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ARMY AIR FORCES HISTORICAL STUDIES: No. 40

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EXPANSION OF
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1940-1945

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ARMY AIR FORCES HISTORICAL STUDIES: NO. 40

EXPANSION OF INDUSTRIAL FACILITIES

UNDER ARMY AIR FORCES AUSPICES

1940-1945

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FOREWORD

This study of the expansion of industrial facilities under AAF auspices during World War II was prepared by Capt. Robert R. Russel of the Historical Office, Air Technical Service Command. One of a series of studies of materiel development and procurement being brought out by the AAF Historical Office, this history describes the mobilization of American industry for the production of aircraft and air equipment for the AAF. The main emphasis is upon the period since 1940, although the planning for industrial mobilization in the twenty-year period between the two world wars is also treated.

Readers familiar with the subject matter are invited to contribute additional facts, interpretations, and suggestions. For this purpose, perforated sheets have been placed at the back of the study. This history will be handled in strict compliance with AR-380-5.

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C O N T E N T S

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I	INTRODUCTION	1
II	PEACETIME PLANNING FOR INDUSTRIAL MOBILIZATION, 1920-1930	4
III	LAYING THE LEGISLATIVE BASE FOR INDUSTRIAL MOBILIZATION, 1940	22
IV	DEVELOPMENT OF AN ORGANIZATION AND PROCEDURE--TO 7 DECEMBER 1941	45
V	PROCUREMENT OF AIR CORPS FACILITIES TO DEC. PER 1941	73
VI	FACILITIES PROCUREMENT IN THE LATE MONTHS OF THE WAR	109
VII	PROBLEMS OF FACILITIES MANAGEMENT	136
VIII	FACILITIES PROCUREMENT, 1943-1944	161
IX	PROBLEMS IN ORGANIZATION AND ADMINISTRATION	188
X	THE MEASURE OF ACHIEVEMENT IN FACILITIES EXPANSION	219
	GLOSSARY	233
	BIBLIOGRAPHY	235
APPENDICES		
1.	Revised Memorandum as Approved by the Assistant Secretary of War on December 5, 1940 /on expan- sion of industrial facilities/	243
2.	/Col. Philip Schneeberger/, Basic Principles for Expansion of Facilities with Government Aid, 11 July 1941, Revised	252
3.	Procedural Steps for Negotiation of a Defense Plant Corporation Facilities Agreement, 8 April 1941	254
4.	Master Agreement of Lease--DP Form #2	255
5.	Airplane Production, 1940-1944 (chart)	265
6.	Statement by Mr. Knudson /to Automobile Manufac- turers Association, 25 October 1940/	266
	INDEX	268

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Expansion of Industrial Facilities Under Army Air Forces Auspices, 1940-1945

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Chapter I

INTRODUCTION

This study deals with the mobilization of American industry for the purpose of producing aircraft and air equipment for the Army Air Forces in World War II. The emphasis is upon conversion of factories from production for civilian use to production for the armed forces and, especially, upon the provision of new war plants. The whole matter of production control¹ is discussed only sufficiently to show its relation, which was very close, to the problem of procuring industrial facilities for making materiel for the AAF.

The emphasis of this study is on the activities and accomplishments of the AAF, specifically those of Wright Field and the materiel section of AAF Headquarters, which together constituted one of the Army's "supply services." Enough detail on military and civilian agencies outside the AAF is included to assure a degree of clarity.

In spite of the fact that the AAF enjoyed a large measure of autonomy in expanding production facilities, its policies and problems had much in common with those of the other supply services. The Army Air Forces operated under the same laws and executive orders governing the other supply services and bore the same relation to coordinating and supervising agencies. They were affected by the same states of public opinion with regard to the war and preparedness for war.

1. Production programs and controls are the subject of another AAF Historical Study, in preparation.

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2

They labored under similar uncertainties as to the demand for their "end product." They encountered similar technological problems and the same business structure and business methods. They also were involved in all the great public issues connected with industrial mobilization for war. It would appear that even their problems of internal organization and procedure were to a considerable degree typical of those of military supply services in general. This monograph, therefore, although it covers only a limited field of materiel, should contribute to a proper appraisal of the whole matter of the mobilization and utilization of our economic resources during World War II.

The great public issues connected with industrial mobilization may be briefly stated in advance. One of these issues was how to prepare in time of peace for industrial mobilization for war. Another great matter of public debate was organization. What governmental agencies should be charged with responsibility for industrial mobilization and particularly for expanding industrial facilities? Should we have one supply service or a dozen? If a number, how should their policies and activities be coordinated? Unfortunately, perhaps, the organization had partly to be improvised after the emergency was upon us.

Closely related to the issue of organization was that of function and general method. To what extent should we rely upon patriotism and the hope of profit to induce private owners to take war contracts and convert their factories for military production or construct new ones, and to what extent should we resort to compulsory measures? In general

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3

what controls should be established over the economic life of the nation in the interest of industrial mobilization?

The questions of quantity and timing were ever present. How much materiel must we have as a minimum? How much could we have? How much should we have? How many war plants would be required? When should we start mobilizing industry? How rapidly should we proceed? How long would it take to get war industries into full production?

Another great issue was that of the conversion of existing industrial facilities versus the construction of new ones. This involved careful consideration of facilities requirements and the question of time required to get into production. It involved comparative initial costs and comparative costs of production in the two types of facilities. It also involved the questions of reconversion and the effect of war-time expansion of industrial facilities upon our postwar economy.

Never before in wartime have the American people shown so much concern over the effect of war measures upon their postwar economy as they have during World War II. Every measure proposed for procuring industrial facilities for military production has been debated not only upon its merits as a war measure but even more as to its effects upon the future economic structure and system. This study deals only to slight extent with the effect of war measures upon our postwar economy, a subject to be undertaken in a separate study of demobilization. It does deal, however, with the effect of public concern over postwar economic conditions upon industrial mobilization for war.

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Chapter II

PEACETIME PLANNING FOR INDUSTRIAL MOBILIZATION, 1920-1939

When M-Day came in September 1939,¹ existing plans for industrial mobilization proved to be inadequate and ill-adapted to the situation. They were scrapped for the most part, and new plans were forged in the midst of the crisis. Officials responsible for industrial planning could not foresee the type of war into which the country would be plunged nor the manner of the nation's entrance. For various reasons that will presently appear, they had not even been able to plan adequately for the sort of industrial mobilization they had envisaged. Yet something was salvaged from the old industrial M-Day plans, and it would have been unfortunate indeed if there had been no such planning at all.

Planning for the mobilization of industry pursued a very consistent course, as far as the Air Corps was concerned, from the close of World War I to the summer of 1938. There were few significant changes in basic concepts and but few in organization and procedure. The efforts of planning officers were largely confined to detailed administration and to the refinement of plans and methods. From the summer of 1938, the growing threats of another great European war, the scale of the preparations, the popularization of the concept of "total" war, and later the reality of war with the demonstrations and foreshadowings of the role of air power therein, shook planning officials in this country

1. President's proclamation of a limited national emergency, 8 Sep. 1939, in Federal Register, 9 Sep. 1939, p. 3851.

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5

out of any complacency they may have had and compelled them to re-examine their plans in all aspects. When M-Day came, plans for industrial mobilization were in the process of being revamped.

Those officials outside the Air Corps who in the period 1920 to 1938 were responsible for planning did not expect an emergency that would require a considerable air force ready to go into action immediately or at a very early date. They considered the Navy the first line of national defense, behind which the other arms could complete their preparations in an orderly fashion. Even the Air Corps, however, did not seek to have aircraft plants set up, equipped, and ready to go into full production at a moment's notice. The industrial war planning agencies had as their principal objective the preparation of plans for speedy conversion of peacetime industry for war production after M-Day.²

Nor did planning officials during the period 1920 to 1938 contemplate a war that might tax the economic resources of the nation to the utmost and require a considerable expansion of every major branch of industry. Planning officers were concerned primarily with making industrial surveys; with computing the "loads" that must be imposed upon established industries and apportioning these loads among plants, communities, and districts; with allocating available plants among the various supply arms and services; with preparing detailed plans for

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2. Memo for Pres., National Aeronautic Association by Brig. Gen. W. E. Gillmore, Chief, Mat. Div., 4 Jan. 1928, in RCS 300.9, Functions of IPS (Previous Years); memo for C/AC by Brig. Gen. H. C. Pratt, Chief, Mat. Div., 3 Oct. 1930, in ATSC 381, Mobilization Plans; C/AC to Chief, Mat. Div., 10 June 1938, and 2d wrapper ind. (basic unknown), Chief, Mat. Div., to C/AC, 7 Jan. 1938, quoting WDGS as of 17 Dec. 1937, in ATSC 381.4, Shadow Factories.

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6

procuring difficult or critical items; and with preparing "factory plans" for the conversion of specific plants for war production.³

"Load" was defined in the M-Day plans as the amount of war work to be required of any plant, community, or district. Loads were computed not only in numbers of articles and amounts of materials but also in percentages of capacities. After the general adoption of the eight-hour day, normal capacity of a facility came to be defined as what the facility could produce with one eight-hour shift; potential capacity, as what it could produce with three such shifts. Potential capacity was assumed to be 250% of normal, allowance being made for the necessity of stopping machinery during the third shift for such operations as cleaning, changing dies, and making minor repairs. Industrial surveys were to be kept up to date and loads and capacities computed with a degree of care.⁴

Obvious purposes of computing loads and capacities were: to enable higher authorities to know what could reasonably be expected of industry in time of war; to facilitate the allocation of plants among the supply arms and services; and to enable procurement agencies to avoid overloading any plant, industry, or community with war work with the consequent failure to meet schedules. The computation of loads and capacities would also make it possible to mobilize industry for war with a minimum of interference with essential civilian needs, and would

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3. Maj. Scott B. Ritchie, "The Allocation Division," a lecture before the Army Industrial College, 9 Dec. 1938, copy in History Office, EPD; OASW, Planning Branch Circular No. 1, 19 Nov. 1936, in RGS Industrial War Plans Circulars file. This is a typical circular of the period.
4. Ibid.

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facilitate as equitable a distribution of war's economic burdens, or benefits, among concerns, communities, and sections as strategic considerations would permit.

It came to be an established rule in industrial planning that, in case of war, one half the normal capacity of any facility that had a civilian market must be left for civilian production. Except for cogent reasons, not more than half the capacity of converted facilities might be taken for war work; but the total capacity of new wartime constructions might be so utilized.⁵ It is obvious that these rules were not based upon anticipation of total war.

From the strategic viewpoint, it was not considered desirable that any branch of war production should be highly concentrated in one area. Facilities in the most vulnerable areas, Zone I, were not to be allocated unless it could be shown by the service concerned that suitable production facilities were not available elsewhere. This strategic consideration was not taken very seriously by the Air Corps even in the years of "theoretical planning." Near the end of the period, when somewhat higher estimates of war requirements were being made, a highly placed planning officer commented that, while it was necessary to give consideration to tactical and strategic considerations, "any effort to distribute the allocated load over the country other than essentially in proportion to the distribution of productive capacity would appear questionable."⁶

5. Ibid. See also OASW, Planning Branch Order No. 7 (Revised), 8 Nov. 1935, in RCS Indust. War Plans Circulars file.

6. Memo for chiefs of all supply arms and services by Col. H. K. Rutherford, Dir., Planning Br., OASW, 9 Aug. 1938, in RCS 300.5, Circulars file.

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In allocating facilities among the several supply arms and services the industrial planning authorities had three principal objectives. They would prevent an unseemly and time-wasting scramble for facilities, such as followed the nation's entrance into World War I. They would avoid competition among the supply services and, thereby, keep down costs. And, perhaps most important, after the allocations were made, the authorities would be able to proceed with the formulation of the detailed procurement plans and factory plans that were considered essential to the speedy conversion of industry to war purposes.

The procedure for obtaining allocations, as far as the Air Corps was concerned, had these essential features:⁷ The Industrial War Plans Section of the Materiel Division at Wright Field (Industrial Planning Section after 25 May 1937), principally through district procurement planning representatives, surveyed industry and selected the facilities it considered suitable for production of Air Corps materiel in time of war. The Materiel Division then made applications for allocations to the Planning Branch of the Office of the Assistant Secretary of War (OASW) through the Office of the Chief of the Air Corps (OCAC). The Planning Branch made the allocations, giving proper consideration to principles of distribution and to the claims of other supply arms and services. The Army-Navy Munitions Board, furthermore, reconciled claims of the Army and the Navy. As allocations were made they were published

7. OASW, Planning Branch Circular No. 1, 19 Nov. 1936; report of Lt. Col. A. W. Robins, Exec., Mat. Div., to C/AC, 24 March 1932, in RCS 300.9, Functions of IPS (Previous Years) /cited as Robins Report/.

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AIFHS-40

9

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in a Directory of Allocated and Reserved Facilities. The directory was circularized among the agencies concerned. The allocations were subject to change as industry shifted, firms rose and fell, and estimates of requirements were modified.

Facilities that produced critical materials or articles in demand by more than one supply service were not allocated in the usual sense. They were "reserved" by the OASW, and only "capacity credits," that is, proportions of prospective production, were allocated to the Air Corps and other services. Commodity divisions in the OASW supervised this type of allocation and, presumably, in wartime would enforce conformance. Notable examples of reserved facilities were plants producing machine tools, basic steel products, aluminum products, and optical glass.

Planning authorities were careful not to carry the allocations system too far lest it become too unwieldy for efficient administration. It became the accepted rule that no facility should be allocated unless it was expected that in time of war more than one fourth of its product would be required by the armed forces. Facilities producing "commercial" articles, that is, articles for which military specifications did not differ greatly from civilian, were not ordinarily allocated. Also unallocated were plants valued at less than \$50,000 and, in general, subcontractors' facilities. Some highly placed officers thought it was a mistake not to allocate subcontractors' plants,⁸ but those who made policy felt that better results could be obtained by allowing prime

8. E.g., Col. R. M. Jones, Procur. Planning Repres., EPD, and Maj. P. Schneeberger, Chief, IPS, WF. See Jones to Schneeberger and reply, 13 and 27 Sep. 1939, in Historical Office, EPD, 381, Indust. Planning Matters.

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AAFHS-40

10

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contractors to make their own subcontracting arrangements. The Air Corps in actual peacetime procurement made a distinction between contractor-furnished equipment, "CFE," and government-furnished equipment, "GFE," and often found it economical to go directly to small concerns for various articles. The war industrial planning officers, however, believed that in wartime it would be well to avoid the administration of a vast number of contracts and that therefore it would be better to deal only with the larger firms, leaving them in turn the task of mobilizing the smaller concerns.⁹ The Air Corps, at least, did not want the job of regimenting the economic life of the nation and did not believe extensive control would be necessary.

