.....	18	35	32	16	9	7	3
FARM MACHINERY.....	6	9	8	5	1	2	1

SEE FOOTNOTES AT END OF TABLE.

**Table B-2. Indirect employment requirements by industry and program—Continued**

PRODUCING INDUSTRY	VETERANS ADMINISTRATION HEALTH CARE	NATIONAL INSTITUTES OF HEALTH EXTRAMURAL PROGRAMS					DIRECT OPERATIONS
		TOTAL EXTRAMURAL AND DIRECT	TOTAL	PROGRAM PURCHASES	CONSTRUCTION GRANTS <sup>1</sup>	LOANS AND FELLOWSHIPS <sup>2</sup>	
CONSTRUCTION, MINING, AND OIL FIELD							
MACHINERY.....	24	42	35	13	18	4	7
MATERIAL HANDLING EQUIPMENT.....	58	112	103	11	89	3	9
METALWORKING MACHINERY.....	81	133	117	74	27	16	16
SPECIAL INDUSTRY MACHINERY.....	48	54	47	32	8	7	7
GENERAL INDUSTRIAL MACHINERY.....	82	145	130	48	70	12	15
MACHINE SHOP PRODUCTS.....	59	123	112	69	23	20	11
COMPUTERS AND PERIPHERAL EQUIPMENT.....	60	455	405	398	3	4	50
TYPEWRITERS AND OTHER OFFICE MACHINES.....	125	42	31	26	2	3	11
SERVICE INDUSTRY MACHINES.....	85	92	79	34	11	11	13
ELECTRIC TRANSMISSION EQUIPMENT.....	174	262	233	191	33	9	29
ELECTRIC INDUSTRIAL APPARATUS.....	113	197	179	108	54	17	18
HOUSEHOLD APPLIANCES.....	32	83	79	36	6	37	4
ELECTRIC LIGHTING AND WIRING.....	124	257	243	68	156	19	14
RADIO AND TELEVISION SETS.....	89	74	72	42	2	28	2
TELEPHONE AND TELEGRAPH APPARATUS.....	37	73	65	52	6	7	8
OTHER ELECTRONIC COMMUNICATION EQUIPMENT.....	189	276	236	205	26	5	40
ELECTRONIC COMPONENTS.....	207	464	417	345	41	31	47
OTHER ELECTRICAL MACHINERY.....	612	131	115	91	9	15	16
MOTOR VEHICLES.....	23	171	166	36	3	127	5
AIRCRAFT.....	52	86	73	52	11	10	13
SHIP AND BOAT BUILDING AND REPAIR.....	14	36	34	8	17	9	2
RAILROAD AND OTHER							
TRANSPORTATION EQUIPMENT.....	9	13	12	6	2	4	1
MISCELLANEOUS TRANSPORTATION EQUIPMENT.....	15	17	16	-	1	15	1
SCIENTIFIC AND CONTROLLING INSTRUMENTS.....	961	1,632	1,413	1,245	152	16	219
MEDICAL AND DENTAL INSTRUMENTS.....	1,887	375	311	298	3	10	64
OPTICAL AND OPHTHALMIC EQUIPMENT.....	228	406	323	316	1	6	83
PHOTOGRAPHIC EQUIPMENT AND SUPPLIES.....	326	200	155	136	5	14	45
MISCELLANEOUS MANUFACTURED PRODUCTS.....	137	195	177	75	16	86	18
RAILROAD TRANSPORTATION.....	355	578	525	307	128	90	53
LOCAL TRANSIT AND INTERCITY BUS.....	1,209	286	246	173	17	56	40
TRUCK TRANSPORTATION.....	969	1,001	872	441	241	190	129
WATER TRANSPORTATION.....	43	84	76	45	12	10	8
AIR TRANSPORTATION.....	259	504	392	268	68	56	112
OTHER TRANSPORTATION.....	63	86	73	40	13	20	13
COMMUNICATIONS, EXCEPT RADIO AND TV.....	781	837	695	324	180	191	142
RADIO AND TV BROADCASTING.....	131	113	102	63	11	28	11
ELECTRIC UTILITIES.....	345	276	235	120	37	78	41
GAS UTILITIES.....	196	158	147	82	18	47	11
WATER AND SANITARY SERVICES.....	87	58	48	26	8	14	10
WHOLESALE TRADE.....	3,317	3,466	3,125	1,887	521	717	341
RETAIL TRADE.....	1,234	8,245	8,048	4,102	746	3,200	197
FINANCE.....	394	753	709	257	59	393	44
INSURANCE.....	333	770	725	326	75	324	45
OWNER-OCCUPIED DWELLINGS.....	-	-	-	-	-	-	-
OTHER REAL ESTATE.....	332	640	600	361	52	187	40
HOTELS AND LODGING PLACES.....	281	746	599	408	42	149	147
OTHER PERSONAL SERVICES.....	1,093	929	905	400	16	489	24
MISCELLANEOUS BUSINESS SERVICES.....	1,623	3,097	2,748	2,248	236	264	349
ADVERTISING.....	141	110	100	60	13	27	10
MISCELLANEOUS PROFESSIONAL SERVICES.....	1,372	1,115	1,058	403	470	181	57
AUTOMOBILE REPAIR.....	272	318	300	121	50	129	18
MOTION PICTURES.....	96	119	112	68	6	38	7
OTHER AMUSEMENTS.....	74	217	211	61	9	141	6
HEALTH SERVICES EXCEPT HOSPITALS.....	5,676	1,310	758	371	5	382	552
HOSPITALS.....	428	3,114	3,112	2,651	1	460	2
EDUCATIONAL SERVICES.....	901	2,821	2,771	2,477	2	292	50
NONPROFIT ORGANIZATIONS.....	4,409	862	730	264	31	435	132
POST OFFICE.....	590	715	608	424	51	133	107
COMMODITY CREDIT CORPORATION.....	-	-	-	-	-	-	-
OTHER FEDERAL ENTERPRISES.....	459	99	92	43	12	37	7
STATE AND LOCAL GOVERNMENT ENTERPRISES.....	532	343	298	163	35	100	45
DIRECTLY ALLOCATED IMPORTS.....	-	-	-	-	-	-	-
TRANSFERRED IMPORTS.....	-	-	-	-	-	-	-
BUSINESS TRAVEL, ENTERTAINMENT, AND GIFTS	-	-	-	-	-	-	-
OFFICE SUPPLIES.....	-	-	-	-	-	-	-

SEE FOOTNOTES AT END OF TABLE.

**Table B-2. Indirect employment requirements by industry and program—Continued**

PRODUCING INDUSTRY	MANPOWER INSTITUTIONAL TRAINING PROGRAM			NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
	TOTAL	LIVING ALLOWANCES	PROGRAM PURCHASES	TOTAL NASA	SPACE SHUTTLE
TOTAL.....	12,688	10,238	2,450	160,417	100,674
LIVESTOCK AND LIVESTOCK PRODUCTS.....	326	314	12	237	14
CROPS AND OTHER AGRICULTURAL PRODUCTS....	368	349	19	388	24
FORESTRY AND FISHERIES.....	11	9	2	34	3
AGRICULTURE, FORESTRY, AND FISHERY SERVICES.....	61	57	4	115	7
IRON ORE MINING.....	3	2	1	61	6
COPPER ORE MINING.....	4	2	2	164	14
OTHER NONFERROUS METAL ORE MINING.....	3	2	1	127	11
COAL MINING.....	23	16	7	275	19
CRUDE PETROLEUM.....	63	47	16	373	20
STONE AND CLAY MINING AND QUARRYING.....	9	6	3	110	8
CHEMICAL AND FERTILIZER MINING.....	3	2	1	27	3
NEW RESIDENTIAL BUILDING CONSTRUCTION....	-	-	-	-	-
NEW NONRESIDENTIAL BUILDING CONSTRUCTION..	-	-	-	614	15
NEW PUBLIC UTILITIES CONSTRUCTION.....	-	-	-	7	2
NEW HIGHWAY CONSTRUCTION.....	-	-	-	33	1
ALL OTHER NEW CONSTRUCTION.....	-	-	-	820	14
MAINTENANCE AND REPAIR CONSTRUCTION.....	195	148	47	1,689	117
GUIDED MISSILES AND SPACE VEHICLES.....	1	1	-	14,354	1,323
OTHER ORDNANCE.....	-	-	-	213	13
FOOD PRODUCTS.....	439	422	17	313	20
TOBACCO MANUFACTURING.....	20	20	-	4	-
FABRIC, YARN, AND THREAD MILLS.....	126	109	17	189	12
MISCELLANEOUS TEXTILES AND FLOOR COVERINGS.....	14	10	4	57	4
HOSIERY AND KNIT GOODS.....	49	45	4	29	2
APPAREL.....	378	350	28	160	12
MISCELLANEOUS FABRICATED TEXTILE PRODUCTS.....	25	20	5	40	2
LOGGING, SAWMILLS, AND PLANING MILLS.....	37	22	15	282	18
MILLWORK, PLYWOOD, AND OTHER WOOD PRODUCTS.....	31	16	15	238	16
HOUSEHOLD FURNITURE.....	32	28	4	47	3
OTHER FURNITURE.....	26	1	25	132	10
PAPER PRODUCTS.....	115	62	53	644	36
PAPERBOARD.....	46	36	10	272	18
PUBLISHING.....	167	60	107	725	33
PRINTING.....	163	75	88	1,417	63
CHEMICAL PRODUCTS.....	71	44	27	84	72
AGRICULTURAL CHEMICALS.....	9	8	1	28	2
PLASTIC MATERIALS AND SYNTHETIC RUBBER...	16	11	5	220	28
SYNTHETIC FIBERS.....	19	16	3	39	3
DRUGS.....	30	29	1	30	2
CLEANING AND TOILET PREPARATIONS.....	46	39	7	43	3
PAINT.....	11	6	5	106	8
PETROLEUM PRODUCTS.....	37	28	9	232	13
RUBBER PRODUCTS.....	39	31	8	311	23
PLASTIC PRODUCTS.....	49	34	15	708	57
LEATHER, FOOTWEAR, AND LEATHER PRODUCTS..	66	62	4	50	4
GLASS.....	32	26	6	392	20
CEMENT, CLAY, AND CONCRETE PRODUCTS.....	14	9	5	204	13
MISCELLANEOUS STONE AND CLAY PRODUCTS....	17	8	9	329	23
BLAST FURNACES AND BASIC STEEL PRODUCTS..	67	33	34	1,326	123
IRON AND STEEL FOUNDRIES AND FORGINGS...	27	14	13	943	89
PRIMARY COPPER METALS.....	2	1	1	70	5
PRIMARY ALUMINUM.....	4	2	2	155	19
OTHER PRIMARY AND SECONDARY NONFERROUS METAL PRODUCTS.....	4	2	2	165	14
COPPER ROLLING AND DRAWING.....	6	2	4	148	10
ALUMINUM ROLLING AND DRAWING.....	6	3	3	286	26
OTHER NONFERROUS ROLLING AND DRAWING....	9	3	6	468	32
MISCELLANEOUS NONFERROUS METAL PRODUCTS..	10	4	6	931	120
METAL CONTAINERS.....	20	17	3	44	3
HEATING APPARATUS AND PLUMBING FIXTURES..	6	3	3	61	4
FABRICATED STRUCTURAL METAL.....	17	9	8	435	27
SCREW MACHINE PRODUCTS.....	35	21	14	1,377	102
OTHER FABRICATED METAL PRODUCTS.....	76	28	48	1,275	114
ENGINES, TURBINES, AND GENERATORS.....	7	4	3	159	12

SEE FOOTNOTES AT END OF TABLE.

**Table B-2. Indirect employment requirements by industry and program—Continued**

PRODUCING INDUSTRY	MANPOWER INSTITUTIONAL TRAINING PROGRAM			NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
	TOTAL	LIVING ALLOWANCES	PROGRAM PURCHASES	TOTAL NASA	SPACE SHUTTLE
PAPM MACHINERY.....	2	1	1	23	2
CONSTRUCTION, MINING, AND OIL FIELD MACHINERY.....	5	3	2	98	7
MATERIAL HANDLING EQUIPMENT.....	5	2	3	98	8
METALWORKING MACHINERY.....	36	8	28	1,327	130
SPECIAL INDUSTRY MACHINERY.....	15	6	9	156	8
GENERAL INDUSTRIAL MACHINERY.....	20	7	13	624	62
MACHINE SHOP PRODUCTS.....	26	10	16	3,382	373
COMPUTERS AND PERIPHERAL EQUIPMENT.....	8	3	5	3,375	127
TYPEWRITERS AND OTHER OFFICE MACHINES.....	28	1	27	98	4
SERVICE INDUSTRY MACHINES.....	12	4	8	127	7
ELECTRIC TRANSMISSION EQUIPMENT.....	22	6	16	2,154	63
ELECTRIC INDUSTRIAL APPARATUS.....	37	12	25	836	50
HOUSEHOLD APPLIANCES.....	32	29	3	94	5
ELECTRIC LIGHTING AND WIRING.....	19	8	11	777	49
RADIO AND TELEVISION SETS.....	23	16	7	121	6
TELEPHONE AND TELEGRAPH APPARATUS.....	8	5	3	528	22
OTHER ELECTRONIC COMMUNICATION EQUIPMENT.....	6	2	4	9,015	319
ELECTRONIC COMPONENTS.....	35	19	16	4,891	268
OTHER ELECTRICAL MACHINERY.....	14	9	5	261	16
MOTOR VEHICLES.....	60	49	11	174	4
AIRCRAFT.....	9	6	3	24,373	2,750
SHIP AND BOAT BUILDING AND REPAIR.....	5	4	1	108	6
RAILROAD AND OTHER TRANSPORTATION EQUIPMENT.....	4	3	1	29	3
MISCELLANEOUS TRANSPORTATION EQUIPMENT.....	-	-	-	4	-
SCIENTIFIC AND CONTROLLING INSTRUMENTS.....	20	6	14	2,960	250
MEDICAL AND DENTAL INSTRUMENTS.....	14	6	8	299	3
OPTICAL AND OPHTHALMIC EQUIPMENT.....	6	1	5	1,019	4
PHOTOGRAPHIC EQUIPMENT AND SUPPLIES.....	21	7	14	459	21
MISCELLANEOUS MANUFACTURED PRODUCTS.....	57	29	28	281	19
RAILROAD TRANSPORTATION.....	205	180	25	861	60
LOCAL TRANSIT AND INTERCITY BUS.....	656	618	38	438	30
TRUCK TRANSPORTATION.....	203	162	41	1,570	109
WATER TRANSPORTATION.....	47	43	4	113	6
AIR TRANSPORTATION.....	41	26	15	1,405	71
OTHER TRANSPORTATION.....	21	16	5	185	10
COMMUNICATIONS, EXCEPT RADIO AND TV.....	207	153	54	2,872	130
RADIO AND TV BROADCASTING.....	30	24	6	185	9
ELECTRIC UTILITIES.....	96	69	27	862	49
GAS UTILITIES.....	76	54	22	214	19
WATER AND SANITARY SERVICES.....	24	15	9	99	7
WHOLESALE TRADE.....	1,097	906	191	5,222	344
RETAIL TRADE.....	2,405	2,333	72	3,332	225
FINANCE.....	139	112	27	1,175	79
INSURANCE.....	288	238	50	1,063	71
OWNER-OCCUPIED DWELLINGS.....	-	-	-	-	-
OTHER REAL ESTATE.....	280	229	51	1,097	56
HOTELS AND LODGING PLACES.....	96	77	19	1,366	90
OTHER PERSONAL SERVICES.....	489	469	20	1,583	73
MISCELLANEOUS BUSINESS SERVICES.....	427	204	223	12,122	898
ADVERTISING.....	29	24	5	144	9
MISCELLANEOUS PROFESSIONAL SERVICES.....	154	111	43	5,300	204
AUTOMOBILE REPAIR.....	62	46	16	604	38
MOTION PICTURES.....	65	32	33	509	20
OTHER AMUSEMENTS.....	51	45	6	180	11
HEALTH SERVICES EXCEPT HOSPITALS.....	183	179	4	145	7
HOSPITALS.....	314	313	1	96	4
EDUCATIONAL SERVICES.....	303	17	286	18,254	110
NONPROFIT ORGANIZATIONS.....	253	245	8	3,191	338
POST OFFICE.....	164	108	56	1,837	114
COMMODITY CREDIT CORPORATION.....	-	-	-	-	-
OTHER FEDERAL ENTERPRISES.....	30	25	5	193	8
STATE AND LOCAL GOVERNMENT ENTERPRISES.....	214	175	39	994	55
DIRECTLY ALLOCATED IMPORTS.....	-	-	-	-	-
TRANSFERRED IMPORTS.....	-	-	-	-	-
BUSINESS TRAVEL, ENTERTAINMENT, AND GIFTS.....	-	-	-	-	-
OFFICE SUPPLIES.....	-	-	-	-	-

- Denotes no employment.

