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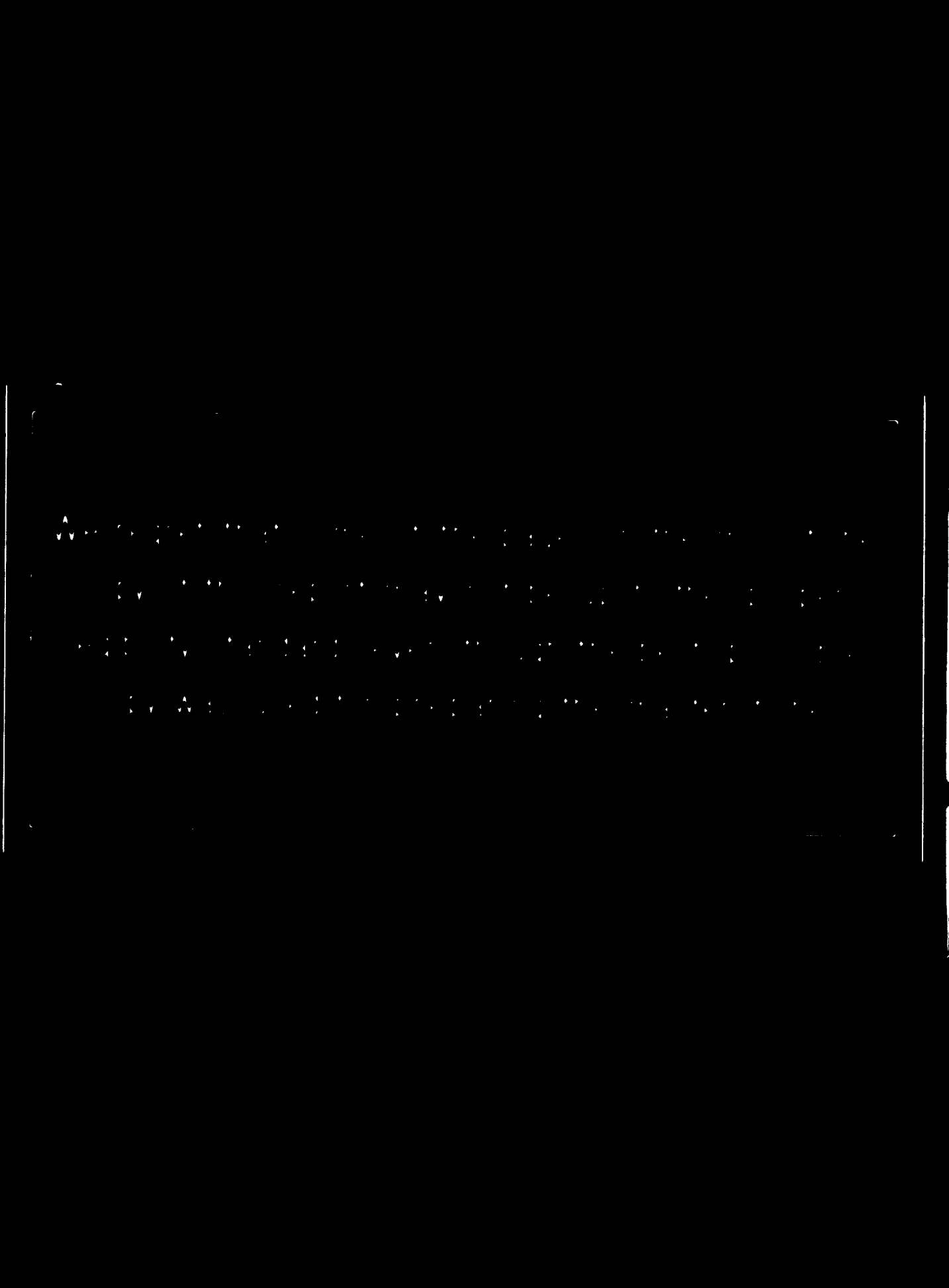

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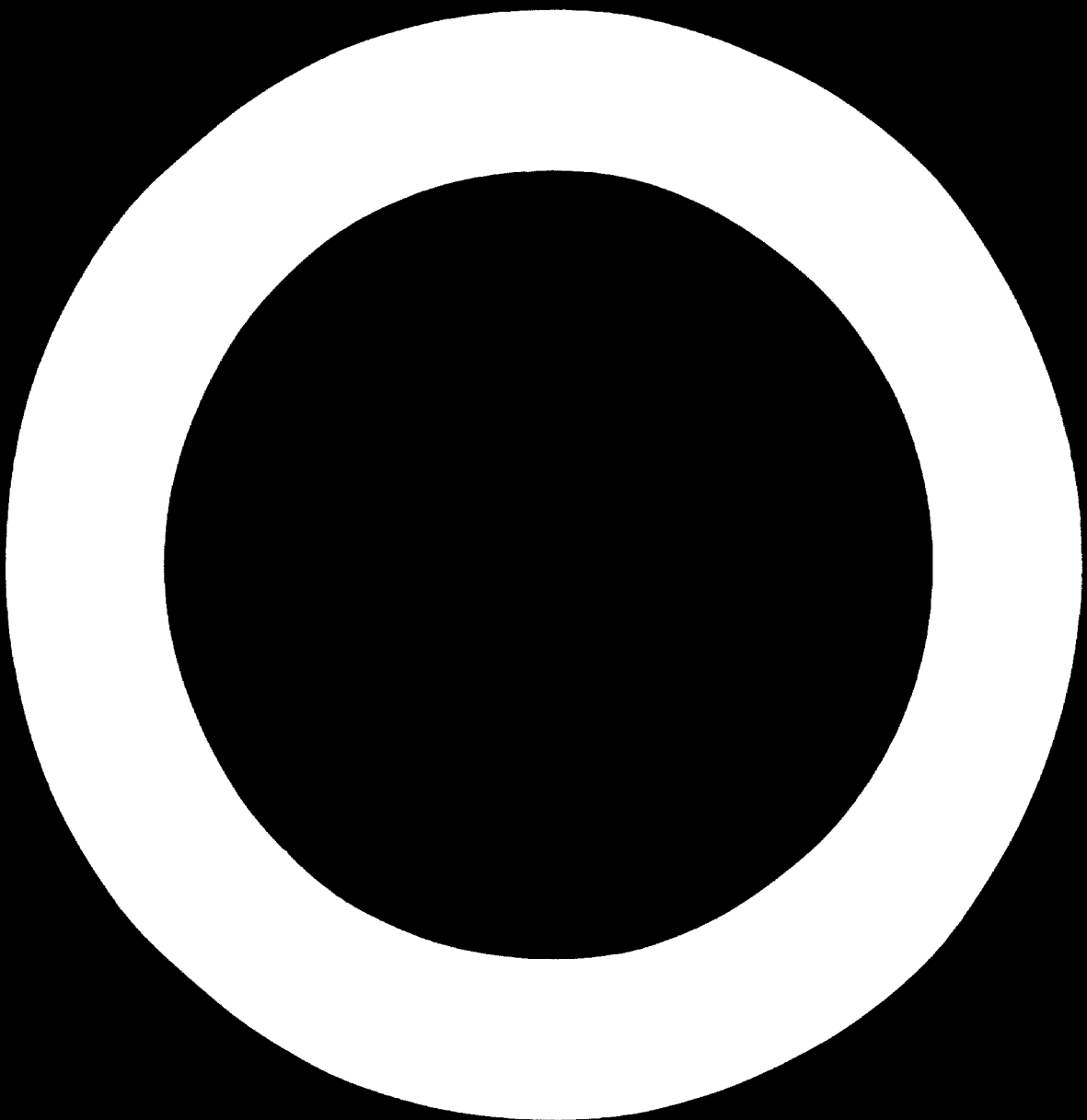
by

Charles A. Simmons, Jr.
President
Simmons Machine Tool Corporation



U N I T E D N A T I O N S
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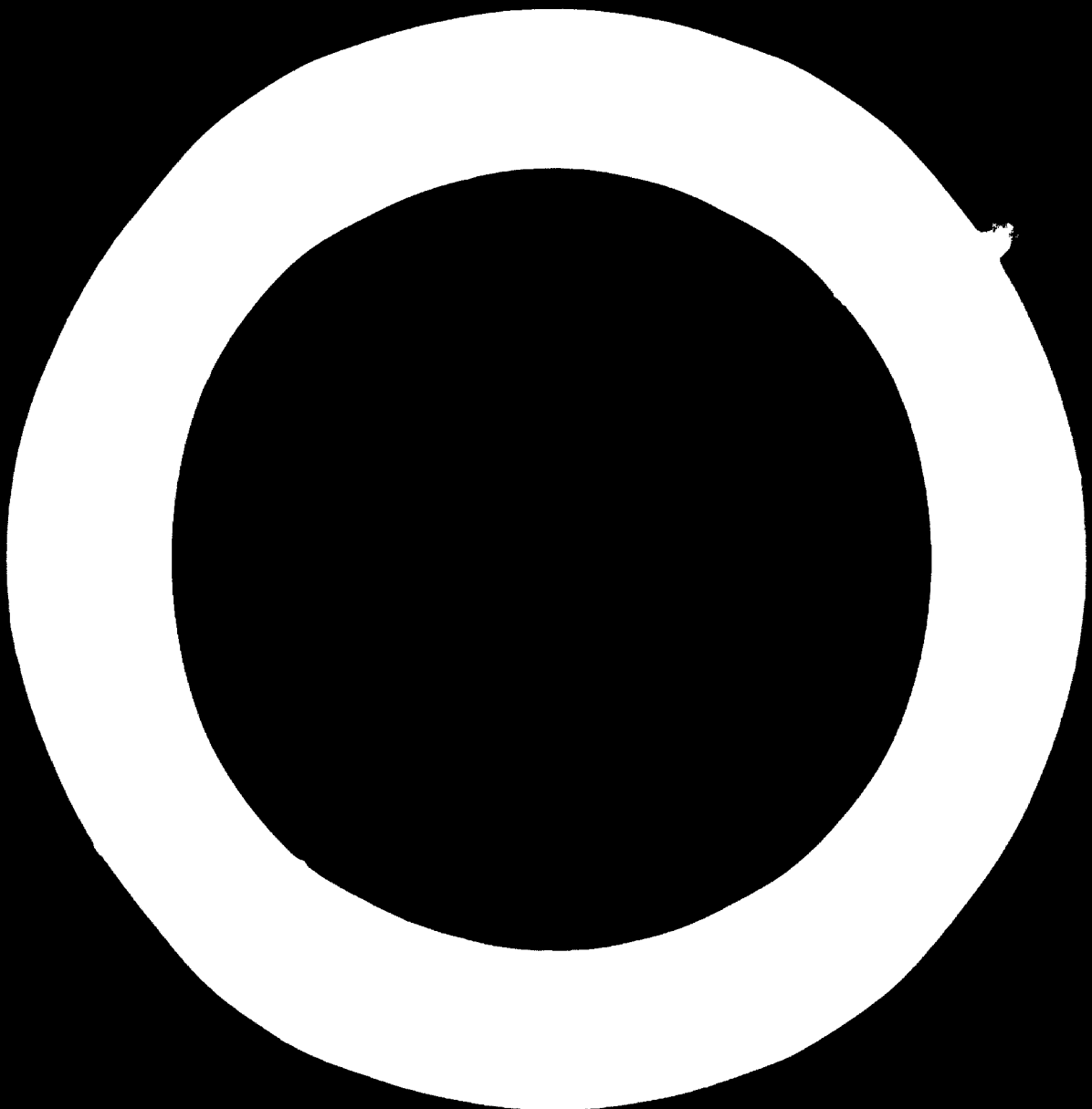


AN ANALYSIS OF THE USED MACHINE TOOL MARKET IN THE UNITED STATES

I. THE EFFECTS OF NEW TECHNOLOGY

Volumes have been written on the technological storm that has descended in the last decade, and particularly in the last five years, on the new machine tool industry. But very little attention has been paid to the effects of that storm on the used and rebuilt machine tool market -- effects that, while they may be slower in coming, are nevertheless already discernible, and will in time be equally profound.

The reason is so simple that one wonders why it has been largely neglected. It is axiomatic to me that no technological change or severe marketing shift in new machine tools can possibly occur without causing reverberations in the used and rebuilt machine tool industry.

It would be convenient -- but impractical and grossly inaccurate -- to separate technological from market changes, and to suppose that two causes are operating independently to achieve different effects. The machine tools of today cannot be assessed in that fashion because too many of them are conceived, designed, produced, marketed and operated as systems. The unique feature, separating today's systems from the systems of yesterday, is that single machine tools have become systems -- through numerical-control, pre-set tooling, automatic tool changing, computer feedback and other devices. We have machine tools, in other words, which are approaching that machining milennium which researchers have referred to as "UMT" -- universal machine tools.