A difficult specific question in industrial mobilization planning was how and to what extent the Air Corps should plan to utilize the automotive industry in making airframes and airplane engines. On this question thinking underwent some change during the period between 1920 and 1938. In the earlier years it was taken for granted that the automotive industry must be extensively utilized.¹⁰ As the years went by, the Air Corps watched the growth of the aeronautical industry carefully and hopefully. It was very friendly toward the export of aircraft, military as well as commercial, largely because such trade was

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9. Memo for C/AC by Dir. of Procur., OASW, 26 Sep. 1929, and 2d ind., Maj. E. Fickel, Exec., to C/AC, 5 Oct. 1929, in ATSC 381, Mobilization Plans; memo for chiefs of all supply arms and services by Col. H. K. Rutherford, Dir., Planning Br., OASW, 9 Aug. 1938, in RCS 300.5, Circulars file.
10. Maj. H. H. Arnold, Exec., for Chief, Mat. Div. to C/AC, 24 Feb. 1931, ATSC 381, Mobilization Plans; Robins Report.

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AAPHS-40

11

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 calculated to develop productive capacity at home.¹¹ As the industry thrived in the 1920's, Air Corps officials began to believe that by using the larger aircraft factories primarily as assembly plants and requiring them to do extensive subcontracting of parts and subassemblies it would be possible to procure the required number of airframes, if not engines, without converting automobile factories.¹² The Great Depression after 1929 checked the growth of the aeronautical industry, and as the 1930's wore on, Air Corps thinking again swung back to the view that in case of a war of considerable magnitude the aid of the automotive industry must be enlisted.

The detailed procurement plans covering the various items of Air Corps materiel in case of mobilization were prepared by the Industrial War Plans Section, Materiel Division, at Wright Field. Plans for difficult and critical items were required to be "intensive-formal"; for other items they might be informal. The formal plans were filed in the OASW; the informal plans did not need to be filed there, but assurance had to be given the Assistant Secretary that such plans had been made. Plans were revised at frequent intervals to keep them abreast of changing patterns of industry and changing prospective Air Corps requirements.

Essential features of procurement plans were the accepted schedules. Planning representatives sought written undertakings from allocated concerns to produce specified items of materiel during a period of 24

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11. AAF Historical Studies, No. 11: Distribution of Air Materiel to the Allies, 1939-1944; Controls, Procedures, Policies, pp. 3-13.
 12. Draft of speech dated 30 Jan. 1930, in RCS 300.9, Functions of IPS (Previous Years).
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AAFHS-40

12

months following M-Day according to agreed-upon monthly schedules.¹³

The final step in detailed planning was the preparation of factory plans. At best a factory plan was a detailed plan for converting a plant for the production of specified items of materiel after M-Day. The factory plans were prepared by District Procurement Planning Representatives of the Materiel Division with such assistance as the managements of the factories might choose to give.¹⁴

Mobilization planners made various estimates of the time that industry would require to get into quantity production of military aircraft after the go-ahead signal should have been given. In general, as events proved, their estimates were somewhat optimistic. Maj. Gen. H. H. Arnold in January 1939 thought quantity production could be reached until the twelfth or fifteenth month.¹⁵ Brig. Gen. Geo. H. Brett in May 1939 estimated that current production could be doubled in from 12 to 18 months.¹⁶ Typical accepted schedules of aircraft companies indicated seven months as the time required to convert from production of a military model, assuming that drawings, templates, jigs, and dies had

13. OASW, Planning Branch Circular No. 2, 10 June 1938, "Procurement Plans," in RCS Indus. War Plans Circulars file; Robins Report.

14. Capt. C. F. Wheeler, Mat. Div., "Account of the Industrial War Plans Section," 20 May 1936, in RCS 300.9, Functions of IPS (Previous Years).

15. Army Industrial College lecture, "The Materiel Problems for the Air Corps," 9 Jan. 1939, in Historical Office, EPD. A similar estimate is in memo for Dir. Planning Br., OASW, by Lt. Col. E. E. MacMorland, 10 Feb. 1939, in Historical Office, EPD, 385, Procur. Planning.

16. Report on Industrial Planning, 4 May 1939, par. 2c, in Historical Office, EPD.

AAFHS-40

13

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all been prepared in advance. And at a procurement planning conference in Washington on 6 September 1938, representatives of the companies stated that proper retooling of a plant for quantity production would take from one to two years.¹⁷

Since it was not anticipated that there must be extensive construction of new facilities, the Air Corps had no specific plans for such construction. The assumption seems to have been that such expansions as might be necessary would be made by private industry and financed thereby with prospect of recovery through profits on sales of products to the government and otherwise.

The Industrial Mobilization Plan, as revised in 1936, contemplated that in case of war a civilian War Resources Administration would be established and that it would be charged with the expansion of industrial facilities as well as with control of transportation, power and fuel, and the flow of raw materials.¹⁸

Such, in brief, were the principles and policies of planning industrial mobilization in the piping years of peace. Their great, overriding defect was that they were based upon the premise that the next war, if there should be one, would be on a smaller scale than the last one. And a number of conditions and practical difficulties militated against effective planning for even the limited sort of industrial mobilization envisaged during the years 1920-1933.

The Industrial War Plans Section at Wright Field and the Procurement Planning District offices, which had to do the "pick and shovel"

17. Résumé in Historical Office, EPD. Time intervals actually achieved, ranging from 20 to 40 months, are discussed below in chap. X.

18. Pp. 34 ff. Copy in Historical Office, EPD.

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AAFHS-40

14

work, were always understaffed.¹⁹ Of course, the general public feeling that there was no imminent danger of war was responsible for this. For the same reason, planning personnel worked without a sense of urgency or a high sense of the importance of their tasks. Their frequent use of the terms "theoretical planning" and "academic planning" is an evidence of this fact. Furthermore, Air Corps aeronautical engineers were constantly being drawn away by private industry, which offered higher salaries.²⁰

Planning personnel secured their data mostly from private business firms. The firms were not paid for supplying information and were under only a moral obligation to furnish it. Most concerns were cooperative, yet some feared to give out much information lest it become the property of competitors or be used against them by government regulatory agencies. Planning officers had standing instructions to avoid harassing or antagonizing business by too frequent surveys or requests for information.

Planning officials gave considerable thought to the best methods of establishing friendly relationships with manufacturers.²¹ Unfortunately perhaps for the establishment of the proper contacts, planning officers had nothing to do directly with actual peacetime procurement of

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19. Statement to author by C. D. Backus, civilian assistant to Chief, Indust. War Plans Sect. and its successors from an early date to the time of writing; numerous lists of personnel in files.
 20. See, e.g., draft of a speech dated 30 Jan. 1930, in RCS 300.9, Functions of IPS (Previous Years).
 21. E.g., J. B. Johnson, Chief, Mat. Br., Eng. Sect., Mat. Div., to S. K. Colby, Aluminum Co. of America, Pittsburgh, 13 July 1932, in ATSC 381, Mobilization Plans; OASW, Planning Branch Circular No. 1, 19 Nov. 1936, in RCS Indust. War Plans Circulars file.

AAFES-40

15

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Air Corps materiel. The four Inspection (Procurement) Districts and the six Procurement Planning Districts were not conterminous, and in only a few cases were their offices in the same cities.²² It would seem in retrospect that the agencies engaged in regular peacetime procurement should also have had the responsibility of planning for procurement in case of war. At least they were in a better position to learn by experience the structure and methods of American business, with which the Air Corps would have to deal on a large scale in wartime. When the emergency actually came, the procurement officers seemed to know as much about how to proceed to mobilized industry as did the industrial planning officers. There had been, to be sure, frequent transfers of personnel from the one type of activity to the other.

Some companies which, in event of war, would have to be utilized for the production of Air Corps materiel refused to sign "accepted" schedules. Their refusals were based largely on their unsatisfactory experience with government contracts either in World War I or in peacetime. In some cases their bids had been too low; they had not realized how closely inspectors would hold them to specifications and consequently had suffered many rejections. Some concerns, on the other hand, accepted unduly optimistic schedules. They overestimated the quantities they could produce and underestimated the time it would take to get into production. There was no penalty attached. Acceptance of a schedule was

22. C. D. Backus, "Industrial Planning Section," in RCS Indust. War Plans Circulars file; ATSC historical study: History of the Army Air Forces Materiel Command, 1926 through 1941, pp. 27-30.

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by no means the equivalent of signing a contract. It did not obligate the company to sign a contract if one should be proffered. It did not even guarantee that in case of mobilization the government would offer the company a contract.²³

Of course, it was not assumed by the industrial mobilization planners that in case of war the government would have to depend solely upon the voluntary cooperation of manufacturers. The National Defense Act of 1916 gave the President the power to place orders with any firm he should think capable of filling them. It made compliance obligatory and gave such orders precedence over all others.²⁴

The factory plans for converting plants for war production after M-Day were generally as unrealistic as were the accepted schedules. The district procurement planning representatives were not equipped to make the necessary detailed technical studies; and the companies did not feel that they could afford to assign competent engineers in their employ to assist in the preparation of the plans, as the government made no provision for compensating the manufacturers for such services.

In 1938 and 1939 the approach of war in Europe with its ominous implications for the United States gave an unwonted urgency to industrial mobilization planning and led to a more searching analysis of plans and policies. Current procurement programs were drastically increased in

23. Brig. Gen. E. C. Pratt, Chief, Mat. Div., to W. V. Baker, aeronautical engineer, Detroit, 20 Feb. 1931, in ATSC 381, Mobilization Plans; Col. H. K. Rutherford, Dir. Planning Br., OASW, to C/AC, 23 Sep. 1938, in ATSC 381, Mobilization Plans; Capt. C. F. Wheeler, "Industrial War Plans Section," 20 May 1936, in RCS 300.9, Functions of IPS (Previous Years).

24. Act of 3 June 1916, sect. 120; 39 Stat. 213.

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AAFHS-40

17

these years and gave opportunity actually to test industrial plans to a limited extent. As a consequence of study and experience several changes in policies and methods were made.

After conferences with the aeronautical companies in the autumn of 1938, the Air Corps definitely adopted the policy that automotive companies "will not be treated as 'prime contractors' for the production of aircraft materiel, particularly airplanes, but will be treated solely in the status of 'subcontractors' to parent aeronautical firms, such prime contractor and subcontractor relationship to be the result of mutual managerial agreements to that effect."²⁵ The adoption of this policy was dictated, in part at least, by the circumstance that the aircraft companies had the aeronautical engineers and had proprietary interest in the designs of planes and engines needed by the Air Corps. Obviously the automotive companies could not go into the production of complete planes without the aid of the aeronautical concerns or at least without proselyting their engineers. And the automobile companies could not build planes without first constructing new plants or rebuilding their existing factories to provide the larger clearances required.

An effort was made in these late years to use "educational orders"

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25. 1st ind. (basic unknown), Maj. Gen. H. H. Arnold, C/AC to AS/W, 12 Oct. 1938, in ATSC 381, Mobilization Plans; Circ. ltr., Brig. Gen. Geo. H. Brett, Chief, Mat. Div., to Air Corps Dist. Inspection Reps. and Air Corps Dist. Procur. Plan. Reps., 25 May 1939, in ATSC 321.9, IPS. For a brief defense of the policy see Maj. Gen. H. H. Arnold, Army Indust. College lecture, "The Materiel Problems for the Air Corps," 9 Jan. 1939, pp. 10-11, copy in Historical Office, EPD.

AAFHS-40

18

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as a device for preparing selected plants for rapid conversion to military production in case of emergency. An Act of Congress approved 16 June 1938 authorized the placement of such orders and the appropriation of the meager sum of \$2,000,000 per year for five years for the purpose,²⁶ beginning in the fiscal year 1938-1939. The director of the Planning Branch, OASW, instructed the chiefs of the supply arms and services to use educational orders in such a way as to secure at least "one set of special equipment, with drawings, specifications, patterns, etc., permitting duplication, and such production and engineering data as is possible of development in time of peace to reduce to a minimum the time to get into quantity production in war." Only a sufficient number of items to serve the purpose of the act was to be manufactured under an educational order.²⁷ Unfortunately educational orders were expensive, funds were limited, and time was short. Only a few were placed before the emergency came.

The Air Corps also began to seek more realistic factory conversion plans. In a conference convened in Washington by the Chief of the Air Corps on 6 September 1938, the aeronautical companies very definitely and properly indicated that they would have to be paid for their assistance in the preparation of such plans.²⁸ Other services received similar notices. Accordingly the War Department sought and secured an

26. 52 Stat. 707.

27. Memo for chiefs of all supply arms and services by Col. H. K. Rutherford, Dir., Planning Br., OASW, 9 May 1939, in ATSC 381, Mobilization Plans.

28. 1st ind. (Dir., Planning Br., OASW, to C/AC, 23 Sep. 1938), C/AC to AS/W, 12 Oct. 1938, *ibid.*; résumé of the conference, in Historical Office, EPD, 385, Aircraft Procur. Planning.

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amendment to the Educational Orders Act, approved 3 April 1939, permitting procurement of "production studies, factory plans, and other production data and the storage and maintenance of gages, dies, jigs, tools, fixtures, and other special aids."²⁹ Congress appropriated \$14,250,000 for educational orders, as now defined, for the fiscal year ending 30 June 1940. A portion of this sum was allocated to the Air Corps.

Thereafter the Air Corps, in its circulars to manufacturers inviting bids on technical items, included invitations to bid on factory plans as well, and in making contracts for such items it included provision for procurement of such production studies.³⁰ A letter of instructions from the Chief of the Materiel Division to the Assistant Chief at Wright Field suggested that in inviting bids for production studies the production goal of each plant must be sufficiently advanced beyond current production to require "exploration of the possibility" of developing additional subcontracting and of plant expansion.³¹ The aircraft companies reacted unfavorably to the emphasis on subcontracting and on conversion of non-aeronautical plants, preferring "augmentation under the management, design, and direction of current producers."³² Only

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- 29. Louis Johnson, AS/W, to C/AC, 8 May 1939, in ATSC 381, Mobilization Plans; 53 Stat. 560. This act appropriated \$34,500,000 for educational orders for the fiscal years 1939, 1940, and 1941, and \$2,000,000 for each of the four successive fiscal years.
 - 30. Louis Johnson, AS/W, to C/AC, 8 May 1939, in ATSC 381, Mobilization Plans; and 1st ind. (basic unknown), Asst. Exec., Mat. Div., WF, to Dir., Planning Br., OASW, 26 May 1939, ibid.
 - 31. 31 Oct. 1939, in ATSC 381, IPS.
 - 32. Report of Brig. Gen. Geo. H. Brett, Chief, Mat. Div., on Industrial Planning, 4 May 1939, copy in Historical Office, EPD, 381, Procur. Planning.
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AAFHS-40

20

~~CONFIDENTIAL~~

a very few of the new-style factory plans had been secured when M-Day came.