<sup>1</sup> Based on factors for hospital construction in Factbook for Estimating the Manpower Needs of Federal Programs, Bulletin 1832 (Bureau

of Labor Statistics, 1975).

<sup>2</sup> Employment generated by a standard pattern of personal consumption expenditures.

Table B-3. Employment requirements by program and occupation

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH					
	TOTAL	DIRECT	INDIRECT	EXTRAMURAL PROGRAM			DIRECT OPERATIONS		
				TOTAL	DIRECT	INDIRECT	CONSTRUCTION GRANTS	NIH STAFF	INDIRECT
TOTAL, ALL OCCUPATIONS.....	159,150	111,700	47,450	115,750	56,910	31,100	10,770	11,610	5,350
PROFESSIONAL AND TECHNICAL WORKERS...	66,050	57,440	8,610	6,650	44,740	5,120	860	5,210	720
ENGINEERS, TECHNICAL.....	780	50	730	1,490	530	520	200	150	100
ENGINEERS, AERO-ASTRONAUTICAL...	*	-	*	*	-	*	*	-	*
ENGINEERS, CHEMICAL.....	60	-	60	70	*	*	*	-	*
ENGINEERS, CIVIL.....	*	*	*	180	*	*	*	90	*
ENGINEERS, ELECTRICAL.....	NA	*	220	460	210	160	*	*	*
ENGINEERS, INDUSTRIAL.....	NA	*	120	150	-	90	*	*	*
ENGINEERS, MECHANICAL.....	NA	*	110	190	60	80	*	-	*
ENGINEERS, METALLURGICAL.....	*	-	*	*	-	*	*	-	*
ENGINEERS, MINING.....	*	-	*	*	-	-	*	-	-
ENGINEERS, PETROLEUM.....	*	-	*	*	-	-	*	-	*
ENGINEERS, SALES.....	*	-	*	*	-	-	*	-	*
ENGINEERS, OTHER.....	NA	*	120	370	230	80	*	*	*
LIFE AND PHYSICAL SCIENTISTS.....	2,110	1,270	790	5,110	22,740	130	*	2,200	*
AGRICULTURAL SCIENTISTS.....	*	*	*	*	-	-	-	*	*
ATMOSPHERIC, SPACE SCIENTISTS...	*	-	*	*	-	-	-	-	-
BIOLOGICAL SCIENTISTS.....	630	460	170	3,250	2,610	-	-	610	*
CHEMISTS.....	1,210	730	480	5,510	4,820	80	*	580	*
GEOLOGISTS.....	*	-	*	*	-	-	*	-	*
MARINE SCIENTISTS.....	*	-	*	*	-	-	-	-	-
PHYSICISTS AND ASTRONOMERS.....	NA	60	*	1,500	1,440	-	*	*	*
LIFE, PHYSICAL SCIENTISTS NEC...	*	*	*	4,830	13,870	-	-	960	-
MATHEMATICAL SPECIALISTS.....	*	-	*	590	420	-	*	160	*
ACTUARIES.....	*	-	*	*	-	-	-	-	-
MATHEMATICIANS.....	*	*	*	80	*	-	-	*	-
STATISTICIANS.....	*	*	*	510	380	-	*	110	*
ENGINEERING AND SCIENCE									
TECHNICIANS.....	790	130	790	6,050	14,310	470	170	1,020	90
AGRICULTURAL AND BIOLOGICAL									
TECHNICIANS.....	180	-	180	4,150	13,430	-	-	700	*
CHEMICAL TECHNICIANS.....	80	-	80	80	-	60	-	*	*
DRAFTERS.....	180	-	180	290	*	150	90	*	*
ELECTRICAL AND ELECTRONIC									
TECHNICIANS.....	180	60	120	580	370	90	*	80	*
INDUSTRIAL ENGINEERING									
TECHNICIANS.....	*	-	*	*	-	*	*	-	*
MATHEMATICAL TECHNICIANS.....	-	-	-	-	-	-	-	-	-
MECHANICAL ENGINEERING									
TECHNICIANS.....	*	-	*	*	-	*	*	-	*
SURVEYORS.....	*	-	*	*	-	*	*	-	*
ENGINEERING AND SCIENCE									
TECHNICIANS NEC.....	270	70	200	900	490	130	*	230	*
MEDICAL WORKERS, EXCEPT									
TECHNICIANS.....	51,361	49,361	2,000	3,560	1,700	960	*	710	170
CHIROPRACTORS.....	*	-	*	*	-	-	-	-	*
DENTISTS.....	2,110	1,100	1,010	160	-	*	-	120	*
DIEITITIANS.....	NA	1,000	*	740	90	*	-	*	*
OPHTHALMISTS.....	*	*	*	*	*	*	*	*	*
OPHTHALMISTS.....	NA	950	*	90	-	50	*	*	*
PHARMACISTS.....	14,650	14,200	450	350	80	210	-	-	60
PHYSICIANS, MD OSTEOPATHS.....	*	*	*	*	-	*	-	-	*
PODIATRISTS.....	*	-	*	*	-	*	-	-	*
REGISTERED NURSES.....	20,530	20,150	380	2,380	1,440	520	*	380	*
THERAPISTS.....	*	*	*	90	*	*	-	*	*
VETERINARIANS.....	*	*	*	180	*	110	-	*	*
OTHER MEDICAL AND HEALTH									
WORKERS.....	NA	4,210	*	130	*	-	-	90	-
HEALTH TECHNOLOGISTS AND									
TECHNICIANS.....	8,590	7,490	1,100	3,250	2,480	540	-	210	*
CLINICAL LAB TECHNICIANS.....	170	-	170	2,490	2,230	110	-	140	*
DENTAL HYGIENISTS.....	160	-	160	80	80	*	-	-	*
HEALTH RECORD TECHNICIANS.....	*	-	*	*	-	*	-	*	-
RADIOLOGIC TECHNOLOGISTS AND									
TECHNICIANS.....	*	-	*	220	170	*	-	-	*
THERAPY ASSISTANTS.....	720	-	720	430	-	370	-	60	*
OTHER HEALTH TECHNOLOGISTS AND									
TECHNICIANS NEC.....	90	-	90	90	-	60	*	-	*
TECHNICIANS, EXCEPT HEALTH.....	*	930	-	NA	-	NA	NA	-	NA
AIRPLANE PILOTS.....	-	-	-	NA	-	NA	NA	-	NA
AIR TRAFFIC CONTROLLERS.....	-	-	-	NA	-	NA	NA	-	NA
EMBALMERS.....	*	-	*	NA	-	NA	NA	-	NA
FLIGHT ENGINEERS.....	*	-	*	NA	-	NA	NA	-	NA
RADIO OPERATORS.....	*	-	*	NA	-	NA	NA	-	NA
TOOL PROGRAMMERS, NUMERICAL.....	930	930	*	NA	-	NA	NA	-	NA
OTHER TECHNICIANS EXCEPT HEALTH..	*	-	*	NA	-	NA	NA	-	NA
COMPUTER SPECIALISTS.....	200	-	200	1,090	720	300	*	-	*
COMPUTER PROGRAMMERS.....	120	-	120	NA	NA	NA	NA	-	NA
COMPUTER SYSTEMS ANALYSTS.....	70	-	70	NA	NA	NA	NA	-	NA
OTHER COMPUTER SPECIALISTS.....	*	-	*	NA	NA	NA	NA	-	NA
SOCIAL SCIENTISTS.....	110	NA	110	1,220	1,090	60	*	50	*
ECONOMISTS.....	60	-	60	60	-	-	*	*	*
POLITICAL SCIENTISTS.....	*	-	*	-	-	-	-	-	-

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH EXTRAMURAL PROGRAM					
	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT	DIRECT OPERATIONS		
							CONSTRUCTION GRANTS	NIH STAFF	INDIRECT
PSYCHOLOGISTS.....	1,800	1,800	*	1,080	1,040	*	-	*	*
SOCIOLOGISTS.....	*	-	*	*	-	*	-	-	-
URBAN AND REGIONAL PLANNERS.....	*	-	*	*	-	*	-	-	-
OTHER SOCIAL SCIENTISTS.....	*	*	*	70	50	*	-	*	-
TEACHERS.....	510	*	510	780	*	730	*	*	*
ADULT EDUCATION.....	*	-	*	NA	NA	NA	NA	NA	NA
AGRICULTURE.....	-	-	-	NA	NA	NA	NA	NA	NA
ART, DRAMA, MUSIC.....	*	-	*	NA	NA	NA	NA	NA	NA
ATMOSPHERIC, EARTH, AND MARINE SCIENCE.....	*	-	*	NA	NA	NA	NA	NA	NA
BIOLOGY.....	*	-	*	NA	NA	NA	NA	NA	NA
BUSINESS, COMMERCE.....	*	-	*	NA	NA	NA	NA	NA	NA
CHEMISTRY.....	*	-	*	NA	NA	NA	NA	NA	NA
COACHES, PHYSICAL EDUCATION.....	*	-	*	NA	NA	NA	NA	NA	NA
ECONOMICS.....	*	-	*	NA	NA	NA	NA	NA	NA
EDUCATION.....	*	-	*	NA	NA	NA	NA	NA	NA
ELEMENTARY SCHOOL.....	90	-	90	NA	NA	NA	NA	NA	NA
ENGINEERING.....	*	-	*	NA	NA	NA	NA	NA	NA
ENGLISH.....	*	-	*	NA	NA	NA	NA	NA	NA
FOREIGN LANGUAGE.....	*	-	*	NA	NA	NA	NA	NA	NA
HEALTH SPECIALTIES.....	*	-	*	NA	NA	NA	NA	NA	NA
HISTORY.....	*	-	*	NA	NA	NA	NA	NA	NA
HOME ECONOMICS.....	*	-	*	NA	NA	NA	NA	NA	NA
LAW.....	*	-	*	NA	NA	NA	NA	NA	NA
MATHEMATICS.....	*	-	*	NA	NA	NA	NA	NA	NA
PHYSICS.....	*	-	*	NA	NA	NA	NA	NA	NA
PRESCHOOL, KINDERGARTEN.....	60	-	60	NA	NA	NA	NA	NA	NA
PSYCHOLOGY.....	*	-	*	NA	NA	NA	NA	NA	NA
SECONDARY SCHOOL.....	60	-	60	NA	NA	NA	NA	NA	NA
SOCIOLOGY.....	*	-	*	NA	NA	NA	NA	NA	NA
SOCIAL SCIENCE TEACHERS NEC.....	*	-	*	NA	NA	NA	NA	NA	NA
MISCELLANEOUS COLLEGE AND UNIVERSITY TEACHERS.....	*	-	*	NA	NA	NA	NA	NA	NA
COLLEGE AND UNIVERSITY TEACHERS NEC.....	*	-	*	NA	NA	NA	NA	NA	NA
THEOLOGY.....	*	-	*	NA	NA	NA	NA	NA	NA
TRADE, INDUSTRIAL.....	*	-	*	NA	NA	NA	NA	NA	NA
TEACHERS NEC, EXCEPT COLLEGE AND UNIVERSITY.....	150	-	150	NA	NA	NA	NA	NA	NA
WRITERS, ARTISTS, ENTERTAINERS....	790	200	790	1,210	420	40	70	230	80
ACTORS.....	*	-	*	*	-	*	-	-	-
ATHLETES AND KINDRED WORKERS.....	*	-	*	*	-	*	-	-	*
AUTHORS.....	140	-	140	*	-	*	-	-	*
DANCERS.....	*	-	*	*	-	*	-	-	-
DESIGNERS.....	90	*	90	100	-	70	*	-	*
EDITORS AND REPORTERS.....	140	-	140	130	-	100	*	-	*
MUSICIANS AND COMPOSERS.....	50	-	50	*	-	*	-	-	*
PAINTERS AND SCULPTORS.....	*	-	*	80	-	60	*	-	*
PHOTOGRAPHERS.....	200	200	*	300	170	*	*	90	*
PUBLIC RELATIONS WORKERS AND WRITERS.....	80	-	80	240	60	*	*	120	*
RADIO, TV ANNOUNCERS.....	*	-	*	*	-	*	*	-	*
WRITERS, ARTISTS, AND ENTERTAINERS NEC.....	160	-	160	260	190	*	*	*	*
OTHER PROFESSIONAL AND TECHNICAL WORKERS.....	7,000	5,390	1,610	220	340	930	330	460	150
ACCOUNTANTS.....	320	*	320	540	-	290	140	60	50
ARCHITECTS.....	*	-	*	70	-	*	-	-	-
ARCHIVISTS AND CURATORS.....	*	-	*	*	-	*	-	-	-
CLERK.....	800	800	*	80	-	50	*	*	*
RELIGIOUS, EXCEPT CLERGY.....	*	-	*	*	-	*	-	-	*
FARM MANAGEMENT ADVISORS.....	*	-	*	*	-	*	-	-	-
FORESTERS, CONSERVATIONISTS.....	*	-	*	*	-	*	-	-	-
HOME MANAGEMENT ADVISORS.....	*	-	*	*	-	*	-	-	-
JUDGES.....	-	-	-	-	-	-	-	-	-
LAWYERS.....	50	-	50	240	-	120	100	*	*
LIBRARIANS.....	350	350	*	360	230	*	*	80	*
OPERATIONS, SYSTEMS RESEARCH.....	60	-	60	60	-	*	*	-	*
PERSONNEL, LABOR RELATIONS.....	190	*	190	320	-	160	*	90	*
RESEARCH WORKERS NEC.....	370	-	370	360	50	100	*	190	*
RECREATION WORKERS.....	NA	-	*	90	50	*	-	*	*
SOCIAL WORKERS.....	3,000	2,860	140	*	-	*	-	-	*
VOCATIONAL COUNSELORS.....	-	-	-	-	-	*	-	-	-
MANAGERS, OFFICIALS, AND PROPRIETORS.	4,720	830	3,890	5,690	180	2,850	1,060	1,150	460
BUYERS, SALES AND LOAN MANAGERS... BANK, FINANCIAL MANAGERS.....	580 130	-	580 130	710 NA	-	500 NA	130 NA	* NA	80 NA
CREDIT MANAGERS.....	*	-	*	NA	-	NA	NA	NA	NA
BUYERS, SHIPPERS, FARM PRODUCTS.....	*	-	*	NA	-	NA	NA	NA	NA
BUYERS, WHOLESALE, RETAIL.....	50	-	50	NA	-	NA	NA	NA	NA
PURCHASING AGENTS, BUYERS NEC....	120	*	120	NA	-	NA	NA	NA	NA
SALES MANAGERS, RETAIL TRADE.....	*	-	*	NA	-	NA	NA	NA	NA
SALES MANAGERS, EXCEPT RETAIL TRADE.....	230	-	230	NA	-	NA	NA	NA	NA

