MEMORANDUM
RM-6024-1-PR
DECEMBER 1969

GOVERNMENT-OWNED PLANT EQUIPMENT FURNISHED TO CONTRACTORS: An Analysis of Policy and Practice

Edward Greenberg

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PREFACE

This Memorandum is a product of RAND's procurement research program. Several studies in that program focus on the barriers to competition in defense procurement and policies for overcoming such barriers; this work haa been summarized by G. R. Hall and R. E. Johnson, Aircraft Co-Production and Procurement Strategy, P-450-PR, May 1967, and Competition in the Procurement of Military Hard Goods, P-3796-1, June 1968. Other efforts, such as I. N. Fisher, A Reappraisal of Incentive Contracting Experience, RM-5700-PR, July 1968, have examined alternatives to competition. The present study of the Defenae Department's policy of supplying equipment to its contractors combines both themes. On the one hand, Government-furnished equipment solves a number of problems encountered in a noncompetitive environment. On the other hand, it creates other difficulties and complicates the problem of obtaining competition in defense procurement. The study examines the Air Force inventory of industrial plant equipment, analyzes Government and contractor motivations to furnish and accept such equipment, and considers alternatives to the current policy.

Government-furnished capital, little studied for many years, has recently received considerable attention. In 1968-1969, many of the regulations dealing with Government-furnished capital were changed (for example, revisions in the Armed Services Procurement Regulations 13-301, 13-405, and 7-702.12, as well as changes described in the new AFR 78-24). This Memorandum reflects these revisions. This study, however, focuses on some basic policy issues, so that the 1968-1969 changes have not been singled out for special attention. It should also be emphasized that the questions addressed herein are only part of the many complex issues raised by the practice of furnishing assets to contractors. The issues addressed, though, are important, and the data and discussion should be relevant for other issues as well as those considered here.

The author is a consultant to RAND's Management Sciences Department.

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SUMMARY

The United States Government began supplying equipment to its defense contractors at the beginning of World War II. It continues to do so despite its stated preference that contractors furnish their own equipment. This study attempts to evaluate public policy toward, and the practice of, furnishing equipment to contractors.

The Air Force's inventory of equipment currently supplied to its contractors consists largely of general purpose equipment. Almost half of this inventory was acquired between the Korean and Vietnam wars, when the United States was not involved in major military action.

One conclusion of the study is that profitability considerations in the face of uncertainty explain contractors' willingness to use Government-furnished equipment (GFE). In particular, using GFE sidesteps two kinds of uncertainty: the possibility that procurement quantities may be reduced, and that another firm will obtain subsequent contract awards. Furthermore, the penalties for using GFE are mild, and they are not enforced with sufficient rigor to discourage contractors from using it.

The Government, on the other hand, prefers that contractors furnish their own equipment for several reasons. One is the ideological principle that, in a basically free-enterprise economy, firms are expected to supply their own equipment; another is the host of administrative difficulties in controlling a large inventory of general purpose equipment in scattered locations. But perhaps the Government's strongest objection to furnishing equipment is that the practice tends to restrict competition by conferring advantages upon the contractor possessing the equipment. In addition, the Government's practice of charging initial projects with the entire cost of new equipment, while failing to compute charges on subsequent projects for the use of equipment it already owns, may distort choices among weapon systems.

Nevertheless, furnishing property alleviates a dual problem the Government faces: the contractor's reluctance to invest in equipment when 1) uncertainties exist about the demand for his products--uncertainties that are especially significant when procurement is unusually

heavy because of an emergency, and 2) when the equipment ia so specialized that it is not uaable for other projects.

Since this prcblem doea not apply to a substantial amount of the equipment in the hands of contractors, however, the Government requires other motives for continuing to furnish property. This study arguea that the limited extent of effective price competition in weapon-system procurement, and the resultant practice of basing contract terms on cost estimates, provide little incentive for firms to reduce costa. This includes a limited incentive to invest substantial amounts of their own funds in equipment that will reduce costs. Accordingly, the Government may provide equipment in order to obtain the benefits of lower costs.

The Memorandum considers some alternatives to the practice of furniahing Government property. They are designed to deal with the ideological, administrative, and anticompetitive problems. The goal is to reduce both uncertainty and costs, assuming that the preferred long-run cost-reduction strategy is to promote competition. Therefore, policies to reduce both uncertainty and costa in the short run ahould not interfere with achievement of the long-run goal. The alternative short-run policies analyzed are: support prices for the equipment, a greater reliance on subcontracting, and use of minimum-buy contracts.

The Memorandum concludes thst, in combinstion, these techniques could assist significantly in achieving the DOD's goal of shifting investment reaponsibility from the Government to contractors.

ACKNOWLEDGMENTS

The author thanks R. J. Young and D. T. Gatley of the RAND Corporation for assistance in processing the data, and G. R. Hall, R. E. Johnson, Almarin Phillips, Linda Kleiger, T. T. Tierney, D. DiSalvo, and other members of RAND's Management Sciences and Economics Departments for comments and suggestions.

CONTENTS

I. INTRODUCTION

This study examines the Defense Department'a policy of supplying its contractors with part of the equipment necessary for performing a contract. There appeer to be few studies of the aubject; and Government interest, in the past, has been largely confined to perfunctory questioning by the Defense Department Subcommittee of the Houae Appropriations Committee on the funds requested by the DOD for industrial facilities, and the study in 1956 by the Hebert Committee, which wes largely sympathetic to tne practice.* There have been only a few nongovernme. tel investigations, most notably a Stanford Research Institute study.**

The present atudy considers the general purpose induatrial plent equipment furniahed to contractors by the Department of Defense, one of many typea of equipment supplied to contractors. Attention ia focuaed on this part of the Government's investment policy, aince furnishing general purpose equipment raises a number of intsresting iasues not encountered in connection with other typea of facilities. An idea of the magnitude of thia category of equipment can be derived from Table 1, which presents the ecquiaition cost of the plant equipment inventory held by the DOD. Of the $9.6 billion invantory in 1965, approximately $3 billion worth was in the hands of contractors.*** The remainder was controlled by the srmed services at beses or depota.

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*Subcommittee for Special Investigationa of the Committee on Armed Sorvices, House of Repreaentatives, Report on Aircreft Production Coats and Profits, 84th Cong., 2d aess., Government Printing Office, Washington, D.C., July 13, 1956 (hereinaftsr referred to as the Hebert Committee Report). More recently, Senator William Proxmire has been investigating thia subject and has introduced legislation designed to regulate contractor use of Government production equipment. See Congressional Record, Senate, Merch 8, 1968, pp. S-2446-2448.

**The Industry-Government Aeroapece Reletionahip, Stanford Reseerch Institute, Menlo Park, California, 1963.

***Report of the Subcommittee on Federal Procurement and Regulation of the Joint Economic Committee, U.S. Congresa, Economic Impact of Federal Procurement--1966, Government Printing Office, Washington, D.C., 1966, p. 5.

Peck and Scherer report that the practice of supplying equipment began just before World War II.* At that time, because defense contractors were unwilling to make the huge investment required for mobilization, the Government provided facilities to be operated by contractors. Newer defense firms expected the same treatment, and the procedure became an established way of doing business. During the 1950's, contractors began investing substantial funds of their own in capital facilities, in addition to the DOD-owned facilities they already held.

Table 1

PLANT EQUIPMENT INVENTORY BY DOD COMPONENT

(In $ million)

Year as of June 30	Total	Army	Navy	Air Force	Defense Supply Agency
1963	8,563	3,513	3,181	1,868	
1964	9,582	3,812	3,162	2,212	395
1965	9,598	3,733	3,258	2,019	387
1966	10,416	4,328	3,407	2,343	338

SOURCE: Office of the Comptroller, Department of Defense, Real and Personal Property of the Department of Defense (annual).

The Hebert Committee reported that in 1955 twelve companies were using Government plants and tools acquired at a cost to the Government of over $895 million, compared with $349 million worth of their own plants and equipment in use.** The 1963 Stanford Research Institute report implied that 1956 was a pivotal year in the balance between Government and private facilites; SRI found that:

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*M. J. Peck and F. M. Scherer, The Weapons Acquisition Process: An Economic Analysis, Harvard Graduate School of Business Administration, Boston, Mass., 1962, pp. 164-169.

**Hebert Committee Report, p. 3111.

> On the basis of information supplied by 12 companies, during 1952-56 the value of government-supplied plant and equipment was 69 percent greater than company-owned property. In the 1956-61 period government-supplied property was only 5 percent greater than company-owned property--a substantial reduction in industry dependence on government facility support.*

Neither study givea a subtotal for Government-furnished plant equipment, but it is ressonsble to aasume that it has been an important component of the asaets utilized by major defense contractors.

Section II of the present study describes Air Force industrial plant equipment in the possession of contractors. Section III examines contractor motivations for accepting government property, snd Sec. IV considers the Government'a reasons for furnishing the property. Section V suggests some noasible alternatives to the present policies.

Two general notea of explanation are neceaaary. First, Air Force data and practices were selected for a detailed examination only for convenience; the Army and Navy also provide a large quantity of plant equipment to contractors, and the motivations and policy problems do not appear to differ greatly among the servicea. Second, this study does not attempt to detail the many changes that have occurred in Government policy; the study is bssed primarily on the Armed Services Procurement Regulation (ASPR) recent Congressional hearings, and statements by DOD officials about current policies.**

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*Op. cit., Vol. 1, p. 44.

**The relevant parts of the ASPR were extensively revised in 1969. However, the basic policies that are the concern of this study were affected only marginally.

II. CHARACTERISTICS OF AIR FORCE PRODUCTION EQUIPMENT LOANED OR LEASED TO CONTRACTORS

Before considering official policy regarding the provision of equipment to contractors, it is useful to examine practices in this area as they are reflected in the inventory of the equipment actually supplied to contractors. This is done by using the inventory records maintained by the Defense Industrial Plant Equipment Center (DIPEC). Each item in the inventory is recorded in the following manner:*

1. Equipment category code
2. Status: Loaned (no rental chargad) or leased (rental charged)
3. Possessor: Business or nonprofit institution
4. Type: General purpose, general purpose with apecial features, single purpose, and other
5. Acquisition cost
6. Year of manufacture.

Because certain items are not under DIPEC's control, the DIPEC records examined for this study cannot be used to estimate the total amount of Air Force equipment in the possession of contractors. The most important categories excluded are the following:

1. Items with an acquisition cost of less than $1000;
2. Equipment:
    a. In mobilization reserve package plants (standby lines and active base packages);
    b. Installed in mobila vans and ships;
    c. In service misaions stocks;
    d. In National Industrial Equipment Resarve;
    e. Idle and stored at a contractor's plants;**
3. Special tooling and special test equipment.

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*Appendix A contains detailed definitions of the type of data to be found in the DIPEC records.

**Defense Supply Agency, Department of Defense, Defensa Industrial Plant Equipment Center Operations, DSAM 4215.1, Cameron Station, Alexandria, Va., January 1965, Par. 20101.