Even before the proclamation of a limited emergency in September 1939, developments had compelled a drastic revision upward of estimates of aircraft requirements in case of war and consequently compelled reconsideration of the capacity of industry to meet them. On 8 August 1939 the Assistant Secretary of War, Louis Johnson, declared that a preliminary comparison of capacities and requirements indicated that the aircraft industry might have to be expanded "several" times.³³ Adequate plans for expanding the industry must be prepared. He suggested three alternatives: (1) depend upon the existing industry but require it to make the maximum use of subcontractors in addition to those customarily employed by the aeronautical companies; (2) expand existing aircraft and accessory facilities, "by Government financing, if necessary," to provide stand-by plants to be operated in war by the existing companies; (3) build government-owned plants in peace and hold them in reserve for operation in war by private parties or, if necessary, by the government itself. The chief of the Materiel Division instructed Wright Field soon after M-Day, on 31 October 1939, to proceed with planning on the assumption that the aircraft industry must be expanded to five times its current capacity. Plans which contemplated new construction and new plants, he said, must be considered as a last resort. If new

33. Memo for Maj. Gen. H. H. Arnold by Louis Johnson, 8 Aug. 1939, in ATSC 381, IPS.

~~CONFIDENTIAL~~

construction proves necessary, "it may be assumed that the government will finance it." Management would be delegated to "management groups" of the existing industry.³⁴

When Mobilization Day came, then, industrial surveys were incomplete and inadequate.³⁵ Procurement plans were largely obsolete and were in process of being completely revised. The old conversion plans were considered of little value, and new methods were being instituted for securing better ones. Accepted schedules were unrealistic. No specific plan had been adopted for expanding the aeronautical industry. Allocations among the services were incomplete and, in the event, were--perhaps unwisely--not closely adhered to. The most valuable features of the earlier planning proved to be the general principles of distributing loads and making allocations and the skeleton organization, which of course had to be elaborated, for performing these functions. Many of the established techniques of computing requirements, loads, and capacities also proved useful, as did very decidedly the knowledge of the aeronautical industry that had been gained by the Regular Army officers, reserve officers, and trained civilian personnel of the Industrial Planning Section. It had always been the expectation that, if and when industrial mobilization should occur, planning personnel would be absorbed into the actual work of procurement. This expectation was realized.³⁶

34. LI 4, *ibid.*

35. See S. Rept. No. 480, pt. 5, app. II, 77 Cong., 1 sess., pp. 191 ff. (Truman Committee, 17 Nov. 1941).

36. C. D. Backus, "Industrial Planning Section," in RCS Indust. War Plans Circulars file.

AAFHS-40

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Chapter III

LAYING THE LEGISLATIVE BASE FOR
INDUSTRIAL MOBILIZATION, 1940

The old plans drafted prior to M-Day for industrial mobilization were inadequate and inappropriate for any sort of large-scale war. It is extremely unlikely, however, that any plans could have been made in peacetime suitable to the particular manner in which this nation entered World War II.

The country inched its way into war. A reluctant Administration led an originally isolationist and ever reluctant people into the war progressively step by step. It now undertook not to plan for an M-Day in the old sense of the term but to prepare for a possible D-Day. It could not set the day or determine with any degree of precision the scale of preparation necessary or desirable.

During this period of preparation, at least during 1939-1940, industrial controls adaptable to wartime could not be established; an only partially convinced public would not submit to them. Industrial management and labor had to be enticed and prodded from their civilian pursuits, with enticement and prodding in nicely adjusted proportions. Every economic group watched jealously to see that there should be no inequality of sacrifice demanded. Every measure proposed was studied and publicly debated not only with reference to its efficacy in preparing for war but also, and principally, with regard to its effects upon our economic structure. And--there is no point in blinking at the fact--the purposes of the Administration in this latter respect were

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under strong suspicion by a very large portion of the business public. Under such circumstances and conditions legislation on industrial conversion and expansion was literally hammered out.

The first considerable expansion of the aeronautical industry for military purposes during the emergency period September 1939-1941 was made principally under Allied auspices. Our neutrality laws as of September 1939 forbade export of munitions to belligerents. Consequently, when war broke out in Europe during the first days of that month, exports of aircraft to the powers involved had to cease. The national sympathies and interests lay strongly with the Allies, however. Accordingly the neutrality laws were so modified in November as to permit exports of munitions to the Allied powers on a "cash and carry" basis. Shortly these nations, especially England and France, undertook to place large orders. Such orders on top of the somewhat enlarged program of the Air Corps made expansion of the industry necessary and at once raised the question of how the expansion should be financed.

The aircraft companies did not wish to bear the expense of expansion because military orders might cease long before the plants could be paid for and it was unlikely that civilian demand would increase sufficiently to allow the expanded facilities to be used profitably. The United States government obviously stood to benefit from an enlarged aircraft industry (as well as from Allied resistance to German aggression), although Allied purchases might interfere somewhat with our own.¹ With

1. Maj. Gen. H. H. Arnold gave a brief, clear statement of the advantages in an address before the American Legion at Indianapolis on 28 April 1940. Text in Brig. Gen. A. J. Lyon's Project Record Books, Book 50. Cited below as Lyon, with appropriate book no.

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AAFHS-40

24

some difficulty an arrangement was worked out.

Under the arrangement the Allies were to advance funds for the expansion and expect to recover only in part in the form of lower prices.² Secretary of the Treasury Henry Morgenthau, Jr., promised a liberal interpretation of the law in the matter of deduction of plant depreciation in computing income taxes. Earlier policy permitted the export of obsolescent models only and forbade the export of novel items. Now, under a "new" policy adopted 25 March 1940, the Air Corps released a number of standard models of planes, engines, and items of equipment to the Allies, and the Allies agreed to confine their orders to those models.³ This policy was designed, of course, not only to give the Allies the best planes we had but also to insure that the new plants would be prepared to turn to manufacturing the very latest models for the United States without delay if occasion should demand. The Administration insisted that deliveries of planes to our own armed forces be deferred in the interest of earlier deliveries to the powers actually engaged against the Axis; and the Air Corps somewhat reluctantly supported this item of policy. Secretary Morgenthau, who had been appointed chairman of a committee to act as liaison between our government and the foreign purchasing commissions, invited leaders of the machine-tools industry to Washington and requested them to give priority to the orders of airplane engine companies. The

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2. Lyon, Book 10C, numerous documents; Business Week, 10 Feb., 9 March, 27 April 1940.
 3. TWX, Tech. Exec., Mat. Div., Wash., to Asst Chief, WF, 2 April 1940
Lyon, Book 10A; AAF Historical Studies, No. 11: Distribution of Air Materiel to the Allies, 1939-1944: Controls, Procedures, Policies, pp. 13-15.

AAFHS-40

25

whole arrangement, it is clear, was extremely favorable to the United States government. It also contained hints of future problems and policies.

Before the new expansions could be completed came the overrunning of the Low Countries, the fall of France, the Battle of Britain, and with them, for the first time, some widespread realization in this country of the extent of the danger which America might face. Our armament program was greatly enlarged. In June 1940, the "A" and "B" aircraft programs were devised, calling for procurement of 18,661 planes by 30 June 1942, of which 10,022 were to be of combat types.⁴ The President announced the goals of an air force of 50,000 planes, for the Army and Navy together, and a capacity to produce at the rate of 50,000 planes a year.⁵ Similarly, enlarged programs were made for other kinds of munitions. Congress appropriated the requisite funds and in June and July 1940 passed a series of bills designed to facilitate the placement of the new munitions orders.⁶

This legislation of midsummer 1940, insofar as it was concerned with industrial mobilization, was in line with concepts implicit in the plans formulated prior to M-Day. It was based upon the assumption that industry would accept orders if prices were reasonable and would itself, for the most part, finance the necessary conversions and expansions if

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4. "Historical Record of ('A' and 'B' Programs)," compiled by Statistical Control Office, Mat. Comd., WF. in History of the Army Air Forces Materiel Command, 1926 through 1941, app. E1.
 5. Message to Congress, 16 May 1940, in H. Doc. No. 751, 76 Cong., 3 sess. p. 6244.
 6. For a general account of this legislation see AAF Historical Studies, No. 22: Legislation Relating to the AAF Materiel Program, 1939-1944.

AAFHS-40

26

prices were high enough and taxes low enough to afford reasonable prospect of reimbursement out of profits. It was based, also, on the valid premise that, in arming for war, the government must utilize the initiative and the managerial and technical knowledge of business and therefore must have its willing cooperation.

Legislation of 28 June and 2 July 1940 authorized the Secretaries of Navy and War, respectively, to dispense with competitive bidding in placing orders for specialized articles, such as airplanes and airplane parts, if they should see fit, and to determine "fair and reasonable" prices by negotiation.⁷ One object was to save the time required for advertising for bids. Another was to raise prices and thus provide inducements. Then, too, negotiations would make it possible to place orders with weaker firms that could not meet the prices of the stronger thus making it possible to spread war orders more widely and get them filled more rapidly.⁸

Authorization to substitute negotiation for competitive bidding also enabled procurement agencies to use the letter of intent and the letter contract. Such letters stated that the government intended to negotiate a contract with the manufacturer and meanwhile authorized him to spend up to a specified amount in anticipation. The government agreed that, in case it should fail to negotiate an acceptable contract within a specified time, it would reimburse the contractor for all his trouble and

7. Public Law No. 671, 76 Cong., sect. 2, 154 Stat. 676; Public Law No. 703, sect. 1a; 54 Stat. 712.

8. "Priority Unemployment," in New Republic, 105:264 (25 Aug. 1941), gives a good defense of negotiated contracts.

AAFHS-40

27

expense. The letter of intent put the government at a disadvantage in negotiating and, on that account, was very acceptable to the contractors. But it also offered a compensating advantage to the government. With it, the manufacturer could start tooling up, assemble his labor, and place materials orders before the plans and specifications were complete for the articles he was to produce, something which, for obvious reasons, he would not dare do under the competitive bidding system. Plans and specifications for airplanes and other complicated articles were far from complete at the outset and lagged all through the war. Therefore, the use of the letter of intent could greatly speed up procurement.

The same acts of 28 June and 2 July 1940, while expressly forbidding the form of contract based on cost plus a percentage of cost, expressly permitted the cost-plus-a-fixed-fee form.⁹ The first was forbidden to avoid giving manufacturers an incentive to pyramid costs, as they had done in World War I to the great public scandal. The cost-plus-a-fixed-fee (CPFF) contract, while it gave contractors no incentive to keep costs down, gave no inducement to boost them and offered several positive advantages to the government. It enabled the government to place orders with concerns that would have feared to risk taking fixed-price contracts except, perhaps, at exaggerated figures. It permitted speedy signing of contracts for the manufacture of unfamiliar articles whose costs of production neither the government nor the manufacturer could estimate in advance. With this form of contract the government stood to reap the benefit of any reduction in costs that might flow from the application of

9. Public Law No. 671, 76 Cong., sect. 2; 54 Stat. 676; Public Law No. 703, sect. 1a; 54 Stat. 712.

AAFHS-40

28

quantity production methods or improved methods of manufacture in general. The principal disadvantage of the CFFF contract from the government's point of view, in addition to that of offering no inducement to reduce costs, was that it gave contractors a strong inducement to "pad" their costs and, by consequence, compelled the government to make careful audits of contractors' accounts.¹⁰ The great advantage of the CFFF contract from the manufacturer's point of view was that it relieved him of virtually all risk.

The act of 23 June 1940 authorized the Secretary of War, the Secretary of the Navy, and (when buying for the Coast Guard) the Secretary of the Treasury to advance contractors as much as 30% of their contract sums and to make further partial payments as production should proceed.¹¹ The object was to be able to assign defense work to concerns whose financial position was none too strong.

An act of 25 June 1940 authorized the Reconstruction Finance Corporation (RFC) to make loans to any corporation or to purchase its capital stock for the purpose of providing the corporation working capital with which to engage in the manufacture of defense articles or undertake the construction of plants for their manufacture.¹² It was the expectation of the sponsors of this provision that the RFC, because it was a government

10. Some disadvantages are stated in IOM, Lt. Col. F. M. Hopkins, Chief, Facil. Sect. Mat. Div., Wash., to Chief, IPS, WF, 5 Sep. 1941; memo for chiefs of supply arms by Brig. Gen. J. W. N. Schulz, Dir. of Purchases and Contracts, OUSW, 1 Oct. 1941, in Facil. Br., WF, Gen. Proceed. file.

11. Public Law No. 671, 76 Cong., sect. 1; 54 Stat. 676.

12. Public Law No. 664, 76 Cong., sect. 5; 54 Stat. 573.

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agency, would be more liberal in making loans for defense work than private banks might be. More specifically it was presumed that, in case of a loan for plant construction and equipment, the RFC would take a mortgage on the facilities as security; then if the emergency should suddenly end and the facilities lose their value, it would be the RFC, that is, the government rather than the manufacturer or a private bank, that would bear the loss.¹³

Thus, by liberalizing the procurement laws in these many respects, Congress sought to induce industry to accept defense orders and to provide whatever new facilities might be necessary. Congress did not rely entirely on the willing cooperation of private industry, however. It added other strings to the bow.

The Defense Act of 28 June 1940 gave the President the power to give Army and Navy orders priority over all deliveries for private account or for export.¹⁴ A similar provision was already in the National Defense Act of 1916 but was applicable only in time of war.¹⁵

Section 8b of the same act of 28 June 1940 gave the Secretary of the Navy the authority, in case he should deem any existing plant necessary to the national defense and should be unable to arrive at an agreement with its owners, to take over the plant and have it operated either by government personnel or private parties and to fix the compensation to be paid the owners. Power of seizure was not given to the Secretary of War until September.¹⁶

13. Business Week, 20 July 1940.

14. Public Law No. 671, 76 Cong., sect. 2; 54 Stat. 676.

15. 39 Stat. 213.