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH					
	TOTAL	DIRECT	INDIRECT	EXTRAMURAL PROGRAM			DIRECT OPERATIONS		
				TOTAL	DIRECT	INDIRECT	CONSTRUCTION GRANTS	NIH STAFF	INDIRECT
PUBLIC ADMINISTRATORS, INSPECTORS, ASSESSORS, CONTROLLERS, AND TREASURERS.....	140	-	140	310	130	170	*	-	*
CONSTRUCTION INSPECTORS.....	-	-	-	NA	NA	NA	NA	-	NA
HEALTH ADMINISTRATORS.....	80	-	80	NA	NA	NA	NA	-	NA
INSPECTORS, EXCEPT PUBLIC CONSTRUCTION.....	*	-	*	NA	NA	NA	NA	-	NA
PUBLIC ADMINISTRATORS AND OFFICIALS NEC.....	*	-	*	NA	NA	NA	NA	-	NA
POSTMASTERS AND MAIL SUPERVISORS.....	*	-	*	NA	NA	NA	NA	-	NA
SCHOOL ADMINISTRATORS, COLLEGE..	*	-	*	NA	NA	NA	NA	-	NA
SCHOOL ADMINISTRATORS, ELEMENTARY AND SECONDARY.....	*	-	*	NA	NA	NA	NA	-	NA
OTHER MANAGERS, OFFICIALS, AND PROPRIETORS.....	3,170	-	3,170	4,670	50	2,180	930	1,150	370
FUNERAL DIRECTORS.....	*	-	*	NA	NA	NA	NA	NA	NA
MANAGERS AND BUILDING SUPERINTENDENTS.....	50	-	50	NA	NA	NA	NA	NA	NA
OFFICE MANAGERS NEC.....	220	-	220	NA	NA	NA	NA	NA	NA
OFFICERS, PILOTS, PURSERS, SHIP..	*	-	*	NA	NA	NA	NA	NA	NA
OFFICIALS OF LODGES, UNIONS.....	220	-	220	NA	NA	NA	NA	NA	NA
RAILROAD CONDUCTORS.....	*	-	*	NA	NA	NA	NA	NA	NA
RESTAURANT, CAFE, BAR MANAGERS..	210	-	210	NA	NA	NA	NA	NA	NA
OTHER MANAGERS, ADMINISTRATORS..	3,280	830	2,450	NA	NA	NA	NA	NA	NA
SALES WORKERS.....	1,530	-	1,530	2,550	-	1,920	410	-	220
ADVERTISING AGENTS AND SALES WORKERS.....	60	-	60	NA	-	NA	NA	-	NA
AUCTIONEERS.....	*	-	*	NA	-	NA	NA	-	NA
DEMONSTRATORS.....	*	-	*	NA	-	NA	NA	-	NA
HUCKSTERS AND PEDDLERS.....	*	-	*	NA	-	NA	NA	-	NA
INSURANCE AGENTS, BROKERS, AND UNDERWRITERS.....	100	-	100	NA	-	NA	NA	-	NA
NEWSPAPER CARRIERS AND VENDORS..	*	-	*	NA	-	NA	NA	-	NA
REAL ESTATE AGENTS, BROKERS.....	130	-	130	NA	-	NA	NA	-	NA
STOCK AND BOND SALES AGENTS.....	*	-	*	NA	-	NA	NA	-	NA
SALES REPRESENTATIVES, MFG.....	460	-	460	NA	-	NA	NA	-	NA
SALES REPRESENTATIVES, WHOLESALE TRADE.....	530	-	530	NA	-	NA	NA	-	NA
SALES CLERKS, RETAIL TRADE.....	*	-	*	NA	-	NA	NA	-	NA
SALES WORKERS, RETAIL TRADE, EXCEPT CLERKS.....	-	-	-	NA	-	NA	NA	-	NA
SALES WORKERS, SERVICE AND CONSTRUCTION.....	150	-	150	NA	-	NA	NA	-	NA
CLERICAL WORKERS.....	14,810	6,360	8,450	18,750	7,230	6,000	1,440	3,040	1,040
STENOGRAPHERS, TYPISTS, AND SECRETARIES.....	7,100	4,190	2,910	10,550	6,470	1,840	450	1,490	300
SECRETARIES, LEGAL.....	*	-	*	NA	NA	NA	NA	NA	NA
SECRETARIES, MEDICAL.....	120	-	120	NA	NA	NA	NA	NA	NA
SECRETARIES, OTHER.....	2,180	-	2,180	NA	NA	NA	NA	NA	NA
STENOGRAPHERS.....	60	-	60	NA	NA	NA	NA	NA	NA
TYPISTS.....	550	-	550	NA	NA	NA	NA	NA	NA
OFFICE MACHINE OPERATORS.....	810	440	370	660	50	380	70	110	50
BOOKKEEPING, BILLING OPERATORS..	*	-	*	NA	NA	NA	NA	NA	NA
CALCULATING MACHINE OPERATORS..	*	-	*	NA	NA	NA	NA	NA	NA
COMPUTER, PERIPHERAL EQUIPMENT OPERATORS.....	90	-	90	NA	NA	NA	NA	NA	NA
DUPLICATING MACHINE OPERATORS..	*	-	*	NA	NA	NA	NA	NA	NA
KEYPUNCH OPERATORS.....	180	-	180	NA	NA	NA	NA	NA	NA
TABULATING MACHINE OPERATORS..	*	-	*	NA	NA	NA	NA	NA	NA
OTHER OFFICE MACHINE OPERATORS..	*	-	*	NA	NA	NA	NA	NA	NA
OTHER CLERICAL WORKERS.....	5,160	*	5,160	7,540	710	3,780	920	1,440	690
BANK TELLERS.....	70	-	70	NA	NA	NA	NA	NA	NA
BILLING CLERKS.....	90	*	90	NA	NA	NA	NA	NA	NA
BOOKKEEPERS.....	940	*	940	NA	NA	NA	NA	NA	NA
CASHIERS.....	150	-	150	NA	NA	NA	NA	NA	NA
CLERICAL ASSISTANTS, SOCIAL WELFARE.....	*	-	*	NA	NA	NA	NA	NA	NA
CLERICAL SUPERVISORS NEC.....	90	-	90	NA	NA	NA	NA	NA	NA
COLLECTORS, BILL AND ACCOUNT...*	*	-	*	NA	NA	NA	NA	NA	NA
COUNTER CLERKS, EXCEPT FOOD...*	130	-	130	NA	NA	NA	NA	NA	NA
DISPATCHERS, STARTERS, VEHICLE...*	70	-	70	NA	NA	NA	NA	NA	NA
ENUMERATORS AND INTERVIEWERS...*	*	-	*	NA	NA	NA	NA	NA	NA
ESTIMATORS, INVESTIGATORS NEC...*	180	-	180	NA	NA	NA	NA	NA	NA
EXPEDITERS, PRODUCE CONTROLLERS..*	140	-	140	NA	NA	NA	NA	NA	NA
FILE CLERKS.....	150	-	150	NA	NA	NA	NA	NA	NA
INSURANCE ADJUSTERS, EXAMINERS..*	*	-	*	NA	NA	NA	NA	NA	NA
LIBRARY ATTENDANTS, ASSISTANT...*	*	-	*	NA	NA	NA	NA	NA	NA
MAIL CARRIERS, POST OFFICE.....	220	-	220	NA	NA	NA	NA	NA	NA
MAIL HANDLERS, EXCEPT POST OFFICE.....	90	-	90	NA	NA	NA	NA	NA	NA
MESSENGERS AND OFFICE HELPERS...*	*	-	*	NA	NA	NA	NA	NA	NA

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH					
	TOTAL	DIRECT	INDIRECT	TOTAL	EXTRAMURAL PROGRAM			DIRECT OPERATIONS	
					DIRECT	INDIRECT	CONSTRUCTION GRANTS	NIH STAFF	INDIRECT
METER READERS, UTILITIES.....	*	-	*	NA	NA	NA	NA	NA	NA
PAYROLL, TIMEKEEPING CLERKS.....	100	-	100	NA	NA	NA	NA	NA	NA
POSTAL CLERKS.....	260	-	260	NA	NA	NA	NA	NA	NA
PROOFREADERS.....	*	-	*	NA	NA	NA	NA	NA	NA
REAL ESTATE APPRAISERS.....	*	-	*	NA	NA	NA	NA	NA	NA
RECEPTIONISTS.....	640	-	640	NA	NA	NA	NA	NA	NA
SHIPPING, RECEIVING CLERKS.....	310	-	310	NA	NA	NA	NA	NA	NA
STATISTICAL CLERKS.....	160	-	160	NA	NA	NA	NA	NA	NA
STOCK CLERKS, STOCKKEEPERS.....	250	-	250	NA	NA	NA	NA	NA	NA
TEACHER AIDES, EXCEPT MONITORS..	*	-	*	NA	NA	NA	NA	NA	NA
TELEGRAPH MESSENGERS.....	*	-	*	NA	NA	NA	NA	NA	NA
TELEGRAPH OPERATORS.....	*	-	*	NA	NA	NA	NA	NA	NA
TELEPHONE OPERATORS.....	280	-	280	NA	NA	NA	NA	NA	NA
TICKET STATION EXPRESS AGENTS.....	90	-	90	NA	NA	NA	NA	NA	NA
WEIGHTERS.....	*	-	*	NA	NA	NA	NA	NA	NA
MISCELLANEOUS CLERICAL WORKERS NEC.....	2,190	1,700	490	NA	NA	NA	NA	NA	NA
CRAFT WORKERS.....	7,520	450	7,070	8,350	320	3,560	3,370	370	740
CONSTRUCTION CRAFT WORKERS.....	2,230	*	2,230	3,200	*	740	2,140	160	150
CARPENTERS.....	NA	*	680	NA	NA	NA	NA	NA	NA
CARPENTERS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
BRICKMASONS AND STONEMASONS.....	150	-	150	NA	NA	NA	NA	NA	NA
BRICK, STONEMASON APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
BULLDOZER OPERATORS.....	*	-	*	NA	NA	NA	NA	NA	NA
CEMENT AND CONCRETE FINISHERS.....	*	-	*	NA	NA	NA	NA	NA	NA
ELECTRICIANS.....	NA	*	360	NA	NA	NA	NA	NA	NA
ELECTRICIANS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
EXCAVATING, GRADING, MACHINE OPERATORS.....	80	-	80	NA	NA	NA	NA	NA	NA
FLOOR LAYERS, EXCEPT TILESETTERS.....	*	-	*	NA	NA	NA	NA	NA	NA
PAINTERS, CONSTRUCTION AND MAINTENANCE.....	NA	*	330	NA	NA	NA	NA	NA	NA
PAINTERS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
PAPERHANGERS.....	*	-	*	NA	NA	NA	NA	NA	NA
PLASTERERS.....	-	*	*	NA	NA	NA	NA	NA	NA
PLASTERERS' APPRENTICES.....	-	-	-	NA	NA	NA	NA	NA	NA
PLUMBERS AND PIPEFITTERS.....	NA	*	300	NA	NA	NA	NA	NA	NA
PLUMBERS' AND PIPEFITTERS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
ROOFERS AND SLATERS.....	70	-	70	NA	NA	NA	NA	NA	NA
STRUCTURAL METAL WORKERS.....	60	-	60	NA	NA	NA	NA	NA	NA
TILESETTERS.....	*	-	*	NA	NA	NA	NA	NA	NA
BLUE-COLLAR WORKER SUPERVISORS NEC.....	950	-	950	1,010	*	560	560	*	120
METALWORKING CRAFT WORKERS EXCLUDING MECHANICS.....	670	*	670	960	180	400	400	*	80
BLACKSMITHS.....	*	-	*	NA	NA	NA	NA	NA	NA
BLACKSMITHS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
HEAT TREATERS, ANNEALERS, AND TEMPERERS.....	*	-	*	NA	NA	NA	NA	NA	NA
FORGE AND HAMMER OPERATORS.....	*	-	*	NA	NA	NA	NA	NA	NA
JOB AND DIE SETTERS, METAL.....	50	-	50	NA	NA	NA	NA	NA	NA
MACHINISTS.....	230	-	230	NA	NA	NA	NA	NA	NA
MACHINISTS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
MILLWRIGHTS.....	50	-	50	NA	NA	NA	NA	NA	NA
MOLDERS, METAL.....	*	-	*	NA	NA	NA	NA	NA	NA
MOLDERS' APPRENTICES.....	-	-	-	NA	NA	NA	NA	NA	NA
PATTERN AND MODEL MAKERS.....	*	*	*	NA	NA	NA	NA	NA	NA
ROLLERS AND FINISHERS, METAL.....	*	-	*	NA	NA	NA	NA	NA	NA
SHEET METAL WORKERS, TINSMITHS..	100	*	100	NA	NA	NA	NA	NA	NA
SHEET METAL APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
TOOL, DIE MAKERS.....	110	-	110	NA	NA	NA	NA	NA	NA
TOOL, DIE MAKER APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
MECHANICS, REPAIRERS, INSTALLERS..	1,470	210	1,470	1,620	120	940	330	80	160
AIR CONDITIONING, HEATING, AND REFRIGERATION.....	90	*	90	NA	NA	NA	NA	NA	NA
AIRCRAFT MECHANICS.....	50	-	50	NA	NA	NA	NA	NA	NA
AUTO ACCESSORIES INSTALLERS.....	*	-	*	NA	NA	NA	NA	NA	NA
AUTO BODY REPAIRERS.....	50	-	50	NA	NA	NA	NA	NA	NA
AUTO MECHANICS.....	320	-	320	NA	NA	NA	NA	NA	NA
AUTO MECHANICS' APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA
DATA PROCESSING MACHINE REPAIRERS.....	*	-	*	NA	NA	NA	NA	NA	NA
FARM IMPLEMENT MECHANICS.....	*	-	*	NA	NA	NA	NA	NA	NA
HEAVY EQUIPMENT MECHANICS INCLUDING DIESEL.....	460	-	460	NA	NA	NA	NA	NA	NA
HOUSEHOLD APPLIANCE MECHANICS.....	70	-	70	NA	NA	NA	NA	NA	NA
LOOM FIXERS.....	*	-	*	NA	NA	NA	NA	NA	NA
OFFICE MACHINE REPAIRERS.....	80	*	80	NA	NA	NA	NA	NA	NA
RADIO, TV REPAIRERS.....	*	-	*	NA	NA	NA	NA	NA	NA
RAILROAD CAR SHOP REPAIRERS.....	*	-	*	NA	NA	NA	NA	NA	NA
MECHANICS, EXCLUDING AUTO APPRENTICES.....	*	-	*	NA	NA	NA	NA	NA	NA

SEE FOOTNOTES AT END OF TABLE.