II. PROJECTIONS AFFECTING USED TOOL SUPPLIES

Where does that leave the used and rebuilt machine tool market? Let us first look at some new machine tool projections in one area, numerical-control.

Francis J. Trecker, the president of Kearney & Trecker Corporation, Milwaukee, Wis., and a past president of the National Machine Tool Builders' Association, has estimated that 75 per cent of the machine tools in use 20 years from today will be numerically-controlled.[1] This means that all but a few of that 75 per cent will have to have been produced since 1960, when numerical-control made its first real impact on the market after the Machine Tool Show in Chicago. And it means that all but about 6,000 to 7,500 of that number will be produced in the next 20 years. This is a machinery replacement job of staggering proportions, given an estimated total of 3,353,000 metal-cutting and metal-forming machine tools now operating in the United States.[2]

The replacement, of course, is not a one-for-one proposition. Numerically-controlled drilling machines of relatively simple types have time and again displaced two, three, four and more conventional drill presses. Given these proportions, it is within the realm of possibility that 1.5 to 2 million machine tools will be displaced by numerically-controlled tools over the next two decades -- an average of 72,000 to 100,000 per year.

[1] Steel, p. 33, Aug. 9, 1965

[2] American Machinist, 9th Inventory of Metalworking Equipment, June 10, 1963

This is 7 to 10 times the number of used tools sold by the 250 members of the Machinery Dealers National Association in the peak years of 1963 and 1964.
R. Douglas Williams, the president of Williams Machinery Co. of Chatham, N.J., and the chairman of the MDNA Statistical Committee, has compiled figures for those years, showing that 11,452 units were sold in 1964 and 10,643 units in 1963. These figures include MDNA members only, accounting for 33 per cent to 50 per cent of the nation's dealers, and probably well over half of total used and rebuilt sales.

Even while an uptrend in unit sales of used and rebuilt tools can be anticipated, it is not going to be sufficient to absorb, and carry in inventory, all of the used machinery which can be expected to be removed from production floors. New markets must be created if the used and rebuilt industry is to remain economically healthy.

III. AIR FORCE TOOL REPLACEMENT

A more specific indication of machinery displacement trends was a study prepared by Chemical & Metallurgical Research, Inc., Chattanooga, Tenn., under the supervision of the Manufacturing Technology Division, Wright-Patterson Air Force Base, Dayton, O. It showed that the number of machine tools in the Air Force inventory would be cut in half by 1965, dropping from 64,000 to 32,000, as the following table shows:

Summary of requirements for major types of equipment

Equipment category	[illegible] No.	[illegible]	[illegible] No.	[illegible]	[illegible]	[illegible]
Material removal	38.1	307	8.0	[illegible]	412	40.0
Sheet metal forming	3.3	86	5.2	[illegible]	307	10.0
Welding	3.3	30	4.0	160	300	9.0
Electromagnetic test equipment	14.0	46	2.9**	130	[illegible]**	6.4
[illegible]	9.2	86	10.0	105	400	8.4
Heat-treat furnaces	2.2	46	1.6	30	150	8.4
Totals	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

*Estimate of required annual additions to inventory for fiscal '65 and '66 (average for two years)

**New or modernization items only; does not include additions from contract systems

Current and forecast active Air Force inventory of selected (priority) material-removal equipment

Machine type	End of fiscal year 1964: Units No.	%	Value Million $	%	End of fiscal year 1970: Units No.	%	Value Million $	%
Boring machines	2400	8.0	106	10.5	[illegible]	10	[illegible]	10.5
Drilling machines	3700	13.1	37	6.6	[illegible]	10	[illegible]	3.6
Grinding machines	[illegible]	[illegible]	[illegible]	14.1	[illegible]	[illegible]	[illegible]	11.7
[illegible]	[illegible]	4.0	25	4.4	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] (form)	317	1.1	14	2.5	[illegible]	[illegible]	[illegible]	[illegible]
Lathes	[illegible]	21.0	[illegible]	15.2	[illegible]	20	21	8.8
Milling machines	[illegible]	[illegible]	277	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	2.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	107	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Traveling column	[illegible]	0.2	11	1.9	[illegible]	17	[illegible]	[illegible]
Miscellaneous	[illegible]	16.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total, major types	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: AMERICAN MACHINIST, July 5, 1965. Page 80

And look also at the changes in the equipment mix, most dramatically illustrated in the second part of the table under the three electromachining types -- electro-erosion, electrodischarge and electrochemical. Their combined percentage of the total number of machine tools in the Air Force inventory in 1964 was 1.1 per cent; by 1975, they are expected to comprise 19 per cent of the total.

The fundamental question, for the used and rebuilt market, is the disposition of the 32,000 tools that will leave the AF inventory -- an average of nearly 3,000 a year for the Air Force alone. They could, of course, be absorbed, for utilization or surplus, by the Government, which in 1963 owned and estimated 255,000 machine tools, or about 8 per cent of the total in metalworking.[2] They could also find their way into the open market. In this respect, it is pertinent to quote from a letter dated July 30, 1965, from Colonel Samuel F. Langley, Commander, Defense Industrial Plant Equipment Center, Memphis, Tenn., which oversees the disposition of all Department of Defense-owned tools:

"It should be interesting to note that approximately 600 items per month are presently sold on the open market, either through military or contractor sales offices. This figure should remain fairly constant dependent upon the above exceptions."

The exceptions listed by Col. Langley were: "(a) Emphasis placed upon updating the Department of Defense inventory, which is primarily based on availability of funds, and (b) World conditions, which obviously can result in fewer items on the market."

I will turn later to an examination of the role of the Defense Industrial Plant Equipment Center, or DIPEC, in the machine tool market today. First, let us see what numerical-control is already doing in the used and rebuilt machine tool market.

IV. THE EFFECTS OF N/C ON THE USED TOOL MARKET

The former president of the Machinery Dealers National Association, Belford A. Small, the president of MacDell Corp., Chicago, estimated in late 1964 that numerically-controlled tools would comprise1 to 2 per cent of the dollar volume for that year, or triple the numerical-control share of the used market for a year earlier. "The trend is there," he said, "I did a study on this and we anticipate in three years (i.e., 1967) it will amount to 10 per cent of the industry dollar volume. And by 1970 it will represent 25 per cent."[3] Since numerically-controlled tools are generally more expensive than their conventional counterparts, the share in units will probably be less than that. But the curve is there and it will keep rising; eventually, the proportion of numerically-controlled tools

[3] Iron Age, p. 25, Dec. 3, 1965

with respect to the total number of tools in use, and the proportion of used numerically-controlled tools with respect to the total number of used tools, are going to balance out. But between now and then, a lot of acclimation and adjustment, some of it very painful, are going to be gone through.

The reason is that the used and rebuilt industry is discovering, as the new machine tool industry did before it, that numerical-control is not just another machine tool with an electronic "black box" attached. It requires engineers with an intimate knowledge of electromechanical, electro-hydraulic and fully-electronic servo systems; it requires a sound appreciation of the multi-machining functions now possible with one tool; it requires an awareness of the increasing sophistication of measurement and inspection supporting equipment; to back up guarantees, it requires a much higher level of skill than has ever before been required of repair and maintenance personnel -- and more of them. These comments are currently more particularly pertinent to the machinery rebuilder than to the dealer who sells without rebuilding, but eventually they will be just as important to the non-rebuilder. Numerical-control cannot be efficiently marketed any more than it can be efficiently designed and manufactured without a total encompassing knowledge of all its aspects.

V. TWO TRENDS IN USED TOOL SALES

It might be interesting to note here what I consider to be two divergent trends, brought on largely by an unprecedented boom in used machine tool sales.

On the one hand, under the press of market conditions, the average-size, general-purpose used machine tool is being sold with little or no rebuilding involved. It is cycled out, operated through its range of speeds and feeds, cleaned up, and delivered. This does not imply any carelessness on the part of the seller, or any willingness on the part of the buyer to accept lesser-quality merchandise. It does reflect the urgency of production requirements today.

On the other hand, with the market stimulus again operating, more large, special-purpose machine tools are being thoroughly rebuilt than ever before. By rebuilding, I mean that the spindle bearing is rebuilt, the machine ways are rescraped, automatic controls and other optical equipment are added, and the horsepower is often increased.

By and large, it is smaller companies who are buying the non-rebuilt tools and the bigger companies who are going in for complete rebuilding jobs. Three stimuli are operating to perpetuate the rebuilding trend, in a kind of escalating fashion: The United States' awesome appetite for goods is at bottom, keeping industry extremely busy and generating sizeable amounts of investment capital. The builders of new machine tools, pushed to capacity, are forced to extend their delivery times, particularly on

larger tools. Production requirements and the long delivery times combine to put the squeeze on a manufacturer who cannot wait for a new machine tool, nudging him into the rebuilt market. These are the conditions of today and their duration is open to question. But even without these conditions, it is my contention that the rebuilding of major machine tools will occupy a considerably larger dollar portion of tomorrow's used tool market than it does today. The great stimulus here will be numerical-control retrofitting, which was shyly approached at first but has lately become an acknowledged technique of machinery modernization.[4] Control systems builders, particularly Bunker Ramo Corp., Cleveland, Ohio, have contributed to the push behind this approach. Not all machines can be successfully retrofitted with numerical-control systems, but enough has been done to establish the rationale for considering that option.

Retrofitting, of course, provides the equivalent in the numerical-control arena of one of the classic, indisputable motivations for machine tool rebuilding -- and that is cost, a much lower cost than a manufacturer would have to pay for a new numerically-controlled tool. Provided that the rebuilding decision is technically sound, the purchaser of a rebuilt, retrofit machine tool will have a bargain equivalent to that which the buyer of a rebuilt tool has always been able to obtain.

[4] Metalworking News, p.1, March 8, 1965

I cannot stress too heavily however, that the question of retrofitting vs. purchasing a new tool must be approached first of all from an engineering standpoint, and secondarily from economic considerations. It would be folly to reverse those criteria.

VI. THE USED TOOL MARKET AS A WHOLE

Some attention ought now to be given to the used machine tool market as a whole. It has been estimated that used tool sales for 1965 will reach approximately $3.5 million, substantially above the former record high established just a year ago. The Machinery Dealers National Association (see page 3) has reported that sales in the second quarter of this year were at a record high for any quarter, reaching an index figure of 174.7. The effect of this selling pace on inventories was readily apparent: In June, the final month of the quarter, the number of used tools invoiced at $200 or more dropped 14.9 per cent behind below May, 1965, and 14.7 per cent below June, 1964, a much heavier than normal inventory drain. The complete statistical trend through June is given in the tables below and in the graphs on the following pages; the source for all of this material is the Machinery Dealers National Association, 1400-20th Street, N.W., P.O. Box 19128, Washington, D.C. 20036.

The Annual Index is based on Annual Sales 1957-1959 = 100.0. The Quarterly Index is based on Average Quarterly Sales 1957-1959 = 100.0. The Monthly Index is based on Average Monthly Sales 1957-1959 = 100.0.