The last item is defined in ASPR 13-101.5 and 13-101.6 as follows:

> Special tooling means all jigs, dies, fixtures, molds, patterns, taps, gauges, other equipment and manufacturing aids, and replacements thereof, which are of such a specialized nature that, without substantial modification or alteration, their use is limited to the development or production of particular supplies or parts thereof, or in the performance of particular services. The term includes all components of such items, but does not include:
>
> (i) consumable property;
> (ii) special test equipment; or
> (iii) buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special tooling), general or special machine tools, or similar capital items.
>
> Special test equipment means electrical, electronic, hydraulic, pneumatic, mechanical or other items or assemblies of equipment, which are of such a specialized nature that, without modification or alteration, the use of such items (if they are to be used separately) or assemblies is limited to testing in the development or production of particular supplies or parts thereof, or in the performance of particular services. The term "special test equipment" includes all components of any assemblies of such equipment, but does not include:
>
> (i) consumable property;
> (ii) special tooling; or
> (iii) buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special test equipment), general or special machine tools, or similar capital items.

Items in categories 1, 2a, 2b, 2c, and 3 may be used by contractors.

Other omissions in DIPEC records are suggested by the following statement of the Comptroller General:

> With respect to the overall management of DOD-owned plant equipment, our limited review disclosed a need for increased attention to the area. We found a significant amount of plant equipment which should have been but was not recorded on DIPEC records. Also, we found instances of plant equipment being retained by contractors without approval.*

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*Defense Contract Administration Services Region, Philadelphia, Audit Analysis of the Management of Government-Furnished Property, as of March 2, 1966 (Report 66-67), pp. 252-253. Reprinted in Economic

Nonetheless, the DIPEC records provide a useful, global view of Government investment in aeroapace plant equipment.

Equipment with an acquisition cost of slightly over $1 billion was included in the Air Force portion of the DIPEC inventory as of April 30, 1966. This amount was about 43 percent of the Air Force inventory as of June 30, 1966. The oldest item was manufactured in 1900, and the record contains equipment manufactured as recently as 1966. Of the approximately 75,000 recorded items, 656 were in the hands of nonprofit institutions. Supplying property to such institutions raises unique policy issues; therefore, the detailed tables in Appendix B are limited to equipment supplied to busineas firms. Although only 131 of the items were leased, rather than loaned, the tables differentiate between them because of the current efforts of the Government to lease rather than loan equipment.

Over 44,000 of the items were classified as "general purpose," and the greatest amount (29,000) of the remainder were "unclassified." "General purpose equipment with special features" accounts for 346 items, "apecial purpose" accounts for 851, and "other plant equipment" accounts for 127. Converaation with an official of DIPEC revealed that the classification of equipment into these categories is not closely checked until an item is declared idle; prior to that time property managera may tend to place items in the gsneral purpose category.

Two characteristics of the inventory data are troublesome for examining trends: First, the amounts recorded in the inventory do not represent the total amount of equipment acquired, because the acquisition cost of items sold or otherwise disposed of were deducted from the inventory at the time of disposal. This tends to understate any decline in investment, for older items are more likely to have been removed from the inventory. Since these items have a useful life of more than ten years, however, the patterns are not overly distorted.

Impact of Federal Procurement, Hearinga before the Subcommittee on Federal Procurement and Regulation of the Joint Economic Committee of the United States Congress, 89th Cong., 2d sess., January 24, March 23-24, 1966, Government Printing Office, Washington, D.C., Appendix 4, pp. 240-272.

Second, items remain in the inventory at acquisition cost rather than being depreciated. As a result, the value of the Government investment is substantially overstated. On the other hand, the average age of the equipment is also overstated, since the inventory is dominated by equipment purchased during the Korean War.

Some broad-trend movements in additions to the stock of Government-furnished equipment are revealed in Table 2 and Fig. 1. Acquisitions reached a peak around 1952-53--the Korean War period--but remained on a plateau until 1957. Since 1957 there has been a decline to a new level, followed by a gradual downward trend.

As an indication of whether the lower level of acquisitions is due to changes in the level of procurements rather than to policy changes with respect to GFE, Fig. 1 also graphs aerospace industry sales to the Department of Defense. The data confirm a change in Government practices; after 1957, aerospace sales to the Department of Defense remained around $13 to $14 billion, but the inventory of the equipment acquired in those years declined. (These data do not reflect policy changes resulting from intensified activity in Vietnam.) Acquisitions were over $20 million in 1964; between 1955 and 1962 they amounted to over $450 million.

Table 2 also gives the composition of the inventory by type of equipment. Because DIPEC did not begin to function until fiscal year 1964, a large percentage of items inventoried for the years 1949 through 1957 were unclassified; presumably, many of the older items were not classified when the inventory was compiled. The increase in unclassified items around 1961 to 1964 seems to be the result of a change in classification: for a few years, numerically controlled equipment was placed in a special category, but is now mostly unclassified. The most interesting feature of the inventory is the predominance of general purpose equipment, which accounts for over 70 percent of the items acquired since 1957 and 96 percent of items acquired in 1964.

Data from the DIPEC Air Force inventory, arranged by equipment code, are compiled in Table 3. Over 60 percent of the inventory (valued at acquisition cost) is composed of machine tools, of which one-half are general purpose and 40 percent are unclassified--that is, over

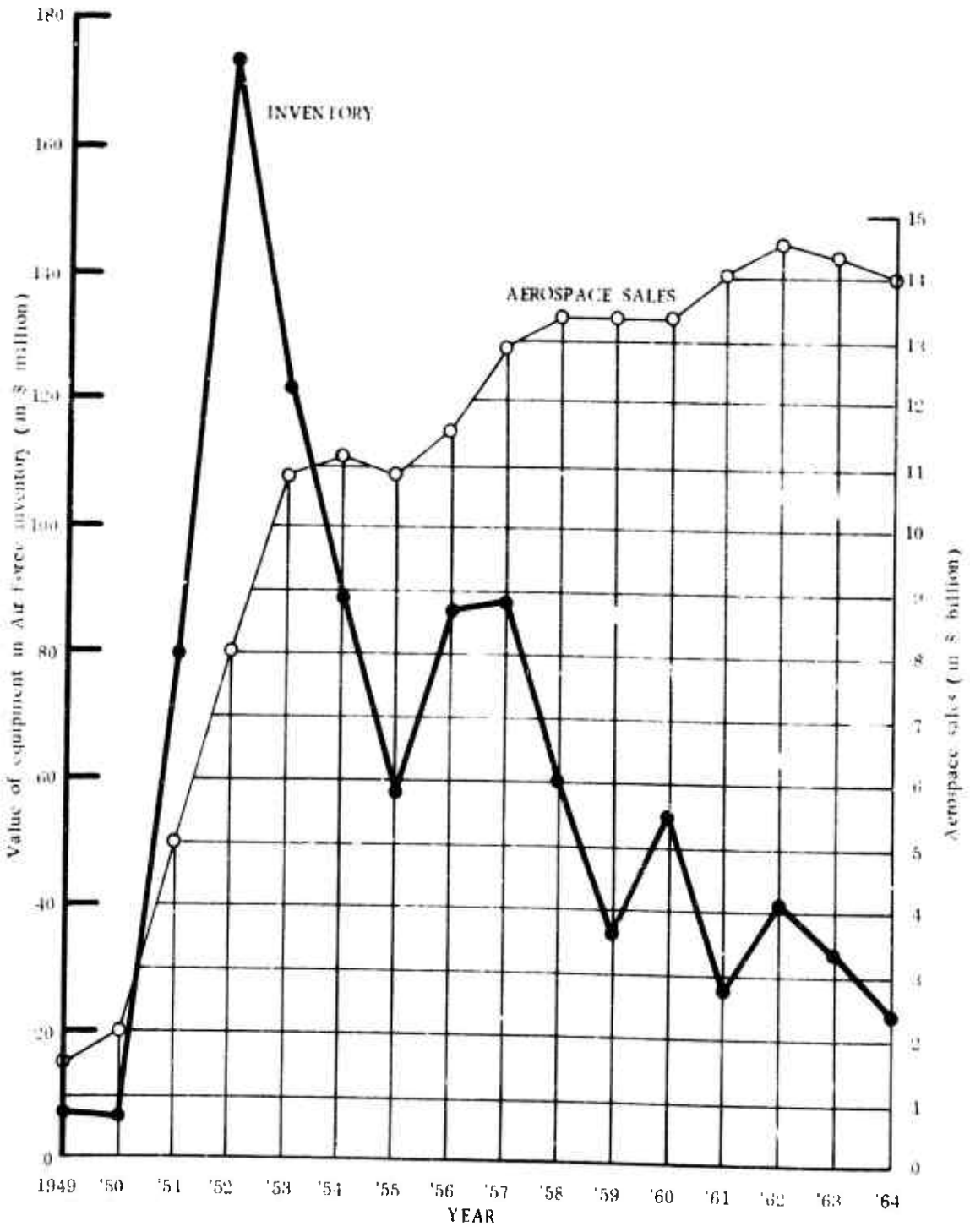
Table 2

GOVERNMENT-FURNISHED EQUIPMENT INVENTORY AS OF APRIL 30, 1964

(Values in $ thousand; percentages are percentages of total acquisitions for the year)

Year Acquired	General Purpose		General Purpose with Special Features		Single Purpose		Other		Unclassified		Total	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	% of Grand Total
1949	1,366	20.4	--	--	76	1.1	--	--	5,253	78.5	6,696	0.6
1950	1,995	31.9	40	0.6	198	3.2	1	--	4,013	64.2	6,247	0.6
1951	32,534	40.7	101	0.1	745	0.9	21	--	46,527	58.2	79,929	7.6
1952	72,420	41.8	167	0.1	1,520	0.9	29	--	99,298	57.3	173,435	16.5
1953	52,395	43.3	138	0.1	1,027	0.8	9	--	67,550	55.8	121,119	11.5
1954	36,141	40.6	377	0.4	543	0.6	120	0.1	51,817	58.2	88,998	8.5
1955	22,695	39.0	188	0.3	963	1.7	38	0.1	34,339	59.0	58,223	5.5
1956	44,096	51.1	303	0.3	1,988	2.3	46	0.1	39,825	46.2	86,258	8.2
1957	65,766	74.4	4,964	5.6	4,232	4.8	91	0.1	13,361	15.1	88,414	8.4
1958	53,314	88.4	452	0.7	2,177	3.6	23	--	4,311	7.2	60,278	5.7
1959	31,765	86.9	380	1.0	2,988	8.2	10	--	1,401	3.8	36,544	3.5
1960	36,462	65.6	491	0.9	14,296	25.6	13	--	4,362	7.8	55,624	5.3
1961	23,883	85.2	157	5.6	908	3.2	4	--	3,067	10.9	28,019	2.7
1962	29,464	71.2	191	0.5	733	1.8	44	0.1	10,925	26.4	41,356	3.9
1963	25,316	75.0	841	2.5	687	2.0	41	0.1	6,851	20.3	33,736	3.2
1964	22,952	96.0	49	0.2	513	2.1	2	0.1	395	1.7	23,910	2.3
Total	552,566		8,840		33,593		490		393,296		988,786	94.9
Pre-1949											53,373	5.1
Total, pre-1949 and 1949-1964											1,042,159	100.0

SOURCE: DIPEC Air Force Plant Equipment Inventory.
NOTE: Detail does not necessarily add to totals because of rounding.