16. Public Law No. 783, 76 Cong., sect. 9, 54 Stat. 892.

~~CONFIDENTIAL~~

The Defense Acts of 23 June and 2 July 1940 also authorized the Secretaries of War and Navy, respectively, to use funds appropriated for national defense for the purpose of constructing, converting, and equipping facilities for the manufacture and repair of military equipment, to provide for the operation of such facilities either by "selected qualified commercial manufacturers" or by government personnel, and to lease or sell the facilities when they should deem it necessary in the interests of national defense.¹⁷ By the First Supplemental National Defense Appropriation Act, 1941, approved 26 June 1940, Congress appropriated \$150,000,000 to enable the Secretary of War, upon the recommendation of the Council of National Defense and its Advisory Commission and the approval of the President, to "expedite the production of equipment and supplies for the Army for emergency national defense purposes." By the Second Supplemental National Defense Appropriation Act, 1941, approved 9 September 1940, Congress appropriated an additional \$162,500,000 for the same purpose.¹⁸ Other appropriations of "expediting-production funds" were to follow.¹⁹ It came to be the rule that only expediting-production appropriations might be applied to the procurement of industrial facilities.²⁰

The Act of 25 June 1940 authorized the RFC, upon request of the

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17. Public Law No. 671, 76 Cong. 54 Stat. 676; Public Law No. 703, sect. 16; 54 Stat. 712.
 18. Public Law No. 667, 76 Cong. title II; 54 Stat. 599; Public Law No. 781, title I; 54 Stat. 872.
 19. Legislation Relating To The AAF Materiel Program, 1939-1944, pp. 70-79.
 20. Army Air Forces Contract Handbook, prepared by the Judge Advocate, Mat. Comd., AF, 2 vols. (revised edition), 15 July 1943, 800.2-2-4. (Cited as AAF Contract Handbook.)

AAEHS-40

31

Federal Loan Administrator (Jesse Jones) with the approval of the President, to charter a subsidiary with power to (a) "purchase and lease land, to purchase, lease, build, and expand plants, and to purchase and produce equipment, supplies, and machinery, for the manufacture of arms, ammunition, and implements of war," (b) "lease such plants to private corporations to engage in such manufacture," and (c), "if the President finds that it is necessary for a Government agency to engage in such manufacture, to engage in such manufacture itself." The RFC might make loans to the subsidiary to enable it to perform the above functions.²¹ It was under this provision of law that the Defense Plant Corporation (DPC) was shortly organized on 22 August.²²

It was the Defense Plant Corporation--in conjunction with expediting-production funds, the cost-plus-a-fixed-fee form of contract, and the letter of intent--upon which, as events proved, much the greater part of the mighty structure of war plants financing was to be reared. But such was not the intention either of the Administration or of business at the time. It was the force of circumstances rather than foresight that made the DPC the chief of the corner.

It almost certainly was the expectation in midsummer 1940 that direct government financing of war plants, to say nothing of government seizure and operation, was to be the exception rather than the rule. Provision for such direct financing and operation was made largely for

21. Public Law No. 664, 76 Cong., sect. 5; 58 Stat. 573.

22. "The War Goes to Mr. Jesse Jones," in Fortune, Dec. 1941, p. 187. According to this article some people in Washington credited the idea of DPC to Emil Schram, then chairman of RFC, and two RFC Lawyers, Clifford J. Durr and Hans A. Klagsbrunn; others credited it to Jesse Jones, Federal Loan Administrator.

~~CONFIDENTIAL~~

admonitory purposes. It was expected, to be sure, that the government would build and own, as in the last war, a number of highly specialized plants that would have no value after the war except as stand-by factories for the government itself.

It soon became apparent that the new legislation did not hold out sufficient inducement to bring industry into the defense program on the desired scale. Concerns engaged in production for the civilian competitive market were indisposed to take defense work if by so doing they would lose any of their civilian customers. They even urged the procurement officers to give the defense work to competitors.²³ The public was in no mood to see the production of civilian goods curtailed and, in general, seemed to believe that the country could prepare for war and conduct all its regular peacetime pursuits at the same time. The large amount of unemployment in the country lent support to the view. Industrialists, in general, took the line that conversion of existing plants to war work would be expensive and in many cases impossible and that much new construction and expansion would be necessary. The supply services and the influential business men of the new Advisory Commission to the Council of National Defense (the NDAC), which President Roosevelt had appointed in May, were loath to enter upon government construction.²⁴ The banks were anxious to finance the prospective expansions but wanted greater security.

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23. Interview with R. F. Trimbach, Chief, Manuf. Methods Br., RCS, AF, 23 Oct. 1944; New Republic, 9 Sep. 1940.
24. Hans A. Klagsbrunn, Counsel for DPC, "Some Aspects of War Plant Financing," American Economic Review, XXXIII, no. 1, pt. 2, sup., pp. 119-127 (March 1943). (Cited as Klagsbrunn article.)
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Preparedness lingered while Congress for about three months longer considered the demands of management, labor, and other interests and sought to formulate more acceptable legislation.

Specifically, spokesmen for business demanded the enactment of a tax-amortization plan, so called, which the President had endorsed in July.²⁵ This would in effect permit a concern to reimburse itself for a large portion of the cost of any emergency plant facilities it might provide by the simple expedient of tax deductions. Business spokesmen also asked for the repeal of the provisions of the Vinson-Trammel Act of 1934, as amended, which limited profits on construction of naval vessels to 8% and on construction of airplanes to 12% of the amount of the contracts.²⁶ These are percentages, be it noted, of prices of the product, not of capital invested. Twelve per cent of a price is 13.6% of cost and might represent any percentage on capital investment from zero up. Business spokesmen wanted the federal tax policy settled, especially as to excess profits. They also asked for suspension of the Fair Labor Standards Act of 1938, the maintenance of which they said would cause labor costs to rise.

Labor leaders on their part insisted that labor gains must not be sacrificed because of the emergency. They specifically demanded that

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25. Fortune, vol. 22, pp. 50 ff. (Oct. 1940); Business Week, 6 July, 3 Aug. 1940, 4 Jan. 1941; New Republic, vol. 103, pp. 351, 780 (9 Sep., 9 Dec. 1940); memo for Chief of Staff, by Maj. Gen. H. H. Arnold, (telling of meeting with aeronautical companies), 30 July 1940, Lyon, Book 42; pamphlet, Factors Which Affect Increased Production and Unit Costs of Military Aircraft, Engines and Accessories, a Report of the . . . National Research Council . . . 9 July 1940, sect. VII, copy in Historical Office, ATSC.
26. Legislation Relating to the AAF Materiel Program, 1939-1944, pp. 95-96.

~~CONFIDENTIAL~~
defense orders be withheld from companies which had not yet complied with the provision of the National Labor Relations Act requiring collective bargaining. Many people took the position that, if our young men were to be drafted into the armed forces, management and labor should also be conscripted.

Finally in September and October 1940 Congress and the administration effected a compromise. One item of the settlement was the tax-amortization scheme. The Second Revenue Act of 1940 amended the Internal Revenue Code to permit a corporation that constructed new defense facilities with its own or borrowed funds to recover a large part of the cost by deductions in computing income and excess profits taxes.²⁷ It might deduct the cost from gross income in installments spread through five years or, in case the emergency should end in less than five years, through the period of the emergency. Put another way, a corporation was to be allowed to depreciate emergency facilities for tax purposes at the rate of 20% or more a year, whereas the allowances for depreciation and obsolescence of factory buildings and machine tools used in production for normal peacetime demand had been much less, perhaps averaging 5% for buildings and 12% for machinery.²⁸ It is evident that by tax amortization the corporation would recover from the government in a short period that percentage of its cost which would be its average tax rate on income and excess profits during the period. And during the emergency presumably taxes would be at their peak. Indeed it is estimated

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27. Public Law No. 801, 76 Cong., sect. 302 (sect. 124 of Internal Revenue Code, 26 U.S.C., sup. V, par. 123); 54 Stat. 998. The law is analyzed in AAF Contract Handbook, 800.3.
28. Internal Revenue Code, sect. 113, 26 U.S.C., sup. V, par. 23.
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AAFHS-40

35

that the percentage borne by the government will run as high as 80 to 85.

The tax-amortization law contained detailed provisions to protect the interests of the government as well as those of the corporation. To be eligible for the amortization privilege the corporation must have constructed or acquired the facilities after 10 June 1940. The National Defense Advisory Commission and either the Secretary of War or the Secretary of the Navy must have certified to the Bureau of Internal Revenue, first, that the facility was essential to the national defense (the "necessity certificate") and, second, that the corporation either was not being reimbursed a second time directly or indirectly in the form of higher prices or otherwise ("certificate of non-reimbursement") or, in case the corporation was being so reimbursed a second time, that the interest of the government in the future use and disposition of the facility was adequately protected ("certificate of government protection"). Of course the facilities must be employed in defense work to the extent demanded by the government.

Just why the amortization privilege was extended only to corporations, as it was, and not to individuals and partnerships is not clear. The oversight, if it was an oversight, was rectified later.²⁹

Congress repealed the profits limitation clause of the Vinson-Trammel Act as business demanded.³⁰ At the same time, it increased income taxes and imposed taxes on excess profits.³¹ The new tax rates

29. Public Law No. 753, 77 Cong., sect. 155, approved 21 Oct. 1942; 56 Stat. 849.

30. Second Revenue Act of 1940, approved 8 Oct., Public Law No. 801, 76 Cong.; 54 Stat. 974.

31. Ibid.

permitted retention of generous profits, but there could be no assurance that a later Congress would not increase the tax rates. By another act Congress forbade fixed fees under CPFF contracts in excess of 6% of the estimated costs.³²

The Fair Labor Standards Act was not disturbed. This meant in effect that wages would be increased; for when hours should be increased, as they must, workers must be paid time and one-half for work in excess of 40 hours per week. The Administration assured labor that in the future no orders would be given to employers who did not obey the National Labor Relations Act. Eventually the Administration secured, in turn, a no-strike pledge from labor union leaders.³³

By an act approved 16 September 1940, the act that also provided for compulsory military service, Congress greatly enlarged the power of the government to compel manufacturers to accept orders for military materiel and give defense orders precedence over other orders. If the manufacturer should refuse to accept orders or to give them the requested priority or refuse to furnish the materiel at a fair price as determined by the Secretary of war or the Secretary of the Navy, the President might through either secretary take over the manufacturer's plant and operate it. Moreover, the head or heads of the recalcitrant firm might be deemed guilty of a felony and imprisoned and fined.³⁴ This act was intended to be used in tough cases, not to establish a usual procedure.

32. Public Law No. 781, 76 Cong., title I, approved 9 Sep. 1940; 54 Stat. 872.

33. Statement prepared for the use of Sidney Hillman, Assoc. Dir., OFM, in appearance before House Judiciary Committee, 20 Feb. 1941, copy in Historical Office, EPD.

34. Public Law No. 733, 76 Cong., sect. 9; 54 Stat. 892.

~~RESTRICTED~~

AFES-40

37

Even before the tax-amortization plan was enacted into law, it had become apparent that it would not assure facilities expansion on the scale then believed necessary. Too many companies were unwilling to take even the limited risks involved.³⁵ It was necessary, therefore, for the government to finance directly new defense plants on a much larger scale than had been anticipated. Three or four different plans or methods of direct financing were developed and utilized.

About the time of the passage of the tax-amortization law, the National Defense Advisory Commission, in collaboration with lawyers of the War and Navy Departments and the Bureau of Internal Revenue, worked out a "bankable" facilities contract or, as it came to be commonly known, the emergency-plant-facilities (EPF) contract.³⁶ The contractor, according to this contract, agreed to construct or acquire the facilities--plant, equipment, durable tools--and the government agreed to reimburse him for his costs, including interest but not overhead, in five annual installments. The title remained in the possession of the contractor until he should have been fully reimbursed, when it would pass to the government. With the contract as security the contractor could, presumably, borrow the necessary funds from the banks or the RFC.

To give the contractor an incentive to keep costs down and build well and to enable him to guard against raising up competitors for the postwar period, he was given the option of buying the facilities back from the government at the end of the emergency. As it developed, the options

35. Klagsbrunn article; Business Week, 31 Aug., 28 Sep. 1940.

36. AAF Contract Handbook, 800.4; Business Week, 5 Oct. 1940, credited the idea to Wm. G. Potter, Chairman, Guaranty Trust Co., New York City.

AAFHS-40

38

in this and other similar types of facilities contracts were of three principal forms, namely, (1) the option of buying at the end of the emergency at cost less depreciation, depreciation to be figured by a scale stated in the contract; (2) the option of negotiating for purchase within a specified period during which the government might not offer the facility for sale to outsiders; and (3) the option, during an extended period, of buying at the best price offered the government by a third party. Whether justified or not, it was the general impression that at the end of the emergency the contractor with an option would stand an excellent chance of getting a good plant cheap.

From the viewpoint of the Air Corps and other supply services, the EPF contract had serious defects. To guard against possible loss by reason of failure of Congress to appropriate funds to meet the installments, the bankers got a clause inserted whereby, if three months prior to the close of any fiscal year Congress had not made the funds available, the whole amount of their loans would be due immediately.³⁷ This clause made it necessary for the services to set aside the whole amount of the contract from the original appropriation, and thus put them in the position of paying interest to the banks when they (the services) already had funds available to pay the principal. A lesser defect was that, during the period when the government had an equity in the facilities but not title, there were difficulties with state and local governments over taxes.³⁸ After a time, when war financing had reached greater proportions

37. Klagsbrunn article.

38. Remarks of Col. R. C. Harmon, Chief Facil. Br., Contract Sect., in Stenographic Report of Conference Held at WF, 11, 12, 13, January 1944 . . . Re: Facilities, p. 11, copy in Historical Office, AFSC. (Cited as Stenographic report of AF conference of 11-13 Jan. 1944.)