	ANNUAL INDEX	QUARTERLY INDEX			
		1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
1947	98.4				
1948	87.1				
1949	98.1				
1951	142.1				
1952	116.8				
1953	103.1	116.1	109.1	93.7	91.3
1954	78.8	87.8	84.6	74.2	68.5
1955	91.2	81.7	86.6	95.8	100.7
1956	109.3	117.7	106.5	94.6	118.3
1957	108.1	123.0	111.4	94.6	79.5
1958	90.7	98.2	83.5	85.0	102.0
1959	107.2	104.8	108.3	111.6	104.3
1960	99.4	95.6	110.3	93.6	98.0
1961	107.6	105.3	106.0	100.5	120.5
1962	121.4	113.4	132.6	115.7	124.0
1963	126.7	124.3	133.1	119.1	130.5
1964	146.1	128.9	155.5	152.9	147.0
1965		149.2	174.7		

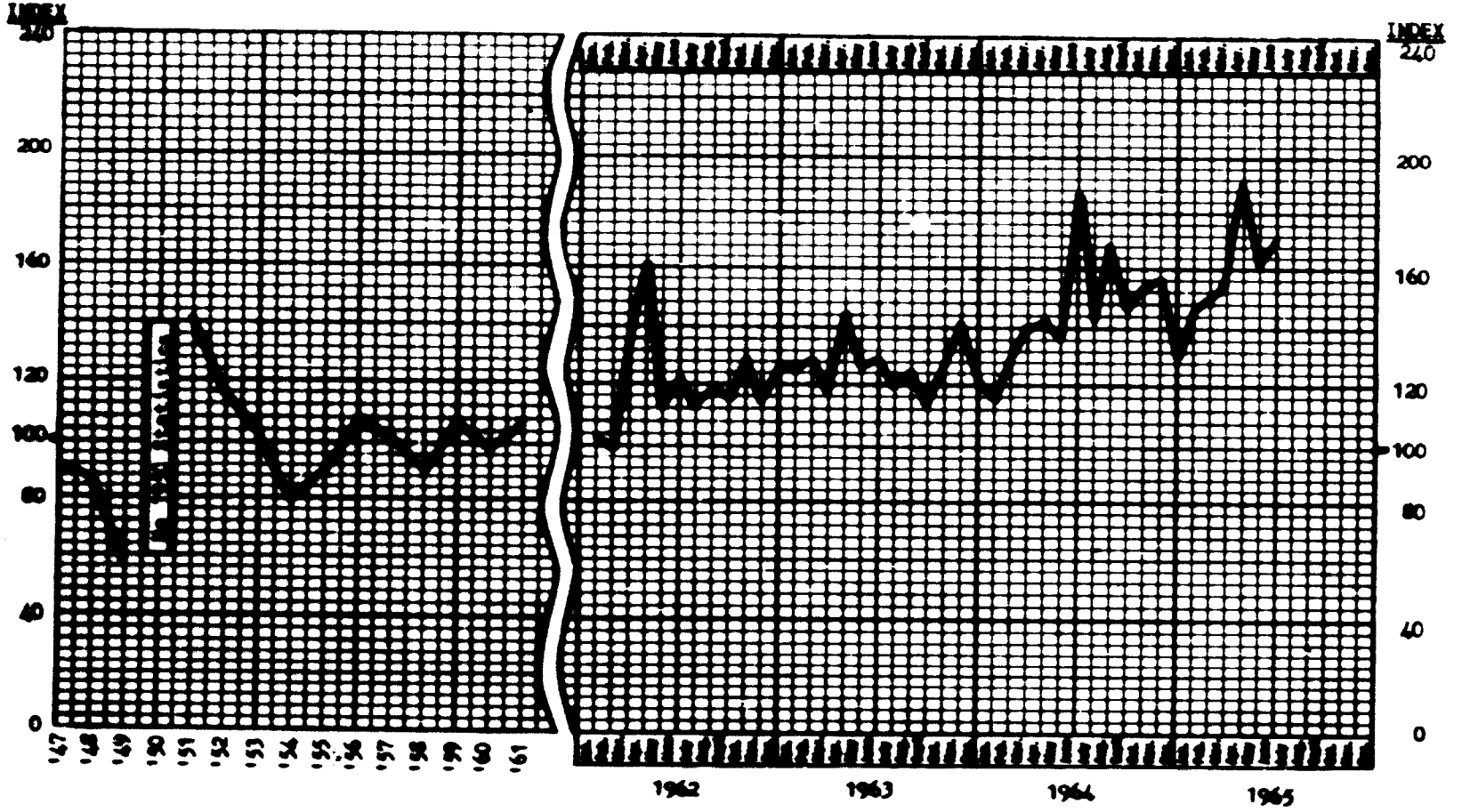
	MONTHLY INDEX											
	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1957				120.5	105.1	108.5	99.3	91.6	92.7	86.3	82.8	69.4
1958	95.9	96.6	84.2	83.2	78.8	88.6	91.1	74.0	90.0	102.0	96.9	107.1
1959	86.7	117.3	110.4	105.3	115.4	104.1	107.2	110.7	117.0	115.0	100.5	97.5
1960	91.1	102.4	99.3	108.9	113.4	108.7	84.0	107.2	89.7	100.5	103.9	89.7
1961	129.2	85.5	101.1	101.9	92.7	117.4	91.0	108.0	102.4	137.5	114.4	109.6
1962	103.7	99.8	136.7	142.1	112.1	123.6	112.5	119.4	115.1	130.3	114.3	127.5
1963	126.5	129.4	117.0	144.4	126.4	128.5	119.0	124.9	113.3	127.9	142.4	121.1
1964	115.7	130.6	140.5	142.1	136.5	187.9	142.9	168.9	146.8	154.6	156.2	130.2
1965	146.8	148.8	152.1	191.1	161.2	171.7						

* Used Machine Tool Sales cover only sales where the ultimate user of the equipment was invoiced and do not include sales to other dealers. Sales of new machines, domestic or foreign, are not included.

INDEX TREND - USED MACHINE TOOL SALES

REPORT FOR THE MONTH OF JUNE, 1965

MACHINERY DEALERS NATIONAL ASSOCIATION



NOTE: Index is based on Average Used Machine Tool Sales 1957-1959 = 100.0.

Compiled by
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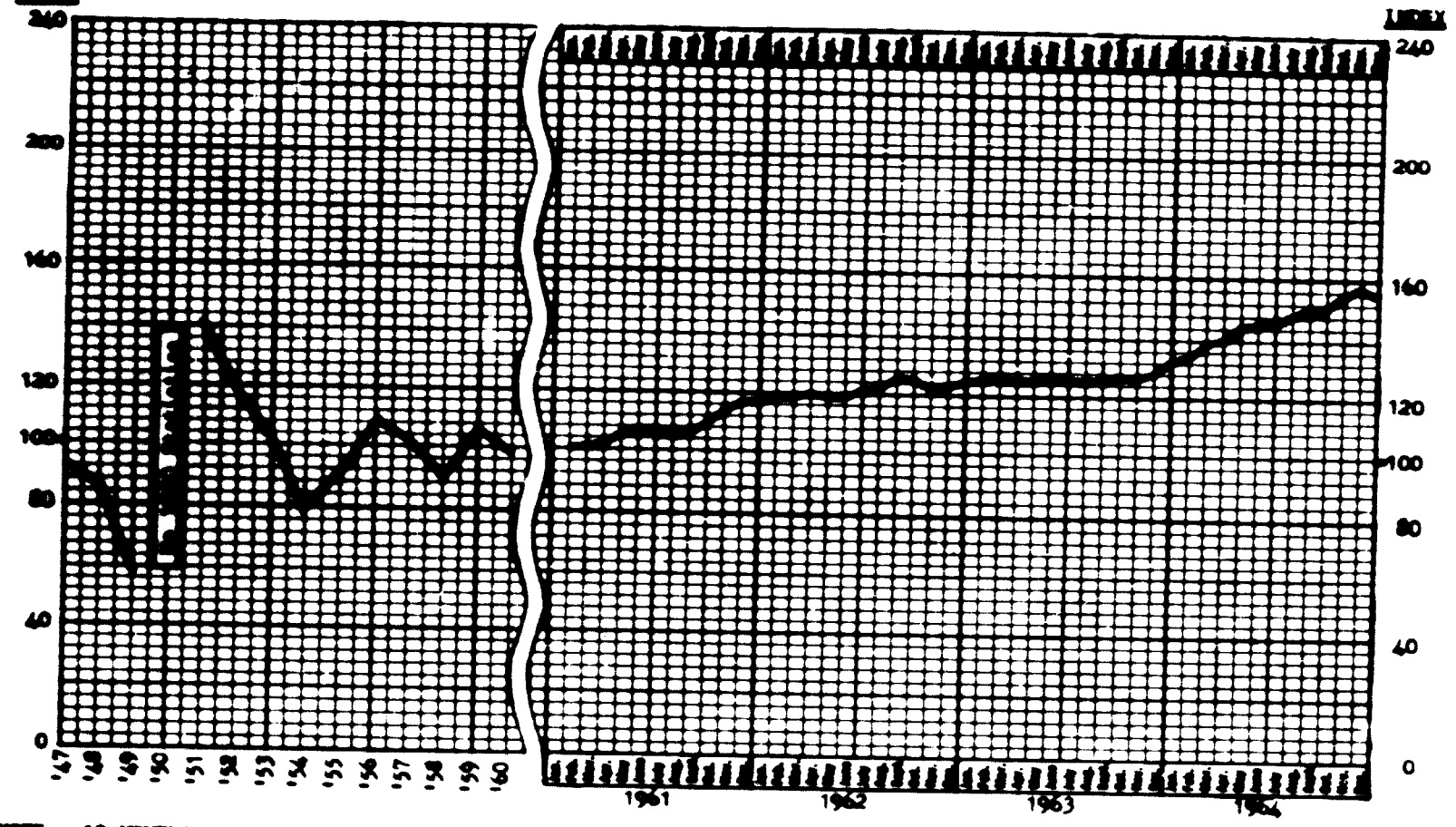
New York, N. Y.

12 MONTHS MOVING AVERAGE - USED MACHINE TOOL SALES

REPORT FOR THE MONTH OF JUNE, 1966

MACHINERY DEALERS NATIONAL ASSOCIATION



NOTE: 12 MONTHS MOVING AVERAGE IS BASED ON AVERAGE MONTHLY DOLLAR SHIPMENTS 1957-1959 = 100.0. AVERAGE MONTHLY FIGURES ARE USED FOR 1947-1960. THE AVERAGE FOR EACH 12 MONTHS TOTAL IS CHARTED AT THE CENTER OF THE PERIOD, E. G., THE AVERAGE FOR THE 12 MONTHS ENDING DECEMBER, 1962, IS CHARTED AT JUNE, 1962.

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VII. THE POTENTIAL USED TOOL SUPPLY

From these statistical summaries of the sales trend, we can profitably turn to some tables from the most reliable indication of the potential future supply of used machine tools, the Ninth American Machinist Inventory of Metalworking Equipment. The tables are self-explanatory and the conclusions that can be drawn from them are literally innumerable; the major point to remember is that the figures represent a sizeable base for tomorrow's used tool market, a base that has been widening ever since American Machinist began surveying the ages of active metalworking equipment in 1945. At that time, 37 per cent of the nation's machine tools were at least 10 years old. Since then, the percentage has risen progressively -- to 43 per cent in 1949, 56 per cent in 1953, 60 per cent in 1958, and 64 per cent in 1963. Sooner or later, that accumulation of age and obsolescence has to burst out upon the used tool market. This supply of used tools is literally between pincers, being squeezed on the one side by an accelerating rate of technological change, and on the other by the inescapable deterioration that comes with use and age. These twin pressures must eventually drive tens of thousands of used tools into the open market. By analyzing the following tables, it is possible to make some educated calculations on where the potential used tool supply is most "ripe", both by industry and types of machines; and to begin to grasp the implications of this supply for the used tool market in the next 10 to 25 years. The critical, unanswered question, at this point, is the disposition of this used tool supply once it

hits the market. Can it be absorbed, even assuming a continuing expansion of the United States economy? Will it be technologically acceptable, given the trend toward numerical-control, tracer control, and other types of automated operations? Or will the used tool supply accelerate at a manageable, more-or-less steady pace, not increasing by any disruptive amounts? These are questions that the used tool industry will be trying to answer, and here are the figures that constitute the background of these questions:

ESTIMATED TOTAL EQUIPMENT IN THE UNITED STATES

SOURCE: American Machinist	Total Machine Tools: Total Units	10 Yr & over	Over 20 Yr	Metal-Cutting Machine Tools: Total Units	10 Yr & over	Over 20 Yr	Metal-Forming Machine Tools: Total Units	10 Yr & over	Over 20 Yr
Metalworking Industries	2,808,000	64%	21%	2,137,000	64%	20%	671,000	64%	23%
Other Industries	400,000	66	30	280,000	66	30	120,000	66	31
Training	75,000	79	29	70,000	80	30	5,000	75	25
In Storage & Surplus	70,000	64	21	50,000	64	30	20,000	64	23
Total	3,353,000	65%	22%	2,537,000	65%	21%	816,000	64%	24%

[redacted]