SOURCES: Defense Industrial Plant Equipment Center records, and Aerospace Industries Association, Aerospace Facts and Figures, Washington, D.C., 1965

Fig. 1 -- Air Force equipment furnished to contractors by year acquired, and aerospace sales

Table 3

DIPEC AIR FORCE INVENTORY, APRIL 30, 1966, BY EQUIPMENT TYPE

(In $ thousand)

Equipment Type	General Purpose	General Purpose with Special Features	Single Purpose	Other	Unclassified	Pre-1949	Total
Material removal							
Loaned	267,559	1,972	5,413	--	234,039	27,632	536,614
Leased	892	--	--	--	203	237	1,331
Total	268,450	1,972	5,413	--	234,242	27,869	537,946
Material removal (portable)							
Loaned	16,551	1,933	951	--	19,328	1,808	40,651
Leased	4	--	--	--	--	17	21
Total	16,555	1,933	951	--	19,328	1,905	40,672
Sheet metal forming							
Loaned	71,864	2,251	398	--	65,733	13,823	154,070
Leased	27	--	--	--	--	16	43
Total	71,891	2,251	398	--	65,733	13,839	154,113
Welding							
Loaned	14,945	176	480	--	4,935	1,054	21,589
Leased	65	--	--	--	--	3	68
Total	15,010	176	480	--	4,935	1,057	21,657
Electromagnetic testing							
Loaned	64,050	155	4,733	126	5,534	31	74,629
Leased	1	--	--	--	--	--	1
Total	64,052	155	4,733	126	5,534	31	74,631
Mechanical measuring and testing							
Loaned	22,448	437	16,857	45	4,364	1,464	45,615
Leased	--	--	--	--	--	--	--
Total	22,448	437	16,857	45	4,364	1,464	45,615
Heat treating furnaces							
Loaned	1,736	16	114	--	3,017	110	4,933
Leased	6	--	--	--	--	--	6
Total	1,742	16	114	--	3,017	110	4,999
Subtotal							
Loaned	459,152	6,940	28,945	171	336,951	46,002	879,161
Leased	995	--	--	--	203	274	1,472
Total	460,146	6,940	28,945	171	337,154	46,276	880,633
All other equipment types							
Loaned	102,422	1,911	4,977	319	56,137	7,090	172,856
Leased	53	--	--	--	6	7	66
Total	102,475	1,911	4,977	319	56,142	7,097	172,922
Grand Total							
Loaned	561,574	8,851	33,923	490	393,087	53,092	1,051,017
Leased	1,048	--	--	--	208	281	1,537
Total	562,622	8,851	33,923	490	393,296	53,373	1,052,555
Addendum: Machine tools[a]							
Loaned	339,422	4,224	5,811	--	299,773	41,455	690,684
Leased	918	--	--	--	203	254	1,375
Total	340,340	4,224	5,811	--	299,976	41,708	692,058

SOURCE: DIPEC Air Force Plant Equipment Inventory as of April 30, 1966.
NOTE: Detail may not add to totals because of rounding.

[a]Material removal and sheet metal forming: PEC 3411-19 and 3441-9.

95 percent of the machine tools classified are in the general purpose category. The next largest category is "other," the items ranging from general plant equipment to specialized equipment used in the chemical industry. The table also shows that less than 1 percent (by dollar value) of the items are leased rather than loaned, and most of the leased items are general purpose.

Appendix B contains detailed tables of the yearly breakdown from 1949 through 1966 for major equipment types. Appendix B indicates that $13.4 million of the 1964 acquisitions (slightly more than half) consisted of general purpose material-removal equipment. There are 160 such items in the hands of business contractors, with an average acquisition cost of about $87,000. Additional characteristics of the equipment are contained in Table 4. Overall, the majority of the items cost under $50,000.

In summary, Table 2 indicates a decline in additions to the inventory since 1952, but even so, substantial quantities of equipment, including modern, numerically controlled machine tools on loan to contractors, have been and are being added to the inventory. Moreover, much of this equipment is general purpose rather than specific to the production of particular aerospace systems or even types of systems.

One can easily understand an entrepreneur's reluctance to invest in highly specialized equipment for a short-term contract, but it is harder to understand Government investment in general purpose equipment. Sections III and IV, accordingly, examine contractor motivations for using Government-owned plant equipment, and the Government's motivations for furnishing it.

Table 4

MATERIAL REMOVAL EQUIPMENT MANUFACTURED IN 1964,
IN DIPEC AIR FORCE INVENTORY, APRIL 30, 1966

(In $ thousand)

Machine Type	PEC	Numerically Controlled				Not Numerically Controlled				Control Not Specified				Total
		Under $50	$50-150	$150-250	Over $250	Under $50	$50-150	$150-250	Over $250	Under $50	$50-150	$150-250	Over $250	
Boring	3411	1	4	2			2			1	1			11
Drilling	3413	3	5			1					1			10
Geartooth chamfer	3414					6	1			3	1			11
Grinding	3415					17								17
Lathe	3416	6	19			16	1			9				51
Milling	3417			6	4	14				16	4	2	8	54
Miscellaneous	3419					4				1			1	6
Total		10	28	8	4	58	4	0	0	30	7	2	9	160

Aggregate Totals

	Under $50	$50-150	$150-250	Over $250
All equipment	98	39	10	13

	Numerically Controlled	Not Numerically Controlled	Control Not Specified
All equipment	50	62	48

SOURCE: DIPEC inventory as of April 30, 1966.

III. CONTRACTOR MOTIVATIONS FOR USING GOVERNMENT-FURNISHED PROPERTY

This section considers the factors influencing a contractor's preference to use Government-furnished property rather than acquire it under his own investment program. In the case of contracts negotiated without price competition--the method by which almost all weapon systems are procured--the following considerations help shape his decision:

1. In accordance with the "weighted guidelines" method of determining profit objectives, the profit rate applied to the target cost may be reduced up to two percentage points when extensive use is made of Government property.*

2. Depreciation is an allowable cost, but only to the extent that it conforms with Internal Revenue guidelines or similar depreciation rates.** These rates may result in a less than complete recovery of investment costs over the life of a procurement contract.

3. Interest is not an allowable cost.***

Let us assume that a contractor has the choice of using Government property or of purchasing the same equipment at a cost of I. The expected cost of the project, not including the cost associated with the equipment in question, is C. The profit rate on target cost without the use of Government property is λ, and the rate using Government-Furnished property is $(\lambda - \beta)$, where β is the penalty for using Government property. Allowable depreciation on the equipment in question for the life of the contract is D; interest charges are R; and V is the present value of the equipment after the contract expires. The profit on the contract received by the contractor who uses Government property is then

$$(1) \qquad (\lambda - \beta)C \ .$$

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*ASPR 3-808.4.

**ASPR 15-205.9.

***ASPR 15-205.17.

The profit realized on the contract by the contractor who furnishes his own equipment is

(2) $\lambda(C + D) - R + (V - I + D)$.

Accordingly, we see that profit on the contract using Government property is greater than the profit from using contractor property, when

(3a) $(\lambda - \beta)C > \lambda(C + D) - R + (V - I + D)$,

or

(3b) $\beta C - R + \lambda D < I - V - D$.

The contractor prefers to use Government property if the penalty for doing so, minus the interest paid to finance the investment, plus the profit charged against depreciation, is less than ($I - V - D$), the capital loss (gain if positive) from acquiring the equipment. The most important factor in this expression is likely to be the possibility of a large capital loss, particularly if the project requires an item of specialized equipment for which Internal Revenue guidelines depreciation charges are small compared with the life of the contract. Moreover, the value of the equipment in future uses, even if it is not highly specific to a particular system, may be highly uncertain because of the unpredictable political, diplomatic, and military events that influence defense procurement, aside from the usual business uncertainties.

Even if V is reasonably high, firms may prefer to use GFE for other ressons.

First of all, in practice, the actual deduction from the profit rate for using Government property is likely to be less than the maximum of two percentage points. An impression about practices with respect to penalty rstes may be obtained from data submitted by the Air Force for the first half of fiscal 1967 on DD Forms 1499, "Report of

Individual Contract Profit Plan." An examination of these forms covering 815 items, including all obligations over $500,000 plus a sample of smaller contracts and contract changes, shows only 69 recorded penalties under the heading "Selected Factors." This category includes the profit penalty for use of Government-furnished facilities. Of the 69 negative items, 55 were penalized 1 percent and 14 were penalized 2 percent. The category includes not only the penalty for relying on Government property, but there are rewards for "other Selected Factors." Rewards in these other categories may have canceled some penalties for using Government property. Therefore, the impact of weighted guidelines profit system on investment decisions based on such figures is inconclusive. Nonetheless, the sample does suggest that the profit objective contained negative amounts for selected factors in relatively few of the contracts, and for most of these the penalty was only one percentage point. This implies that the penalties for using Government-furnished plant and equipment are not being rigorously applied, or the penalties are usually offset by other considerations, such as "special achievements."

Second, in a capital budgeting situation (in which the firm fixes ex ante the amount it will spend for investment), if there are sufficient other profitable uses for funds, projects that do not require funds will appear especially attractive. The alternative uses for the funds may be in other Government work for which Government property is not available, commercial business related to the contractor's defense business, or attempts to diversify by investing in unrelated business activities.

Third, again in a capital rationing situation, some authors recommend ranking projects by the ratio of present value to initial investment. Since Government property requires a zero initial investment, its use is assured. In effect, using Government property is a way to lever profits without paying interest or incurring borrowing risks.

The above formulation abstracts from three additional factors that should be mentioned: 1) If the contractor purchased the equipment, he would be free to use it on commercial work. ASPR, however, places

various constraints on commercial use.* Some contractors have used Government property extensively for commercial work, as may be seen from the following examples:

> The Defense Department supplies a $1.4 million forge press to a contractor to turn out jet-engine parts for the military. But over three years the company runs the press 78 percent of the time for its own commercial production.
>
> Another concern gets $6.1 million of various Pentagon equipment to do Air Force work. For a six-month period, however, it uses the equipment 58.5 percent of the time to fill its non-Government orders.**

If the examples discovered by the General Accounting Office are typical, it would not appear that restriction on use is a major disadvantage to the contractor using Government-furnished equipment. The Government side of the matter is another story, of course, and is considered later.

Penalties for using Government-furnished property as deductions from the profit objectives and rentals are relatively new, and the Government's inventory of industrial plant equipment was accumulated during a period when contractor incentives for using such property were stronger than at present. The extent to which these penalties contribute to the increasing ratio of contractor-to-Government-furnished equipment noted in Sec. I will not be examined here, for other factors are probably more significant, including a firmer Government policy against supplying property, Government disposal of certain property, and the increase in commercial aircraft business.

2) The Department of Defense may charge rentals on equipment. Its policy is stated as follows:

> When use of Government production and research property is authorized by the contracting officer having cognizance of the property, rent computed in accordance with 13-404 shall be charged for such use except where use without charge is authorized under 13-402. . . .***

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*Also, OSD approval is required and is now being granted only one year at a time.

**Wall Street Journal, November 27, 1967, p. 2. The article is based on a report issued by the General Accounting Office entitled, "GAO Studies Charge Firms Misuse U.S. Property for Commercial Gain."

