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ABSTRACT

Summarized is an employment survey, conducted by the Engineers Joint Council for the National Science Foundation. Twenty percent of the membership of 23 engineering societies were sampled. The results are reported as unemployment rates for selected degree and age groups, field of specialization, geographical areas, citizenship, and type of employer. The major problem areas are those engineers without college degrees or with highest degrees in nonengineering curricula, those in electronics and aerospace specialities, those whose particular speciality was nonengineering in nature, those who were not U. S. citizens, or under 30 or over 55, and those in the Seattle or Wichita areas. (TS)

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EMPLOYMENT PROBLEMS OF ENGINEERS HIGHLIGHTED BY NEW SURVEY

The depressed job market in 1970-71 has created an engineering "employment problem" rate of 4.7 percent, according to Dr. Robert J. Raudebaugh, President of Engineers Joint Council. The figures were obtained by querying one-fifth of the 500,000 individual members of twenty-three major engineering societies, representing all fields of engineering employment. The survey, conducted last summer by EJC for the National Science Foundation, was completed in August and the results have just been released by the Foundation. Because of the membership qualifications of the engineering societies, the group covered, constituting about 40 percent of all self-styled engineers in the U.S., is "more qualified, more experienced, and more professionally oriented than the total engineer population," according to NSF. A similar survey of as conducted by the Foundation earlier in the summer.

The unemployment rate for the group surveyed, as reported by the National Science Foundation, was 3.0 percent. EJC believes that those engineers who are working only part-time or doing nonengineering work because of inability to find full-time professional employment should be added to the completely unemployed in order to analyze current employment problems. Out of every 1000 engineers in EJC's "employment problem" category, 678 were out of work, 119 were doing part-time engineering work while seeking full-time employment, and 203 were working

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in nonengineering positions because engineering jobs were not available. EJC has also used a slightly different data base for its "employment problem" statistics by not including those engineering society members who reported that they preferred doing nonengineering work or were working part-time and not seeking full-time employment. The National Science Foundation, using Labor Department classifications, counted as employed all those who were doing work of any kind whether full- or part-time, engineering or nonengineering, and numbered as unemployed only those without a job of any kind. For example, a laid-off engineer working temporarily in a nonengineering job such as driving a taxicab would be considered employed in the government's statistics whereas from the engineering profession's point of view he would clearly constitute part of the employment problem. The government unemployment rate therefore represents 1,700 unemployed engineers out of a labor force of 55,800, while EJC's "employment problem" rate represents 2,500 unemployed or sub-professionally employed out of a total of 52,000 engaged in or seeking full-time engineering work. The actual magnitudes of the two rates are less important than the comparative relationships among the various subgroups identified in the survey data. (Tables 1 and 2 attached show in detail how the government and EJC statistics were derived.)

According to the survey, engineering unemployment has almost doubled between March 1970 and June 1971. This compares to an increase of about 27 percent in total national unemployment over the same period. Even more dramatic is the increase in engineering unemployment since the 1964-69 period, when less than one percent of the respondents to major surveys conducted by EJC on behalf of the National Engineers Register reported themselves out of work.

The depressed job market has not affected all kinds of engineers equally, however. A detailed analysis of the survey data shows the following groups to have been particularly hard hit:

Engineers without college degrees had an "employment problem" rate 44 percent higher than those with degrees.

Graduates whose highest degrees were in nonengineering curricula were 49 percent more likely to have employment problems than those with highest degrees in engineering.

The problem rate for electronics and aerospace specialists was over 60 percent higher than for engineers in general. Other specialties with substantially higher than average "employment problem" rates were manufacturing engineering, computer and mathematics, systems engineering, and industrial engineering. Groups with the lowest incidence of problems were civil, petroleum, environmental and sanitary, and chemical engineering. Other specialties with low problem rates were agricultural and mining engineering.

The highest problem rate of all was found among those who were doing engineering related work but who indicated that their particular specialty was nonengineering in nature.

Non-U.S. citizens, although relatively few in total numbers in the survey, were nearly 80 percent more likely to have employment problems than U.S. citizens.

Self-employed engineers and those in educational and nonprofit institutions had about four times as high a "problem" rate as government workers.

Engineers under 30 or over 55 had the highest rates of unemployment or professional underemployment.

Geographically, Seattle engineers had the highest official unemployment rate

but those in Wichita had the highest "employment problem" rate, although the number involved was apparently much smaller. Other high unemployment areas were Southern California, Cape Kennedy, and Boston.

Tables 3, 4 and 5 attached show how the EJC "employment problem" rates compare with the unemployment rates reported by the National Science Foundation for a number of selected groups.

The employment survey has helped in several ways to clarify the real nature of the engineering unemployment problem. One indication that should be encouraging to students is the fact that engineers possessing strong educational qualifications are much less likely to be unemployed than are individuals who received their preparation in other fields. Also, the pinpointing of age groups, specialties, and geographical regions having the most serious employment problems should enable corrective efforts to be concentrated where they will do the most good. The identification of fields where the demand for engineers is still strong should be helpful to educators, students, and government agencies in shaping educational and retraining programs.