	TOTAL MACHINE TOOLS: Units	10 Yr & over	Over 20 Yr	METAL CUTTING: Units	10 Yr & over	Over 20 Yr	METAL FORMING: Units	10 Yr & over	Over 20 Yr	% of Total Equipment in Each Industry	Machines per 100 Employees*
Ordnance and Accessories	28,943	68%	23%	24,124	64%	21%	4,819	69%	33%	1.0%	16.7
Furniture and Fixtures	43,087	59	14	20,286	59	14	22,701	57	14	1.5	36.2
Primary Metals Industries	169,518	68	27	126,363	69	26	43,155	68	31	6.1	13.0
Fabricated Metal Products**	633,998	65	21	390,711	64	18	243,287	68	25	22.7	50.8
Cutlery, Hand Tools, Hardware	85,018	68	24	51,856	66	19	33,162	73	32	3.0	64.2
Heating, Plumbing Fixtures	33,513	74	21	21,884	77	23	11,689	67	16	1.2	34.4
Fab Structural Metal Products	174,059	61	18	94,683	66	17	79,376	66	21	6.2	41.3
Screw-Machine Products	118,952	68	24	95,411	67	20	23,541	70	36	4.2	12.4
Metal Stampings	92,304	64	19	40,858	60	14	51,846	68	28	3.3	124.0
Misc Fab Metal Products	66,198	64	19	53,371	66	17	12,827	67	26	2.4	59.7
Machinery, Except Electrical	961,901	67	22	853,644	67	22	118,257	68	26	33.8	56.2
Engines and Turbines	47,205	75	30	41,916	80	40	5,289	72	26	1.7	37.5
Farm Machinery and Equipment	52,387	75	29	39,888	73	26	12,599	81	26	1.9	46.5
Construction, Mining, Matl Hdlg	89,928	74	25	75,356	74	24	14,572	73	32	3.2	38.4
Metalworking Machinery	210,638	63	20	196,106	63	20	14,532	62	20	7.5	70.8
Special-Industry Machinery	110,906	72	28	100,235	72	25	10,671	72	33	3.8	56.5
General Industrial Equipment	168,242	68	24	147,466	69	23	20,776	69	31	6.0	61.2
Office Machines	40,582	59	14	31,857	57	13	8,745	64	50	1.4	28.6
Service-Industry Machinery	47,882	68	25	33,461	69	27	14,431	59	20	1.7	35.0
Misc Machinery, Exc Electrical	184,174	36	14	167,502	59	14	16,672	62	15	6.5	100.0
Electrical Machinery and Equipment	329,548	54	14	229,111	36	13	99,437	59	17	11.7	24.0
Electrical Equipment	175,848	59	16	117,886	59	14	57,978	59	14	6.3	28.6
Household Appliances	33,888	77	30	21,587	69	36	12,301	71	30	1.2	39.2
Communication, Electronic Equip	118,857	41	8	89,730	39	7	29,128	43	9	4.2	18.4
Transportation Equipment	460,079	66	23	361,415	69	23	98,664	68	23	16.0	32.6
Complete Motor Vehicles	39,400	70	23	25,341	71	26	14,159	70	21	1.4	11.9
Automotive Parts	177,786	67	21	134,082	67	30	43,704	65	22	6.3	52.0
Complete Aircraft	53,427	69	19	40,651	67	30	12,776	70	17	1.9	22.8
Aircraft Engines and Parts	159,223	61	25	146,904	69	25	13,289	69	16	5.7	52.0
Ships and Railroad Equipment	60,164	82	41	15,377	81	26	4,787	50	50	0.7	12.1
Precision Instruments	124,521	59	16	103,163	58	16	21,358	58	15	4.4	37.5
Misc Manufacturing Industries	77,955	61	20	48,680	59	17	29,275	64	24	2.8	20.0
Total	2,808,880	64%	21%	2,137,407	64%	20%	671,686	64%	23%	100.0%	38.2

*In calculations, figures from the McGraw-Hill Census of Manufacturers were revised to include plants with fewer than 20 employees

**Totals given are for all of Fabricated Metal Products (SIC 34). The six industries listed immediately below are not a complete breakdown of SIC 34

SOURCE: American Machinist

How equipment ages — percentages from five inventories

Source: American Machinist

METAL-CUTTING MACHINE TOOLS

	% at least 10 years old				
	1946	1949	1953	1958	1963
Boring machines	34%	43%	55%	58%	64%
Broaching machines	35	31	50	59	69
Contour sawing and filing machines	—	—	36	49	59
Cutoff and sawing machines	34	33	45	51	55
Drilling machines	38	41	53	59	63
Gear cutting and finishing machines	30	50	58	64	72
Grinding machines	30	37	53	60	64
Honing and lapping machines	13	24	44	45	52
Lathes	41	47	58	64	67
Milling machines	37	46	59	61	63
Planers	78	75	81	85	89
Polishing and buffing machines	41	39	51	53	63
Shapers	64	63	69	77	83
Threading (except pipe and bolt) machines	40	54	61	62	66
Special way-type machines	—	—	—	15	26

METAL-FORMING MACHINE TOOLS

	% at least 10 years old				
	1946	1949	1953	1958	1963
Bending and forming machines	40%	50%	51%	54%	59%
Wire and metal ribbon formers	—	67	87	87	86
Hydraulic presses	51	37	46	52	53
Pneumatic presses	—	18	33	46	39
Mechanical presses	61	61	68	66	71
Punching and shearing machines	—	50	61	68	66
Forging machinery	48	72	72	80	80
Riveting machines (not hand)	26	30	46	52	57
Die-casting machines	—	17	46	30	44
Plastics molding machines	—	28	42	44	37

VIII. THE FOREIGN MARKET

The used tool industry has been more active in foreign markets than is generally realized, oftentimes operating in the face of discriminatory regulations by foreign countries anxious to protect local industries and short on exchange capital.

One measure of the extent of sales by United States used tool firms in foreign countries comes from the Machinery Dealers National Association, which "broke out" foreign sales in a supplementary survey covering 70 of its members in 1964. For those 70 members alone, export sales were listed as totalling $2,238,911 or 5.5 per cent of total sales. For 47 stocking dealers operating their own warehouses, the total was $2,061,211, or 5.7 per cent of total sales.

One interesting trend in the export of used tools is a very distinct preference among the buyers -- in Latin America, the Far East and Africa -- for reconditioned or rebuilt tools, mainly because of extremely limited local resources for repair and maintenance. The demand is essentially for late-model, general-purpose tools, either reconditioned or rebuilt into top shape.[5]

[5] American Machinist, p. 53, April 27, 1964

Another trend, operating side by side, is the idea of packaged plants for abroad. This involves buying used production equipment, putting together the elements necessary to produce a product (or, in other words, start a business), and merchandise the whole package in a foreign nation. A Los Angeles machine tool distributor, following that concept, sold two plants valued at $4 million to Africa.[6] A tool, die and precision machining organization located in Nashville, Tenn., redesigned a refrigerator, rebuilt presses, and produced the tooling for a complete refrigerator plant for a Venezuelan firm.[7]

The names of machinery dealers operating in the export market are obtainable from the Machinery Dealers National Association; see the address on page 10.

IX. THE ROLE OF DIPEC[8]

The basic mission of the Defense Industrial Plant Equipment Center (Memphis, Tenn., 38102) is to assure the reutilization of idle machine tools owned by the Department of Defense. Within that framework, which indirectly affects

[6] Steel, p. 17, June 22, 1964

[7] International Commerce, Feb. 15, 1965

[8] American Machinist, p.70, May 25, 1964
Iron Age, p. 69, Feb. 14, 1963

the future used tool market, DIPEC also performs other functions:

1. The screening of all Department of Defense procurement requisitions for machine tools and other metalworking equipment; 2. Maintenance of the Department of Defense inventory and record system; 3. The preparation of procurement standards and the maintenance of the Production Equipment Codes.

For the used machine tool market, one of the most pertinent aspects of DIPEC's operations involves the criteria used to determine whether a machine tool, having a certain service life expectancy and age, is economically amenable to rebuilding. The DIPEC criteria, reproduced as Appendix I, establish a pro-rata percentage of acquisition cost which may be spent on a machine tool for complete rebuilding, based on service life expectancy and age.

As with any formulae, the DIPEC criteria must be applied with judgement, common sense, and a recognition of the limitations of this approach. The formulae are reproduced here for the guidance they may provide in this very important area.

MACHINERY REBUILD FUNDS LIMITATION CRITERIA

(PEC 3411-3419 and 3441-3449)

INTRODUCTION:

Percentage cost factors contained herein were computed by application of the following formulae, which establish a pro-rata percentage of acquisition cost which may be expended on an item for complete rebuild, based on its service life expectancy and age.

FORMULAE:

1. P = 90 - a (if a ≤ 75) = This formula is applied to equipment which has not exceeded 3/4 of its service life expectancy. (Reference non-shaded areas of Age Conversion Tables)

2. P = 15 / (a-a) (if a ≥ 75) = This formula is applied to equipment which has exceeded 3/4 of its service life expectancy. (Reference shaded area of Age Conversion Tables)

The factors used in the above formulae are identified as follows:

1. P = The maximum percentage of acquisition cost which may be expended to completely rebuild an item dependent upon its age and service life expectancy.

2. 90 = This figure represents the maximum percentage of acquisition cost that may be expended to completely rebuild an item which is in new condition. It is realized that the requirement to rebuild new equipment is extremely rare; however, in the event it becomes necessary, it is not considered feasible to expend funds in excess of 90% of the acquisition cost when a new item can be procured for an additional 10% of this cost. Furthermore, costs relative to transportation of the equipment to a rebuild area, preliminary inspections and the time expended in preparing, submitting and reviewing correspondence relative to rebuild are not normally considered or costed against the rebuild function. Consideration of these costs will, in many cases, exceed the additional 10% required to effect new procurement.

3. 15 = This figure represents the minimum percentage of acquisition cost that may be expended to rebuild an item which has reached the end of its service life expectancy. Historical records indicate that resale of equipment in the production equipment codes (PEC) represented here will average approximately 15% of the acquisition cost. It is extremely doubtful that complete rebuild can be accomplished on such items for less than 15% of the acquisition cost; however, if so, it seems more feasible to apply the funds received from resale of the equipment toward procurement of a new machine. Rebuilding equipment which has reached the end of its expected service life is not considered practical unless other factors, i.e. obsolescence, availability of procurement funds, usage, delivery lead time, etc., are weighed against the advantages of such action.

4. a = Service life expectancy of equipment being considered for rebuild. The service life of equipment as indicated herein was obtained from Defense Supply Agency "Report on the Management of Capital Plant Equipment", Volume III, Data and References, May 1962, (ref. 4215.14 (vol. I), September 10, 1959, pages 436 through 440).

5. a = Age of equipment in years.

6. f = This factor is used in the formula for equipment which has not exceeded 3/4 of its service life expectancy (reference non-shaded areas of Age Conversion Tables), and is arrived at by dividing 69% by 3/4 of the service life expectancy of the equipment being considered for rebuild. Consideration has been given to an accelerated decrease in the depreciation rate for equipment during the last 1/4 of its service life expectancy. On a straight-line depreciation scale, an item would depreciate 23% during the last 1/4 of its expected service life; however, for the purpose of this formula, a depreciation of 39% has been determined to be more applicable since it is reasoned that as an item becomes older it will tend to wear more rapidly, resulting in an increased depreciation rate. By subtracting this 39% from 100%, a remainder of 65% is arrived at, which reflects the per cent of depreciation which may be expected to occur during the first 3/4 of the items service life.

7. F = This factor is utilized in the formula when equipment has exceeded 3/4 its service life expectancy (reference shaded areas of Age Conversion Tables), and is computed by dividing 39% by 1/4 of the service life expectancy. This portion of the depreciation rate encompassee the increased percentage of depreciation for the last 1/4 of service life expectancy.

8. 75 = This figure represents the spread of percentage of acquisition cost which may be considered for rebuild within the provisions of these formulae.

APPLICATION OF FORMULAE:

1. Application of these formulae to any specific item has been simplified by the inclusion herein of Production Equipment Code (PEC) Identification Tables and Age Conversion Tables. To determine the maximum percentage of acquisition cost (P) which may be expended to completely rebuild an item, it is necessary to determine the first six digits of the applicable PEC, the correct age, and the acquisition cost of the item.

a. The applicable PEC of equipment may be obtained by reference to Volumes D1 or D2 of the Production Equipment Directory, Metalworking Machinery, 1960 Revision. PEC codes for metalworking equipment not included in this publication may be obtained by forwarding a request for identification to DSPEC, ATTN: DSPEC-TE.

b. Since age is the most determinative factor in these formulae, every effort should be exerted to ensure that the correct age of affected equipment is known. This may be accomplished by referring to the "Metalworking Machinery Serial Number Reference Book", 1963 Revision, published by, Industrial Publishing Corporation, 14239 Myers Road, Detroit 35, Michigan, or by direct contact with manufacturer. In either case, the equipment serial number of the item must be available.

c. The correct acquisition cost of equipment may be obtained from the items historical records or by direct contact with the manufacturer.

8. When the preceding three factors have been ascertained, the following steps should be taken:

a. By reference to the PEC Identification Tables on pages 4 through 7, locate the six digit PEC for the item being considered for rebuild. Select the applicable Age Conversion Table from the column titled "Table No.".

b. The nine Age Conversion Tables, pages 8 through 16, indicate the "P" factor for any age of equipment within the nine categories of service life expectancy. When the correct table is selected, merely choose the column representative of the age of the equipment and obtain the "P" factor from the bottom of the table. Multiply the "P" factor times the acquisition cost to determine the maximum funds which may be expended for rebuild.