***ASPR 13-403(a).

Not very helpfully, the relevant part of paragraph 13-402 states:

> A contractor may use Government production and research property without charge:
>
> (i) in the performance of--
>
> (A) prime contracts which specifically authorize use without charge;
>
> (B) subcontracts of any tier if the contracting officer having cognizance over the prime contractor concerned has authorized use without charge. . .
>
> (ii) provided, as to (A) and (B) of (i) above--
>
> (B) the contracting officer having cognizance of the prime contract determines that the Government will receive adequate consideration for the use of the property through reduced costs for the supplies or services or otherwise. . . .*

Thus, no rentals are charged if the contractor or subcontractor is authorized to use the property without charge, and if the Government receives lower costs or some other benefits. As noted above, only a small amount of the property is rented. Moreover, rentals for machine tools appear to be arbitrary, and may have no relation to market rentals. The Government's rental charges for machine tools are shown below.**

Age of Equipment (Years)	Monthly Rate as Percentage of Acquisition Cost
0-2	3 %
2-3	2 %
3-6	1.5 %
6-10	1 %
Over 10	0.75 %

3) Finally, our analysis assumed that the contractor had to choose between purchasing an item of equipment or using the same item furnished by the Government. This is not the only choice possible,

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*ASPR 13-402. These rental rates were introduced in 1969 and represent a substantial increase over the prior rates.

**ASPR 7-702.12. Other property is to carry a fair and reasonable rental, based on sound commercial practice.

however. In the absence of Government-furnished property, the contractor may prefer to use somewhat different equipment--perhaps equipment that would result in a higher value of C, since the amount of profits depends on target costs. This point is taken up in Sec. IV.

IV. GOVERNMENT POLICIES WITH RESPECT TO GFE

The following discussion of Government policy is in two parts. The first analyzes the Government's reasons for preferring that contractors furnish their own equipment; the second considers the circumstances under which the Government acquires and provides equipment.

REASONS FOR PREFERRING CONTRACTOR-FURNISHED PROPERTY

Section III suggested a number of reasons why contractors might prefer to use Government equipment, and the substantial Government investment in such facilities suggests that the Government finds the practice worthwhile. Official policy, however, reflects a different position:

> It is the policy of the Department of Defense to support a national industrial base responsive to peacetime and wartime requirements and to assure that this industrial base has adequate responsiveness to the rapidly changing weapons technology and the continuous demands to improve our defense posture. It is also DOD policy to encourage increased private investment where plant expansion is required to perform defense contracts and that provision of new government industrial facilities to contractors will be held to the absolute minimum.
>
> There is a desire on the part of both the Department of Defense and the aerospace industry for increased private ownership of facilities. This includes not only facilities which are required in the future, but also to the extent practicable, purchase and private ownership by contractors of facilities now held in Department of Defense inventories. . . .*

Ideological Objectives

One reason for the Government's preference is ideological: in a predominantly capitalistic system, facilities should be privately owned. In Secretary Charles's words:

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*Incentives for Private Investment, Task Force No. 4 Report to the Ad Hoc Machine Tool Advisory Committee to the United States Air Force, May 1965, p. 2.

> The next queation, of course, is . . . why shouldn't the Government put up the money. The answer is so deeply ingrained in our system that I am surprised it is asked. I recognize, of course, that words like "socialism," "capitalism," and "free enterprise" are what might be called "color words." There are few polar choices in this ambiguous world. Nevertheless, there sre meaningful distinctions between them; and industry--and the nation--should not expect to continue to reap the benefits of capitalism and free enterprise without shouldering its burdens. We can't have it both wsys.*

Administrative Burden

The ASPR is largely silent about the Government's reasons for preferring private investment. The following paragraph refers to special tooling, but it seems to apply to all types of plant equipment:

> It is the policy of the Department of Defense that contractors provide and retain title to special tooling required for the performance of defense contracts to the maximum extent consistent with sound procurement objectives. Government acquisition of title or the right to title in special tooling crestes substantial administrative burden, encumbers the competitivs procurement process and frequently results in che retention of special tooling without advantage commensurate with such burden. . . .**

Administrative burden includes monitoring s huge inventory located throughout the country, writing contracts for inventory items, evaluating requests to use nventory items for non-Governmental purposes, preventing equipment from being hoarded for future contrscts (which is likely when there is a low or zero rentsl), and arranging for maintensnce and transportstion.***

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*"The Problem of Long Lead Time," excerpt from an sddress by the Honosable Robert H. Chsrles, Assistsnt Secretsry of the Air Force, Installations and Logistics, reprinted in Defense Industry Bulletin, Vol. 3, No. 3, Msrch 1967, p. 15.

**ASPR 13-305.1.

***Administrative problems, including hoarding of equipment, are discussed in the testimony of Comptrollsr General Elmer B. Stsats snd others. See Economic Impact of Federal Procurement, Hesrings before the Subcommittee on Federal Procurement and Regulation of the Joint Economic Committee, Congress of the Unitsd Ststes, 89th Cong., 2d sess.,

Competitive Advantage for Firm Holding Equipment

The ASPR passage also recognizes the advantage that a firm holding Government property may have in winning contracts. The Government attempts to offset this advantage, but the process is at best imperfect. When equipment is furnished a contractor, the advantage is supposed to be removed by charging rents, or rent equivalents, and additional costs to reactivate, rehabilitate, and convert equipment, and make it available to the contractor. At the same time, evaluation factors are used to represent certain savings to the Government from industrial use of facilities:

> (c) If measurable savings to the Government will result directly from the use of Government production and research property on the contract for which the solicitation is made, a dollar amount representing such savings shall be set forth in the solicitation and employed in the evaluation of bids and proposals. Examples of such savings include:
>
> (i) savings occurring as a direct result of activation of idle tools being maintained in idle status at known cost to the Government; and
>
> (ii) avoidance of the cost of deactivation and placing active tools in lay away or storage, or of maintaining them in an idle state where the prospective costs are known and firm decisions have been made that such tools will be laid away or stored if not used on the contract for which solicitation is made.
>
> Avoidance of the costs of initial lay away or storage shall not be avalueted when such costs will merely be deferred by the proposed use.*

Government Printing Office, Washington, D.C., January 24, March 23-24, 1966, pp. 149-150. See also Appendix 4 to that document, pp. 240-272. The latter contains an example of hoarding: ". . . the Assistant Secretary cited one installetion that had 47 turrat lathes but only 17 operators, and enother facility that had 30 grinders but only 40 hours of grinder work a month. The Assistant Secretary stated that the work had been spread out over the 30 machines so that all could be reported as active when it could have been accomplished by one machine in one week," p. 244. Admiral Rickover's statement, quoted on p. 22, also illuetrates this problem.

*ASPR 13-505.

Presumably, then, a contractor in possession of Government-owned equipment may claim a cost-saving from its use if the equipment would otherwise be foreseeably laid away or stored. This policy would appear to favor such a contractor, since other bidders on the project would have to pay the same rental in addition to the costs necessary to make the equipment available at their plants. Still other aspects of Government policy appear to favor the contractor who possesses equipment. For example, equipment in the hands of contractors is covered by a facilities contract not tied to any particular procurement contract. This makes it easier for the contractor to retain possession of a piece of equipment, even when the original need for it has passed. The following extracts from the testimony of Vice Admiral H. G. Rickover explain the situation:

> What usually happens is that initially the Government probably has a real need to put Government-owned machine tools in a particular supplier's plant. Often, after a few years, this need passes. However, as other contracts are placed with the supplier, Government contracting officers authorize him to use the Government-owned tools on the new work on the basis that the Government should get its money's worth out of the tools. It is not a question of whether the Government-owned tools are really needed to do the work or whether authorizing their use on new contracts will keep the tools at the supplier's plant longer than necessary, but whether the supplier wants to use them on other Government work. . . .
>
> Once a company gets the Government to provide him with machine tools, he almost certainly can keep them in his plant forever. All he has to do is to get permission from a contracting officer to use the Government-owned machine tools on a new Government contract. This in turn enables him to justify a "requirement" for the machine tools. . . .*

Distortions in Decisionmaking

Rational decisionmaking within the Department requires that benefits and costs be computed for the various missions in order to allocate resources in an optimal manner. Government-furnished property

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*Department of Defense Appropriations for 1967, Hearings before Subcommittee on Department of Defense Appropriations of the Committee on Appropriations of the House of Representatives, 89th Cong., 2d sess., Part 6, pp. 171-172.

may distort these costs. To reflect mission costs accurately, each mission should be charged for the Government-furniahed property it is using, in terms of alternative uses. Although this may be done in internal DOD documents, data that appear in the Defense portion of the U.S. Budget and are presented to the Appropriations Committeea auggest that the full acquisition cost of new equipment is charged to the mission for which the equipment is initially acquired, but that projects are not charged for using existing equipment. Since general purpose equipment is frequently used on more than one contract, thia practice favors projects that use existing equipment over projects requiring new equipment, and over those using contractor-furnished equipment whose costs include depreciation chargea. In fact, projects that uae existing equipment may be credited with a savings. This procedure is reasonable only if the inventory is assumed to have no value for alternative uses, including sale of the items.

Summary

The case against providing contractors with Government property is thus based on a number of considerations. On purely ideological grounds, in a free-enterprise system it is expected that firms will provide their own equipment. On more practical grounds, a large inventory in various locations creates difficult administrative burdens. The practice also appears to conflict with two important goals of the DOD: the encouragement of competitive procurement and rational decisionmaking. Firms possessing Government-furnished property may have an advantage in competing for further Government contracts (and possibly in competing for commercial contracts), and the budget treatment of Government-furnished property appears to penalize systems requiring new equipment relative to those using existing equipment.

CIRCUMSTANCES UNDER WHICH GOVERNMENT PROPERTY MAY BE PROVIDED

For two general reaaons, the Government is often willing to provide equipment to its contractors in spite of the objections reviewed above. One reason is the DOD's desire to alleviate the contractor's

undertainty, discussed in Sec. III; the other is the endeavor to reduce costs by having the contractor use modern equipment in performing the work.

Overcoming Contractor Uncertainty

The basic ASPR policy statement on furnished Government property is the following:*

(a) It is the policy of the Department of Defense that contractors will furnish all facilities required for the performance of Government contracts. Facilities will not be provided to contractors for expansion, replacement, modernization or other purposes except as follows:
  (i) for use in a Government-owned contractor-operated plant operated on a cost-plus-fixed-fee basis;
  (ii) for mobilization production of items being procured in accordance with an approved mobilization plan (ASOD) package; or
  (iii) when--
    (A) the Secretary of the Department or his designee, in the case of new facilities, or an authorized official of the Department in the case of existing Government facilities, determines that: (1) the Defense contract cannot be fulfilled by any other practical means, or (2) it is in the public interest; and

. . . . . .

Later, the ASPR expands on this general policy as follows:

(c) New facilities shall not be provided by the Government where an economical, practical and appropriate alternative exists. Examples include:
  (i) procuring from sources not requiring Government-owned facilities;
  (ii) requiring the contractor to make full utilization of subcontractors possessing adequate and available capacity;
  (iii) having the contractor rent facilities from commercial sources; and
  (iv) using existing Government-owned facilities.

(d) New construction or improvements having general utility shall not be provided with appropriations for research or development unless authorized by law.

(e) Facilities shall not be provided by the Government to contractors under this Section solely for non-Government use.**

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*ASPR 13-301, 30 June 1969, Revision 3.