AAFHS-40

39

and the Air Corps had had some brushes with banks over interest rates, the Air Corps modified most of its EPF contracts to provide for payment in a lump sum and transfer of title to the government as soon as the facilities should be completed. For some ineffable reason such modified EPF contracts were known as special-facilities (SF) contracts.³⁹

In spite of the defects mentioned and others which may appear later, the EPF-contract plan or a modification of it might have become the principal method of financing emergency facilities if the Defense-Plant-Corporation plan had not been evolved. The latter proved more popular with both manufacturers and the Air Corps. The DPC plan had been devised and tentatively tried out in August 1940 but had been held up for a time by the NDAC and the War and Navy Departments because of opposition of the bankers and general distrust of government ownership.⁴⁰

Under the DPC plan of financing, one of the supply services, the Air Corps for example, became the "sponsoring agency."⁴¹ The sponsor decided, subject to approval of higher authority, what facilities should be provided and for what firms. It then requested DPC to provide the facilities. If DPC was agreeable, it and the War Department then signed a "take-out" agreement. The War Department agreed to pay to DPC a portion of the estimated cost at once, usually 40% or 50%, and at the end of the emergency to pay the remaining portion, less whatever sums DPC should have

39. Ibid.; AAF Contract Handbook, 800.5.

40. On origin see Klagsbrunn article; New Republic, vol. 104, pp. 83, 234 (20 Jan., 17 Feb. 1941), vol. 105, p. 881 (29 Dec. 1941). For an example of banker opposition, see memo for C/AC by Lt. Col. E. E. Meyers, 29 July 1941, in MWS Facil. file.

41. Plan described in detail in AAF Contract Handbook, 800.6.

AAFES-40

40

realized from rentals and sales. If, perchance, DPC should have more than recovered the cost of the facilities covered by the contract, it was to refund the excess to the War Department. DPC agreed to make no charge for overhead. Having signed the take-out agreement with the War Department, DPC then entered into a lease agreement with the designated contractor. The lessee undertook to construct or acquire facilities as agent for DPC and according to plans and specifications approved by DPC and the sponsoring agency. DPC undertook to reimburse the lessee, as agent, his actual expenses incurred in constructing or acquiring the facilities when he should present receipted bills and to pay him a fixed fee, usually the conventional \$1.00. The lessee might not charge any portion of his business overhead as expense in connection with the facilities. Finally DPC leased the subject facilities to the contractor for operation in producing materiel for the sponsoring agency under such supplies contracts as he might hold or get. Under the act of 25 June 1940 DPC lessees must be private corporations. By act of 10 June 1941 this⁴² restriction was removed.

A DPC agreement, as did an EPF contract, usually gave the lessee the option of buying the facilities at the end of the emergency. Title was to remain in DPC until the contractor should exercise his option, or the facilities should be sold to a third party, or, in case they should not be sold, until the War Department should have reimbursed DPC in full. In the latter case, title would pass to the War Department. If the lessee

42. Memo for Col. W. F. Vollandt, Asst. Chief, Mat. Div., by W. S. Ege, Special Asst. to USW, 23 Oct. 1941, in RCS Facil. Br., Process. Proceed. file.

AAFHS-40

41

produced an article or articles for which he had no competitors, he paid a rental of \$1.00 a year, and rent was not an item in fixing price. If the lessee produced in competition, he paid a real rental, and it was an item in fixing price. In the latter case the rental was usually either the estimated depreciation or, for ease of computation, a percentage of the sales value of the articles produced that was estimated to be roughly equivalent to the depreciation.⁴³

This sponsoring agency-DPC-lessee-agent-operator arrangement may seem unnecessarily complicated. It was complicated. But there were logical reasons for its inception, and it proved to have advantages as well as complications in operation.

The Defense Plant Corporation, being essentially a government-owned bank, could borrow money (from RFC) and might take risks but was not supposed to incur losses, at least not large losses. Therefore it did not care to finance the plants up to 100%. Moreover, while anxious to help in the war effort, it did not presume to know who were best qualified to manufacture various articles of materiel or what sorts of buildings and machine tools should be provided. It wisely chose to remain in the role of a service agency to the supply arms and services.⁴⁴ As for the latter--at least this was true of the Air Corps--while desiring to retain control of supply, they were willing to share responsibility for providing facilities. Furthermore, they had no independent borrowing power, and the 40% or 50% take-out enabled them to make their appropriations go from two to two and one-half times as far. Ownership by DPC did not look so

43. Notes by Lt. Col. Philip Schneeberger, 3, 7 March, 4 April 1941; ibid.

44. "The War Goes to Mr. Jesse Jones," in Fortune, Dec. 1941, p. 203;
"Jones' Bottleneck," in Business Week, 11 Oct. 1941.

AAFES-40

42

ominous to the public as ownership by the War Department. Both the Air Corps and the DPC, and nearly everyone else, were anxious to utilize the "know-how" of the contractor not only in operating the facilities but also in constructing buildings and acquiring tools. As for the contractors, they knew a good contract when they saw it and were not to be deterred by fear of bankers or by theoretical opposition to government ownership, especially when such ownership was likely to be only for the duration. The advantages and disadvantages of the DPC plan are amplified and illustrated more conveniently elsewhere in this study.⁴⁵

An obvious plan for financing industrial facilities for defense production was direct government construction with funds provided entirely by appropriations. This plan also was utilized. The construction was done, or rather contracted for, and the equipment bought and installed by the Construction Department of the Quartermaster Corps or, after the transfer of function in December 1940,⁴⁶ by the Corps of Engineers. The plants were sponsored by the various supply services, somewhat as under the DPC plan. The sponsor of each particular factory approved the plans and specifications and supplied the funds out of its appropriation for expediting production. The private company that was to operate the factory upon completion was consulted as to building plans and especially equipment, and in some cases was itself the architect manager under contract with the Corps of Engineers.⁴⁷ The company operated the plant under lease but was not given the option of buying it at the end of the emergency.

45. See pp. 80-92.

46. Memo for C/AC by C/E, 4 Dec. 1940, quoted in memo for all AC station commanders by Chief, Mat. Div., 23 Dec. 1940, in RCS Facil. Br., Gen. Proced. file.

47. E.g., CMC Fisher Body Div. and the Cleveland plant.

AAFHS-40

43

~~11-13 Jan. 1944~~
Most of the plants built by the government under this plan were intended to be retained as stand-by factories after the emergency.

The government construction plan had the obvious disadvantage, from the Air Corps point of view, of requiring the sponsor to "set up" the entire cost, as the facilities were built out of its limited appropriation. It also did not utilize as fully as did other plans the business experience and technical knowledge of the industrial organization which would eventually operate the plant, although the layout plan was submitted to the intended lessee and approved by him.⁴⁸ Construction by the Corps of Engineers had other deficiencies in practice which can more conveniently be described later.⁴⁹

It was always possible to finance new facilities by including their costs in supplies contracts, although such costs must be paid from expediting-production funds not ordinary supplies funds.⁵⁰ But the costs of facilities provided in this manner were "non-recoverable" in any direct sense; the government could never gain title. Their provision for some contractors was unfair to competitors who did not get them. It did not seem proper to charge facilities to one particular supplies contract out of several a manufacturer might receive. So in general the services refused to pay for facilities in that way except for minor building alterations and repairs and occasional machine tools which it was inconvenient to finance otherwise.⁵¹ Items such as jigs, dies, and templates (which

48. Stenographic report of WF conference of 11-13 Jan. 1944, p. 11.

49. See p. 69.

50. Expressly permitted in Public Law No. 671, 76 Cong., sect. 4, approved 28 June 1940; 54 Stat. 677.

51. AAF Contract Handbook, 800.8.

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AIFMS-40

44

were useful only in the manufacture of particular articles) and expendable tools (as distinguished from durable tools) were always considered legitimate items of cost under supplies contracts.

Before the end of 1940 all the plans and methods for financing emergency facilities had been developed in their essential features. As time went by a whole code of variations, refinements, principles, and procedures grew up about them. The government had assumed virtually all the risks of industrial expansion for military purposes. It remained to be determined in practice whether it had made government financing of new facilities so attractive to manufacturers that they would refuse to convert their old ones. The government had also been given broad powers to establish priorities for defense work, to fix fair and reasonable prices for munitions and supplies, and to seize and operate factories. Again, it remained to be determined in practice to what extent the government would have to use its compulsory powers.

AAFHS-40

Chapter IV

DEVELOPMENT OF AN ORGANIZATION AND
PROCEDURE--TO 7 DECEMBER 1941

The vastly enlarged preparedness program of 1940 and 1941 made it necessary to expand greatly and to elaborate the peacetime organization for procuring industrial facilities. The new function of financing construction and conversion of facilities called especially for new agencies and procedures.

In the process of developing these agencies and procedures, there were bound to be some conflicts over jurisdiction, duplications of effort, and snarls in the "red tape." At any rate organizational and procedural problems were solved as they came, and, if the best solution was not always adopted, at least the machinery was made to work.

Among the new agencies concerned with industrial facilities was the Advisory Commission to the Council of National Defense. The NDAC was summoned to Washington 28 May 1940 to advise and assist in mobilizing the national resources. Technically it was to advise the Council of National Defense. This council was composed of six members of the Cabinet and under the National Defense Act of 1916, as amended, had certain coordinating and supervisory powers over the various departments and agencies of the government that were concerned with defense matters. Practically, the NDAC virtually superseded the Council of National Defense; the latter functioned principally to give legality to the executive acts of the NDAC and its individual members.¹ In addition, members of NDAC, individually

1. Code of Federal Regulations of the U.S., sup. 1940, title 32, ch. VII, p. 4480; "National Defense; the Sinews," in Fortune, XXII (Oct. 1940), pp. 52 ff.

AAPHS-40

46

~~CONFIDENTIAL~~

and collectively, advised the President and the departments and each member exercised such portions of the President's supervisory powers as the latter saw fit to entrust him with. Each of the members was a distinguished specialist in a particular field of our national economy and was given large responsibility in that field insofar as national defense was concerned. Speaking generally, perhaps the principal function NDAC was expected to perform was to arbitrate between the demands of military preparation and civilian needs and desires.

Two members of the NDAC, in particular, were directly concerned with industrial mobilization. Edward R. Stettinius, chairman of the Board of the United States Steel Corporation, was given large responsibility for seeing that the materials for the manufacture of munitions were forthcoming in sufficient quantities. William S. Knudsen, president of the General Motors Corporation, had similar responsibility for the production of munitions of all kinds including, of course, aircraft and accessories. With his wide knowledge of the American industrial structure and of manufacturing methods, he was expected to assist the supply arms and services in placing their orders with manufacturers best equipped to fill them. He was also expected, it seems, to help greatly in inducing his fellow industrialists to come into the preparedness program. Most specifically, at least according to the general public understanding, he was to bring the great automotive industry into the defense effort and particularly to effect an accommodation between it and the aeronautical industry.²

Of the commissioners, Knudsen especially proceeded to build up an

2. For public understanding of Knudsen's role, see Fortune, XXII, pp. 52 ff; New Republic, 103:179 (10 June 1940).

~~CONFIDENTIAL~~

AAFES-40

47

organization. It came to be known as the Production Division of NDAC. He brought in key men from industry, who served without pay or for a dollar a year, and borrowed clerks and specialists from the executive departments of the government. He organized sections according to industries and functions. Dr. George Mead, inventor of the wasp airplane engine, headed the Aeronautical Section, and Theodore P. Wright, of Curtiss-Wright Corporation, was his chief assistant. Knudsen in person and the Aeronautical Section helped conduct negotiations leading to placement of orders for Air Corps materiel and helped allocate plants, find subcontractors, and decide on expansion. Knudsen early secured the establishment of the rule that all considerable munitions orders must clear through his office, and he personally reviewed all contracts, including facilities contracts, of \$500,000 or more in amount. This rule gave the Production Division a veto on facilities projects initiated elsewhere.

About the same time, in June 1940, the President designated Donald Nelson, executive vice president of Sears, Roebuck, and Company to be Coordinator of Defense Purchasing. It was his duty to see that the services bought supplies in an orderly businesslike manner, avoided competition with one another, and properly distributed their purchases throughout the country and throughout the year. He was not so much concerned with industrial capacities, but all defense contracts including facilities contracts had to clear through his office, and it was he who officially approved them on behalf of the Council of National Defense.³

3. Code of Federal Regulations of the U.S., sup. 1940, title 32, ch. VII, p. 4480; Jonathan Mitchell, "Nelson, He's Bought an Army," in New Republic, vol. 103, p. 832 (16 Dec. 1940); Fortune, XXII, p. 58.

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At the turn of the year the President consolidated the new agencies that were most directly concerned with industrial mobilization into an Office of Production Management (OPM). These were the Production Division of NDAC (Knudsen); the Raw Materials Division, NDAC (Stettinius); the Priorities Division, NDAC (also Stettinius); the Office of the Coordinator of Defense Purchasing (Nelson); and the Labor Division, NDAC (Sidney Hillman). The OPM was headed by a four-member board consisting of the Secretaries of War and Navy and the Director and Associate Director of OPM. Knudsen and Hillman were designated Director and Associate Director.⁴ The only part of the old NDAC with any considerable vitality that was left out of OPM was the Office of Price Administration, headed by Leon Henderson. In April 1941 it became the Office of Price Administration and Civilian Supply within the Office for Emergency Management (OEM).⁵ NDAC was not abolished.

The President delegated to OPM most of the powers conferred upon him by the recent legislation relating to industrial mobilization. He virtually gave it also the few powers that had been conferred by law upon NDAC. This transfer he effected by the simple device of establishing the rule that OPM was to serve as the liaison and channel of communication between NDAC and the War and Navy Departments. In addition the President entrusted OPM, as he had entrusted NDAC, with the exercise of a portion of his own authority as Chief Executive to coordinate and supervise the departments of the government. In fact OPM had an organic relation to

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4. Executive Order 8629, 7 Jan. 1941; Code of Federal Regulations of the U.S., sup. 1941, pp. 130-131.
 5. Executive Order 8734, 11 April 1941, Code of Federal Regulations of the U.S., sup. 1941, title 3.
- ~~RESTRICTED~~

AAPHS-40

49

~~CONFIDENTIAL~~

the President somewhat different from that of NDAC. Technically it was in the Office for Emergency Management in the Executive Office,⁶ whereas technically NDAC was advisory to the Council of National Defense, a statutory body. The President practically gave OPM freedom to "write its own ticket." It was the general expectation that Knudsen as Director would dominate the scene.

The OPM was organized with a Production Division, headed by John D. Biggers, of Libbey, Owens, and Ford, who had been Knudsen's executive assistant in Production Division, NDAC; a Purchases Division, headed by Donald Nelson; a Labor Division, by Sidney Hillman; and a Priorities Division, by E. R. Stettinius. The Priorities Division was given a six-member advisory board consisting of a chairman and three other members designated by the President, and the Director and Associate Director of OPM as ex-officio members. Dr. Merrill C. Meigs succeeded Dr. Mead as chief of the Aeronautical Section, Production Division. The Purchases Division on 17 March 1941 organized a Plant Site Committee to regulate the distribution of new government-financed facilities. The designation was shortly changed to Plant Site Board.