EXAMPLES:

1.	PEC	[illegible]	2. PEC	3411-10
	NOMENCLATURE	Lathe, Chucking	NOMENCLATURE	Horizontal Boring, Drilling and Milling Machine
	AGE	6 years	AGE	12 years
	SERVICE LIFE EXPECTANCY	11 years	SERVICE LIFE EXPECTANCY	15 years
	ACQUISITION COST	[illegible]	ACQUISITION COST	$24,740.00

Example 1:

P = 90 - a (f x 75)
P = 90 - 6 (f x 75)
P = 90 - 6 (.08125 x 75)
P = 90 - 6 (6.09375)
P = 90 - 36.56
P = 53.44%
53.44% of $15,[illegible].00 = $[illegible]

Example 2:

P = 15 + (e-a) (f' x 75)
P = 15 + (15-a) (f' x 75)
P = 15 + (15-12) (f' x 75)
P = 15 + (3) (.08750 x 75)
P = 15 + (3) (6.5625)
P = 15 + 19.69
P = 34.69%
34.69% of $24,740.00 = $8582.30

PRODUCTION EQUIPMENT CODE - IDENTIFICATION TABLES

PEC	NOMENCLATURE	SERVICE LIFE	TABLE NO.
3411-BORING MACHINES			
3411-10	Horizontal Boring, Drilling and Milling	15	V
3411-20	Vertical Boring & Turning Mills, including Vertical Turret Lathes	18	VIII
3411-30	Precision	11	I
3411-40	Jig	11	I
3411-50	Cylinder	14	IV
3411-60	Horizontal, Center Drive	13	III
3412-BROACHING MACHINES			
3412-10	Horizontal, Hydraulic	11	I
3412-20	Vertical, Internal, Hydraulic	11	I
3412-30	Vertical, Surface, Hydraulic	11	I
3412-40	Rotary, Surface, Hydraulic	11	I
3412-50	Mechanical Drive	11	I
3412-90	Hydraulic, Convertible, Horizontal - Vertical	11	I
3413-DRILLING MACHINES			
3413-10	Sensitive, Bench	12	II
3413-20	Sensitive, Floor and Pedestal	12	II
3413-30	Upright Type	13	III
3413-40	Radial	15	V
3413-50	Multiple Spindle	14	IV
3413-60	Automatic	14	IV
3413-80	Deep Hole	18	VIII
3413-90	Inverted Spindle	14	IV
3413-90	Rush Spot Facing	14	IV

PEC	NOMENCLATURE	SERVICE LIFE	TABLE NO.
3414-GEAR CUTTING AND FINISHING MACHINES			
3414-10	Gear Hobbing Machines	13	III
3414-20	Shapers	13	III
3414-30	Gear Cutting Machines, Form Milling Type	13	III
3414-40	Bevel	13	III
3414-50	Planer Type	13	III
3414-60	Hourglass Generators	13	III
3414-60	Rack Cutting	13	III
3414-60	Worm and Thread Generating	13	III
3414-70	Gear Tooth Finishing Machine	13	III
3415-GRINDING MACHINES			
3415-10	External, Cylindrical	13	III
3415-20	Internal, Cylindrical	13	III
3415-30	Surface, Rotary Table	13	III
3415-40	Surface, Reciprocating Type	13	III
3415-50	Disk	13	III
3415-60	Thread and Form	13	III
3415-70	Tool and Cutter	13	III
3415-80	Bench	11	I
3415-80	Floor	11	I
3415-80	Snag	11	I
3415-90	Race Radius	13	III
3415-90	Spline	13	III
3415-90	Cylindrical, Forms-Grooves	13	III
3415-90	Optical and Optical Projection	13	III
3415-90	Die and Jig	13	III

PEC	NOMENCLATURE	SERVICE LIFE	TABLE NO.
3416-LATHES			
3416-10	Bench	12	II
3416-20	Floor, Light and Medium, Duty, Engine and Toolroom	13	III
3416-30	Heavy Duty, Engine and Toolroom	15	V
3416-40	Turret	15	V
3416-50	Chucking	11	I
3416-60	Automatic, Between Centers	11	I
3416-70	Bar, (Screw Machines) Automatic	14	IV
3416-80	Boring & Combination Boring & Turning	14	IV
3416-90	Axle	14	IV
3416-90	Crankshaft	14	IV
3416-90	Shell	14	IV
3416-90	Spinning	14	IV
3416-90	Relieving	14	IV
3417-MILLING MACHINES			
3417-10	Bench	12	II
3417-20	Knee Type	14	IV
3417-30	Ram Type	14	IV
3417-40	Rod Type	13	III
3417-50	Planer Type	17	VII
3417-60	Profiling and Duplicating	13	III
3417-70	Die Sinking	13	III
3417-80	Thread	17	VII
3417-90	Engraving	13	III
3417-90	Drum Type	15	V
3417-90	Routing	13	III
3417-90	Spline and Cam	15	V

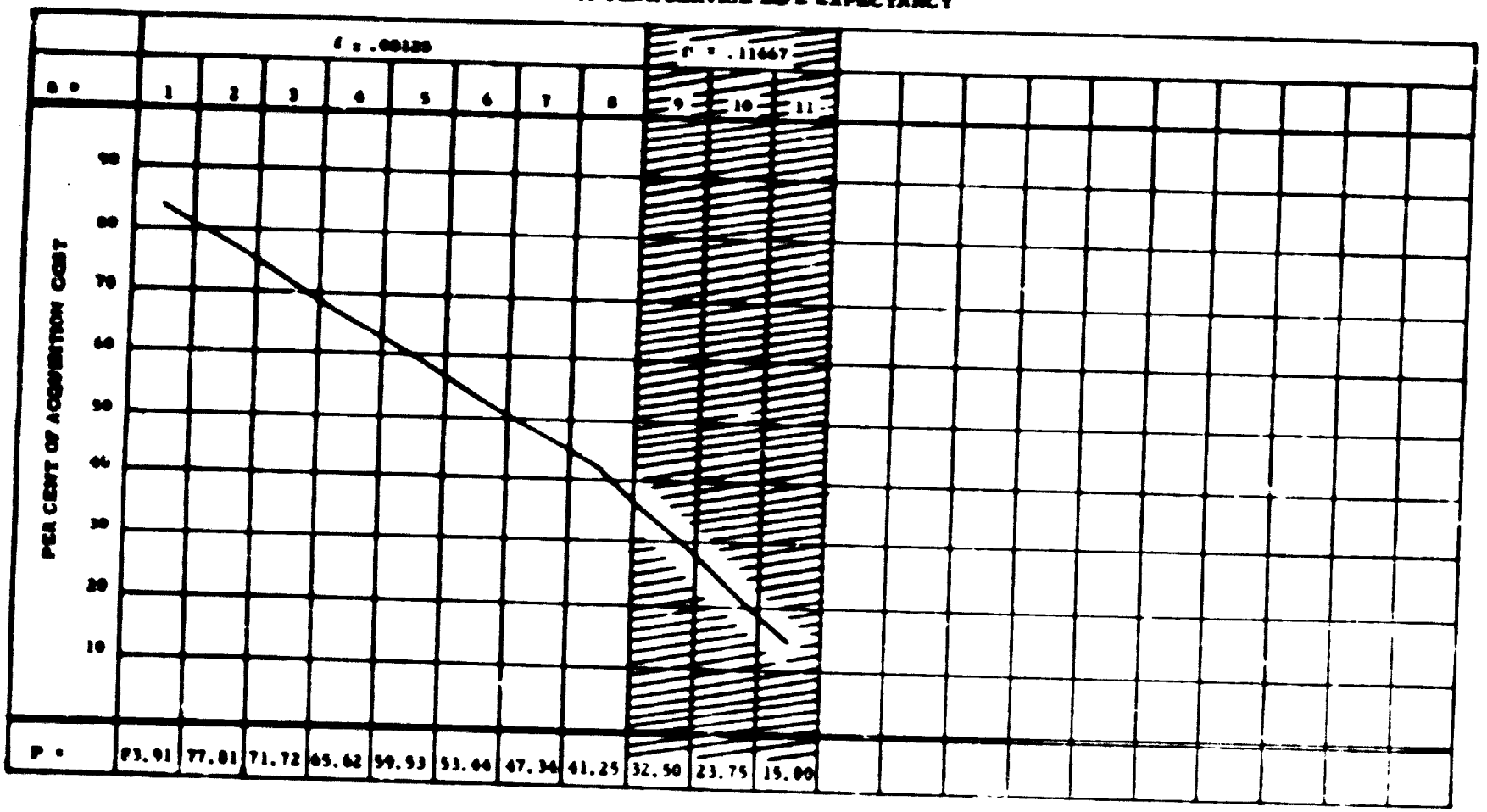
PEC	NOMENCLATURE	SERVICE LIFE	TABLE NO.
3418-PLANERS			
3418-10	Double Housing	18	VIII
3418-20	Openside	18	VIII
3418-30	Plate	18	VIII
3419-MISCELLANEOUS MACHINE TOOLS			
3419-10	Shaping Machines	15	V
3419-10	Slotting Machines	18	VIII
3419-20	Honing Machines	12	II
3419-20	Lapping Machines	15	V
3419-30	Polishing & Buffing Machines	11	I
3419-40	Sawing & Cut-off Machines	15	V
3419-50	Sawing & Filing Machines, Contour	12	II
3419-60	Tapping Machines	13	III
3419-70	Threading Machines	13	III
3419-80	Rifle Working Machines	14	IV
3419-90	Centering Machines	15	V
3419-90	Keyseating Machines	18	VIII
3419-90	Reaming Machines	13	III
3419-90	Grooving Machines	13	III
3419-90	Burring Machines	12	II
3419-96	Way Type Machines (for special application - Boring, Broaching, Drilling, Grinding, Turning, etc.)	15	V
3441-BENDING AND FORMING MACHINES			
3441-10	Bending Rolls, Sheet & Plate, Power Driven	17	VII
3441-20	Bending Rolls, Sheet & Plate, Hand Operated	17	VII

FEC	NOMENCLATURE	SERVICE LIFE	TABLE NO.
3441-30	Bending Rolls, Angles, Bars, Shapes and Pipe	14	IV
3441-40	Bending Brakes & Folders, Power Driven	12	II
3441-50	Bending Brakes & Folders, Hand or Foot Operated	15	V
3441-60	Bending & Forming Machines, Rotary, Power Driven	14	IV
3441-70	Bending & Forming Machines, Rotary, Hand Operated	14	IV
3441-80	Bending Machines, Rotary Head & Ram Type	14	IV
3441-90	Flanging Machines, Pipe	14	IV
3441-90	Expanding Machines, Pipe & Tubing	14	IV
3441-90	Hammers, Stamping & Planishing	14	IV
3441-90	Grooving Machines	14	IV
3441-90	Flanging Machines, Sheet & Plate	14	IV
3441-90	Forming Machines, Multiple Roll	18	VIII
3441-90	Sheet Metal Forming Machines, Upsetting and Shrinking Type	14	IV
3441-90	Bending & Twisting Machines	18	VIII
3442-PRESSES, HYDRAULIC AND PNEUMATIC			
3442-10	Hydraulic, Vertical, Single Action	17	VII
3442-20	Hydraulic, Vertical, Double Action	17	VII
3442-30	Hydraulic, Vertical, Triple Action	17	VII
3442-40	Hydraulic, Horizontal, Single Action	17	VII
3442-50	Hydraulic, Combination Horizontal & Vertical	17	VII
3442-60	Pneumatic	17	VII
3442-90	Die Spotting	17	VII
3442-90	Shell Banding	17	VII
3442-90	Stretch-Wrap Forming	17	VII
3442-90	Hydraulic, Fluid-Die	17	VII
3443-PRESSES, MECHANICAL, POWER DRIVEN			
3443-10	Mechanical, Inclinable, Single Action	13	III
3443-20	Mechanical, Vertical, Straight Sided & Arch Frame, Single Action	12	II
3443-30	Mechanical, Vertical, Gap or "C" Frame, Single Action	16	VI
3443-40	Mechanical, Vertical, Adjustable Bed & Hornings, Single Action	16	VI
3443-50	Mechanical Double & Triple	15	V
3443-60	Mechanical, Horizontal, Single Action	18	VIII
3443-70	Mechanical, Bulldozers	18	VIII
3443-90	Mechanical, Rotary Die Type	18	VIII
3443-90	Mechanical, Multiple Plunger	18	VIII
3443-90	Mechanical, Pull Down Punching and Stamping	18	VIII
3443-90	Mechanical, Multiple Transfer, Automatic	18	VIII
3444-PRESSES, MANUAL			
3444-10	Manual, Rack & Pinion Drive	18	VIII
3444-20	Manual, Hydraulic	18	VIII
3444-30	Manual, Screw Type, Floor & Bench	18	VIII
3444-40	Foot or Kick	18	VIII