**Paragraph (f) of the Section details the screening process used to find existing Government equipment before new equipment may he

Before looking at the problem of uncertainty, it is interesting to note the difference in the trestment of requests for new equipment and equipment already in the Government's possession. The Regulation createa a number of obstacles to obtaining new equipment. Before new facilities are supplied, virtually every possibility must be explored, including a search for suppliers who do not wish to use Government-furnished facilities, renting facilities, and using subcontractors who do not require new facilities. The DOD reports the use of existing equipment as a cost reduction, however, aa in the following statement, made after DIPEC completed its first year of operation:

> During this yesr the Center was responsible for redistributing more than 18,000 pieces of industrial plant equipment (IPE) which had an acquisition cost of more than $101 million. The military departments reused $71 million worth of this equipment, which waa credited to the DOD Cost Reduction Program.*

Budgetary reasons probably account for the different standards. New equipment must come out of DOD appropriations, and the total is screened by the Bureau of the Budget and Congressional committees even if particular items elicit little questioning.

The statement that facilities may be provided when "the Defense contract cannot be fulfilled by any other practical means" can be variously interpreted. It could mean that the contractor would refuse to perform the contract unless Government equipment is provided. If not merely a posture assumed for bargaining purposes, the situation may arise when the expected profitability of the project, given the risk involved, is insufficient to make the investment worth undertaking. To obtain the production, the Government might increase the contractor's profits on the contract by allowing more rapid depreciation of the asset or by allowing a higher profit rate, or it might furnish the equipment. The latter alternative may be preferred if the Government does not wish to amortize the investment over the life of the contract

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purchased. DIPEC is used as the clearing house; before new equipment may be purchased, the service must secure a certificate of nonavailability from DIPEC, stating that no existing Government equipment of the desired type is available for the contractor.

*Office of the Comptroller, Department of Defense, Real and Personal Property of the Department of Defense, June 30, 1965, p. 180.

in question because it foresees a higher salvage value than does the firm. This divergence between public and private estimates of salvage value will arise because the Government is not subject to one uncertainty that the firm must face: subsequent Government contracts on which the item can be used may not be awarded to the firm that purchased the equipment. Secretary Charles points out the problem in connection with the lower costs to be realized from having an extremely expensive 200,000-ton closed-die forging press available for aircraft production:

> I am not suggesting that any company, even if it had the resources, should do such a thing by itself. After all, no company knows in advance that it is going to win a major program, and the time to design, build, and shake down such facilities is much longer than the period from airplane development go-ahead to cutting of production hardware. What is known, however, is that some company will win each program and that it, and the nation, will benefit from the existence of a facility that can save $98 million on one program.*

The possibility that the equipment may substantially lose value is probably important for special purpose equipment with limited uses. But the DIPEC inventory reveals that most of the new equipment the Government purchased in recent years is classified as general purpose:** therefore, the possibility that uncertainty leads to different public and private attitudes toward amortization appears relatively slight.

The salvage value of an asset will also appear low in an emergency situation that is likely to be short-lived, even if it is a general purpose item. This explains why the inventory is heavily weighted with items bought during the Korean War and why, in response to the Vietnam conflict, the Department of Defense increased its purchases of industrial facilities. The impact of Vietnam on Government purchases is revealed by figures presented by Secretary of the Navy Paul R. Ignatius (formerly Assistant Secretary, Department of Defense, Installations and Logistics), as shown in Table 5.***

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*"The Problem of Long Lead Time," p. 15.

**Recall that we are not considering the problem of furnishing special tooling and test equipment, and that such items are not included in the DIPEC inventory.

***Department of Defense Appropriations for 1968, Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives, 90th Cong., 1st sess., Part 4, p. 401.

Table 5

DEPARTMENT OF DEFENSE FUNDING FOR
PRODUCTION FACILITIES EXPANSION

(In $ million)

FY	Amount
1965	56
1966	280
1967	330

Secretary Ignatius pointed out that about $200 million of the 1966 expansion was for ammunition plants. Even so, over $80 million in funding went for items other than ammunition plants. As these latter facilities have long lives (10 to 20 years), they will continue to cause administrative and allocational problems and to interfere with attempts to increase competitive procurement for many years.

Despite the rise in purchases attendant upon the Vietnam crises, the recent experience differs from past military buildups. This point was emphasized by Secretary Charles, who said:

> During the Korean War, about the same time during the other war as presumably we are now, the Air Force bought new equipment totaling $1.2 billion. This year, 1967, the figure is $114 million. . . .
>
> The aerospace industry in 1961 put up $270 million for facilities, of their own money. In 1966 they put up $780 million, and in 1967 they are planning to put up $830 million. Much of this, of course, is for commercial work, but a great deal of it is for military work of a nonsurge variety. And this is a distinction I think we should draw.*

Secretary Charles concluded, however, that "we should not expect industry to put up facilities for one-shot procurement."** In other words, while uncertainty over the lifetime of an asset is one of the factors reflected in Government equipment policy, the emphasis on general purpose equipment and the additions to inventory between the Korean and Vietnam conflicts suggest that a large share of the inventory cannot be attributed to this consideration.

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*Op. cit., pp. 408-409.

**Ibid., p. 408.

Cost Reduction

The usual contractual relationships used in the industry--negotiated cost-plus contracts or negotiated fixed-price contracts--do not provide strong incentives for a firm to undertake programs that would reduce costs. On the contrary, when contracts are negotiated with a single source, it is more profitable for the firm to make target costs as high as possible, since the fee is proportionate to the target cost.* Incentive contracts, of course including fixed-price contracts, produce larger profits if actual costs are lower than the target. But such incentives are not the only consideration, as Task Force No. 4 notes:

> Contractors should be permitted to retain a greater portion of the savings resulting from facilities modernization through private investment to offset these additional risks and expenses. Under present negotiating techniques contractors usually lose the benefit of any savings realized through new facilities acquisitions at the time of negotiations for subsequent buys. . . .**

The fact that present contracting methods do not adequately reward contractors for undertaking cost-saving investments is an important key to understanding the Government's equipment policy.*** Its importance as a motive for furnishing equipment is also shown by the Air Force modernization program. In this connection, the first three items on Task Force No. 4's interpretation of Defense Department objectives are revealing:

1. Decrease cost of end item hardware through a modern machining capability.
2. Obtain technical advantages of a modern machining capability.
3. Support a modern, efficient industrial (defense) production capability. . . .****

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*For a full discussion of this problem, see I. N. Fisher, A Reappraisal of Incentive Contracting Experience, The RAND Corporation, RM-5700-PR, July 1968.

**Op. cit., p. 8.

***I. N. Fisher and G. R. Hall, Defense Profit Policy in the United States and the United Kingdom, The RAND Corporation, RM-5610-PR, October 1968, pp. 44-49.

****Op. cit., p. 4.

These objectives, concerned with the desirability of a modern production capability, list cost-reduction first.

The concern with cost arises because of the notable lack of effective competition at the time contracts are awarded. One solution to this problem is the Air Force modernization program. The magnitude of the program in relation to other equipment programs is shown in Table 6; the program is described in an Air Force Regulation* as follows:

> 2. (a) Contractors will he encouraged to replace old, inefficient Government-owned equipment with privately owned modern equipment. Air Force-financed replacement/modernization projects will he considered only after the contractor has stated in writing that he is unahle or unwilling to replace the Government-owned equipment.
>
> (b) Certain contractors have a capability within their commodity field that is essential to suport Air Force requirements. Government-owned equipment with these contractors may be replaced or modernized under this program when the objective stated in (a) above cannot be accomplished, and it is necessary to assure the maintenance of a modern industrial base which can meet Air Force current and future research, development, production, and mohilization requirements.**
>
> (c) ... determination should be based on industrial capability and mobilization studies, with due consideration for the possibility of sale of the facilities involved to the using contractor.
>
> (e) Preference in modernization programs should he given to Air-Force-owned plants heing used primarily in support of Air Force programs and for which long term current and/or mobilization requirements are projected. Consideration may then be given to contractor-owned plants which contain a large proportion of Air Force-owned tools heing used in excess of 75 percent for military efforts, ...
>
> 3. (a) It is not necessary to consider a specific weapon system to determine an essential contractor, but rather, the determination that a contractor's capability in his commodity field is essential to support Air Force requirements.

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*Air Force Regulation 78-24, Industrial Equipment Modernization and Replacement Program, Washington, D.C., 28 August 1968.

**References to commodity fields refer to an aerospace system or subsystem such as avionics, airframe, or engine. They also apply to hasic fields such as forgings and extensions.

Table 6

AIR FORCE BUDGET FOR INDUSTRIAL FACILITIES IN AIRCRAFT PROGRAMS

(In $ thousand)

Industrial Facilities	Fiscal Year		
	1966	1967	1968
Conversion, rehabilitation, and equipment acquisition	12,000	39,500	13,700
Nonrecurring maintenance	9,100	6,000	8,800
Preparation for shipment	1,200	1,500	1,100
Machine-tool modernization (replacement)	18,800	27,300	24,300
Total	41,100	74,300	47,900

SOURCE: Department of Defense Appropriations for 1968, Hearings Before a Subcommittee of the Committee on Appropriations, House of Representatives, 90th Cong., 1st sess., Part 4, p. 67.

This program seems consistent with a general policy to reduce Government inventory of industrial facilities. However, other statements might suggest the level of inventory is considered to be about right -- the emphasis is on replacement. As a report to the Air Force by an advisory group states:

> But in addition to the orders financed by contractors themselves, with a Government guarantee against loss, the Air Force should invest its own funds in the critical profiling machine program. Such expenditures would be part of the Air Force's long-standing policy of modernizing continuously its own production equipment used for manufacture of aerospace vehicles.*

Unfortunately, there appears to have been no analysis of why the Air Force should acquire modern equipment if, with the proper incentives, the contractors will provide the facilities and mobilization response themselves. An exchange between Representative Mahon and General Gerrity, however, is enlightening:**

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*Profile Milling Requirements for the Hard Metals, 1965-1970, report of the Ad Hoc Machine Tool Advisory Committee to the Department of the Air Force, May 1965.

**Department of Defense Appropriations for 1968, pp. 34-35.

Mr. Mahon: You are requesting $27.5 million for machine tool modernization. . . . What is your reason for this and what is the total program?

General Gerrity: The program for machine tool modernization is $27.5 million, and that is up from $25.5 million last year. The reaaon is, Mr. Chairman, that notwithstanding the fact that we are reducing the number of plants that the Government owns and the machine tools, those that we still have in use do require modernization for efficiency. Where we see value return in two yeara or less in terms of savings and amortization of the cost through lower production cost, we are modernizing equipment in that category. We believe our standards are tough. We are looking for a return on this investment just as any good commercial organization would.

The rapid payback period of many acquisitions was revealed by General Gerrity when he replied to Congressman Sikes' request to "List for the record examples of the machine tools you propose to modernize, showing the savings which would result from this modernization." General Gerrity presented the following list.

UTILIZATION OF MODERN EQUIPMENT (COMPARED WITH OLD EQUIPMENT)

Type of Equipment	Cost of Equipment	Estimated Annual Savings	Payback Period (years)
Milling machine numerical control (N/C hydrotel)	$303,432	$124,034	2.45
Retrofit of profiler with N/C system	57,702	96,736	0.60
Dial feed spot welder, 6 station automatic	12,304	14,284	0.85
N/C boring, drilling, and milling machines, 4 spindle	70,451	59,651	1.18
N/C drilling machine	126,127	51,261	2.46

General Gerrity's statement implies that the Government sometimes believes it necessary to undertake the type of investment that would appeal to any good commercial organization. The obvious question is why the Government should have to undertake investments that will pay for themselves in so short a time as two years or less--i.e., why private firms do not undertake them. The policy statements quoted and the

previous analysis of the lack of cost-reducing incentives suggest two primary motives: modernization for its own sake, and cost reduction. These motives are not necessarily compatible: cost may be reduced by using older equipment, if the marginal cost of using it is lower than the total cost of using new equipment.*

But note that the total inventory can remain approximately stable while new equipment is purchased, since the old equipment being replaced is written off at its acquisition cost; observance of policy as recorded in the ASPR, however, would indicate a decrease in inventory. The modernization program is also a convenient circumvention of ASPR's curb on acquiring new facilities, because modernization may increase the contractor's capacity to produce.