Naturally, some frictions and misunderstandings developed between the new agencies and their successors on the one hand and the established procurement authorities of the War and Navy Departments on the other. But in general the supply services recognized their lack of preparation for directing the industrial mobilization of the nation and welcomed the

6. For creation of OEM see Executive Order 8248, 8 Sep. 1939, Code of Federal Regulations of the U.S., sup. 1939, title 3; Administrative Order of 25 May 1940, ibid., sup. 1940, title 3, ch. VII.

~~CONFIDENTIAL~~

AAFES-40

50

help of the new civilian agencies. Indeed, no less a person than the Chief of the Air Corps, Maj. Gen. H. H. Arnold, proposed that the Air Corps abandon industrial planning and place responsibility for expanding industry upon industry itself and civil agencies of the government such as the NDAC. This, he said, would eliminate the necessity of having the Air Corps make surveys in search of industrial capacity. "Developments during the current emergency have demonstrated the inability of the Air Corps to select sub-contractors who will be acceptable to our major prime contractors."⁷ General Arnold's proposal was in accord with the old plans for M-Day.⁸ For reasons already suggested, General Arnold's proposal was not approved.⁹ Although inadequate, the Army and Navy had supply services with established organization and procedure, while NDAC and OPI must start from scratch. Congress had chosen to entrust the expenditure of expediting funds to the War and Navy Departments. It had given them the power to commandeer facilities when necessary. The Army, Navy, and Air Corps had the responsibility for deciding what materiel must be procured, for drawing up specifications, and for accepting articles produced; therefore they wished to retain a measure of control over the manufacture of materiel. The President may have told Knudsen and Nelson to explore the limits of their jobs. It is not likely that he intended that they should develop a civilian service of supply.

The Air Corps likewise recruited civilian experts for its procurement organization. There was no law or moral obligation to prevent the

7. Memo for AS/W by C/AC, 7 Sep. 1940, copy in ATSC 321.9, IPS; see also draft of memo for AS/W, 20 Sep. 1940, in Lyon, Book 42B.

8. See p. 12.

9. See memo for AS/W by C/AC, 7 Sep. 1940, and 1st Ind. by Col. J. H. Burns, CASW, 30 Sep. 1940, in ATSC 321.9, IPS.

AAFHS-40

51

~~CONFIDENTIAL~~

supply arms and services from recruiting businessmen and production experts, and, as will appear, they did this extensively.

Within the Air Corps the function of procurement resided almost entirely in the Materiel Division, Office Chief of the Air Corps. It operated principally at and out of Wright Field, Dayton, Ohio, and in its Procurement Districts. On 2 October 1939, the Chief of the Materiel Division with a portion of his staff moved to Washington. There they supervised and directed the activities of Wright Field and the districts through the Assistant Chief and his staff at Wright Field. The Office of the Chief of the Materiel Division in Washington was divided into sections and branches corresponding closely to those at Wright Field.¹⁰ Under this arrangement the "pick and shovel" work was done at Wright Field and in the districts, while the Office of the Chief formulated policy and acted as liaison between Wright Field and the Chief of the Air Corps, other divisions of his office, the Office of the Assistant Secretary of War (the Assistant Secretary became the Under Secretary, December 1940), the Production Division of the NDAC (after it was organized), and numerous other agencies in the capital. This arrangement did not preclude the Chief of the Air Corps or the Chief of the Materiel Division from initiating facilities projects, conducting negotiations, or even signing contracts; and, especially in the earlier part of the emergency, they frequently did so.

At Wright Field before April 1939 the principal operating sections

10. LI No. 1, Functions and Organization of the Mat. Div., WF CF, 321.91. For organization charts, see History of the Army Air Forces Materiel Command, 1926 through 1941.

~~CONFIDENTIAL~~

AAFHS-40

52

had been Engineering, Procurement, and Industrial Planning. Procurement Section then performed all the functions of procurement. It designed standard articles or secured them from Engineering Section, advertised for bids, negotiated and signed contracts, and inspected and accepted the materiel bought. When procurement problems increased in early 1939 with the somewhat enlarged program, it was decided to divorce the administration of production from research and experimentation, lest striving after perfection on the part of those engaged in research delay actual production of standard items of materiel.¹¹ For some reason, contrary to the report of a committee of officers appointed to study problems of organization,¹² "production engineering" was entrusted to a separate section; and the old Procurement Section was thus divided into three, namely, Production Engineering, Contract, and Inspection. The former Engineering Section became Experimental Engineering Section,¹³ and the Industrial Planning Section continued as before.

The Production Engineering Section (PES) was directed to prepare designs for standard articles of Air Corps materiel as distinguished from experimental items and prepare authorities for purchase (AFP's) for the same. After contracts were let, it was to counsel with manufacturers in problems of production and especially to approve or disapprove changes in designs or specifications that might be suggested in the interests of economy, improvement, or speed in manufacture. Its chief function was to

11. Memo for Brig. Gen. G. H. Brett, Chief, Mat. Div., by Maj. Gen. H. H. Arnold, C/AC, 17 Feb. 1939, in Lyon, Book 14.

12. Report of committee, Maj. Fred S. Borum, Chairman, 6 Jan. 1939, ibid.

13. Mat. Div. GO #2, 1 March 1939; GO #3, 11 April 1939.

AAFHS-40

53

speed up production. Contract Section was to do the actual purchasing.

The vigorous chief of the new PES, Maj. K. B. Wolfe,¹⁴ built up a staff of aeronautical engineers, production engineers, and business men. In June 1939 he created a Production Control Branch headed by R. F. Trimbach, an aeronautical engineer with Army experience, and composed almost entirely of production engineers, all civilians. This branch was charged with estimating costs of new items, estimating costs of design changes made after manufacture had started, and reviewing standard designs with a view to better adapting them to quantity production--also with keeping in contact with manufacturers and granting minor deviations in design.¹⁵ The Contract Section, on the other hand, whether by accident or design, came to be composed largely of lawyers.

The consequence of these developments, whether intended or not, was that of the two sections, PES and Contract, only Production Engineering had the technical knowledge to say whether a bidder was competent to manufacture a particular article and--something very essential under the negotiated-contract system when it came into use--what constituted a reasonable price for the article. By consequence it was principally Production Engineering that, insofar as Wright Field was concerned, found the sources of supply, virtually conducted the negotiations, and, if new facilities at government expense were indicated, decided who should have them and on what scale.¹⁶ The officers of the Contract Section were

14. He was assistant chief at the start and shortly became chief.

15. PES OM No. 39-12, 17 June 1939.

16. Adequate support for this statement is lent by the files of the old Prod. Control Br., in Office of Manuf. Methods Br., RCS, WF.

AAFHS-40

54

concerned chiefly with seeing that contracts conformed to law and Army regulations and did not contain jokers. Although this was an essential and by no means insignificant task, Contract Section, as far as the main job of procurement was concerned, was largely shoved into a corner.¹⁷

Yet, illogical as it may seem, it was officers in Contract Section who signed the contracts, who technically were responsible for their administration, and who alone could give legal sanction to changes in them.¹⁸

It if should see fit, Contract Section could disregard the advice of Production Engineering Section in making purchases and sometimes did so.

It very shortly became apparent that a great amount of detailed work must be done in "processing" applications for government financing of new facilities. Land sites and costs must be analyzed, building plans must be studied to see that they were appropriate and not too lavish, and tools and equipment lists must be studied to see that only items necessary to meeting supplies contracts were included. Staffs in Washington were not equipped to do this work. PES at Wright Field processed a few of the early applications, but it was already overburdened with duties and had had no experience with land and construction problems. At a conference held on 31 August 1940 in the office of Col. Oliver P. Echols, Assistant Chief of the Materiel Division, it was decided to give the new function to Industrial Planning Section.¹⁹

The Industrial Planning Section (IPS) seemed best equipped for the

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17. Interview with Brig. Gen. A. E. Jones, Chief of Procur. Div., Mat. Comd., 29 Nov. 1943, filed in AFSC Historical Office.
 18. AEF Contract Handbook, 000.1-3, 213.3-5.
 19. Notes by Lt. Col. P. Schneeberger, Chief, IPS, in Facil. Br., RCS, Gen. Proceed. file.

AAFHS-40

55

function by virtue of former experience in making industrial surveys and factory plans. Then, too, it had little else to do.²⁰ It had been the expectation that, when D-Day should come, IPS should be absorbed by Procurement.²¹ The processing of facilities applications now gave it a new lease on life and for a time became almost its only function.

Lt. Col. Philip Schneeberger, chief of IPS, was an efficient administrator and a stickler for regularity in procedure. He built up a well-knit, smoothly running organization. He promptly organized a Facilities Expansion Branch and for months gave it his close personal attention.²² At first the branch had to enlist the aid of architects in the office of the Post Quartermaster to review building plans.²³ Shortly it managed to get two competent officers transferred from that office and to find others with architectural experience; it then set up a Structures Evaluation Unit.²⁴ IPS was long dependent upon Production Engineering and especially upon the engineers in Production Control Branch thereof

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20. IOM, Maj. B. E. Meyers to Tech. Exec., Mat. Div., 24 Aug. 1940, in Lyon, Book 11. Major Meyers said he had been reviewing the activities of IPS. "Investigation disclosed that the Section . . . is preparing industrial war plans based on P.M.P. for 1939 . . . The asininity of this procedure is obvious in the face of a current procurement program objective which is in excess of the P.M.P. objective."
 21. Brig. Gen. G. H. Brett, Chief, Mat. Div., to "Dear Hap" (Maj. Gen. H. H. Arnold), 25 May 1939, in ATSC 321.9, IPS.
 22. Colonel Schneeberger did much of his business in writing and made careful notes on conferences and telephone conversations. He apparently filed everything. His activities can be followed almost from day to day in the files of RCS, WF.
 23. IOM, Adm. Exec., WF, to Chief, Mat. Div., Wash., 22 Jan. 1941, Facil. Br., RCS, WF, Process. Proced. file.
 24. IOM, Maj. A. H. Harris, Chief, Facil. Expansion Br., 10 March 1941, Facil. Br., RCS, WF, Process. Proced. file; IPS Circular No. 203-1, 15 July 1941, in RCS IWP Circulars file.

AAFHS-40

56

~~SECRET~~ 25
 for reviewing applications for machine tools and equipment. Eventually
 it got its own Equipment Evaluation Unit²⁶ and its own Tools Unit.²⁷
 Applications for Certificates of Necessity under the tax-amortization law,
 when it was passed, had to be studied and evaluated in much the same way
 as applications for direct government financing, and a Certifications
 Unit was established in Facilities Expansion Branch to handle them.²⁸

Because of its former experience in making industrial surveys, IPS
 was able from the start to be of assistance to PES in establishing the
 necessity for expansion. It could often suggest subcontractors. It
 gradually took over the function of determining necessity, insofar as
 Wright Field was involved, and eventually gained the prime responsibility.²⁹

The form on which manufacturers made application for government-
 financed facilities soon became a lengthy document, thanks to circumstances
 and perhaps Colonel Schneeberger's thoroughness. The applicant must state,
 among other things, what he proposed to manufacture, the proportion of the
 work he expected to subcontract, his present floor space and equipment,
 what additions he proposed, what proportion of the new floor space would
 be "productive" and what "unproductive" (that is, space used for ad-
 ministrative offices, storage, etc.), how much additional labor he would

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- 25. Memo by Maj. K. B. Wolfe, Chief, PES, 15 Feb. 1941, in Facil. Br., RCS, Process. Proced. file.
 - 26. IPS OM No. 48, 11 Dec. 1941, in Facil. Br., RCS, Process. Proced. file. The unit was organized earlier.
 - 27. IPS OM No. 84, 25 Feb. 1942, in Facil. Br., RCS, Process. Proced. file.
 - 28. Notes by Lt. Col. P. Schneeberger on telephone conversation with Cooper, OUSW, 27 Dec. 1940, in Certification Unit, Facil. Br., RCS, Proced. file; IPS Circular No. 203-1, 15 July 1941, in RCS IWP Circulars file.
 - 29. IOM, Chief, IPS, to Chief, PES, 2 Feb. 1942, in Facil. Br., RCS, Gen. Proced. file.
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AAFHS-40

57

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employ by categories (such as male and female, "productive" and "un-productive," skilled, and semi-skilled, and unskilled), number of shifts intended, what critical materials he would use in construction, what transportation facilities were available, where and how he proposed to get power, light and water, the plan of financing he preferred, and, of course, his estimate of cost. The latter was the most important item. It was broken down into four schedules: I, land and land improvements; II, buildings; III, machine tools and equipment; and IV, portable tools and automotive vehicles. The applicant must also submit a preliminary "Appendix A." In this he gave such additional information as he thought might be helpful, broke down the schedules into lists of items, and described plans and specifications in detail, perhaps with preliminary drawings.

IPS checked the application and appendix "A" carefully. This might involve having items of information investigated by district personnel, conferences with the applicant, frequent requests for additional information, and coordination with other sections. Estimates of building costs and of labor and output in proportion to floor space were checked against
30
indices. These indices showed average costs per square foot for different types of structure, number of square feet per worker, output per worker, proportion of workers in each category, and other similar averages as reported by facilities already in operation. Careful checking might well result in scaling down schedules materially and thus save money for the taxpayers.

30. Ideas on indices were gained from an article by T. P. Wright, Chief Engineering Office, Curtiss-Wright Corp., "50,000 Planes a Year . . .," Aviation, July 1940, pp. 34 ff.

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After IPS had reviewed and revised the application and appendix "A," it prepared the "processing IOI" for the Office of the Chief of the Materiel Division and higher authorities. This was essentially a justification of the project. It stated the necessity for expansion, justified the proposed location, showed that labor and transportation would be available, and defended the estimates of costs.³¹

Experience soon revealed that numerous special matters of law, Army regulations, and business practice were involved in processing applications for facilities and negotiating facilities contracts. There were, for examples, the nice matters of whether reconversion costs should be included, how "off-leasehold" facilities (railroad spurs, power lines, water mains, etc.) should be paid for, the form of option, and the rate of interest. To handle such matters a special Facilities Branch was formed to operate in October 1940 in the Judge Advocate's Office at Wright Field.³² It functioned as a branch of Contract Section and later, when the division was formed, of Procurement Division, Maj. R. C. Harmon was chief of Facilities Branch and Capt. R. L. Pastner shortly became assistant chief. Both served in these capacities during the entire period of the war. Facilities Branch and Industrial Planning Section did an exceptionally good job of coordinating their activities.

Facilities procurement also called for participation on the part of the districts. According to the old pre-W-Day plans, when the day should come, procurement was to be decentralized from Wright Field to the districts.