**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH					
	TOTAL	DIRECT	INDIRECT	EXTRAMURAL PROGRAM			DIRECT OPERATIONS		INDIRECT
				TOTAL	DIRECT	INDIRECT	CONSTRUCTION GRANTS	WITH STAFF	
OTHER MECHANICS AND REPAIRERS...	210	200	210	NA	NA	NA	NA	NA	NA
PRINTING CRAFT WORKERS.....	340	-	340	450	NA	290	*	*	80
BOOKBINDERS.....	*	-	*	NA	-	NA	NA	NA	NA
COMPOSITORS AND TYPESETTERS.....	140	-	140	NA	-	NA	NA	NA	NA
ELECTROTYPERS, STEROTYPERS.....	*	-	*	NA	-	NA	NA	NA	NA
ENGRAVERS EXCEPT PHOTOENGRAVERS..	*	-	*	NA	-	NA	NA	NA	NA
PHOTOENGRAVERS, LITHOGRAPHERS...	*	-	*	NA	-	NA	NA	NA	NA
PRINTING PRESS OPERATORS.....	120	*	120	NA	-	NA	NA	NA	NA
PRINTING PRESS APPRENTICES.....	*	-	*	NA	-	NA	NA	NA	NA
PRINTING APPRENTICES, EXCEPT PRESS OPERATORS.....	*	-	*	NA	-	NA	NA	NA	NA
TRANSPORTATION, PUBLIC UTILITY CRAFT WORKERS.....	380	-	380	310	-	160	90	-	60
ELECTRIC POWER LINE INSTALLERS AND REPAIRERS.....	80	-	80	NA	-	NA	NA	-	NA
LOCOMOTIVE ENGINEERS.....	*	-	*	NA	-	NA	NA	-	NA
LOCOMOTIVE ENGINEERS' HELPERS.....	*	-	*	NA	-	NA	NA	-	NA
POWER STATION OPERATORS.....	*	-	*	NA	-	NA	NA	-	NA
TELEPHONE INSTALLERS, REPAIRERS..	220	-	220	NA	-	NA	NA	-	NA
TELEPHONE LINE INSTALLERS, SPLICERS.....	*	-	*	NA	-	NA	NA	-	NA
OTHER CRAFT WORKERS.....	1,030	210	1,030	800	*	460	190	*	90
BAKERS.....	NA	170	*	NA	NA	NA	NA	NA	NA
CABINETMAKERS.....	*	-	*	NA	NA	NA	NA	NA	NA
CARPET INSTALLERS.....	*	-	*	NA	NA	NA	NA	NA	NA
CRANE, DERRICK, HOIST OPERATORS..	90	-	90	NA	NA	NA	NA	NA	NA
DECORATORS, WINDOW DRESSERS.....	*	-	*	NA	NA	NA	NA	NA	NA
DENTAL LABORATORY TECHNICIANS....	150	-	150	NA	NA	NA	NA	NA	NA
FURNITURE AND WOOD FINISHERS.....	*	-	*	NA	NA	NA	NA	NA	NA
PURRIERS.....	-	-	-	NA	NA	NA	NA	NA	NA
GLAZIERS.....	*	-	*	NA	NA	NA	NA	NA	NA
INSPECTORS, LOG AND LUMBER.....	*	-	*	NA	NA	NA	NA	NA	NA
INSPECTORS, OTHER.....	60	-	60	NA	NA	NA	NA	NA	NA
JEWELERS AND WATCHMAKERS.....	60	-	60	NA	NA	NA	NA	NA	NA
MILLERS, GRAIN, FLOUR, FEED.....	*	-	*	NA	NA	NA	NA	NA	NA
MOTION PICTURE PROJECTIONISTS....	*	-	*	NA	NA	NA	NA	NA	NA
OPTICIANS, LENS GRINDERS, AND POLISHERS.....	140	-	140	NA	NA	NA	NA	NA	NA
PIANO, ORGAN TUNERS, REPAIRERS..	*	-	*	NA	NA	NA	NA	NA	NA
SHIPFITTERS.....	*	-	*	NA	NA	NA	NA	NA	NA
SHOE REPAIRERS.....	*	-	*	NA	NA	NA	NA	NA	NA
SIGN PAINTERS AND LETTERERS.....	*	-	*	NA	NA	NA	NA	NA	NA
STATIONARY ENGINEERS.....	120	-	120	NA	NA	NA	NA	NA	NA
STONE CUTTERS, STONE CARVERS....	*	-	*	NA	NA	NA	NA	NA	NA
TAILORS.....	*	-	*	NA	NA	NA	NA	NA	NA
UPHOLSTERS.....	120	*	120	NA	NA	NA	NA	NA	NA
CRAFT AND KINDRED WORKERS NEC....	50	*	50	NA	NA	NA	NA	NA	NA
CRAFT APPRENTICES NEC.....	*	-	*	NA	NA	NA	NA	NA	NA
OPERATIVES.....	9,210	220	8,990	8,720	-	5,310	2,070	330	1,010
OPERATIVES, EXCEPT TRANSPORT....	6,420	-	6,420	6,580	-	4,210	1,600	-	780
SEMISKILLED METALWORKING.....	740	-	740	910	-	450	380	-	00
DRILL PRESS OPERATIVES.....	50	-	50	NA	-	NA	NA	-	NA
FURNACE TENDERS, SMELTERS, AND POURERS.....	*	-	*	NA	-	NA	NA	-	NA
GRINDING MACHINE OPERATIVES.....	80	-	80	NA	-	NA	NA	-	NA
HEATERS, METAL.....	*	-	*	NA	-	NA	NA	-	NA
LATHE AND MILLING MACHINE OPERATIVES.....	90	-	90	NA	-	NA	NA	-	NA
METAL PLATERS.....	*	-	*	NA	-	NA	NA	-	NA
OTHER PRECISION MACHINE OPERATORS.....	*	-	*	NA	-	NA	NA	-	NA
PUNCH STAMPING PRESS OPERATORS..	100	-	100	NA	-	NA	NA	-	NA
SOLDERERS.....	50	-	50	NA	-	NA	NA	-	NA
WELDERS AND FLAME CUTTERS.....	270	-	270	NA	-	NA	NA	-	NA
SEMISKILLED TEXTILE WORKERS.....	280	-	280	120	-	90	*	*	*
CARDING, LAPPING, COMBING.....	*	-	*	NA	-	NA	NA	NA	NA
KNITTERS, LOOPERS, AND TOPPERS..	*	-	*	NA	-	NA	NA	NA	NA
SPINNERS, TWISTERS, WINDERS.....	110	-	110	NA	-	NA	NA	NA	NA
WEAVERS.....	*	-	*	NA	-	NA	NA	NA	NA
OTHER TEXTILE OPERATIVES.....	110	-	110	NA	-	NA	NA	NA	NA
SEMISKILLED PACKING AND INSPECTING.....	1,180	-	1,180	1,050	-	720	190	-	140
CHECKERS, EXAMINERS, EXCEPT MFG.	570	-	570	NA	-	NA	NA	-	NA
GRADERS AND SORTERS, MFG.....	*	-	*	NA	-	NA	NA	-	NA
MEAT WRAPPERS, RETAIL TRADE.....	-	-	-	NA	-	NA	NA	-	NA
PACKERS, WRAPPERS, EXCEPT MEAT..	560	-	560	NA	-	NA	NA	-	NA
GROCERY PRODUCE PACKERS.....	*	-	*	NA	-	NA	NA	-	NA
OTHER OPERATIVES, EXCEPT TRANSPORT.....	4,210	210	4,210	4,760	-	2,960	1,020	250	530
ASBESTOS, INSULATION WORKERS....	*	-	*	NA	-	NA	NA	NA	NA
ASSEMBLERS.....	790	-	790	NA	-	NA	NA	NA	NA
BLASTERS.....	*	-	*	NA	-	NA	NA	NA	NA

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH					
	TOTAL	DIRECT	INDIRECT	TOTAL	EXTRAMURAL PROGRAM			DIRECT OPERATIONS	
					DIRECT	INDIRECT	CONSTRUCTION GRANTS	NIH STAFF	INDIRECT
BOTTLING, CANNING OPERATIVES.....	*	-	*	NA	-	NA	NA	NA	NA
SURVEYORS' HELPERS.....	*	-	*	NA	-	NA	NA	NA	NA
CLOTHING IRONERS AND PRESSERS...	*	-	*	NA	-	NA	NA	NA	NA
CUTTING OPERATIVES NEC.....	180	-	180	NA	-	NA	NA	NA	NA
DRESSMAKERS, EXCEPT FACTORY.....	*	-	*	NA	-	NA	NA	NA	NA
DRILLERS, BARTH.....	*	-	*	NA	-	NA	NA	NA	NA
DRY WALL INSTALLERS, LATHERS.....	*	-	*	NA	-	NA	NA	NA	NA
DRYERS.....	*	-	*	NA	-	NA	NA	NA	NA
FILERS, POLISHERS, SANDERS, AND BUFFERS.....	100	-	100	NA	-	NA	NA	NA	NA
GARAGE WORKERS AND GAS STATION ATTENDANTS.....	*	-	*	NA	-	NA	NA	NA	NA
LAUNDRY, DRYCLEANING OPERATIVES. HEATCUTTERS AND BUTCHERS EXCEPT MFG.....	NA	150	*	NA	-	NA	NA	NA	NA
HEATCUTTERS, BUTCHERS, MFG.....	*	-	*	NA	-	NA	NA	NA	NA
HILLINERS.....	-	-	-	NA	-	NA	NA	NA	NA
MINE OPERATIVES NEC.....	110	-	110	NA	-	NA	NA	NA	NA
MIXING OPERATIVES.....	70	-	70	NA	-	NA	NA	NA	NA
OILERS, GREASERS, EXCEPT AUTO....	*	-	*	NA	-	NA	NA	NA	NA
PAINTERS, MANUFACTURED ARTICLES. PHOTOGRAPHIC PROCESS WORKERS.....	100	-	100	NA	-	NA	NA	NA	NA
PHOTOGRAPHIC PROCESS WORKERS.....	60	-	60	NA	-	NA	NA	NA	NA
RIVETERS AND FASTENERS.....	*	-	*	NA	-	NA	NA	NA	NA
SAILORS AND DECKHANDS.....	*	-	*	NA	-	NA	NA	NA	NA
SAWYERS.....	60	-	60	NA	-	NA	NA	NA	NA
SEWERS AND STITCHERS.....	270	-	270	NA	-	NA	NA	NA	NA
SHOEMAKING MACHINE OPERATIVES... FURNACE TENDERS, STOKERS, EXCEPT METAL.....	*	-	*	NA	-	NA	NA	NA	NA
WINDING OPERATIVES NEC.....	70	-	70	NA	-	NA	NA	NA	NA
MISCELLANEOUS MACHINE OPERATOP.. OPERATIVES NEC.....	1,110	-	1,110	NA	-	NA	NA	NA	NA
	840	60	840	NA	-	NA	NA	NA	NA
TRANSPORT EQUIPMENT OPERATORS.....	250	-	2,570	1,890	*	1,110	470	70	230
BOAT OPERATORS.....	*	-	*	NA	NA	NA	NA	NA	NA
BUS DRIVERS.....	600	-	600	NA	NA	NA	NA	NA	NA
CONDUCTORS AND OPERATORS, URBAN RAIL.....	*	-	*	NA	NA	NA	NA	NA	NA
DELIVERY AND ROUTE WORKERS.....	NA	*	410	NA	NA	NA	NA	NA	NA
FORK LIFT, TOR MOTOR OPERATORS..	170	-	170	NA	NA	NA	NA	NA	NA
RAIL VEHICLE OPERATORS NEC.....	*	-	*	NA	NA	NA	NA	NA	NA
PARKING ATTENDANTS.....	*	-	*	NA	NA	NA	NA	NA	NA
RAILROAD BRAKE OPERATOPS AND COUPLERS.....	*	-	*	NA	NA	NA	NA	NA	NA
RAILROAD SWITCH OPERATORS.....	*	-	*	NA	NA	NA	NA	NA	NA
TAXICAB DRIVERS, CHAUFFEURS.....	410	-	410	NA	NA	NA	NA	NA	NA
TRUCK DRIVEPS.....	890	-	890	NA	NA	NA	NA	NA	NA
SERVICE WORKERS.....	51,630	46,000	5,630	6,580	900	4,080	380	710	530
CLEANING SERVICE WORKERS.....	1,380	-	1,380	1,650	130	1,200	150	*	170
LODGING QUARTERS CLEANERS, EXCEPT PRIVATE.....	110	-	110	NA	NA	NA	NA	NA	NA
BUILDING INTERIOR CLEANERS NEC..	470	-	470	NA	NA	NA	NA	NA	NA
JANITORS AND SEXTONS.....	NA	*	810	NA	NA	NA	NA	NA	NA
FOOD SERVICE WORKERS.....	15,570	14,150	1,420	1,720	90	1,360	150	*	100
BARTENDEFS.....	110	-	110	NA	NA	NA	NA	NA	NA
WAITERS' ASSISTANTS.....	50	-	50	NA	NA	NA	NA	NA	NA
COOKS, EXCEPT PRIVATE.....	2,490	2,100	390	NA	NA	NA	NA	NA	NA
DISHWASHERS.....	100	-	100	NA	NA	NA	NA	NA	NA
FOOD COUNTER, FOUNTAIN WORKERS..	90	-	90	NA	NA	NA	NA	NA	NA
WAITERS, WAITRESSES.....	510	-	510	NA	NA	NA	NA	NA	NA
FOOD WORKERS NEC, EXCEPT PRIVATE.....	12,210	12,050	160	NA	NA	NA	NA	NA	NA
HEALTH SERVICE WORKERS.....	2,010	31,840	2,010	2,290	680	910	*	560	140
DENTAL ASSISTANTS.....	1,040	-	1,040	*	-	*	-	-	*
HEALTH AIDES, EXCEPT NURSING...	1,110	970	140	480	90	100	-	270	*
HEALTH TRAINERS.....	*	-	*	*	-	*	-	-	-
LAY MIDWIVES.....	*	-	*	NA	-	-	-	-	-
NURSES' AIDES, ORDERLIES.....	570	-	570	990	190	500	*	240	70
PRACTICAL NUPSES.....	31,100	30,840	260	760	400	290	-	50	*
PERSONAL SERVICE WORKERS.....	580	-	580	570	-	460	*	-	70
FLIGHT ATTENDANTS.....	*	-	*	NA	-	NA	NA	-	NA
ATTENDANTS, RECREATION AND AMUSEMENT.....	*	-	*	NA	-	NA	NA	-	NA
ATTENDANTS, PERSONAL SERVICE NEC.....	*	-	*	NA	-	NA	NA	-	NA
BAGGAGE PORTERS AND BELLHOPS.....	*	-	*	NA	-	NA	NA	-	NA
BARBERS.....	*	-	*	NA	-	NA	NA	-	NA
BOARDING, LODGING HOUSEKEEPERS..	*	-	*	NA	-	NA	NA	-	NA
BOOTBLACKS.....	-	-	-	NA	-	NA	NA	-	NA
CHILD CARE WORKEPS, EXCEPT PRIVATE.....	330	-	330	NA	-	NA	NA	-	NA