PEC	NOMENCLATURE	SERVICE LIFE	TABLE NO.
3445-PUNCHING AND SHEARING MACHINES			
3445-10	Punching Machines, Power Driven	18	VIII
3445-20	Punching Machines, Hand Operated	18	VIII
3445-30	Shearing Machines, Plate, Power Driven	18	VIII
3445-40	Shearing Machines, Plate, Hand or Foot Operated	18	VIII
3445-50	Shearing Machines, Bar & Angle, Power Driven	18	VIII
3445-60	Shearing Machines, Bar & Angle, Hand Operated	18	VIII
3445-70	Shearing Machines, Rotary	18	VIII
3445-80	Shearing Machines, Combination	18	VIII
3445-90	Shearing Machines, Sprue Cutting	21	IX
3445-95	Shearing Machines, Nibbling	18	VIII
3446-FORGING MACHINERY AND HAMMERS			
3446-10	Hammers, Steam or Air	18	VIII
3446-20	Hammers, Mechanical	14	IV
3446-30	Forging Machines	14	IV
3446-40	Forging Machines, Bending & Forming, Hot	18	VIII
3446-90	Forging, Double Frame, Counter-blow	15	V
3447-WIRE AND METAL RIBBON FORMING MACHINERY			
3447-10	Wire & Metal Ribbon Forming Machines, Press Type	16	VI
3447-20	Wire & Metal Ribbon Cutting Machines	16	VI
3447-30	Wire Spring Hooking & Knotting	16	VI
3447-40	Wire & Metal Ribbon Straightening & Cut-off Machines	16	VI
3447-60	Wire Bunching, Stranding, Twisting & Braiding Machines	16	VI
3447-70	Wire Spring Setting Machines	16	VI
3447-80	Wire Bail Forming & Hooking Machines	16	VI
3447-90	Wire Ring Forming Machines	16	VI
3448-RIVETING MACHINES			
3448-10	Squeeze Type, Not including Magazine (Auto) Rivet Feed	12	II
3448-20	Squeeze Type, Magazine (Auto) Rivet Feed	12	II
3448-30	Rotary, Vibrating Type	12	II
3448-40	Spinning Type	12	II
3448-50	Stationary, Hammer Type	12	II
3449-MISC. SECONDARY METAL FORMING & CUTTING MACHINES			
3449-10	Thread Rolling Machines, including Combination Thread Rolling & Marking & Thread Rolling & Knurling Machines	15	V
3449-20	Marking Machines, including Combination Marking & Knurling Machines	15	V
3449-30	Embossing Machines	15	V
3449-40	Knurling Machines	15	V
3449-50	Graduating Machines	15	V
3449-60	Trimming Machines	15	V