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31. All these documents, including the application, app. "A," and processing IOI, went through a long process of evolution.
32. Mat. Div. Notice, 23 Jan. 1941, in ATSC 321.9, IPS; Proc. Div. Notice, 1 Jan. 1943, in Facil. Office, RCS.

When the day did come, this simply could not be done.³³ The districts had neither the organization nor the personnel. Furthermore district procurement would have been extremely inconvenient, especially in the earlier part of the emergency when the prime task was to expand the big aeronautical and accessory plants and line up big automotive and other concerns as subcontractors thereof and expand their facilities. Some of these big companies had branch plants in other districts and proposed to erect new facilities in other districts from that of the parent plant. Prime contractor and subcontractor often were in different districts. Moreover, the big companies preferred to deal directly with Wright Field or with Washington.

However, the districts were reorganized and built up.³⁴ In 1939 the former independent Inspection Districts and Procurement Planning Districts were consolidated into Procurement Districts. The old planning personnel were shortly organized into Industrial Planning Sections, and from time to time other sections and branches were set up. In general each district was given an organization closely paralleling that of Wright Field, and each section was given functions in conjunction with the corresponding section at Wright Field. Each section in the district was under the supervision and direction of its counterpart at Wright Field, subject to

33. Notes on Industrial Planning Policies, 12 Dec. 1938, in RCS 300.9, Functions of IPS (Previous Years); draft IOM, Brig. Gen. Geo. E. Brett, Chief, Mat. Div., to Asst. Chief, 2 Jan. 1940, in ATSC 381, IPS. No record has been found of a formal decision in favor of centralized procurement.

34. General account of district reorganization in History of the Army Air Forces Materiel Command, 1926 through 1941, pp. 20-36.

AAFHS-40

60

the coordinating and supervisory power of the District Supervisor at one end and the Assistant Chief of the Materiel Division at the other. All official correspondence between the district and Wright Field went through these officers, and technically the District Supervisor was responsible to the Assistant Chief for all the official acts of his subordinates.³⁵

With the important qualification just mentioned, then, district Industrial Planning and Production Engineering Sections assisted their counterparts at Wright Field in procuring facilities. In the earlier part of the emergency and war period, the district Industrial Planning Section acted only on individual matters referred to it by Wright Field; applications and appendix "A"s came directly to IPS, Wright Field, without having been investigated or reviewed in the districts, and representatives from Wright Field went out into the districts to make independent investigations or visits and did not always remember to coordinate with the district offices. Later the districts gained more important functions.³⁶

The growing volume of facilities matters led to the establishment of a Facilities Section in the Office of the Chief of the Materiel Division in Washington, on 25 October 1940.³⁷ Maj. F. M. Hopkins, Jr., was made chief and Lt. J. C. Vaughan his assistant. They served long in these capacities, during the entire period of the war.³⁸ Facilities Section,

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35. Mat. Div. GO #9, 28 Dec. 1939; Mat. Div. FOM No. 1, 11 Dec. 1941. By an exception to the rule in the text, correspondence might pass directly between an Air Corps Factory Representative and Wright Field, with only copies to the District Supervisor.
36. See pp. 188-94.
37. Mat. Div. Notice No. 58, 25 Oct. 1940, quoted in LF Notice, 1 Nov. 1940, in ATSC 321.9, IPS.
38. See below, p.197.

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AAFES-40

61

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Washington, and IPS, Wright Field, worked together very smoothly. Aside from the usual staff functions of preparing instructions and framing policies for IPS, it was the principal function of Facilities Section in the capital to get the projects that had been processed at Wright Field approved by higher authority and the necessary funds "set up." On one occasion Major Hopkins in a personal note to Colonel Schneeberger subscribed himself "Your Man Friday."

The Army supply services in facilities matters, as well as in procurement in general, operated under the direction of the Assistant Secretary of War or, as he was designated after December 1940, the Under Secretary of War. From July 1940 on, Judge Robert P. Patterson³⁹ filled that key position. The Purchase and Contract Branch in his office dealt with legal aspects, and Warren S. Ege was made special assistant to the Under Secretary in the premises. A Facilities Section, of the Industrial Planning Division, and an Industrial Sites Board were organized to review plans and locations.⁴⁰ The important roles of the Office of the Under Secretary of War (OUSW) in facilities expansion will be amply illustrated later.

In April 1941 the Office of Assistant Secretary of War for Air was revived, and Robert A. Lovett was appointed to the position. He did not have any direct official responsibility for expanding industrial facilities, but he participated in many important conferences relating thereto and

39. In July 1940 Patterson resigned as judge in the U. S. Circuit Court of Appeals.

40. The nomenclature was fleeting. It became successively the Sites Location Board and the Facilities Board.

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AAFHS-40

62

gave much personal assistance to responsible officers.

The organization and procedure for expanding production facilities for Air Corps materiel at government expense may now be briefly summarized as they existed early in 1941.⁴¹ They have continued in most of their essential features until the time of this writing, as of the end of the European war. There have been changes in nomenclature, some shifts in functions, and some new agencies and controls; these will be described later.

Most of the big projects were originated in Washington in conferences and consultations among William S. Knudsen, Under Secretary of War Patterson, key men in the Aeronautical Section of OPM, General Arnold (Chief of the Air Corps), and Brig. Gen. Oliver P. Echols (Chief of Materiel Division) after 1 December 1940.⁴² Other early projects were initiated by PES, Wright Field. On an early occasion when OPM and Wright Field did not see eye to eye on the expansion of certain plants, Colonel Schneeberger inquired of Major Hopkins, Washington, whether OPM had more than advisory powers. The reply was, "Mr. Knudsen is in the driver's seat."⁴³

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41. The development of this procedure was too complicated to trace in detail here. The general process is well illustrated by the following documents filed in Facil. Br., RCS, Process. Proceed. file: memos., Chief, IPS, 10, 15 Oct. 1940, on emergency plant facilities; LI No. 89, Chief, Mat. Div. to Asst. Chief, 8 Oct. (file date 25 Oct.), on "Procedure . . . New Plants or Major Expansions"; memo. for ASW by acting chief, Mat. Div., 16 Nov. 1940; Revised Memo. (on procedure) as Approved by the ASW, 5 Dec. 1940 (reproduced as App. 1 below).
 42. General Echols was preceded by Brig. Gen. Carl Spaatz, who served less than a month, and, before Spaatz, by Brig. Gen. George H. Brett, who also had been very active in facilities matters.
 43. Notes by Lt. Col. F. Schneeberger on conference of 1 Feb. 1941, in Facil. Br., RCS, Process. Proceed. file. OPM's assertion of authority is also illustrated in memo. for Chief, Mat. Div., by T. P. Wright, Asst. Chief, Aircraft Sect., OPM, 15 May 1941; and memo. for H. S. Brown, OPM, by USW, 8 May 1941, in Facil. Br., IPS, file on OPM.

AAFHS-40

63

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At the conclusion of preliminary negotiations, the manufacturer was usually given a supplies contract or letter of intent for what he was to produce with an "escape" clause relating to facilities. An escape clause stated in substance that, if the government should fail to provide adequate facilities by a specified date, the contractor would be relieved in whole or in part of his obligations under the supplies contract.⁴⁴

Armed with a supplies contract or letter of intent and a preliminary commitment with regard to facilities, the manufacturer then made formal application for facilities to IFS, Wright Field. IFS "processed" the application in the manner already described and sent it and supporting documents, most notably a justificatory letter, to Facilities Section, Washington. If Facilities Section approved--and it nearly always did--its next step was to seek the approval of the Chief of the Air Corps. After General Arnold's approval had been obtained, procedure varied somewhat with the plan of financing proposed or permitted.

If DFC financing was indicated, Facilities Section now first sought the informal approval of key men in the Sites Location Board, CUSH, of Aeronautical Section, OPM, and perhaps of DFC. This gained, a sanguine contractor might actually begin construction. The Facilities Section would then send the documents to the Purchase and Contract Branch, CUSW, which would secure the preliminary approval of the Under Secretary and undertake preliminary negotiations with DFC and the manufacturer, with an Air Corps representative probably sitting in. These negotiations having been successful, Facilities Section would request formal approval of

44. AAF Contract Handbook, 800.9.

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AAFS-40

64

all higher authorities.

The Planning Branch, CUSW, would now take the project in hand and secure successively the formal approval of the Sites Location Board of CUSW, the Division of Purchases of OPM (Donald Nelson), the NDAC, the Council of National Defense (a mere technicality), the Bureau of the Budget in the Office of the President, and, finally, the President. After the President had approved, the Bureau of the Budget authorized the War Department to allocate the funds to the Air Corps. The proper authorities in the War Department made the allocation and notified the Office of the Chief of the Air Corps.

The funds having been "set up," the applicant and DPC negotiated a lease agreement. A contracting officer in the Air Corps signed a letter agreement with DPC obligating the War Department to reimburse DPC. The Chief of the Air Corps and the Under Secretary of War approved this "take-out" letter. A copy of this letter was sent to Wright Field. IPS proceeded to get a final appendix "A" from the contractor, and DPC proceeded to supervise the construction and purchase of facilities.

If the project called for an emergency-plant-facilities (EPF) contract instead of a DPC lease agreement, the procedure was quite similar, except of course for the informal, preliminary, and final negotiations with DPC. After the expediting funds had been set up in the manner described for the DPC plan of financing, the contract was negotiated by Contract Section, Wright Field. The contract was then sent through channels to the CUSW for approval. Finally it was returned to Contract Section, Wright Field, for execution, distribution, and administration.⁴⁵

45. Charts showing procedural steps in cases of DPC and EPF financing are attached to IOM, Chief, Facil. Sect., Office, Chief, Met. Div., to Chief, IPS, 23 May 1941, in Facil. Br., PCS, Gen. Proced. file. For one or these charts, see App. 3 below.

AAFHS-40

65

If the project called for construction of a plant by the Corps of Engineers, the procedure was the same as that in case of the EPF contract-- to and including the point of setting up funds. After that presumably only a lease agreement need be signed between the Air Corps and the manufacturer who was to operate the plant.

If the applicant was not seeking direct government financing at all but only tax amortization, the procedure differed materially. The corporation went ahead and built its facilities on the written or verbal assurance of someone in authority, perhaps only of a prime contractor, that the facilities were necessary to national defense. Then he applied for a Certificate of Necessity either to the Tax Amortization Branch, Purchase and Contract Section, OUSW, or to Facilities Branch, Contract Section, Wright Field. In either case the application was processed in Facilities Expansion Branch, IPS, Wright Field. IPS made a recommendation to Contract Section as to the necessity of the facilities to national defense. Contract Section in turn made its recommendation through Facilities Section, Office of the Chief of Materiel Division, Washington, to the Tax Amortization Branch, OUSW. The latter agency approved on behalf of the Secretary of War and sent the application with the required certificates on for the approval of NDAC. NDAC in turn approved and sent the documents to the Bureau of Internal Revenue.⁴⁶ It will be noted that the papers did not have to go through the Sites Location Board, OUSW, or through the Production Division, OFIL. Presumably the matter of location had been taken care of in letting the supplies contracts.

46. Revised Memo (on procedure) as Approved by the AS/W on 5 Dec. 1940, in Facil. Br., RCS, Process. Proceed. file.

AAFES-40

66

~~These procedures were complicated, even more complicated than here~~
described, for some minor procedural steps have been omitted from this discussion in striving after clarity. The complexity may have deterred a few small manufacturers from seeking defense orders, at least in the first year or so when the procedure was unfamiliar. At the end of a long procedural chart showing 26 steps in getting an EPF contract, some wag in the Facilities Section, Washington, added a block inscribed:
"the manufacturer, happy but weary. His trouble is now just starting."⁴⁷
The procedure took time and thus to some extent delayed defense preparations, although it is remarkable how quickly some big project could be rushed through if all key figures approved. The largest segments of the whole period of time were absorbed by the initial negotiations and by the efforts of Wright Field to persuade manufacturers to keep their estimates within reasonable bounds and to present their plans in sufficient detail.

From the viewpoint of protecting the government's financial interest, the organization and procedure thus briefly described had the defect of affording an applicant the opportunity of dealing with agencies separately, one by one, and of playing one off against another. If he should have trouble in getting a commitment from Wright Field, he might plead verbal assurances from Washington or threaten to appeal to "topside." If a decision was made in Washington, which might not have all the facts, Wright Field had to carry it through. If promises were made by PES or Contract Section, IPS was morally obligated to keep them, although if it had been consulted in the first place it might have suggested a more

47. See note 43 above.

AAFHS-40

67

economical alternative. Big corporations sent well balanced teams to Wright Field or Washington to negotiate the teams normally being headed by business executives and manned with lawyers, engineers, and architects. They did not always meet government teams and, when they did, the members of the latter were frequently unaccustomed to working together.⁴⁸

A rather difficult matter to iron out was the working relations of the Air Corps (as sponsor) and the DPC, after the lease agreement had been signed. Various questions arose, such as the voice each should have in determining plans and specifications, authorizing changes and overruns, fixing rents and interest rates, transferring the lease from one lessee to another, and lending or transferring machine tools. Of these matters, the most difficult were changes and overruns.

Because of differences in organization it would have been more economical of time and effort to permit DPC to authorize necessary changes in plans and specifications. DPC quickly built up a corps of resident engineers and always had an engineer on the site or close by while a facility was being constructed or acquired. The Air Corps as a rule did not have a representative on the site, except possibly for an occasional visit, until the facility was in operation. DPC had had an advantage over the Air Corps in building up a field staff.⁴⁹ It did not have to wait for appropriations as did the Air Corps. There was only one DPC for the whole

48. See Procur. Div., ATSC, Annual Report, 1944, pp. 3-5, 14, and Chart 3, in ATSC Historical Office. See below, pp. 225-226.

49. Colonel Schneeberger on several occasions unsuccessfully recommended provision for putting representatives of IPS on the sites during construction. See, e.g., notes on conference with Chief, Facil. Sect., Office, Chief Mat. Div., 1 Feb. 1941, in Facil. Br., RCS, Process. Proceed. file.

AAFHS-40

69

country, while the Air Corps was only one of several supply services. Also, perhaps because it was not limited by Army traditions of chain of command, DPC gave its resident representatives larger authority to act on their own responsibility. However, the Air Corps was putting up a large portion of the money and therefore insisted upon being consulted in the matter of changes. It was responsible for production. Moreover, if a change in plans and specifications should result in the costs exceeding the estimates, it would have to go through the whole tedious process of getting additional funds allocated to the project. If the Air Corps tried to avoid the latter difficulty, as it sometimes did by allowing liberally for "contingencies" in making the original estimates, the manufacturer usually tried to spend the contingency fund, and DPC was not always as zealous in protecting the fund as the Air Corps thought it should be.