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	VETERANS ADMINISTRATION HEALTH CARE			NATIONAL INSTITUTES OF HEALTH EXTRAMURAL PROGRAM					
	TOTAL	DIRECT	INDIRECT	TOTAL	CONSTRUCTION GRANTS			DIRECT OPERATIONS	
					DIRECT	INDIRECT	CONSTRUCTION GRANTS	NIH STAFF	INDIRECT
ELEVATOR OPERATORS.....	*	-	*	NA	-	NA	NA	-	NA
HAIRDRESSERS, COSMETOLOGISTS...	*	-	*	NA	-	NA	NA	-	NA
HOUSEKEEPERS, EXCEPT PRIVATE...	70	-	70	NA	-	NA	NA	-	NA
PERSONAL SERVICE APPRENTICES...	*	-	*	NA	-	NA	NA	-	NA
SCHOOL HORTICULTURISTS.....	*	-	*	NA	-	NA	NA	-	NA
USHERS, RECREATION, AMUSEMENT...	*	-	*	NA	-	NA	NA	-	NA
WELFARE SERVICE AIDES.....	*	-	*	NA	-	NA	NA	-	NA
PROTECTIVE SERVICE WORKERS.....	240	-	240	360	*	150	*	120	*
CROSSING GUARDS, BRIDGETENDERS..	*	-	*	NA	NA	NA	NA	NA	NA
FIREFIGHTERS.....	*	-	*	NA	NA	NA	NA	NA	NA
GUARDS.....	220	-	220	NA	NA	NA	NA	NA	NA
MARSHALS AND CONSTABLES.....	-	-	-	NA	NA	NA	NA	NA	NA
POLICE AND DETECTIVES.....	*	-	*	NA	NA	NA	NA	NA	NA
SHERIFFS AND BAILIFFS.....	-	-	-	NA	NA	NA	NA	NA	NA
PRIVATE HOUSEHOLD WORKERS.....	-	-	-	NA	NA	NA	NA	NA	NA
CHILD CARE WORKERS.....	-	-	-	NA	NA	NA	NA	NA	NA
COOKS, PRIVATE.....	-	-	-	NA	NA	NA	NA	NA	NA
HOUSEKEEPERS, PRIVATE.....	-	-	-	NA	NA	NA	NA	NA	NA
LAUNDERERS, PRIVATE.....	-	-	-	NA	NA	NA	NA	NA	NA
PRIVATE HOUSEHOLD CLEANERS AND SERVANTS.....	-	-	-	NA	NA	NA	NA	NA	NA
LABORERS, EXCEPT FARM.....	2,430	450	1,980	7,600	3,540	1,750	1,120	800	400
ANIMAL CARETAKERS.....	*	-	*	1,730	780	620	*	290	*
CARPENTERS' HELPERS.....	80	-	80	200	-	*	190	-	*
CONSTRUCTION LABORERS, EXCEPT CARPENTERS' HELPERS.....	380	-	380	660	-	100	540	-	*
FISHERS, HUNTERS, AND TRAPPERS..	*	-	*	*	-	*	*	-	*
FREIGHT MATERIAL HANDLERS.....	500	-	500	500	-	300	140	-	60
GARBAGE COLLECTORS.....	*	-	*	*	-	*	*	-	*
GARDENERS AND GROUNDSKEEPERS...	130	-	130	260	-	90	*	-	150
LONGSHORE WORKERS AND STEVEDORES.....	*	-	*	*	-	*	*	-	*
TIMBER CUTTING AND LOGGING WORKERS.....	*	-	*	*	-	*	*	-	*
STOCKHANDLERS.....	160	-	160	350	-	260	60	-	*
TEAMSTERS.....	*	-	*	*	-	*	*	-	*
VEHICLE AND EQUIPMENT, WASHERS AND CLEANERS.....	100	-	100	90	-	60	*	-	*
WAREHOUSE LABORERS NEC.....	90	-	90	80	-	50	*	-	*
OTHER LABORERS.....	360	-	360	3,610	2,770	190	110	510	*
FARMERS AND FARM WORKERS.....	1,310	-	1,310	840	-	530	70	-	250
FARMERS AND MANAGERS.....	730	-	730	NA	-	NA	NA	-	NA
FARMERS (OWNERS AND TENANTS)....	710	-	710	NA	-	NA	NA	-	NA
FARM MANAGERS.....	*	-	*	NA	-	NA	NA	-	NA
FARM LABORERS AND LABOR SUPERVISORS.....	580	-	580	NA	-	NA	NA	-	NA
FARM LABOR SUPERVISORS.....	*	-	*	NA	-	NA	NA	-	NA
FARM LABORERS, WAGE WORKERS.....	370	-	370	NA	-	NA	NA	-	NA
FARM LABORERS, UNPAID FAMILY....	200	-	200	NA	-	NA	NA	-	NA
FARM LABORERS, SELF-EMPLOYED....	-	-	-	NA	-	NA	NA	-	NA

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOWANCES	PURCHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
TOTAL, ALL OCCUPATIONS.....	26,140	13,470	12,670	10,230	2,410	188,150	27,750	160,400	12,920	2,250	10,670
PROFESSIONAL AND TECHNICAL WORKERS...	8,220	7,090	1,130	750	380	56,490	18,440	38,050	3,960	1,860	2,100
ENGINEERS, TECHNICAL.....	120	-	120	80	40	25,240	10,430	14,810	2,090	1,300	790
ENGINEERS, AERO-ASTRONAUTICAL...	*	-	*	*	*	9,660	480	4,780	850	640	210
ENGINEERS, CHEMICAL.....	*	-	*	*	*	370	*	370	*	*	*
ENGINEERS, CIVIL.....	*	-	*	*	*	580	*	580	*	*	*
ENGINEERS, ELECTRICAL.....	*	-	*	*	*	5,830	2,330	3,600	430	240	190
ENGINEERS, INDUSTRIAL.....	*	-	*	*	*	1,400	100	1,300	100	*	100
ENGINEERS, MECHANICAL.....	*	-	*	*	*	2,320	130	2,190	190	*	190
ENGINEERS, METALLURGICAL.....	*	-	*	*	*	530	300	230	*	*	*
ENGINEERS, MINING.....	*	-	*	*	*	-	-	-	*	*	*
ENGINEERS, PETROLEUM.....	*	-	*	*	*	-	-	-	*	*	*
ENGINEERS, SALES.....	*	-	*	*	*	130	-	130	*	*	*
ENGINEERS, OTHER.....	*	-	*	*	*	4,350	2,760	1,590	460	380	80
LIFE AND PHYSICAL SCIENTISTS.....	*	-	*	*	*	5,010	1,420	3,590	140	100	40
AGRICULTURAL SCIENTISTS.....	*	-	*	*	*	*	*	*	*	*	*
ATMOSPHERIC, SPACE SCIENTISTS...	-	-	-	-	-	1,710	*	1,710	*	*	*
BIOLOGICAL SCIENTISTS.....	*	-	*	*	*	70	70	-	*	*	*
CHEMISTS.....	*	-	*	*	*	630	90	540	*	*	*
GEOLOGISTS.....	*	-	*	*	*	240	-	240	*	*	*
MARINE SCIENTISTS.....	-	-	-	-	-	-	*	-	*	*	*
PHYSICISTS AND ASTRONOMERS.....	*	-	*	*	*	1,620	870	750	*	*	*
LIFE, PHYSICAL SCIENTISTS NEC...	-	-	-	-	-	620	380	240	*	60	*
MATHEMATICAL SPECIALISTS.....	*	-	*	*	*	1,210	850	360	*	*	*
ACTUARIES.....	*	-	*	*	*	-	-	-	-	-	-
MATHEMATICIANS.....	*	-	*	*	*	1,100	850	250	*	30	*
STATISTICIANS.....	*	-	*	*	*	100	*	100	*	-	*
ENGINEERING AND SCIENCE											
TECHNICIANS.....	100	-	100	70	*	9,070	4,070	5,000	640	300	340
AGRICULTURAL AND BIOLOGICAL											
TECHNICIANS.....	*	-	*	*	*	*	*	-	*	-	*
CHEMICAL TECHNICIANS.....	*	-	*	*	*	180	*	180	*	*	*
DRAFTERS.....	*	-	*	*	*	1,760	*	1,760	130	*	130
ELECTRICAL AND ELECTRONIC											
TECHNICIANS.....	*	-	*	*	*	-	-	-	-	-	-
INDUSTRIAL ENGINEERING											
TECHNICIANS.....	*	-	*	*	*	3,170	1,760	1,410	150	60	90
MATHEMATICAL TECHNICIANS.....	*	-	*	*	*	160	*	160	*	*	*
MECHANICAL ENGINEERING											
TECHNICIANS.....	-	-	-	-	-	70	70	-	*	*	*
SURVEYORS.....	-	-	-	-	-	810	700	110	*	70	*
ENGINEERING AND SCIENCE											
TECHNICIANS NEC.....	*	-	*	*	*	130	-	130	*	-	*
MEDICAL WORKERS, EXCEPT											
TECHNICIANS.....	250	90	160	150	*	2,700	1,480	1,220	230	150	80
CHIROPRACTORS.....	*	-	*	*	*	330	*	330	*	-	*
DENTISTS.....	*	-	*	*	*	-	-	-	-	-	-
DIETITIANS.....	*	-	*	*	*	-	-	-	-	-	-
OPTOMETRISTS.....	*	-	*	*	*	-	-	-	-	-	-
PHARMACISTS.....	*	-	*	*	*	-	-	-	-	-	-
PHYSICIANS, MD OSTROPATHS.....	*	-	*	*	*	-	-	-	-	-	-
PODIATRISTS.....	*	-	*	*	*	*	*	70	*	-	*
REGISTERED NURSES.....	NA	*	70	70	*	-	-	-	-	-	-
THERAPISTS.....	*	-	*	*	*	*	*	160	*	-	*
VETERINARIANS.....	*	-	*	*	*	-	-	-	*	-	*
OTHER MEDICAL AND HEALTH											
WORKERS.....	*	-	*	*	*	-	-	-	-	-	-
HEALTH TECHNOLOGISTS AND											
TECHNICIANS.....	*	-	*	*	*	150	*	150	-	-	-
CLINICAL LAB TECHNICIANS.....	*	-	*	*	*	*	*	*	*	-	*
DENTAL HYGIENISTS.....	*	-	*	*	*	-	-	-	-	-	-
HEALTH RECORD TECHNICIANS.....	*	-	*	*	*	-	-	-	-	-	-
RADIOLOGIC TECHNOLOGISTS AND											
TECHNICIANS.....	*	-	*	*	*	-	-	-	-	-	-
THERAPY ASSISTANTS.....	*	-	*	*	*	-	-	-	-	-	-
OTHER HEALTH TECHNOLOGISTS AND											
TECHNICIANS NEC.....	*	-	*	*	*	*	*	110	*	-	*
TECHNICIANS, EXCEPT HEALTH.....	*	-	*	*	*	550	80	470	*	*	*
AIRPLANE PILOTS.....	*	-	*	*	*	220	*	220	*	-	*
AIR TRAFFIC CONTROLLERS.....	-	-	-	-	-	-	-	-	-	-	-
BARBERS.....	*	-	*	*	*	-	-	-	-	-	-
FLIGHT ENGINEERS.....	*	-	*	*	*	610	-	610	*	-	*
RADIO OPERATORS.....	-	-	-	-	-	-	-	-	*	*	*
TOOL PROGRAMMERS, NUMERICAL.....	-	-	-	-	-	-	-	-	*	-	*
OTHER TECHNICIANS EXCEPT HEALTH..	*	-	*	*	*	190	70	120	*	-	*
COMPUTER SPECIALISTS.....	5	-	5	*	*	2,320	200	2,120	130	*	130
COMPUTER PROGRAMMERS.....	*	-	*	*	*	1,380	120	1,260	80	*	80
COMPUTER SYSTEMS ANALYSTS.....	*	-	*	*	*	760	60	700	50	*	50
OTHER COMPUTER SPECIALISTS.....	*	-	*	*	*	110	*	110	*	*	*
SOCIAL SCIENTISTS.....	*	-	*	*	*	450	50	400	*	-	*
ECONOMISTS.....	-	-	-	-	-	330	*	330	*	-	*
POLITICAL SCIENTISTS.....	-	-	-	-	-	-	-	-	-	-	-