In summary, two reasons predominate for providing equipment to business firms--uncertainty and cost reduction. The need to overcome contractor uncertainty regarding cash flows and the salvage value of an item of equipment is one major rationale for providing equipment. It is especially evident in the large inventory acquired during the Korean War period and the recent acquisitions associated with the Vietnam war. However, the continued purchase of general purpose equipment during the period between these two conflicts suggests that other factors may be significant.

The belief that contractors will not necessarily obtain cost-reducing equipment may be traced to the lack of effective price competition in negotiations for major weapon systems. Under present practices (negotiated contracts based on cost estimates) there is little incentive for the firm to reduce costs. Evidence of the importance of furnishing equipment for cost-reduction purposes is found in ASPR statements, the Air Force modernization program, and the observation that much of the DIPEC inventory consists of general purpose equipment purchased during a period when the United States was not engaged in a major conflict.

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*Part of the facilities being modernized are for use on Air Force bases, rather than by contractors. Consequently, remarks made here on the lack of contractor incentives for cost reduction apply only to facilities used by contractors.

V. ALTERNATIVES

The preceding analysis has suggested that the military establishment furnishes equipment to its contractors for two main reasons: 1) to reduce contractors' reluctance to bid on contracts because of uncertainty over profits and over the value of company-owned equipment not fully depreciated when the contract expires, and 2) to reduce costs to the Government. We next consider methods designed to achieve the same ends, but also to reduce or eliminate contractor dependence on Government property.

ALTERNATIVES FOR EFFECTING COST REDUCTIONS

Cost-reduction difficulties arise because the prices paid for major weapon systems are usually baaed on costs or cost estimates. If contracts were awarded on the basis of price competition, there would be much less cause for concern. In a competitive situation, market forces would tend to reduce costs to minimum levels without the detailed regulations, negotiations, and equipment furnishings that now prevail in the defense industry. Although at this time few major weapon system contracts are awarded on the basis of price competition, the Government has been attempting to increase the use of price competition in some procurement activities. Total package procurement, second sourcing, co-procurement, and breakouts are being used (or could be used) to a greater extent than in the past to provide opportunities for competitive pricing.* Because price competition is a long-run goal, furnishing contractors with equipment is an undesirable way to reduce costs in the short run. This practice tends to reduce the long-run possibilities for competition by conferring advantages upon contractors who already possess the necesaary assets.

In addition to aiding the drive for more competition in procurement, policies aimed at stimulating firms to acquire their own facilities are needed, because many contracts are now and will continue to be negotiated without effective price competition. Appropriate policies to this end that have bssn suggested include:

*These procedures are discussed more fully in G. R. Hall and R. E. Johnson, Aircraft Co-Production and Procurement Strategy, The RAND Corporation, R-450-PR, Msy 1967, snd idem, Competition in the Procurement of Military Hard Goods, The RAND Corporation, P-3796-1, June 1968.

1. Allowing contractors a greater share in cost savings effected from facilities modernization. Cash-flows from investment in equipment would then reflect the true value of the equipment.
2. Modifying the weighted guidelines to allow greater rewards to firms that furnish their own equipment, or increasing and firmly enforcing penalties for using Government property.
3. Permitting depreciation to be an allowable cost on Government contracts for facilities acquired in connection with a Government contract.*

Further, it might be possible to enforce the rules regulating the use of Government-furnished equipment for non-Government contracts, if this would not create difficult administrative problems and waste valuable equipment capacity.

We turn next to the problem of the special difficulties that defense firms encounter in estimating the cash flows from an investment and the value of equipment after the original contract is completed.

ALTERNATIVES FOR EFFECTING DECREASES IN UNCERTAINTY

For the longer-run problem, some promising approaches to reduce uncertainty about the profits on a contract are: support prices, increased use of subcontracting, and minimum-buy or multiple-year contracting.

Support Prices

Support prices are useful when it is necessary to acquire equipment although future demands are highly uncertain, as in the Vietnam situation. In effect, the Government would support the price of the equipment if demands decreased before the equipment were fully amortized. Task Force No. 4 suggests this approach:

> To reduce the risk of idle facilities the government could provide indemnification to contractors who purchase approved facilities items and are subsequently unable to economically use them because of contract termination, major program redirection or program discontinuance. The recommended extent of the indemnification would be 100 percent of the undepreciated portion of the cost of the facility. Across the board 100 percent indemnification of all facilities is not intended. The government would

*These recommendations are adapted from Incentives for Private Investment, pp. 8-11.

> provide indemnification only on approved items which would be identified in the supply contract. . . .
>
> Although the indemnification would be for 100 percent of the undepreciated portion of the cost of the equipment, it would apply only to items of such cost, size or specialized nature as to represent an investment of unreasonably high risk due to program uncertainties. The contractor would not be indemnified to any extent on the remaining items. The government would have the option to take title to the equipment in the event the contractor requested payment under the indemnification clause. . . . *

Apparently, a variation of this recommendation is being tried at present. Former Assistant Secretary of the Navy Graeme C. Bannerman explained to the Congress an approach being used for some engine contracts:

> I would like to talk about tha Pratt-Whitney situation.
>
> This contractor has just undertaken contractually a major expansion in facilities for several families of engines that are going to be used in new aircraft coming out in the next 3, 4, and 5 years. The expansion in this case, which will run substantially over $100 million, is being totally financed by the company. The Government has undertaken to give them some assurance of the continuity of the programs they are going to be in. So if these programs for which they have undertaken are in fact canceled, the Government will assume a secondary part of the liability for the extra cost of the facilities. But the actual facilities, assuming they go ahead with the program, will be contractor-supplied and contractor-financed throughout. . . .
>
> . . . they are financing the expansion and in the event of termination of these programs, over half of the cost of the facilities will be assumed by the company. The first half, by the way; the Government's liability comes in only if the total costs are beyond that first half. . . . **

This approach provides the contractor with the equivalent of a sure future use for the equipment and provides an incentive for him to maintain and modernize his facilities. Moreover, one could expect a market for used equipment that could probably take over some of DIPEC's functions. Support prices might be useful for specialized equipment as well.

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* Ibid, pp. 6-7.

** Department of Defense Appropriations for 1968, p. 410.

Subcontracting

An increase in subcontracting might encourage the industry to utilize long-lived, expensive, cost-reducing production equipment. This could be especially useful when there is a high probability that a contract requiring the use of this equipment will be awarded, but it is uncertain who will win the prime contract. Under these circumstances, it would profit a firm to acquire the facilities and subcontract to the firm that obtains the prime contracts. Secretary Charles recommends a variation of this approach in the form of a joint venture by the aerospace firms:

> Let me suggest, therefore, that industry consider a consortium to finance, and perhaps operate those facilities that are too expensive for one company prudently to undertake. . . . This would not be new. For example, many years ago when the industry was much smaller and even relatively low-speed wind tunnels were in this category, a consortium was formed to build the tunnel at Pasadena.*

A similar consortium could act as a subcontractor that would provide the necessary equipment and have a high probability of being awarded contracts; the precise manner in which the subcontract were arranged and financed is of less importance.

Minimum-Buy Contracts

Minimum-buy contracts are a third possibility. They are used extensively in the automobile industry, in which suppliers to automobile manufacturers operate under many of the same uncertainties as do defense contractors. Suppliers furnish their own equipment, but are guaranteed minimum orders at the time of contract negotiations.** Given this minimum order as well as forecasts of the actual orders, suppliers are able to acquire the necessary facilities.

Multiple-year contracts have similar effects. The Government, as well, recognizes the connection between contractor-furnished facilities and the reduction of uncertainty through the use of multiple-

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*"The Problem of Long Lead Time," p. 15.

**See H. M. Cunningham and W. P. Sherman, Production of Motor Vehicles, McGraw-Hill Book Company, Inc., New York, 1951, p. 69.

year contracts. One of the safeguards to be included in the legislation that will authorize annual funds on a multi-year contract basis is that of ". . . a substantial initial investment by the contractor."*

*Department of Defense Appropriations for 1968, p. 71.

VI. CONCLUSIONS

This study has attempted to answer the following questions:

1. Why are contractors willing to use Government equipment?
2. Why is the Government willing to furnish it?
3. What are the effects of this policy on the whole range of Defense Department objectives?
4. What alternatives can be offered to attain the results for which equipment is furnished, without conflicting with other goals?

In order to learn about actual Defense Department practices as contrasted with stated policy, the inventory of Air Force equipment in the hands of contractors was analyzed. The analysis revealed: 1) the inventory is heavily weighted with equipment acquired in connection with the Korean and Vietnamese wars, but substantial amounts were purchased during the period between those conflicts, and 2) to a great extent the equipment is general purpose.

Contractor motivations for using Government property are fairly clear: defense contractors are subject to great uncertainties about the demand for their facilities because the level of military procurement largely depends on events over which the contractors have little or no control, and because competitors may be awarded subsequent contracts. These uncertainties are particularly acute when unusually high demands are due to a situation of uncertain duration and when items of specialized equipment that are not likely to be useful for future projects are involved. The use of Government property is a way of dealing with these uncertainties without affecting profits adversely, since penalties for using Government property are low and may not be enforced, and since firms appear to find little difficulty in using such property for commercial work.

The Government, on the other hand, has cogent reasons for preferring that contractors furnish their own equipment: 1) to reduce Government administrative burdens; 2) to avoid conferring advantages on contractors already holding Government equipment; and 3) to increase the private-sector orientation of defense contractors. In addition,

rational Defense Department decisionmaking may be impeded by the budgetary treatment of equipment that must be purchased, as compared with equipment already in Government inventories.

Two reasons appear to account for the Government's willingness to furnish equipment to its contractors. The first is an attempt to overcome the uncertainties mentioned above. The second is a desire to reduce cost. With cost-based contracting, firms have little motivation to acquire cost-reducing equipment; the Government therefore supplies the equipment in order to offset this lack of incentive. Doing so, however, conflicts with the Government objective of obtaining the benefits of increased competition, which would include cost reduction, because it favors contractors already in possession of equipment.

If the long-run objective is to increase price competition among defense contractors, interim policies designed to lower costs and overcome uncertainty should not interfere with the development of a more competitive market. Lower costs might be achieved by allowing contractors to share in cost savings obtained from using new equipment. The main problem remains uncertainty--uncertainty in the present situation, and the uncertainty that would prevail in a more competitive market. Some combination of the following could alleviate uncertainty:

1) Government-supported prices for specialized equipment and for equipment purchased in connection with an emergency situation of unusually high demand and uncertain duration;

2) Increased subcontracting, so that subcontractors can purchase cost-saving equipment with a high probability that they will receive orders from prime contractors;

3) Minimum-buy contracting, which would allow a firm to plan its production under conditions of less uncertainty.