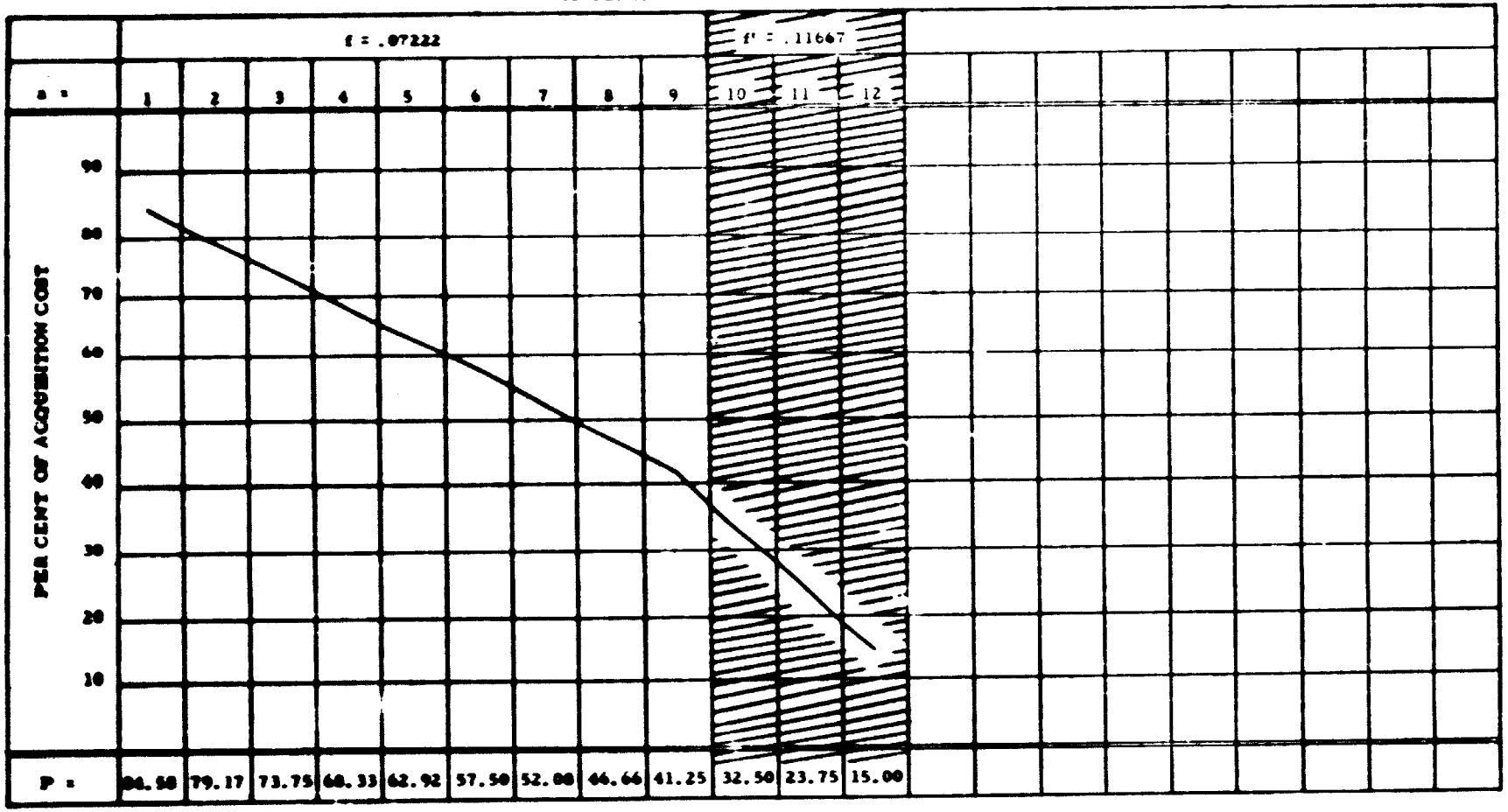
AGE CONVERSION TABLE 1

11 YEAR SERVICE LIFE EXPECTANCY



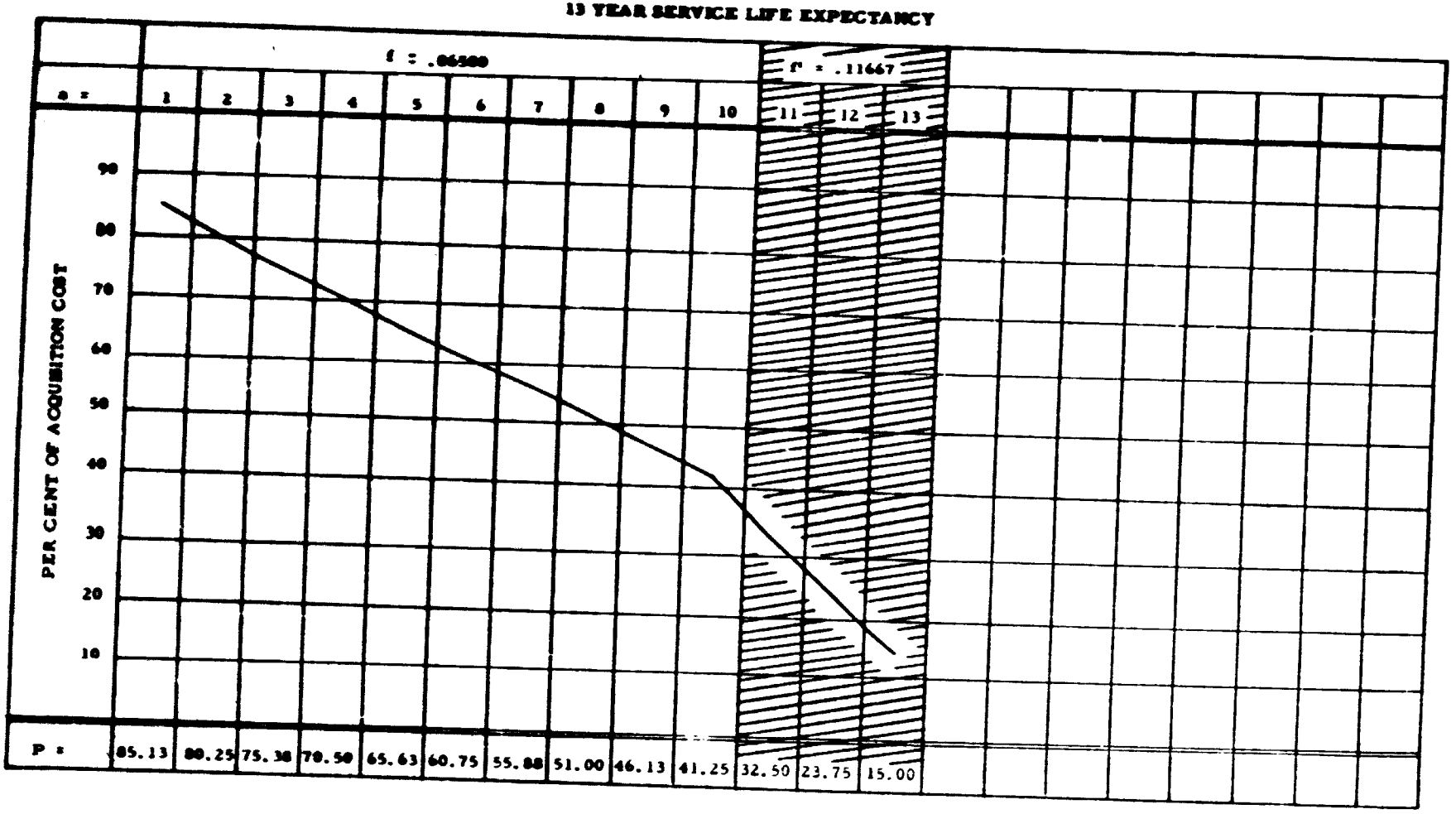
AGE CONVERSION TABLE II

12 YEARSERVICE LIFE EXPECTANCY



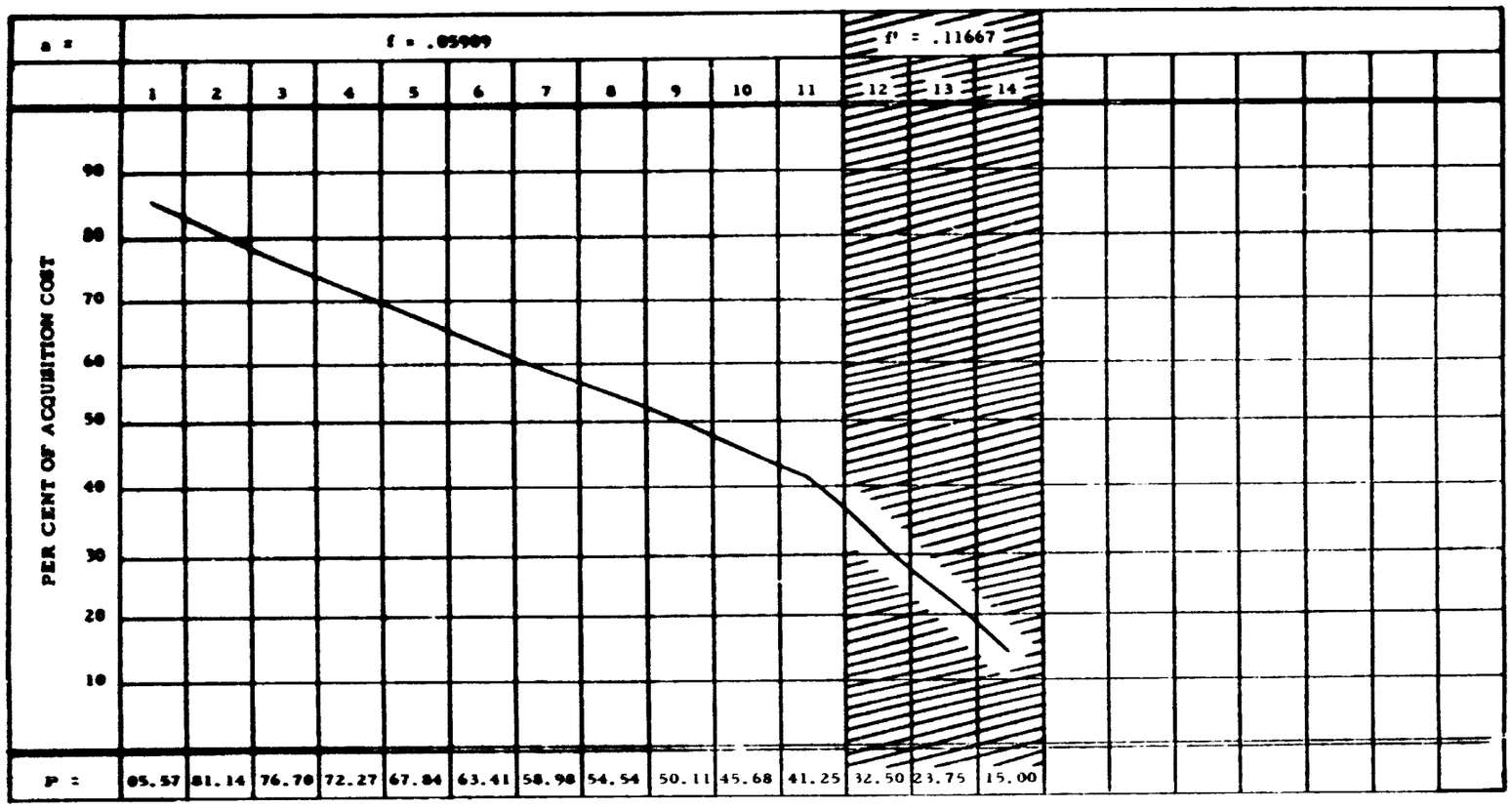
AGE CONVERSION TABLE III

13 YEAR SERVICE LIFE EXPECTANCY



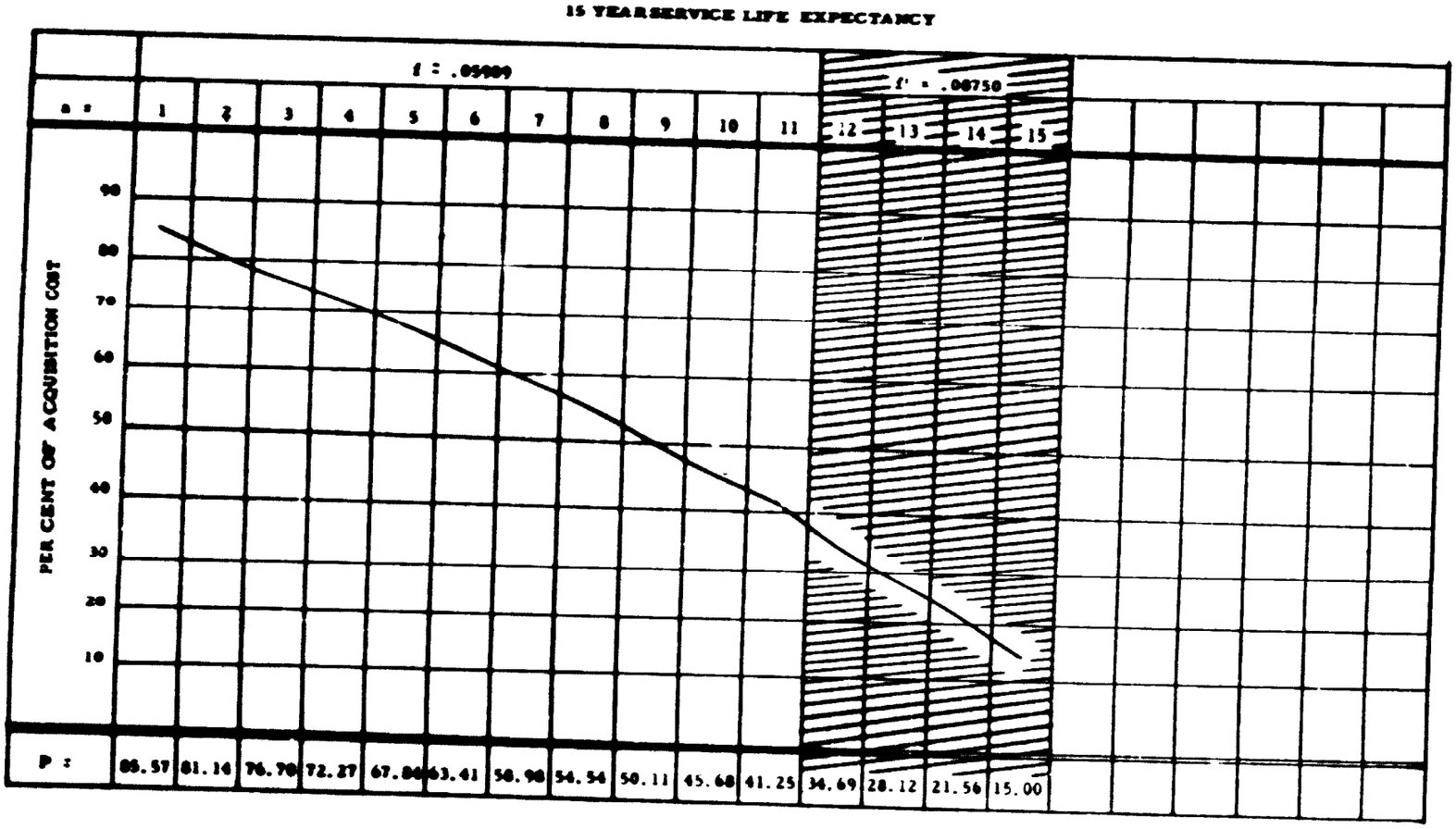
AGE CONVERSION TABLE IV

14 YEAR SERVICE LIFE EXPECTANCY



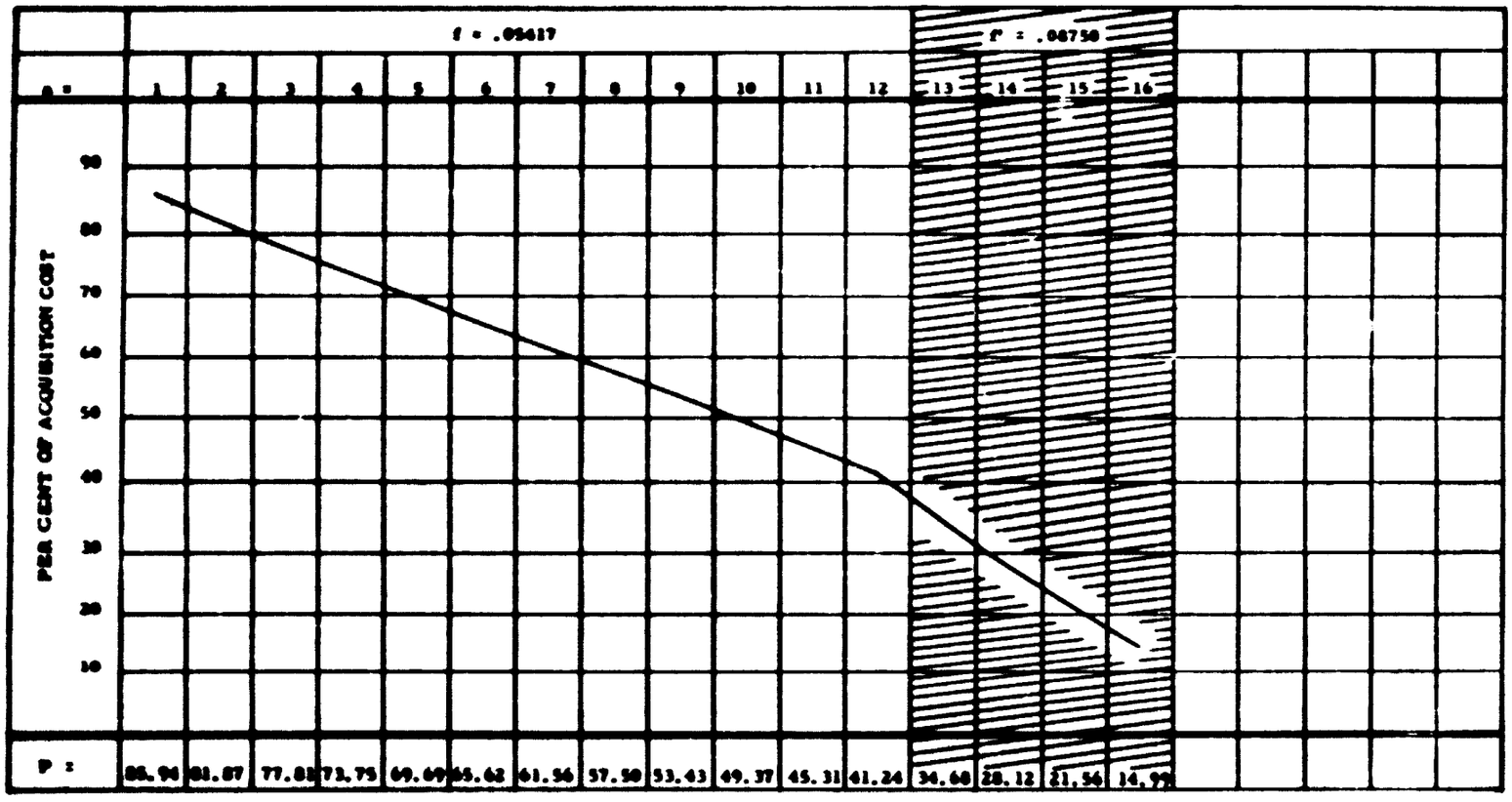
AGE CONVERSION TABLE V