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT <sup>1</sup>	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOWANCES	PURCHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
PSYCHOLOGISTS.....	*	*	*	*	*	*	*	-	*	-	*
SOCIOLOGISTS.....	-	-	-	-	-	-	-	-	-	-	-
URBAN AND REGIONAL PLANNERS.....	*	-	*	-	-	-	-	-	*	-	*
OTHER SOCIAL SCIENTISTS.....	-	-	-	-	-	*	*	-	-	-	-
TEACHERS.....	NA	5,830	*	*	-	840	*	840	70	-	70
ADULT EDUCATION.....	*	-	*	*	-	*	*	-	*	-	*
AGRICULTURE.....	-	-	-	-	-	-	-	-	-	-	-
ART, DRAMA, MUSIC.....	-	-	-	-	-	-	-	-	*	-	*
ATMOSPHERIC, EARTH, AND MARINE SCIENCE.....	-	-	-	-	-	-	-	-	-	-	-
BIOLOGY.....	-	-	-	-	-	-	-	-	*	-	*
BUSINESS, COMMERCE.....	-	-	-	-	-	-	-	-	-	-	-
CHEMISTRY.....	-	-	-	-	-	-	-	-	*	-	*
COACHES, PHYSICAL EDUCATION.....	-	-	-	-	-	-	-	-	*	-	*
ECONOMICS.....	-	-	-	-	-	-	-	-	-	-	-
EDUCATION.....	-	-	-	-	-	-	-	-	-	-	-
ELEMENTARY SCHOOL.....	*	-	*	*	-	-	-	-	*	-	*
ENGINEERING.....	-	-	-	-	-	280	-	280	-	-	-
ENGLISH.....	-	-	-	-	-	-	-	-	*	-	*
FOREIGN LANGUAGE.....	-	-	-	-	-	-	-	-	*	-	*
HEALTH SPECIALTIES.....	-	-	-	-	-	-	-	-	*	-	*
HISTORY.....	-	-	-	-	-	-	-	-	*	-	*
HOME ECONOMICS.....	-	-	-	-	-	-	-	-	-	-	-
LAW.....	-	-	-	-	-	-	-	-	-	-	-
MATHEMATICS.....	-	-	-	-	-	120	-	120	*	-	*
PHYSICS.....	-	-	-	-	-	180	-	180	*	-	*
PRESCHOOL, KINDERGARTEN.....	*	-	*	*	-	-	-	-	*	-	*
PSYCHOLOGY.....	-	-	-	-	-	-	-	-	-	-	-
SECONDARY SCHOOL.....	*	-	*	*	-	-	-	-	-	-	-
SOCIOLOGY.....	-	-	-	-	-	-	-	-	-	-	-
SOCIAL SCIENCE TEACHERS NEC.....	-	-	-	-	-	-	-	-	-	-	-
MISCELLANEOUS COLLEGE AND UNIVERSITY TEACHERS.....	-	-	-	-	-	-	-	-	-	-	-
COLLEGE AND UNIVERSITY TEACHERS NEC.....	*	-	*	*	-	250	-	250	-	-	-
THEOLOGY.....	-	-	-	-	-	-	-	-	-	-	-
TRADE, INDUSTRIAL.....	-	-	-	-	-	-	-	-	-	-	-
TEACHERS NEC, EXCEPT COLLEGE AND UNIVERSITY.....	-	-	*	*	-	*	*	*	-	-	-
WRITERS, ARTISTS, ENTERTAINERS.....	160	-	160	110	50	2,960	400	2,560	230	60	170
ACTORS.....	*	-	*	*	*	-	-	-	*	-	*
ATHLETES AND KINDRED WORKERS.....	*	-	*	*	*	-	-	-	*	-	*
AUTHORS.....	*	-	*	*	*	230	60	170	*	*	*
DANCERS.....	*	-	*	*	*	-	-	-	-	-	-
DESIGNERS.....	*	-	*	*	*	500	-	500	*	-	*
EDITORS AND REPORTERS.....	*	-	*	*	*	370	-	370	*	*	*
MUSICIANS AND COMPOSERS.....	*	-	*	*	*	-	-	-	*	*	*
PAINTERS AND SCULPTORS.....	*	-	*	*	*	350	*	350	*	*	*
PHOTOGRAPHERS.....	*	-	*	*	*	310	120	190	*	*	*
PUBLIC RELATIONS WORKERS AND WRITERS.....	*	-	*	*	*	340	70	270	*	*	*
RADIO, TV ANNOUNCERS.....	*	-	*	*	*	-	-	-	*	*	*
WRITERS, ARTISTS, AND ENTERTAINERS NEC.....	*	-	*	*	*	810	120	690	*	*	*
OTHER PROFESSIONAL AND TECHNICAL WORKERS.....	1,580	1,170	410	220	190	8,320	880	7,440	470	*	470
ACCOUNTANTS.....	200	100	10	70	*	2,740	370	2,370	150	-	150
ARCHITECTS.....	*	-	*	*	*	250	*	250	*	-	*
ARCHIVISTS AND CURATORS.....	*	-	*	*	*	*	*	-	-	-	-
CLERGY.....	*	-	*	*	*	-	-	-	60	-	60
RELIGIOUS, EXCEPT CLERGY.....	*	-	*	*	*	-	-	-	*	-	*
FARM MANAGEMENT ADVISORS.....	-	-	-	-	-	-	-	-	-	-	-
FORESTERS, CONSERVATIONISTS.....	*	-	*	*	*	-	-	-	*	-	*
HOME MANAGEMENT ADVISORS.....	-	-	-	-	-	-	-	-	-	-	-
JUDGES.....	-	-	-	-	-	-	-	-	-	-	-
LAWYERS.....	*	-	*	*	*	1,310	90	1,220	50	*	50
LIBRARIANS.....	*	-	*	*	*	330	*	330	*	*	*
OPERATIONS, SYSTEMS RESEARCH.....	*	-	*	*	*	900	80	820	60	*	60
PERSONNEL, LABOR RELATIONS.....	*	-	*	*	*	1,400	220	1,180	90	*	90
RESEARCH WORKERS NEC.....	*	-	*	*	*	960	60	900	*	*	*
RECREATION WORKERS.....	-	-	-	-	-	80	-	80	-	-	-
SOCIAL WORKERS.....	*	-	*	*	*	-	-	-	*	-	*
VOCATIONAL COUNSELORS.....	*	1,040	*	*	*	270	-	270	*	-	*
MANAGERS, OFFICIALS, AND PROPRIETORS.....	3,080	1,800	1,280	1,060	220	15,200	2,950	12,250	1,000	180	820
BUYERS, SALES AND LOAN MANAGERS.....	230	-	230	190	*	3,010	890	2,120	160	*	160
BANK, FINANCIAL MANAGERS.....	*	-	*	*	*	490	-	490	*	-	*
CREDIT MANAGERS.....	*	-	*	*	*	90	-	90	*	-	*
BUYERS, SHIPPERS, FARM PRODUCTS.....	*	-	*	*	*	-	-	-	*	-	*
BUYERS, WHOLESALE, RETAIL.....	*	-	*	*	*	80	-	80	*	-	*
PURCHASING AGENTS, BUYERS NEC.....	*	-	*	*	*	1,700	890	810	60	*	60
SALES MANAGERS, RETAIL TRADE.....	*	-	50	50	*	80	-	80	*	-	*
SALES MANAGERS, EXCEPT RETAIL TRADE.....	*	-	60	*	*	560	-	560	*	-	*

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOW- ANCES	PUR- CHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
PUBLIC ADMINISTRATORS, INSPECTORS, ASSESSORS, CONTROLLERS, AND TREASURERS.....	*	-	*	*	*	2,820	1,910	910	*	120	*
CONSTRUCTION INSPECTORS.....	-	-	-	-	-	-	*	-	*	-	-
HEALTH ADMINISTRATORS.....	*	-	*	*	-	-	-	-	-	-	-
INSPECTORS, EXCEPT PUBLIC CONSTRUCTION.....	-	-	-	-	-	570	570	-	*	*	-
PUBLIC ADMINISTRATORS AND OFFICIALS NEC.....	*	-	*	*	-	1,300	1,300	-	*	80	*
POSTMASTERS AND MAIL SUPERVISORS.....	*	-	*	*	*	90	-	90	*	-	*
SCHOOL ADMINISTRATORS, COLLEGE..	*	-	*	*	*	600	-	600	*	-	*
SCHOOL ADMINISTRATORS, ELEMENTARY AND SECONDARY.....	*	1,740	*	-	*	-	-	-	*	-	*
OTHER MANAGERS, OFFICIALS, AND PROPRIETORS.....	1,090	60	1,030	860	170	9,570	150	9,420	650	*	650
FUNERAL DIRECTORS.....	*	-	*	*	-	-	-	-	*	-	*
MANAGERS AND BUILDING SUPERINTENDENTS.....	*	-	*	*	*	140	-	140	*	-	*
OFFICE MANAGERS NEC.....	*	-	60	*	*	510	*	510	*	-	*
OFFICERS, PILOTS, PURSERS, SHIP OFFICIALS OF LODGES, UNIONS.....	*	-	*	*	*	-	-	-	*	-	*
RAILROAD CONDUCTORS.....	*	-	*	*	*	-	-	-	*	-	*
RESTAURANT, CAFE, BAR MANAGERS..	NA	*	90	80	*	190	-	190	*	-	*
OTHER MANAGERS, ADMINISTRATORS..	860	50	810	660	150	8,660	150	8,510	580	*	580
SALES WORKERS.....	1,080	-	1,080	950	130	3,970	*	3,970	*	-	*
ADVERTISING AGENTS AND SALES WORKERS.....	*	-	*	*	*	100	-	100	*	-	*
AUCTIONEERS.....	*	-	*	*	-	-	-	-	*	-	*
DEMONSTRATORS.....	*	-	*	*	*	-	-	-	*	-	*
HUCKSTERS AND PEDDLERS.....	*	-	*	*	*	-	-	-	*	-	*
INSURANCE AGENTS, BROKERS, AND UNDERWRITERS.....	90	-	90	70	*	330	-	330	*	-	*
NEWSPAPER CARRIERS AND VENDORS..	*	-	*	*	*	-	-	-	*	-	*
REAL ESTATE AGENTS, BROKERS.....	110	-	110	90	*	430	*	430	*	-	*
STOCK AND BOND SALES AGENTS.....	*	-	*	*	*	70	-	70	*	-	*
SALES REPRESENTATIVES, MFG.....	70	-	70	50	*	1,060	-	1,060	70	-	70
SALES REPRESENTATIVES, WHOLESALE TRADE.....	180	-	180	150	*	720	-	720	60	-	60
SALES CLERKS, RETAIL TRADE.....	430	-	430	420	*	620	-	620	*	-	*
SALES WORKERS, RETAIL TRADE, EXCEPT CLERKS.....	80	-	80	80	*	110	-	110	*	-	*
SALES WORKERS, SERVICE AND CONSTRUCTION.....	*	-	*	*	*	480	-	480	*	-	*
CLERICAL WORKERS.....	5,310	3,060	2,250	1,740	510	30,940	-	30,940	2,210	210	2,000
STENOGRAPHERS, TYPISTS, AND SECRETARIES.....	1,940	1,350	590	440	150	14,860	4,420	10,440	790	140	650
SECRETARIES, LEGAL.....	*	-	*	*	*	2,970	2,500	470	*	-	*
SECRETARIES, MEDICAL.....	*	-	*	*	*	-	-	-	*	-	*
SECRETARIES, OTHER.....	1,760	1,350	410	310	110	7,290	-	7,290	530	80	450
STENOGRAPHERS.....	*	-	*	*	*	1,830	1,540	290	*	*	*
TYPISTS.....	NA	*	140	100	*	2,680	330	2,350	150	*	150
OFFICE MACHINE OPERATORS.....	530	430	100	70	*	2,670	630	2,040	140	*	140
BOOKKEEPING, BILLING OPERATORS..	*	430	*	*	*	160	60	100	*	-	*
CALCULATING MACHINE OPERATORS..	*	-	*	*	*	60	-	60	90	-	90
COMPUTER, PERIPHERAL EQUIPMENT OPERATORS.....	*	-	*	*	*	620	-	620	*	*	*
DUPLICATING MACHINE OPERATORS..	*	-	*	*	*	150	50	100	*	*	*
KEYPUNCH OPERATORS.....	NA	-	50	*	*	970	-	970	*	-	*
TABULATING MACHINE OPERATORS..	*	-	*	*	*	-	-	-	*	-	*
OTHER OFFICE MACHINE OPERATORS..	*	-	*	*	*	160	-	160	*	-	*
OTHER CLERICAL WORKERS.....	2,840	1,280	1,560	1,230	330	20,310	1,860	18,450	1,270	70	1,200
BANK TELLERS.....	*	-	*	*	*	210	-	210	*	-	*
BILLING CLERKS.....	*	-	*	*	*	210	-	210	*	-	*
BOOKKEEPERS.....	NA	*	280	230	*	2,660	170	2,490	160	*	160
CASHIERS.....	NA	*	180	170	*	560	*	560	*	*	*
CLERICAL ASSISTANTS, SOCIAL WELFARE.....	-	-	-	-	-	-	-	-	-	-	-
CLERICAL SUPERVISORS NEC.....	*	-	*	*	*	380	-	380	*	-	*
COLLECTORS, BILL AND ACCOUNT.....	*	-	*	*	*	140	-	140	*	-	*
COUNTER CLERKS, EXCEPT FOOD..	60	-	60	50	*	500	-	500	*	-	*
DISPATCHERS, STARTERS, VEHICLE ENUMERATORS AND INTERVIEWERS..	*	-	*	*	*	110	*	110	*	-	*
ESTIMATORS, INVESTIGATORS NEC..	50	-	50	*	*	710	*	710	50	-	50
EXPEDITERS, PRODUCE CONTROLLERS.	*	-	*	*	*	1,500	-	1,500	130	-	130
FILE CLERKS.....	NA	360	*	*	*	680	-	680	80	-	80
INSURANCE ADJUSTERS, EXAMINERS..	*	-	*	*	*	100	-	100	*	-	*
LIBRARY ATTENDANTS, ASSISTANT...	*	-	*	*	*	510	50	460	*	*	*
MAIL CARRIERS, POST OFFICE.....	60	-	60	*	*	690	-	690	-	-	-
MAIL HANDLERS, EXCEPT POST OFFICE.....	*	-	*	*	*	340	90	340	*	*	*
MESSENGERS AND OFFICE HELPERS..	*	-	*	*	*	130	*	130	*	-	*