Defense firms may thereby be induced to invest in their own equipment in the face of uncertainty over future demands. In the context of the long-run goal of awarding contracts by price competition, these policies would encourage cost reduction and avoid interfering with the competitive process in the interim. They would also help reduce the uncertainty inherent in the defense industry.

Such practicea are consistent with recent policy statements, as well as many actions, of the Department of Defense. The DOD has consistently maintained that contractors should furnish their own facilities to the extent neceaaary to satisfy civilian demands and a normal level of Government demands, with the Government aiding contractors in situations of abnormally heavy demand or when uncertainty is uncommonly high. But such aid does not have to be in tha form of Government-furnished equipment. It is important to emphasize this today, since facilities acquired in connection with the modernization program and with the Vietnam conflict are perpetuating a high level of investment in Government-owned equipment. This trend should be halted, and alternatives sought, before the problem becomes mountainous.

Appendix A

TYPE OF DATA AVAILABLE FOR EACH ITEM IN THE DIPEC INVENTORY AS OF APRIL 30, 1966

1. Equipment category code (by PEC or SCC stock number).
2. Status: Loaned or leased.
3. Possessor: Business or nonprofit institution.
4. Type:

   a. General Purpose Equipment: Equipment designed and built so that it is readily available, within the limits of its capacity range, for operations on any piece of work suitable for the specific types of equipment. Example: turning, milling, boring, etc. These operations may be accomplished with or without attachments and/or accessories which are readily detachable. By the addition of special tooling, jigs, and/or fixtures, the equipment is readily converted to a single-purpose operation but still retaining its basic general purpose characteristics. If these components are permanently attached to the equipment in such a manner as to prevent all of the originally designed uses even though the basic equipment may be general purpose, it becomes single purpose equipment or general purpose equipment with special features and reconversion may be expensive and not feasible from an economic point of view.

   b. General Purpose Equipment with Special Features: General purpose equipment with special features which cannot be defined as single purpose equipment. These special features may be installed by the original builder or subsequent users. They may be in addition to those contained in the manufacturer's original design or they may be substitutes for original features.

   c. Single Purpose Equipment: Equipment which, by reason of basic design, is limited in use, or is peculiar to a particular operation or series of operations on a certain piece or type of work, and cannot, by minor or economical modification, be adapted to other uses.

   d. Other Plant Equipment: Any equipment covered by a DOD Property Record Form and not included in Types 1, 2, and 3.

   e. Not classified: Not classified on the DIPEC records into any of the above categories.

5. Acquisition Cost (includes standard attachments procured and delivered with the basic unit but does not include transportation and installation charges).

6. Year of Manufacture (this is estimated in some cases).*

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*This appendix is mostly taken verbatim from Defense Supply Agency, Defense Industrial Plant Equipment Center Operations, DSAM 4215.1, Appendix IC, p. IC-1.

Appendix B

TYPES AND ACQUISITION COST OF GOVERNMENT EQUIPMENT LOANED AND LEASED TO INDUSTRIAL FIRMS

Table 7 below uses equipment codes for the primary classification; for each type of equipment, yearly detail is given (1949-1966), showing the number of items acquired and their cost, whether the item was loaned or leased, and the equipment category. The equipment categories used in this study are adapted from those of an earlier study, which indicated that 361 different 4-digit Production Equipment Code and Standard Commodity Classifications (PEC/SCC) were represented in the 1964 inventory.* To simplify presentation and computation, and to avoid a large number of empty cells, items acquired before 1949 have been consolidated, and 4-digit codes have been regrouped into the following categories:

Material Removal	3411-3419
Material Removal (Portable)	3421-3429
Sheet Metal Forming	3441-3449
Welding	3431, 3432, 3433, 3436, 3438
Electromagnetic Test Equipment	5619, 5620, 5621, 5628, 5629, 6327, 6625, 6670, 6814
Mechanical Measuring and Testing Equipment	5631, 5633, 5639, 5651-5659, 5683, 5684, 5859
Heat Treating Furnaces	3572
All Other Codes	

The equipment items in these categories are far from homogeneous. For example, a 4-digit code, 3411 (Boring Machines), contains diverse

*Julian Glasser et al., Air Force Long Range Production Equipment Requirements, prepared for Manufacturing Technology Division, Air Force Materials Laboratory, Wright-Patterson Air Force Base, Ohio, under The Ohio State University Research Foundation, Intermittent Research Analysis, Contract AF 33(657)-8741, by Chemical and Metallurgical Research Inc., Chattanooga, Tennessee, December 21, 1964, Chap. 1, Table 2, p. 11.

equipment. The average cost per item manufactured in the last ten years for the overall group is shown as $55,828 in the study cited above, but average costs for the four 6-digit codes in this category range from $26,382 to $69,072. Another example is Milling Machines, group 3417. The overall average is $52,088, but the average costs for specific types of milling machines range from $21,259 to $184,693.*

*Ibid., Chap. 2, Table 1, p. 39.

Table 7

NUMBER OF ITEMS AND ACQUISITION COST OF DIPEC AIR FORCE INVENTORY AS OF APRIL 30, 1966

Year Acq	General Purpose Equipment				General Purpose Equipment with Special Features				Single Purpose Equipment				Other Plant Equipment				Unclassified			
	Loaned		Leased		Loaned		Leased		Loaned		Leased		Loaned		Leased		Loaned		Leased	
	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost
Material Removal Category, PE 3611-29																				
1949	48	533,678	2	11,860	--	--	--	--	--	--	--	--	--	--	--	--	286	3,198,256	--	--
1950	65	704,566	--	--	--	--	--	--	5	90,993	--	--	--	--	--	--	187	1,863,380	--	--
1951	1403	22,356,223	5	62,962	6	71,179	--	--	7	443,453	--	--	--	--	--	--	2341	20,450,635	2	28,306
1952	3013	51,959,623	23	359,543	7	93,204	--	--	31	852,928	--	--	--	--	--	--	4243	63,918,677	9	69,430
1953	1837	41,521,550	13	275,904	2	72,330	--	--	15	244,483	--	--	--	--	--	--	2001	40,449,645	5	82,492
1954	787	21,083,214	2	19,693	3	28,951	--	--	3	80,125	--	--	--	--	--	--	1021	23,722,762	1	26,660
1955	438	9,238,656	1	11,532	2	100,220	--	--	6	40,401	--	--	--	--	--	--	628	16,816,222	--	--
1956	415	12,173,678	3	22,225	2	31,188	--	--	11	604,636	--	--	--	--	--	--	628	12,410,124	--	--
1957	810	33,023,787	1	60,115	14	529,829	--	--	24	1,271,129	--	--	--	--	--	--	222	10,970,154	--	--
1958	424	22,465,526	1	2,456	4	93,480	--	--	10	158,382	--	--	--	--	--	--	18	4,200,040	--	--
1959	285	7,435,538	2	65,004	4	49,095	--	--	14	446,277	--	--	--	--	--	--	13	922,080	--	--
1960	175	4,035,538	--	--	1	6,770	--	--	5	270,656	--	--	--	--	--	--	28	4,056,871	--	--
1961	126	2,364,139	--	--	4	8,372	--	--	7	230,154	--	--	--	--	--	--	21	2,429,864	--	--
1962	168	7,719,488	--	--	1	43,005	--	--	3	99,761	--	--	--	--	--	--	65	9,799,800	--	--
1963	167	11,149,811	--	--	7	285,685	--	--	6	58,750	--	--	--	--	--	--	40	6,448,550	--	--
1964	160	13,388,905	--	--	--	--	--	--	6	166,735	--	--	--	--	--	--	6	382,063	--	--
1965	80	5,780,781	--	--	1	8,782	--	--	3	244,350	--	--	--	--	--	--	--	--	--	--
1966	2	623,731	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		267,558,572		891,194		1,972,080				6,452,733								234,039,175		302,888
Material Removal Category (Portable) PE 3621-29																				
1949	2	9,145	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14	139,658	--	--
1950	3	37,689	--	--	--	--	--	--	--	--	--	--	--	--	--	--	31	330,350	--	--
1951	76	646,837	--	--	--	--	--	--	2	2,963	--	--	--	--	--	--	248	2,523,853	--	--
1952	90	1,005,956	--	--	--	--	--	--	3	10,709	--	--	--	--	--	--	322	4,134,435	--	--
1953	39	667,402	--	--	--	--	--	--	4	21,345	--	--	--	--	--	--	104	1,933,209	--	--
1954	40	5,264,418	--	--	--	--	--	--	--	--	--	--	--	--	--	--	104	1,809,625	--	--
1955	16	425,690	--	--	--	--	--	--	--	--	--	--	--	--	--	--	96	3,518,441	--	--
1956	29	371,365	--	--	--	--	--	--	2	146,581	--	--	--	--	--	--	32	522,360	--	--
1957	89	1,218,526	--	--	3	1,911,197	--	--	2	88,422	--	--	--	--	--	--	13	134,792	--	--
1958	55	641,919	--	--	1	30,216	--	--	1	459,194	--	--	--	--	--	--	1	14,772	--	--
1959	71	1,262,477	1	4,219	--	--	--	--	--	--	--	--	--	--	--	--	1	24,352	--	--
1960	51	2,766,817	--	--	--	--	--	--	1	16,529	--	--	--	--	--	--	--	--	--	--
1961	29	434,895	--	--	--	--	--	--	1	109,345	--	--	--	--	--	--	--	--	--	--
1962	17	400,321	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1963	32	914,464	--	--	1	1,500	--	--	1	33,750	--	--	--	--	--	--	1	7,362	--	--
1964	13	247,869	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1965	4	235,086	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1966	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		16,550,876		4,219		1,932,913				940,880								18,326,349		