15 YEAR SERVICE LIFE EXPECTANCY



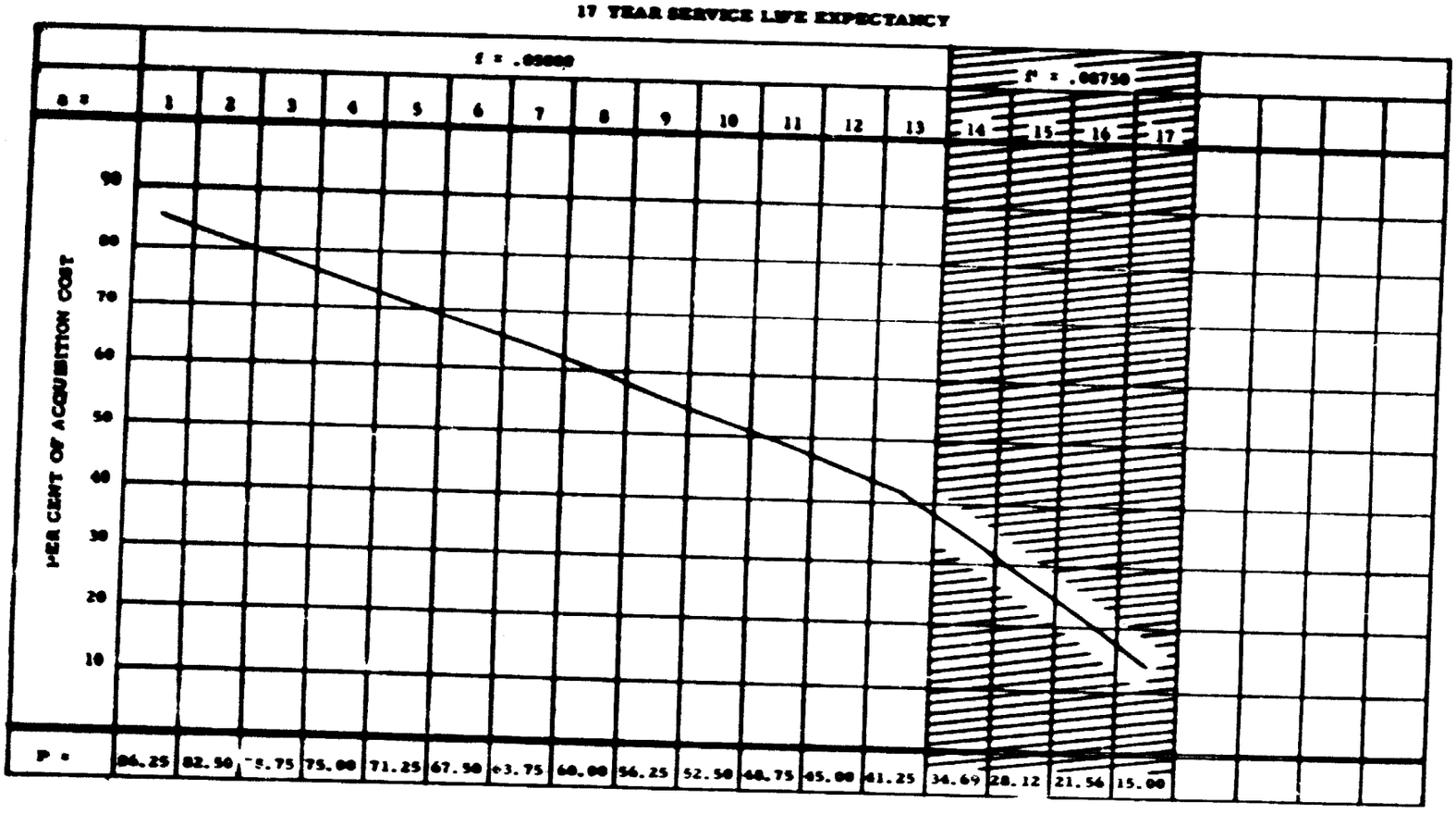
AGE CONVERSION TABLE VI

16 YEAR SERVICE LIFE EXPECTANCY



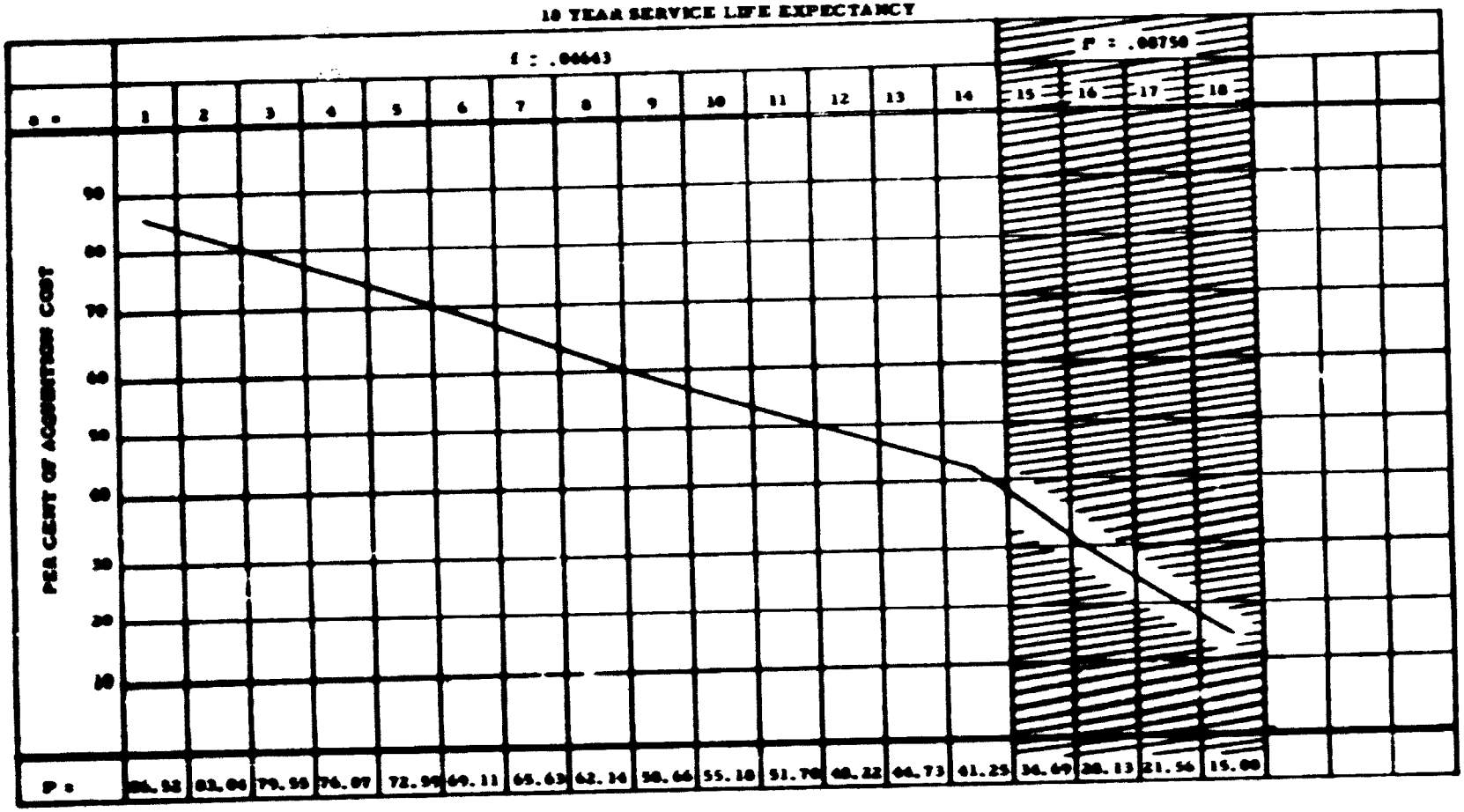
AGE CONVERSION TABLE VII

17 YEAR SERVICE LIFE EXPECTANCY



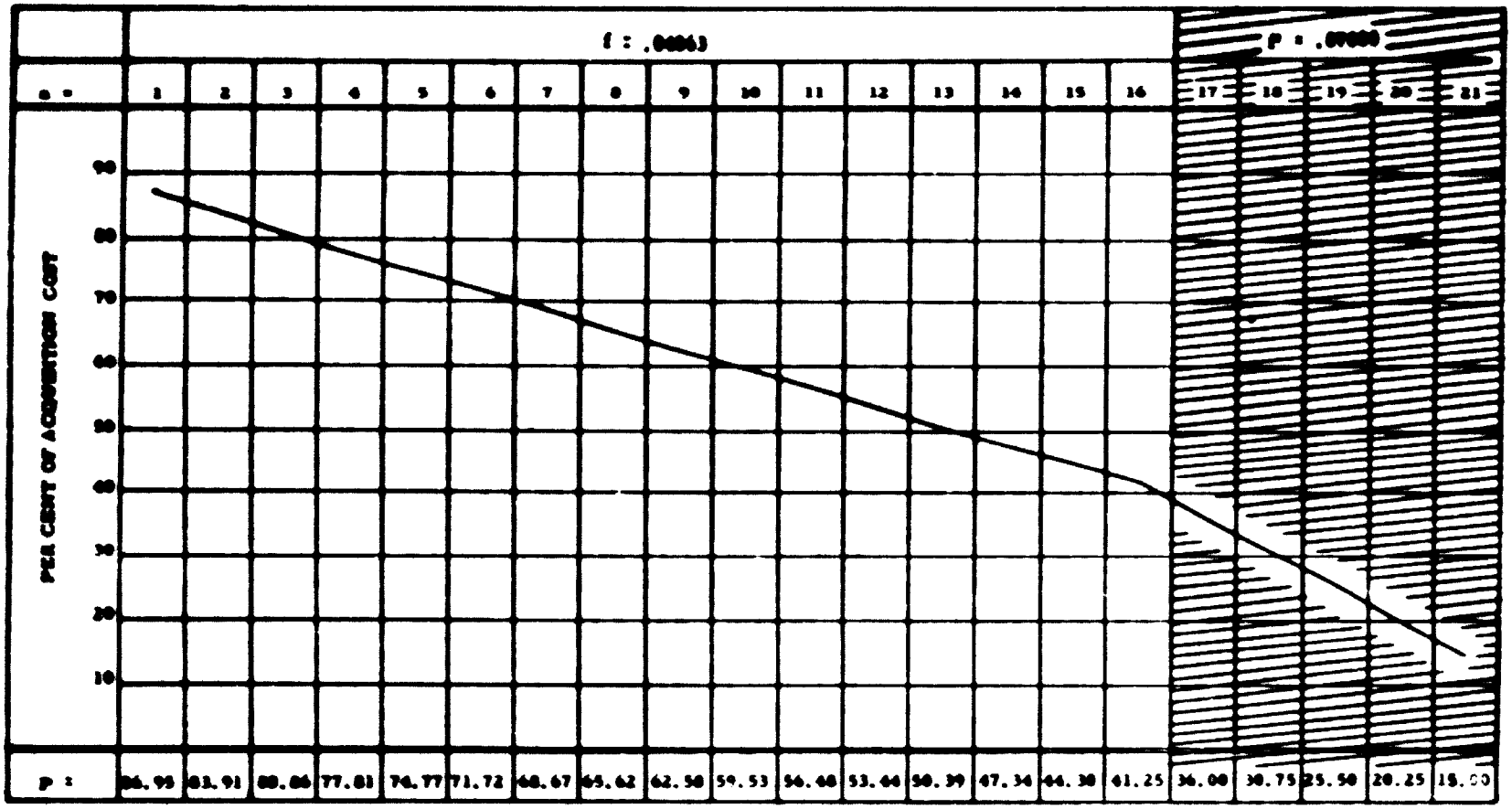
AGE CONVERSION TABLE VIII

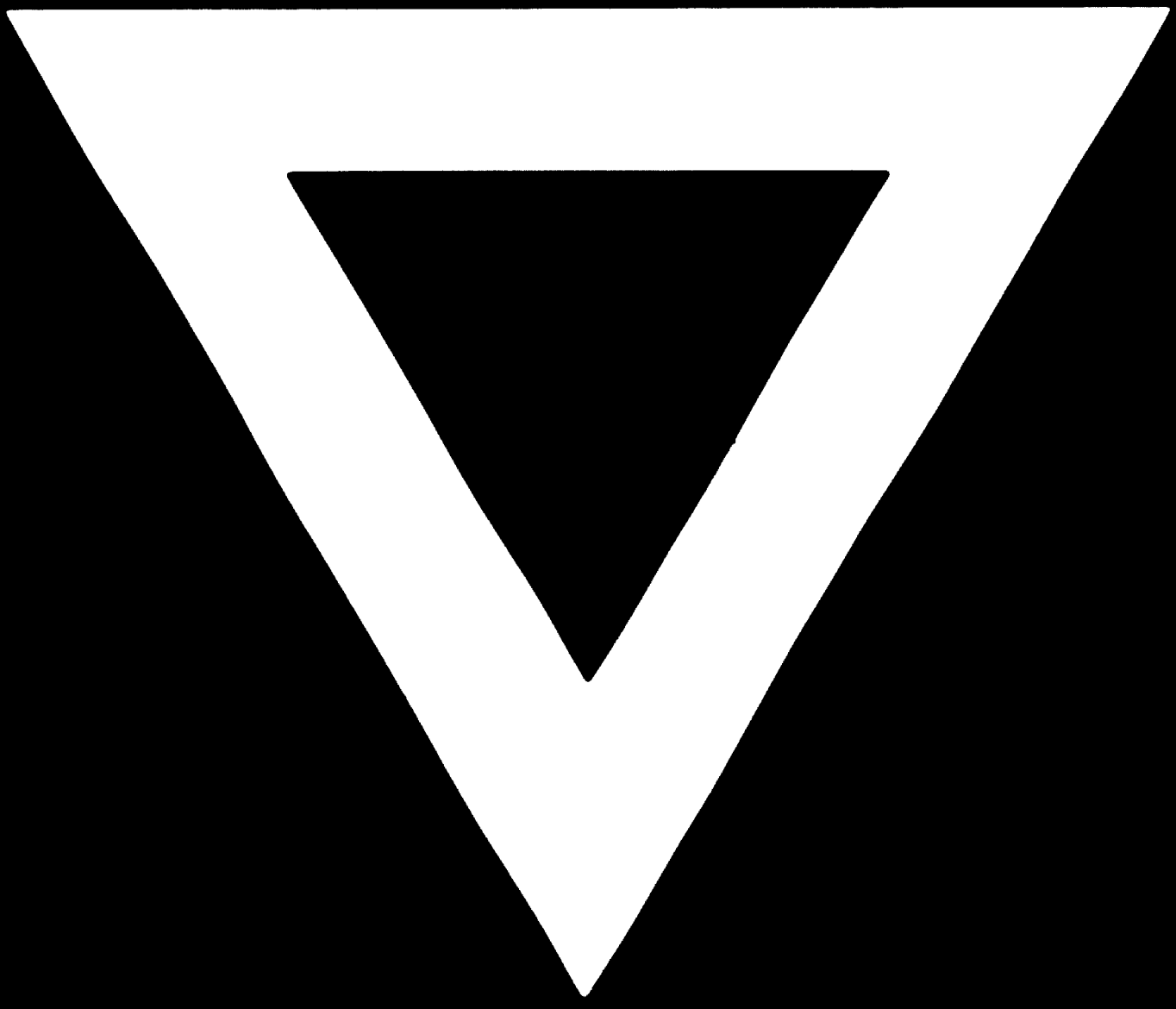
10 YEAR SERVICE LIFE EXPECTANCY



AGE CONVERSION TABLE IX

21 YEAR SERVICE LIFE EXPECTANCY





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