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOW-ANCS	PUF-CHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
METER READERS, UTILITIES.....	*	-	*	*	*	70	-	70	*	-	*
PAYROLL, TIMEKEEPING CLERKS.....	*	-	*	*	*	540	60	480	*	*	*
POSTAL CLERKS.....	70	-	70	*	*	810	-	810	50	-	50
PROOFREADERS.....	*	-	*	*	*	-	-	-	*	-	*
REAL ESTATE APPRAISERS.....	*	-	*	*	*	-	-	-	*	-	*
RECEPTIONISTS.....	NA	*	70	50	*	760	*	760	*	-	*
SHIPPING, RECEIVING CLERKS.....	90	-	90	70	*	930	-	930	20	-	20
STATISTICAL CLERKS.....	*	*	*	*	*	820	110	710	50	*	50
STOCK CLERKS, STOREKEEPERS.....	360	280	80	60	*	1,810	380	1,470	120	*	120
TEACHER AIDES, EXCEPT MONITORS..	NA	620	*	*	*	210	-	210	*	-	*
TELEGRAPH MESSENGERS.....	*	-	*	*	*	-	-	-	-	-	-
TELEGRAPH OPERATORS.....	*	-	*	*	*	-	-	-	*	-	*
TELEPHONE OPERATORS.....	NA	*	80	60	2	1,140	*	1,140	60	-	60
TICKET STATION EXPRESS AGENTS....	*	-	*	*	*	300	-	300	*	-	*
WEIGHTERS.....	*	-	*	*	*	100	-	100	*	-	*
MISCELLANEOUS CLERICAL WORKERS NEC.....	140	*	*	*	*	3,140	1,010	2,130	*	*	140
CRAFT WORKERS.....	NA	*	1,520	1,150	370	25,760	1,030	24,730	1,890	-	1,890
CONSTRUCTION CRAFT WORKERS.....	NA	*	250	190	60	4,450	240	4,210	290	-	290
CARPENTERS.....	NA	*	60	*	*	930	*	930	60	-	60
CARPENTERS' APPRENTICES.....	*	-	*	-	-	-	-	-	-	-	-
BRICKMASON AND STONEMASONS.....	*	-	*	-	-	180	*	180	*	-	*
BRICK, STONEMASON APPRENTICES....	-	-	-	-	-	-	-	-	-	-	-
BULLDOZER OPERATORS.....	*	-	*	*	*	110	*	110	*	-	*
CEMENT AND CONCRETE FINISHERS....	*	-	*	*	*	50	-	50	*	-	*
ELECTRICIANS.....	NA	*	*	*	*	1,380	140	1,240	100	-	100
ELECTRICIANS' APPRENTICES.....	*	-	*	*	*	-	-	-	*	-	*
EXCAVATING, GRADING, MACHINE OPERATORS.....	*	-	*	*	*	200	*	200	*	-	*
FLOOR LAYERS, EXCEPT TILESETTERS.....	*	-	*	*	-	-	-	-	*	-	*
PAINTERS, CONSTRUCTION AND MAINTENANCE.....	*	*	*	*	*	590	*	590	*	-	*
PAINTERS' APPRENTICES.....	-	-	-	-	-	-	-	-	-	-	-
PAPERHANGERS.....	*	-	*	*	*	-	-	-	*	-	*
PLASTERERS.....	*	-	*	*	*	*	*	*	*	-	*
PLASTERERS' APPRENTICES.....	-	-	-	-	-	-	-	-	-	-	-
PLUMBERS AND PIPEFITTERS.....	*	*	*	*	*	600	*	600	*	-	*
PLUMBERS' AND PIPEFITTERS' APPRENTICES.....	*	-	*	*	-	-	-	-	*	-	*
ROOFERS AND SLATERS.....	*	-	*	*	*	60	-	60	*	-	*
STRUCTURAL METAL WORKERS.....	*	-	*	*	*	100	*	100	*	-	*
TILESETTERS.....	*	-	*	*	*	-	-	-	*	-	*
BLUE-COLLAR WORKER SUPERVISORS NEC.....	NA	*	220	170	60	4,210	*	4,210	340	-	340
METALWORKING CRAFT WORKERS EXCLUDING MECHANICS.....	120	-	120	70	*	6,050	200	5,850	520	-	520
BLACKSMITHS.....	*	-	*	*	*	-	-	-	*	-	*
BOILERMAKERS.....	*	-	*	*	*	*	*	*	*	-	*
HEAT TREATERS, ANNEALERS, AND TEMPERERS.....	*	-	*	*	*	130	-	130	*	-	*
FORGE AND HAMMER OPERATORS.....	*	-	*	*	*	80	-	80	*	-	*
JOB AND DIE SETTERS, METAL.....	*	-	*	*	*	520	-	520	*	-	*
MACHINISTS.....	*	-	*	*	*	2,180	60	2,120	190	-	190
MACHINISTS' APPRENTICES.....	*	-	*	*	*	-	-	-	*	-	*
MILLWRIGHTS.....	*	-	*	*	*	250	-	250	*	-	*
MOLDERS, METAL.....	*	-	*	*	*	240	-	240	*	-	*
MOLDERS' APPRENTICES.....	-	-	-	-	-	-	-	-	-	-	-
PATTERN AND MODEL MAKERS.....	*	-	*	*	*	390	110	280	*	-	*
ROLLERS AND FINISHERS, METAL.....	*	-	*	*	*	60	-	60	*	-	*
SHEET METAL WORKERS, TINSMITHS....	*	-	*	*	*	820	*	820	80	-	80
SHEET METAL APPRENTICES.....	-	-	-	-	-	-	-	-	*	-	*
TOOL, DIE MAKERS.....	*	-	*	*	*	1,200	-	1,200	110	-	110
TOOL, DIE MAKER APPRENTICES.....	*	-	*	*	*	-	-	-	*	-	*
MECHANICS, REPAIRERS, INSTALLERS..	NA	*	490	410	80	6,530	430	6,100	490	-	490
AIR CONDITIONING, HEATING, AND REFRIGERATION.....	*	-	*	*	*	190	*	190	*	-	*
AIRCRAFT MECHANICS.....	*	-	*	*	*	1,690	*	1,690	170	-	170
AUTO ACCESSORIES INSTALLERS.....	*	-	*	*	*	-	-	-	-	-	-
AUTO BODY REPAIRERS.....	*	-	*	*	*	120	-	120	*	-	*
AUTO MECHANICS.....	NA	*	120	150	*	*	*	690	50	-	50
AUTO MECHANICS' APPRENTICES.....	-	-	-	-	-	-	-	-	-	-	-
DATA PROCESSING MACHINE REPAIRERS.....	*	-	*	*	*	230	*	230	*	-	*
FARM IMPLEMENT MECHANICS.....	*	-	*	*	*	-	-	-	*	-	*
HEAVY EQUIPMENT MECHANICS INCLUDING DIESEL.....	NA	*	110	80	*	1,890	*	1,890	150	-	150
HOUSEHOLD APPLIANCE MECHANICS....	*	-	*	*	*	150	-	150	*	-	*
LOOM FIXERS.....	*	-	*	*	*	-	-	-	-	-	-
OFFICE MACHINE REPAIRERS.....	*	-	*	*	*	140	-	140	*	-	*
RADIO, TV REPAIRERS.....	*	-	*	*	*	300	*	300	*	-	*
RAILROAD CAR SHOP REPAIRERS.....	*	-	*	*	*	70	-	70	*	-	*
MECHANICS, EXCLUDING AUTO APPRENTICES.....	*	-	*	*	-	-	-	-	*	-	*

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT <sup>1</sup>	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOWANCES	PURCHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
OTHER MECHANICS AND REPAIRERS...	*	-	*	-	*	890	350	540	*	-	*
PRINTING CRAFT WORKERS.....	100	-	100	*	60	930	70	860	50	-	50
BOOKBINDERS.....	*	-	*	*	*	70	-	70	*	-	*
COMPOSITORS AND TYPESETTERS.....	*	-	*	*	*	330	-	330	*	-	*
ELECTROTYPE, STEREOTYPE.....	*	-	*	*	*	-	-	-	*	-	*
ENGRAVERS EXCEPT PHOTOENGRAVERS.....	*	-	*	*	*	-	-	-	*	-	*
PHOTOENGRAVERS, LITHOGRAPHERS.....	*	-	*	*	*	*	*	80	*	-	*
PRINTING PRESS OPERATORS.....	*	-	*	*	*	380	50	330	*	-	*
PRINTING PRESS APPRENTICES.....	-	-	-	-	-	-	-	-	-	-	-
PRINTING APPRENTICES, EXCEPT PRESS OPERATORS.....	*	-	*	*	*	-	-	-	*	-	*
TRANSPORTATION, PUBLIC UTILITY CRAFT WORKERS.....	110	-	110	80	*	1,610	*	1,610	80	-	80
ELECTRIC POWER LINE INSTALLERS AND REPAIRERS.....	*	-	*	*	*	180	-	180	*	-	*
LOCOMOTIVE ENGINEERS.....	*	-	*	*	*	-	-	-	*	-	*
LOCOMOTIVE ENGINEERS' HELPERS.....	*	-	*	*	*	-	-	-	*	-	*
POWER STATION OPERATORS.....	*	-	*	*	*	-	-	-	*	-	*
TELEPHONE INSTALLERS, REPAIRERS.....	*	-	60	*	*	1,160	*	1,160	50	-	50
TELEPHONE LINE INSTALLERS, SPLICERS.....	*	-	*	*	*	160	-	160	*	-	*
OTHER CRAFT WORKERS.....	NA	*	230	190	*	1,970	80	1,890	130	-	130
BAKERS.....	*	-	*	*	*	60	-	60	*	-	*
CABINETMAKERS.....	*	-	*	*	*	60	-	60	*	-	*
CARPET INSTALLERS.....	*	-	*	*	*	-	-	-	*	-	*
CRANE, DERRICK, HOIST OPERATORS.....	*	-	*	*	*	400	-	400	*	-	*
DECORATORS, WINDOW DRESSERS.....	*	-	*	*	*	80	-	80	*	-	*
DENTAL LABORATORY TECHNICIANS.....	*	-	*	*	*	-	-	-	*	-	*
FURNITURE AND WOOD FINISHERS.....	*	-	*	*	*	-	-	-	*	-	*
FURRIERS.....	*	-	*	*	*	-	-	-	*	-	*
GLAZIERS.....	*	-	*	*	*	-	-	-	*	-	*
INSPECTORS, LOG AND LUMBER.....	*	-	*	*	*	-	-	-	*	-	*
INSPECTORS, OTHER.....	*	-	*	*	*	220	*	220	*	-	*
JEWELERS AND WATCHMAKERS.....	*	-	*	*	*	60	-	60	*	-	*
MILLERS, GRAIN, FLOUR, FEED.....	*	-	*	*	*	-	-	-	*	-	*
MOTION PICTURE PROJECTIONISTS.....	*	-	*	*	*	*	*	*	*	-	*
OPTICIANS, LENS GRINDERS, AND POLISHERS.....	*	-	*	*	*	110	-	110	*	-	*
PIANO, ORGAN TUNERS, REPAIRERS.....	*	-	*	*	*	-	-	-	*	-	*
SHIPFITTERS.....	-	-	-	-	-	-	-	-	-	-	-
SHOE REPAIRERS.....	*	-	*	*	*	-	-	-	*	-	*
SIGN PAINTERS AND LETTERERS.....	*	*	*	*	*	100	-	100	*	-	*
STATIONARY ENGINEERS.....	*	-	*	*	*	390	-	390	*	-	*
STONE CUTTERS, STONE CARVERS.....	*	-	*	*	*	-	-	-	*	-	*
TAILORS.....	*	-	*	*	*	-	-	-	*	-	*
UPHOLSTERERS.....	*	-	*	*	*	70	-	70	*	-	*
CRAFT AND KINDRED WORKERS NEC.....	*	-	*	*	*	130	*	130	*	-	*
CRAFT APPRENTICES NEC.....	*	-	*	*	*	-	-	-	*	-	*
OPERATIVES.....	NA	*	2,800	2,290	510	35,570	790	34,780	2,640	*	2,640
OPERATIVES, EXCEPT TRANSPORT.....	NA	*	1,770	1,380	390	37,880	770	37,110	2,360	-	2,360
SEMISKILLED METALWORKING.....	140	-	140	80	60	6,140	*	6,140	520	-	520
DRILL PRESS OPERATIVES.....	*	-	*	*	*	500	-	500	*	-	*
FURNACE TENDERS, SHELTERS, AND POURERS.....	*	-	*	*	*	280	-	280	*	-	*
GRINDING MACHINE OPERATIVES.....	*	-	*	*	*	830	*	830	80	-	80
HEATERS, METAL.....	*	-	*	-	-	-	-	-	*	-	*
LATHE AND MILLING MACHINE OPERATIVES.....	*	-	*	*	*	1,090	-	1,090	100	-	100
METAL PLATERS.....	*	-	*	*	*	210	-	210	*	-	*
OTHER PRECISION MACHINE OPERATORS.....	*	-	*	*	*	430	*	430	*	-	*
PUNCH STAMPING PRESS OPERATORS.....	*	-	*	*	*	760	-	760	60	-	60
SOLDERERS.....	*	-	*	*	*	450	-	450	*	-	*
WELDERS AND FLAME CUTTERS.....	60	-	60	*	*	1,570	*	1,570	130	-	130
SEMISKILLED TEXTILE WORKERS.....	90	-	90	70	*	130	-	130	*	-	*
CARDING, LAPPING, COMBING.....	*	-	*	*	*	-	-	-	*	-	*
KNITTERS, LOOPERS, AND TOPPERS.....	*	-	*	*	*	-	-	-	*	-	*
SPINNERS, TWISTERS, WINDERS.....	*	-	*	*	*	-	-	-	*	-	*
WEAVERS.....	*	-	*	*	*	-	-	-	*	-	*
OTHER TEXTILE OPERATIVES.....	*	-	*	*	*	50	-	50	*	-	*
SEMISKILLED PACKING AND INSPECTING.....	260	-	260	200	60	5,600	*	5,600	420	-	420
CHECKERS, EXAMINERS, EXCEPT MFG.....	100	-	100	70	*	4,440	*	4,440	340	-	340
GRADERS AND SORTERS, MFG.....	*	-	*	*	*	60	-	60	*	-	*
MEAT WRAPPERS, RETAIL TRADE.....	*	-	*	*	*	-	-	-	*	-	*
PACKERS, WRAPPERS, EXCEPT MEAT.....	*	-	140	110	*	1,070	-	1,070	70	-	70
GROCERY PRODUCE PACKERS.....	*	-	*	*	*	-	-	-	*	-	*
OTHER OPERATIVES, EXCEPT TRANSPORT.....	NA	*	1,290	1,020	260	19,890	730	19,160	*	*	1,400
ASBESTOS, INSULATION WORKERS.....	*	-	*	*	*	*	*	*	*	-	*
ASSEMBLERS.....	100	-	100	60	*	6,910	-	6,910	500	-	500
BLASTERS.....	*	-	*	*	*	-	-	-	*	-	*

SEE FOOTNOTES AT END OF TABLE.