Table 7 -- continued

Year Acq	General Purpose Equipment: Loaned Qty	Loaned Acq Cost	Leased Qty	Leased Acq Cost	General Purpose Equipment with Special Features: Loaned Qty	Loaned Acq Cost	Leased Qty	Leased Acq Cost	Single Purpose Equipment: Loaned Qty	Loaned Acq Cost	Leased Qty	Leased Acq Cost	Other Plant Equipment: Loaned Qty	Loaned Acq Cost	Leased Qty	Leased Acq Cost	Unclassified: Loaned Qty	Loaned Acq Cost	Leased Qty	Leased Acq Cost
Welding Category, PEC 3431-3, 3436, 3438																				
1949	3	51,025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	6,210	--	--
1950	16	119,021	1	18,342	1	18,963	--	--	--	--	--	--	--	--	--	--	5	43,648	--	--
1951	139	932,849	--	--	--	--	--	--	5	39,539	--	--	--	--	--	--	153	677,810	--	--
1952	171	1,351,654	3	46,213	--	--	--	--	4	88,200	--	--	--	--	--	--	132	1,173,793	--	--
1953	74	527,961	--	--	1	1,198	--	--	--	--	--	--	--	--	--	--	42	505,613	--	--
1954	65	1,093,886	--	--	--	--	--	--	--	--	--	--	--	--	--	--	53	865,476	--	--
1955	46	481,170	--	--	--	--	--	--	--	--	--	--	--	--	--	--	60	937,308	--	--
1956	182	1,716,523	--	--	1	20,984	--	--	1	4,500	--	--	--	--	--	--	39	854,074	--	--
1957	146	1,700,989	--	--	6	34,000	--	--	2	52,810	--	--	--	--	--	--	20	81,546	--	--
1958	159	1,704,115	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	2,296	--	--
1959	126	870,778	--	--	3	33,967	--	--	3	54,448	--	--	--	--	--	--	--	--	--	--
1960	124	1,324,985	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1961	186	1,149,779	--	--	1	29,415	--	--	1	26,965	--	--	--	--	--	--	--	--	--	--
1962	76	779,776	--	--	1	37,340	--	--	1	11,093	--	--	--	--	--	--	--	--	--	--
1963	56	803,002	--	--	--	--	--	--	5	56,293	--	--	--	--	--	--	7	10,243	--	--
1964	38	127,60-	--	--	--	--	--	--	2	40,905	--	--	--	--	--	--	4	7,654	--	--
1965	39	219,521	--	--	--	--	--	--	2	53,350	--	--	--	--	--	--	--	--	--	--
1966	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		14,944,638		64,555		175,867				480,104								4,934,959		
Sheet Metal Forming Category, PEC 3441-9																				
1949	11	69,389	--	--	--	--	--	--	--	--	--	--	--	--	--	--	57	1,393,022	--	--
1950	20	104,468	--	--	--	--	--	--	--	--	--	--	--	--	--	--	61	84,347	--	--
1951	282	3,217,251	4	20,721	--	--	--	--	1	3,536	--	--	--	--	--	--	565	7,774,143	--	--
1952	330	8,988,129	2	2,649	3	46,547	--	--	2	6,300	--	--	--	--	--	--	628	13,527,400	--	--
1953	128	2,903,442	--	--	2	4,794	--	--	1	1,300	--	--	--	--	--	--	261	7,788,792	--	--
1954	107	2,676,369	--	--	--	--	--	--	--	--	--	--	--	--	--	--	159	11,492,306	--	--
1955	64	5,279,780	1	3,706	2	8,185	--	--	1	4,925	--	--	--	--	--	--	109	3,164,232	--	--
1956	49	18,263,002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	107	19,324,826	--	--
1957	90	10,849,523	--	--	1	2,175,000	--	--	3	173,731	--	--	--	--	--	--	32	539,269	--	--
1958	118	9,182,937	--	--	1	6,900	--	--	1	39,970	--	--	--	--	--	--	2	4,320	--	--
1959	77	1,720,217	--	--	--	--	--	--	1	2,745	--	--	--	--	--	--	--	--	--	--
1960	57	1,298,260	--	--	--	--	--	--	1	32,390	--	--	--	--	--	--	--	--	--	--
1961	58	2,744,912	--	--	--	--	--	--	1	1,003	--	--	--	--	--	--	--	--	--	--
1962	40	1,505,998	--	--	--	--	--	--	2	135,850	--	--	--	--	--	--	3	575,459	--	--
1963	34	807,109	--	--	1	9,990	--	--	--	--	--	--	--	--	--	--	1	4,975	--	--
1964	14	1,553,627	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1,010	--	--
1965	8	699,128	--	--	--	--	--	--	1	15,285	--	--	--	--	--	--	--	--	--	--
1966	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		71,863,541		27,076		2,251,41c				398,033								85,733,370		

Table 7 -- continued

Year Acq	General Purpose Equipment				General Purpose Equipment with Special Features				Single Purpose Equipment				Other Plant Equipment				Unclassified			
	Loaned		Leased		Loaned		Leased		Loaned		Leased		Loaned		Leased		Loaned		Leased	
	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost
Electromagnetic Testing Equipment, PEC 5619, 5621, 5628-9, 6327, 6625, 6670, 4614																				
1949	30	70,865	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1950	23	89,782	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1951	112	467,483	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9	42,753	--	--
1952	172	575,642	--	--	--	--	--	--	2	3,752	--	--	1	9,450	--	--	21	178,230	--	--
1953	157	1,307,835	--	--	--	--	--	--	--	--	--	--	3	3,900	--	--	29	182,224	--	--
1954	263	1,268,392	--	--	1	6,600	--	--	2	3,150	--	--	11	21,665	--	--	39	380,034	--	--
1955	572	2,030,564	--	--	--	--	--	--	5	342,481	--	--	2	3,195	--	--	52	1,382,287	--	--
1956	1233	4,551,246	1	1,450	3	4,170	--	--	2	24,385	--	--	3	4,155	--	--	163	1,711,972	--	--
1957	1147	4,847,867	--	--	2	3,200	--	--	14	761,417	--	--	--	--	--	--	68	266,455	--	--
1958	1746	6,776,173	--	--	3	8,985	--	--	13	1,097,297	--	--	9	18,503	--	--	13	19,847	--	--
1959	1829	7,836,902	--	--	8	16,360	--	--	3	1,450,521	--	--	5	6,709	--	--	10	415,045	--	--
1960	1428	14,191,664	--	--	2	5,953	--	--	5	576,726	--	--	3	8,180	--	--	11	27,359	--	--
1961	837	4,686,783	--	--	1	1,425	--	--	4	443,486	--	--	1	2,655	--	--	6	427,760	--	--
1962	1202	6,604,576	--	--	3	78,369	--	--	5	11,570	--	--	5	7,700	--	--	3	260,644	--	--
1963	960	4,501,334	--	--	6	29,700	--	--	2	4,500	--	--	14	38,380	--	--	14	238,179	--	--
1964	586	2,672,307	--	--	--	--	--	--	2	10,082	--	--	1	1,500	--	--	1	1,000	--	--
1965	372	1,277,784	--	--	--	--	--	--	2	3,777	--	--	--	--	--	--	--	--	--	--
1966	9	292,926	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		64,050,125		1,450		154,782				4,733,144				125,992				5,533,789		
Mechanical Measuring and Testing Equipment, PEC 5631, 5633, 5639, 5651-57, 5659, 5683-4, 5859																				
1949	5	22,360	--	--	--	--	--	--	2	15,306	--	--	--	--	--	--	5	23,582	--	--
1950	9	61,692	--	--	--	--	--	--	1	10,825	--	--	--	--	--	--	15	69,841	--	--
1951	83	657,195	--	--	1	6,500	--	--	2	118,503	--	--	--	--	--	--	109	627,662	--	--
1952	118	916,939	--	--	3	22,083	--	--	6	67,302	--	--	1	16,616	--	--	172	1,359,389	--	--
1953	77	788,104	--	--	2	8,659	--	--	10	407,201	--	--	1	4,893	--	--	48	382,785	--	--
1954	79	457,995	--	--	1	8,365	--	--	7	288,814	--	--	--	--	--	--	40	344,965	--	--
1955	78	612,165	--	--	--	--	--	--	4	504,987	--	--	1	6,321	--	--	70	645,847	--	--
1956	100	881,384	--	--	1	15,945	--	--	9	486,316	--	--	4	7,971	--	--	59	749,018	--	--
1957	178	2,355,177	--	--	5	44,123	--	--	19	902,700	--	--	1	2,185	--	--	20	136,032	--	--
1958	221	2,853,222	--	--	3	213,598	--	--	6	35,542	--	--	2	4,993	--	--	2	6,007	--	--
1959	235	2,049,510	--	--	7	90,125	--	--	6	348,524	--	--	--	--	--	--	--	--	--	--
1960	154	2,138,006	--	--	1	20,428	--	--	6	13,020,740	--	--	--	--	--	--	3	10,593	--	--
1961	220	2,322,854	--	--	1	5,675	--	--	3	17,837	--	--	--	--	--	--	1	2,500	--	--
1962	181	3,494,459	--	--	1	1,991	--	--	6	339,037	--	--	--	--	--	--	--	--	--	--
1963	124	1,703,951	--	--	--	--	--	--	2	293,010	--	--	1	2,190	--	--	1	5,600	--	--
1964	50	626,893	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1965	22	506,455	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1966	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		22,448,351				437,492				16,856,644				45,169				4,363,821	--	--

Table 7 -- continued

Year Acq	General Purpose Equipment				General Purpose Equipment with Special Features				Single Purpose Equipment				Other Plant Equipment				Unclassified			
	Loaned		Leased		Loaned		Leased		Loaned		Leased		Loaned		Leased		Loaned		Leased	
	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost	Qty	Acq Cost
Heat Treating Furnaces Category, PEC 3572																				
1949	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	3,432	--	--
1950	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	[illegible]	79,876	--	--
1951	7	84,683	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26	348,353	--	--
1952	12	56,815	--	--	--	--	--	--	--	--	--	--	--	--	--	--	24	577,175	--	--
1953	2	16,008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10	409,376	--	--
1954	2	79,775	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9	410,076	--	--
1955	3	265,464	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10	1,984,770	--	--
1956	3	17,246	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	31,282	--	--
1957	5	163,332	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	64,466	--	--
1958	6	270,843	1	6,215	1	15,775	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1959	13	320,927	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	8,370	--	--
1960	9	98,874	--	--	--	--	--	--	2	114,081	--	--	--	--	--	--	--	--	--	--
1961	5	190,078	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1962	2	12,705	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1963	7	93,406	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1964	1	2,631	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1965	3	62,800	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1966	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		1,735,677		6,215		15,775				114,081								3,017,176		
All Other Equipment[a]																				
1949	47	595,935	--	--	--	--	--	--	8	[illegible]	--	--	--	--	--	--	146	785,911	--	--
1950	95	859,[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1951	916	[illegible]	[illegible]	[illegible]	12	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
1952	1293	7,[illegible]	[illegible]	13,[illegible]	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	[illegible]	[illegible]
1953	717	4,383,741	1	[illegible]	6	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1954	628	4,197,733	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1955	601	4,346,609	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1956	826	6,082,325	2	15,936	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1957	1252	11,546,998	--	--	16	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1958	1087	9,304,250	1	[illegible]	21	[illegible]	--	--	[illegible]	[illegible]	--	--	--	--	--	--	[illegible]	[illegible]	--	--
1959	1142	10,199,232	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	8	[illegible]	--	--
1960	1054	10,607,630	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1961	1064	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1962	969	8,[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1963	572	5,[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--
1964	357	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	--	--	--	--	[illegible]	[illegible]	--	--
1965	82	[illegible]	--	--	[illegible]	[illegible]	--	--	[illegible]	[illegible]	--	--	--	--	--	--	[illegible]	[illegible]	--	--
1966	[illegible]	13,313	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		[illegible]		[illegible]		[illegible]				[illegible]				[illegible]				[illegible]		[illegible]

[a]Other sheet metal forming, other primary metal forming, General plant [illegible] general purpose machinery, other.

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10. ABSTRACT

An analysis of (1) Government policy and practice in providing contractors with industrial plant equipment; (2) contractor motivations to accept such equipment; (3) alternatives to current policy. Although the Government has continued the practice, begun in WWII, of supplying equipment to its defense contractors, it prefers that they furnish their own equipment for several reasons: (1) Ideologically, in a free-enterprise economy, firms should supply their own equipment. (2) It is difficult to control a large inventory in scattered locations. (3) The practice tends to restrict competition by conferring advantages on contractors possessing the equipment. Contractor willingness to use GFE iss explained by considerations of profit in the face of uncertainty. Altternatives are considered that reduce both uncertainty and costs, including short-run policies of support prices for the equipment, a greater reliance on subcontracting, and the use of minimum-buy contracts.

11. KEY WORDS

Air Force
Procurement
Military contracts
Department of Defense
Policy analysis
Industry
Aerospace industry