On the other hand, the survey has clearly demonstrated that engineers' employment problems are more complex than had been commonly [illegible]. Most current government programs, for instance, are aimed at areas where aerospace and defense cutbacks have been most severe. The survey shows that other categories have serious employment problems too. EJC has proposed a full-fledged program of supply-demand surveys at regular intervals of six months or a year as a means of developing a better understanding of the many-faceted problems periodically besetting engineering, in which manpower shortages are suddenly and unpredictably replaced by surpluses in some areas while unfilled demand continues to exist in others. Such a program, EJC believes, offers the best hope of enabling governmental agencies and professional

organizations to identify employment problem areas and initiate corrective action before the problems grow to crisis proportions. The United States needs to develop the capability of predicting its high-level manpower needs far enough in advance to avoid wasteful imbalances between demand and supply in such critical occupations as engineers and scientists, whose talents are so clearly needed in solving the major technologically-related problems facing our society now and in the future.

Prepared September 24, 1971

Note to Editors: The National Science Foundation report "Unemployment Rates for Engineers, 1971" (Science Resources Studies HIGHLIGHTS, September 23, 1971) may be obtained from the National Science Foundation, National Register Group of the Division of Science Resources Studies, Washington, D.C. 20550.

TABLE 1

Engineering Employment and Unemployment Rates as Computed by the National Science Foundation

Employment Status	Number	Percent
Total survey respondents	59,200	
Not employed and not seeking employment	3,500	
In labor force	55,800	100.0
Employed in engineering work	50,400	90.3
Employed in non-engineering work	3,700	6.7
Unemployed and seeking employment	1,700	3.0

TABLE 2

Engineering "Employment Problem" Rates as Computed by Engineers Joint Council

Employment Status	Number	Percent
Total survey respondents	59,200	
Not employed and not seeking employment	3,500	
Employed in non-engineering work by choice	3,200	
Employed part-time in engineering by choice	500	
Total in or seeking full-time engineering work	52,000	100.0
Employed full-time in engineering work	49,500	95.3
Not employed full-time in engineering work	2,500	4.7
Employed part-time in engineering, seeking full-time	300	0.6
Employed in non-engineering work, engineering not available	500	0.9
Unemployed and seeking employment	1,700	3.2

TABLE 3

Unemployment and Employment Problem Rates for Selected Groups

	Number in Labor Force	NSF Unemployment Rate	EJC Employment Problem Rate
Level of Highest Degree			
Doctorate	4,807	1.9	3.3
Master's	13,379	3.2	5.3
Bachelor's	30,765	2.8	4.3
Less than bachelor's or no report	6,834	4.3	6.5
Age Group			
24 and under	1,283	5.5	10.6
25-29	5,779	3.3	5.4
30-34	7,612	2.2	3.8
35-39	7,743	2.2	3.5
40-44	8,306	2.7	4.2
45-49	9,263	2.8	4.3
50-54	7,130	3.3	5.1
55-59	4,613	4.1	6.2
60-64	2,530	4.2	6.2
65 and over	1,107	3.4	7.2

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TABLE 3 Continued

Field of Specialization	Number in Labor Force	NSF Unemployment Rate	EJC Employment Problem Rate
Aerospace engineering	3,861	5.3	7.6
Chemical engineering	2,072	1.9	2.8
Civil engineering	5,626	1.2	1.9
Communications	1,398	2.9	4.6
Computer/Mathematics	1,293	3.7	6.5
Electrical engineering	4,769	2.2	3.6
Electronics engineering	4,262	5.3	7.7
Environmental/sanitary engineering	1,089	1.6	2.5
Industrial engineering	1,972	2.8	5.2
Management/business administration	3,091	3.0	4.8
Manufacturing engineering	2,751	4.5	7.0
Mechanical engineering	5,232	2.8	3.9
Metallurgical engineering	1,797	2.8	4.5
Petroleum engineering	1,149	0.7	2.0
Plant/facilities engineering	1,406	2.3	3.2
Product engineering	1,343	3.1	4.9
Systems engineering	1,610	4.1	6.3
Non-engineering	1,167	4.5	20.7
Specialty not reported	1,617	4.9	13.4

TABLE 4

Unemployment and Employment Problem Rates for Selected Geographical Areas

Geographical Area	Number in Group	NSF Unemployment Rate for Engineers	USDL Unemployment Rate for all Workers	EJC Employment Problem Rate
Seattle, Washington	807	9.0	14.1	11.8
Orange County, Calif.	855	7.4	7.4	9.1
Wichita, Kansas	116	7.1	10.7	13.0
Los Angeles-Long Beach, Calif.	2,960	6.6	7.5	10.1
Cape Kennedy, Florida (Orlando)	403	6.6	NA	8.4
San Diego, Calif.	587	5.8	6.2	8.8
Boston, Mass.	1,516	4.5	6.2	6.3
Philadelphia, Pa.	1,410	3.8	6.2	5.7
New York, N.Y.	2,876	3.7	5.1	6.4
San Jose, Calif.	990	3.5	6.5	6.1

TABLE 5

EJC Employment Problem Rates for Other Selected Groups

Characteristic	EJC Employment Problem Rate
Highest degree in engineering curriculum	4.3
Highest degree in non-engineering curriculum	6.4
U. S. citizen	4.6
Non-U. S. citizen	8.1
Employed in private industry	4.8
Self-employed	6.9
Employed in education or non-profit organization	6.0
Employed in government	1.6