**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOW- ANCES	PUR- CHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
BOTTLING, CANNING OPERATIVES.....	*	-	*	*	*	-	-	-	*	-	*
SURVEYORS' HELPERS.....	*	-	*	*	*	-	-	-	*	-	*
CLOTHING IRONERS AND PRESSERS...	*	-	*	*	*	120	-	120	*	-	*
CUTTING OPERATIVES NEC.....	*	-	*	*	*	480	-	480	*	-	*
DRESSMAKERS, EXCEPT FACTORY.....	*	-	*	*	*	80	*	80	*	-	*
DRILLERS, BARTH.....	*	-	*	*	*	150	-	150	*	-	*
DRY WALL INSTALLERS, LATHERERS..	*	-	*	*	*	-	-	-	*	-	*
DRYERS.....	*	-	*	*	*	-	-	-	*	-	*
FILERS, POLISHERS, SANDERS, AND BUFFERS.....	*	-	*	*	*	520	-	520	*	-	*
GARAGE WORKERS AND GAS STATION ATTENDANTS.....	100	-	100	90	*	170	*	170	*	-	*
LAUNDRY, DRYCLEANING OPERATIVES. MEATCUTTERS AND BUTCHERS	*	-	*	*	*	160	-	160	*	-	*
EXCEPT HPG.....	*	-	*	*	*	80	-	80	*	-	*
MEATCUTTERS, BUTCHERS, HPG.....	*	-	*	*	*	-	-	-	*	-	*
MILLINERS.....	-	-	-	-	-	-	-	-	-	-	-
HINE OPERATIVES NEC.....	*	-	*	*	*	300	-	300	*	-	*
HIXING OPERATIVES.....	*	-	*	*	*	150	-	150	*	-	*
OILERS, GREASERS, EXCEPT AUTO.	*	-	*	*	*	110	-	110	*	-	*
PAINTERS, MANUFACTURED ARTICLES.	*	-	*	*	*	630	*	630	50	-	50
PHOTOGRAPHIC PROCESS WORKERS....	*	-	*	*	*	360	*	360	*	-	*
RIVETERS AND FASTENERS.....	*	-	*	*	*	180	-	180	*	-	*
SAILORS AND DECKHANDS.....	*	-	*	*	*	-	-	-	*	-	*
SAWYERS.....	*	-	*	230	*	180	-	180	*	-	*
SEWERS AND STITCHERS.....	250	-	250	*	*	300	-	300	*	-	*
SHOEMAKING MACHINE OPERATIVES..	*	-	*	*	*	-	-	-	*	-	*
FURNACE TENDERS, STOKERS, EXCEPT METAL.....	*	-	*	*	*	220	-	220	*	-	*
WINDING OPERATIVES NEC.....	*	-	*	160	*	420	-	420	*	-	*
MISCELLANEOUS MACHINE OPERATOR..	220	-	220	140	60	3,770	*	3,770	290	-	290
OPERATIVES NEC.....	200	-	200	-	60	4,330	700	3,630	280	*	280
TRANSPORT EQUIPMENT OPERATORS....	1,030	*	1,030	910	120	3,750	*	3,750	280	-	280
BOAT OPERATORS.....	*	-	*	*	*	-	-	-	*	-	*
BUS DRIVERS.....	NA	*	310	290	*	390	*	390	*	-	*
CONDUCTORS AND OPERATORS, URBAN RAIL.....	*	-	*	*	*	-	-	-	*	-	*
DELIVERY AND ROUTE WORKERS.....	NA	*	190	160	*	710	-	710	50	-	50
FORK LIFT, TOW MOTOR OPERATORS..	*	-	*	*	*	610	*	610	*	-	*
RAIL VEHICLE OPERATORS NEC.....	*	-	*	*	*	-	-	-	*	-	*
PARKING ATTENDANTS.....	*	-	*	*	*	-	-	-	*	-	*
RAILROAD BRAKE OPERATORS AND COUPLERS.....	*	-	*	*	*	60	-	60	*	-	*
RAILROAD SWITCH OPERATORS.....	*	-	*	*	*	70	*	70	*	-	*
TAXICAB DRIVERS, CHAUFFEURS.....	220	-	220	200	*	200	*	200	*	-	*
TRUCK DRIVERS.....	NA	*	230	190	*	1,610	-	1,610	120	-	120
SERVICE WORKERS.....	2,810	1,490	1,320	1,140	180	10,330	*	10,330	600	-	600
CLEANING SERVICE WORKERS.....	1,700	1,390	310	230	80	4,780	*	4,780	290	-	290
LODGING QUARTERS CLEANERS, EXCEPT PRIVATE.....	*	-	*	*	*	450	-	450	*	-	*
BUILDING INTERIOR CLEANERS NEC..	NA	*	110	80	*	1,380	-	1,380	*	-	*
JANITORS AND SEITONS.....	1,560	1,380	180	130	50	2,960	*	2,960	180	-	180
FOOD SERVICE WORKERS.....	590	70	520	470	*	2,430	-	2,430	90	-	90
BARTENDERS.....	*	-	*	*	*	90	-	90	*	-	*
WAITERS' ASSISTANTS.....	*	-	*	*	*	90	-	90	*	-	*
COOKS, EXCEPT PRIVATE.....	NA	*	130	120	*	630	-	630	*	-	*
DISHWASHERS.....	*	-	*	*	*	250	-	250	*	-	*
FOOD COUFEER, FOUNTAIN WORKERS..	*	-	*	*	*	340	-	340	*	-	*
WAITERS, WAITRESSES.....	NA	*	210	190	*	610	-	610	*	-	*
FOOD WORKERS NEC, EXCEPT PRIVATE.....	NA	*	50	*	*	420	-	420	*	-	*
HEALTH SERVICE WORKERS.....	NA	*	150	150	*	140	*	140	*	-	*
DENTAL ASSISTANTS.....	*	-	*	*	*	*	*	*	*	-	*
HEALTH AIDES, EXCEPT NURSING....	*	-	*	*	*	*	*	*	*	-	*
HEALTH TRAINEES.....	*	-	*	*	*	-	-	-	*	-	*
LAY MIDWIVES.....	-	-	-	-	-	-	-	-	-	-	-
NURSES' AIDES, ORDERLIES.....	NA	*	80	80	*	70	-	70	*	-	*
PRACTICAL NURSES.....	*	-	*	*	*	-	-	-	*	-	*
PERSONAL SERVICE WORKERS.....	NA	*	280	240	*	1,340	*	1,340	90	-	90
FLIGHT ATTENDANTS.....	*	-	*	*	*	140	-	140	*	-	*
ATTENDANTS, RECREATION AND AMUSEMENT.....	*	-	*	*	*	100	-	100	*	-	*
ATTENDANTS, PERSONAL SERVICE NEC.....	*	-	*	*	*	110	-	110	*	-	*
BAGGAGE PORTERS AND BELLHOPS....	*	-	*	*	*	-	-	-	*	-	*
BARBERS.....	*	-	*	*	*	140	-	140	*	-	*
BOARDING, LODGING HOUSEKEEPERS..	*	-	*	*	*	-	-	-	*	-	*
BOOTBLACKS.....	*	-	*	*	*	-	-	-	*	-	*
CHILD CARE WORKERS, EXCEPT PRIVATE.....	*	-	*	*	*	-	-	-	*	-	*
ELEVATOR OPERATORS.....	*	-	*	*	*	60	-	60	*	-	*
HAIRDRESSERS, COSMETOLOGISTS....	NA	-	NA	120	*	420	-	420	*	-	*

SEE FOOTNOTES AT END OF TABLE.

**Table B-3. Employment requirements by program and occupation—Continued**

OCCUPATION	MANPOWER INSTITUTIONAL TRAINING					NATIONAL AERONAUTICS AND SPACE ADMINISTRATION					
	TOTAL	DIRECT <sup>1</sup>	INDIRECT			TOTAL PROGRAM			SPACE SHUTTLE PROGRAM		
			TOTAL	ALLOW- ANCES	PUR- CHASES	TOTAL	DIRECT	INDIRECT	TOTAL	DIRECT	INDIRECT
HOUSEKEEPERS, EXCEPT PRIVATE....	*	*	*	*	*	220	*	220	*	-	*
PERSONAL SERVICE APPRENTICES....	-	-	-	-	-	-	-	-	-	-	-
SCHOOL MONITORS.....	*	*	*	*	*	-	-	-	-	-	-
USHERS, RECREATION, AMUSEMENT....	*	-	*	*	*	-	-	-	*	-	*
WELFARE SERVICE AIDES.....	*	-	*	*	-	-	-	-	*	-	*
PROTECTIVE SERVICE WORKERS.....	NA	*	70	*	-	1,650	*	1,650	120	-	120
CROSSING GUARDS, BRIDGETENDERS..	*	*	*	*	-	-	-	-	-	-	-
FIREFIGHTERS.....	*	-	*	*	-	-	*	-	*	-	*
GUARDS.....	NA	*	60	*	*	1,470	-	1,470	100	-	100
MARSHALS AND CONSTABLES.....	-	-	-	-	-	-	-	-	-	-	-
POLICE AND DETECTIVES.....	*	-	*	*	*	1,320	-	1,320	*	-	*
SHERIFFS AND BAILIFFS.....	-	-	-	-	-	-	-	-	-	-	-
PRIVATE HOUSEHOLD WORKERS.....	-	-	-	-	-	-	-	-	-	-	-
CHILD CARE WORKERS.....	-	-	-	-	-	-	-	-	-	-	-
COOKS, PRIVATE.....	-	-	-	-	-	-	-	-	-	-	-
HOUSEKEEPERS, PRIVATE.....	-	-	-	-	-	-	-	-	-	-	-
LAUNDRESS, PRIVATE.....	-	-	-	-	-	-	-	-	-	-	-
PRIVATE HOUSEHOLD CLEANERS AND SERVANTS.....	-	-	-	-	-	-	-	-	-	-	-
LABORERS, EXCEPT FARM.....	NA	*	600	490	110	4,810	80	5,730	330	*	330
ANIMAL CARETAKERS.....	*	-	*	*	*	*	*	-	*	-	*
CARPENTERS' HELPERS.....	*	-	*	*	*	90	-	90	*	-	*
CONSTRUCTION LABORERS, EXCEPT CARPENTERS' HELPERS.....	*	-	*	*	*	600	-	600	*	-	*
FISHERS, HUNTERS, AND TRAPPERS..	*	-	*	*	*	-	-	-	*	-	*
FREIGHT MATERIAL HANDLERS.....	NA	-	NA	110	*	1,360	-	1,360	100	-	100
GARBAGE COLLECTORS.....	*	-	*	*	*	70	-	70	*	-	*
GARDENERS AND GROUNDSKEEPERS....	*	*	*	*	*	290	*	290	*	-	*
LONGSHORE WORKERS AND STEVEDORES.....	*	-	*	*	*	-	-	-	*	-	*
TIMBER CUTTING AND LOGGING WORKERS.....	*	-	*	*	*	70	-	70	*	-	*
STOCKHANDLERS.....	NA	-	NA	130	*	570	-	570	*	-	*
TEAMSTERS.....	NA	-	NA	*	-	-	-	-	-	-	-
VEHICLE AND EQUIPMENT, WASHERS AND CLEANERS.....	*	-	*	*	*	280	-	280	*	-	*
WAREHOUSE LABORERS NEC.....	*	-	*	*	*	220	50	170	*	-	*
OTHER LABORERS.....	NA	-	NA	80	*	1,120	*	1,120	90	-	90
FARMERS AND FARM WORKERS.....	NA	-	NA	660	*	620	-	620	*	-	*
FARMERS AND MANAGERS.....	NA	-	NA	370	*	350	-	350	*	-	*
FARMERS (OWNERS AND TENANTS)....	NA	-	NA	360	*	340	-	340	*	-	*
FARM MANAGERS.....	*	-	*	*	-	-	-	-	-	-	-
FARM LABORERS AND LABOR SUPERVISORS.....	NA	-	NA	290	*	280	-	280	*	-	*
FARM LABOR SUPERVISORS.....	*	-	*	*	-	-	-	-	-	-	-
FARM LABORERS, WAGE WORKERS.....	NA	-	NA	190	*	180	-	180	*	-	*
FARM LABORERS, UNPAID FAMILY....	NA	-	NA	100	*	90	-	90	*	-	*
FARM LABORERS, SELF-EMPLOYED....	*	-	*	*	-	-	-	-	-	-	-

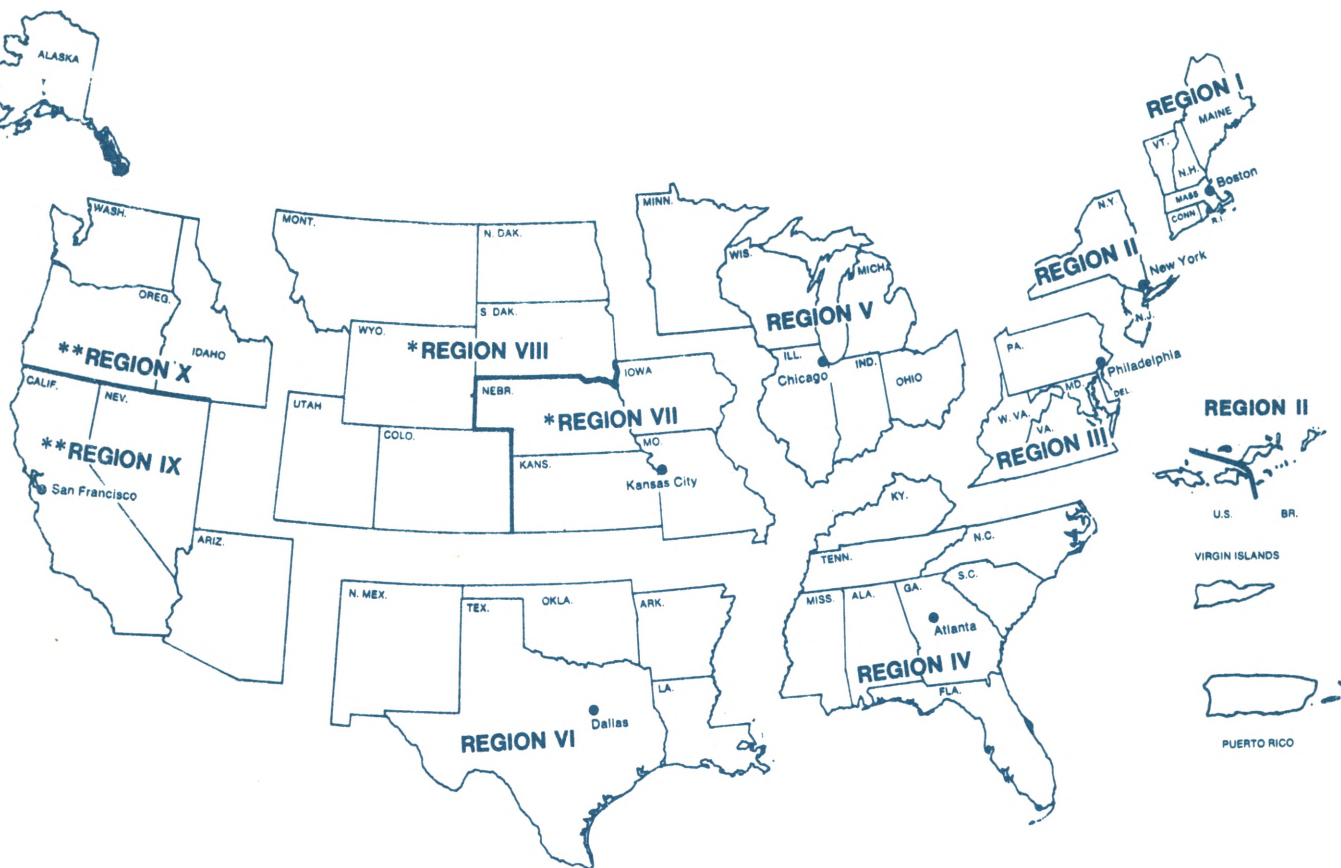
<sup>1</sup> Includes direct employment generated by tuition costs.  
 \* Denotes fewer than 50 jobs.  
 NA = not available.  
 - denotes no employment.

NEC = not elsewhere classified.

NOTE: Detail may not add to totals because of rounding. Also, data for occupations with fewer than 50 jobs are not shown but are included in the totals.

# BUREAU OF LABOR STATISTICS

## REGIONAL OFFICES



### Region I

1603 JFK Federal Building  
Government Center  
Boston, Mass. 02203  
Phone: 223-6762 (Area Code 617)

### Region II

Suite 3400  
1515 Broadway  
New York, N.Y. 10036  
Phone: 971-5405 (Area Code 212)

### Region III

P.O. Box 13309  
Philadelphia, Pa. 19101  
Phone: 597-1154 (Area Code 215)

### Region IV

Suite 540  
1371 Peachtree St., NE.  
Atlanta, Ga. 30309  
Phone: 526-5418 (Area Code 404)

### Region V

9th Floor  
Federal Office Building  
230 S. Dearborn  
Chicago, Ill. 60604  
Phone: 363-1880 (Area Code 312)

### Region VI

Second Floor  
555 Griffin Square Building  
Dallas, Tex. 75202  
Phone: 749-3516 (Area Code 214)

### Regions VII and VIII \*

Federal Office Building  
911 Walnut St., 15th Floor  
Kansas City, Mo. 64106  
Phone: 374-2481 (Area Code 816)

### Regions IX and X \*\*

450 Golden Gate Ave.  
Box 36017  
San Francisco, Calif. 94102  
Phone: 556-4678 (Area Code 415)

\* Regions VII and VIII are serviced by Kansas City  
\*\* Regions IX and X are serviced by San Francisco