Problems such as these of changes and overruns were settled amicably enough by conferences and correspondence among officials of agencies concerned, most notably Colonel Schneeberger, Warren S. Ege (Special Assistant to the Under Secretary of War), John Snyder (Vice-President of DPC), Hans Klagsbrunn (Counsel of DPC), and W. L. Drager (Chief Engineer of DPC). It was agreed that the Air Corps alone would have responsibility for approving the original plans and specifications. DPC representatives might, without reference to the IPS, approve changes provided they did not increase the over-all cost of the facility, of Schedule I, of Schedule II, or of the combined total of Schedules II and III, or if they did not materially alter the character of the facility. Other changes, as well as transfers of leases and loans of tools and equipment, had to be approved

AAFHS-40

69

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by both DFC and IPS. DFC was to submit a monthly progress report to Materiel Division.⁵⁰

Since approvals of the agencies might be given in varying sequence, contractors learned to play one agency against the other. Contingencies continued to give trouble. Other minor differences inevitably occurred as time went by. To facilitate their settlement, DFC finally at the suggestion of IPS stationed a representative, C. C. Van Vechten, in IPS.⁵¹ His tact, care, and sound judgment were very helpful in keeping relations between DFC and the Air Corps smooth and friendly.

Working relations between the Air Corps and the Corps of Engineers, when the latter was constructing facilities under Air Corps sponsorship, were similar to those between the Air Corps and the DFC. But the Engineers were slower in getting facilities started than were private concerns under DFC supervision, and they charged the Air Corps a percentage of the cost of projects for their services. This irked some Air Corps officials, although it cannot be proved that facilities built by the Engineers cost more than those privately constructed. Moreover, the Engineers usually withdrew from projects before they were entirely complete. This was in

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50. The development of this formula can be traced almost day by day in the Process. Proceed. file of Facil. Br., RCS, WF. See especially exchange of letters between William Marbury, Jr., Contract Sect., Office, Chief, Mat. Div., and John Snyder, 17, 18 Nov. 1940; Revised Memo (on procedure) as Approved by the ASW, 5 Dec.; notes by Lt. Col. F. Schneeberger on conference in Washington, 24 Feb. 1941; W. S. Dye to Lt. Col. F. Schneeberger, 1 March (1941); draft, dated 24 March (1941), of letter exchanged between DFC and OUSW; W. L. Drager to Asst. Chief, Mat. Div., att: IPS, 20 June (1941). Minor changes in the arrangement were made later.
51. ICM, Lt. Col. D. A. Graham, Chief, Admin. Br., IPS, LF, to Facil. Br., RCS, in letter's Gen. Proceed. file. Van Vechten established his office at Wright Field on 3 March 1942.
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AAFHS-40

70

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accord with policy. It enabled the Engineers to use their limited staffs to better advantage; also it gave the private lessors who were to operate the plants a freer hand in selecting and arranging tools and equipment, thus utilizing their "know-how" in such matters to better advantage. Withdrawal of the Engineers necessitated, however, negotiation of special-facilities contracts to complete the plants. For these reasons, although opinion was divided on the subject, Air Corps project officers in general preferred to work with DPC.⁵²

Another matter of interagency relationships that had to be worked out was the sponsorship of expansion of those facilities which were designed to produce both for the Army Air Corps and the Navy Bureau of Aeronautics. This was settled amicably at the start and gave surprisingly little trouble thereafter. At a conference held in the office of Brig. Gen. George H. Brett, Chief of Materiel Division, on 10 October 1940, it was decided that in each case sponsorship would be by the service which would claim the larger share of the product and, where expediting funds should be used, expense would be divided between the two in the same proportion as the product should be divided, measured according to value.⁵³ In actual practice the Air Corps expended approximately the same amount of expediting funds for facilities to produce materiel for the Navy Bureau of Aeronautics as

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52. ICM, Chief, IPS, to Chief, Facil. Sect., Office Chief, Mat. Div., 26 July 1941, in Facil. Br., RCS, Gen. Corres. file; draft report of W. J. Keary to Dep. Chief of Staff, Mat. Comd., 27 July 1943, in Facil. Br., RCS, Gen. Proced. file; interview with Brig. Gen. A. E. Jones, Chief, Procur. Div., Mat. Comd., 29 Nov. 1943, in ATSC Historical Office; Stenographic report of WF conference of 11-13 Jan. 1944, p. 14; TWX, Chief, Facil. Sect., Mat. Div., Wash., to Chief, IPS, 25 Feb. 1942, in Facil. Br., M2S, Policy file.
53. Memo filed as of 10 Oct. 1940 in Facil. Br., RCS, Gen. Corres. file; notes by Lt. Col. P. Schneeberger on telephone conversation with Maj. F. M. Hopkins, 18 Jan. 1941, in Facil. Br., RCS, Gen. Proced. file.
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the Bureau expended for facilities to make materiel for the Air Corps; consequently, neither service called upon the other for reimbursement.⁵⁴

A somewhat more difficult question to settle was what agencies should expand or sponsor the expansion of industries producing materials for munitions (as distinguished from munitions themselves) such as aluminum, magnesium, steel, synthetic rubber, and plastics, and those industries producing "common components" of different types of munitions, for example spark plugs, magnetos, gears, and valves. The general principle adopted was that expansion of any particular branch of industry should be sponsored by that service which would have a preponderant claim upon the product of the industry. Preponderant interest was sometimes difficult to establish, and there was a considerable amount of pulling and tugging among the services over some branches of industry. Some expansions were made by DPC or RFC without the sponsorship of any supply service and in some cases OPM or its successor, the War Production Board (WPB), acted as sponsor. Under the general arrangement the Air Corps, in the earlier part of the emergency period, acted as sponsor for the expansion of the aluminum, the magnesium, and other branches of industry producing materials of which there were critical shortages.⁵⁵ Later, sponsorship for expansion in some of these

54. Memo for Lt. Col. H. A. Friedlich, Chief, Contracts and Facil. Div., CUSM, by Brig. Gen. F. M. Hopkins, Jr., 22 Dec. 1944, in Facil. Br., M&S, Policy file.

55. On this whole subject see AAF Historical Study (in preparation), "Light Metals and Other Critical Aircraft Materials: the Participation of the Army Air Forces Materiel Command in the Expansion of Facilities, Production Control, Development, and Conservation of Light Metals and Other Critical Aircraft Materials during the National Emergency." The draft of the study was prepared by the ATSC Historical Office in Aug. 1944. To avoid duplication of effort, matters discussed in the above monograph are considered in the present study only to the extent necessary for clearness.

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ALPHS-40

72

materials industries was taken over by WPB.

There were to be numerous changes later in the organization and procedure for expanding industrial facilities, but none of great consequence until after by far the greater part of the industrial expansion for war purposes had been accomplished.

AAFES-40

Chapter V

PROCUREMENT OF AIR CORPS FACILITIES
TO DECEMBER 1941

The first big facilities contracts were signed in the late summer of 1940. At that time the Army, Navy, and British procurement programs called for approximately 33,000 planes by about April 1942.¹ The productive capacity goal for all services was tentatively set at 50,000 planes a year and was to be achieved by an indefinite date.² Current productive capacity was estimated at 10,000 planes a year, at the highest; our plants were not then operating at maximum capacity.

For a couple of months the officials responsible for the procurement of facilities gave practically all their attention to airframe-assembly and engine plants to the comparative neglect of facilities for propellers, turrets, and other items.³ This was as it should be; for the engine and assembly plants required a longer period to build and tool. Procurement staffs were small, procedures were new, contract forms were being devised. First things must come first. It is doubtful that the staffs concerned with facilities ever worked under greater pressure than they did from late summer of 1940, on into the summer of 1941.⁴

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1. Memo for William S. Knudsen, WDAC, by R. P. Patterson, AS/W, 10 Aug. 1940, in Lyon, Book 37. Others stated the programs with minor variations from this number and date.
 2. The President's message to Congress, 16 May 1940; T. P. Wright, "50,000 Planes a Year. How Much? How Long?," *Aviation*, July 1940, pp. 34 ff. That not all high officials took the President's goal seriously may be seen in numerous documents in Lyon, Book 37.
 3. Notes by Lt. Col. P. Schneeberger on conference held in office of Col. O. P. Echols, Asst. Chief, Mat. Div., 31 Aug. 1940, in Facil. Br., RCS, Gen. Corres. file.
 4. Lt. Col. P. Schneeberger to R. W. Clark, NDAC, 26 Nov. 1940, in Facil. Br., RCS, Gen. Corres. file.

The procurement authorities turned first to the larger aeronautical companies. This action was dictated by the circumstances that the big companies had designed and were developing the planes the Air Corps wished to buy and must buy and that only they had the aeronautical engineers who knew how to design and build such planes. Moreover, it took big plants to assemble big planes.⁵ The Air Corps felt morally bound by its agreement of 1938 to use automotive concerns only as subcontractors to the aeronautical companies.⁶

Both the Air Corps and the NDAC Airplane and Engine Section expected in the summer of 1940 to be able to achieve the desired capacity for producing airframes by expanding the facilities of the aeronautical companies. They undertook to increase the floor space of assembly plants by 200%--approximately 250% in case of the larger companies and only 60% in case of the smaller ones. By placing these expanded facilities on a three-shift basis, when the emergency should demand, they could get an increase in production of about 400% over current production and thus an output of the desired number of planes. Since these calculations involved only straight multiplication, it is clear that the authorities expected the production of airplanes to remain largely a handtool industry; they made no allowance for the further introduction of methods of quantity production. They believed the smaller companies could best serve as makers of training and light cargo planes, leaving the combat planes and heavy transports to the larger concerns. They expected the companies to increase their current rate of subcontracting somewhat and expected to expand the facilities

5. Data prepared for use of the C/AC and Chief, Mat. Div., in appearances before the Truman Committee, filed under date 26 March 1941, in Lyon, Book 69.

6. See p. 17.

AATHS-40

75

of subcontractors, although not necessarily in the same proportions.

The first formal letters were sent out on 15 July 1940 from the Office of the Chief of the Air Corps to thirteen companies allocated to the Army.⁸ In most cases informal negotiations had preceded. The letters stated what the Air Corps expected the respective companies to manufacture and requested their estimates of new buildings and machinery required to meet the proposed schedules, figuring on the basis of two eight-hour shifts. Negotiations proceeded apace. Before the end of August the proposals of five of the companies had been processed and the approval of higher authorities secured. The expansion proposals of six others were approved in September and those of the remaining two in October. Facilities contracts, in cases where government financing was chosen, were signed on various dates from August to December.

These early decisions largely set the pattern for airframe construction throughout the war and, therefore deserve individual mention. The Boeing Airplane Company undertook to expand its Seattle plant at an originally estimated cost of \$7,368,849.43 for the purpose of increasing its production of B-17's,⁹ and to build at Wichita, Kans. a smaller plant

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7. MDAC, Airplane Division Report No. 4, 1 July 1940, prepared by T. P. Wright and A. E. Lombard, Jr., in Lyon, Book 22; memo to AS/W by Lt. Col. Ira C. Eaker for C/AC, 17 June 1940, in Lyon, Book 42B; article by T. P. Wright cited in footnote 2.
 8. Index of early correspondence, filed as of 10 Sep. 1940, in Facil. Br., RCS, Gen. Corres. file; Dr. George J. Lead, Dir., Aeronautical Sect., MDAC, to Brig. Gen. George H. Brett, 12 Aug. 1940, *ibid.*
 9. The amount given is that of the original EPF contract without interest. In the usual case there were changes, later additions, and overruns.

AFHS-40

76

((\$3,367,943) for the purpose of making sub-assemblies.¹⁰ The Glenn L. Martin Company undertook to enlarge its Middle River (Baltimore) plant by about 50% (\$22,576,503.50) for the purpose of constructing B-26 medium bombers and increasing production of Navy PB-1's and other planes. It was also promised a large new plant at another location to build additional B-26's. North American Aviation was to have new tools for its Inglewood, Calif. factory (\$2,270,405.77) to enable it to make B-25 medium bombers. It was also to have a new plant at Dallas, Texas (\$7,133,605) in which to make advanced trainers. The Douglas Aircraft Company engaged to construct a new factory in Long Beach, Calif. (\$11,379,700) and to meet a schedule of 330 light bombers (A-20's) a month. The Lockheed Aircraft Corporation, which had already been expanded considerably under British auspices, was to make a further small expansion of its facilities in order to increase production of P-38 fighters from 22 a month to 125. The Bell Aircraft Corporation engaged to add a new assembly plant to its existing facilities in Buffalo (\$1,023,200) to enable it to increase its schedule of P-39's. The Curtiss-Wright Corporation got the largest expansions. It was to expand its Buffalo facilities and build two new factories, one at St. Louis and the other at Columbus, Ohio, for the purpose of increasing production of P-40's and other airplanes. The first contracts for the three totaled \$37,078,000. The Republic Aviation Corporation agreed to make a

10. Data for this statement and the similar statements which follow in regard to other projects have been collected from various sources. The principal ones are correspondence with the various companies, on file in Facil. Br., RCS, WF, under names of respective companies; "Tentative Report on New Productive Capacity . . . 12 Sep. 1940," in Facil. Br., RCS, Gen. Corres. file; a report of the transactions of Facil. Br., Procur. Div., WF, to 1 May 1943, copy on file in Historical Office, AF; AF Facilities Expansions, Status, Progress, and Performance, a monthly report prepared by RCS, AF.

AAFES-40

77

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large expansion at Farmingdale, Long Island (\$5,125,513.50), for the purpose of increasing its output of P-47 fighters from 13 to 65 a month. Vultee Aircraft, Inc., undertook to expand (\$4,259,798) its plant in Downey, Calif., where it made basic trainers. Ryan Aeronautical Company, San Diego, Fairchild Engine and Aircraft Corporation, Hagerstown, Md., and Beech Aircraft Corporation, Wichita, Kans., all of which were to manufacture training planes, received smaller expansions. Consolidated Aircraft Corporation was allocated principally to the Navy. Several of the smaller airplane companies were not given new facilities at this time.

Negotiations with airplane engine manufacturers moved somewhat more slowly.¹¹ The Wright Aeronautical Corporation was authorized in August to build a new plant at Lockland (near Cincinnati, Ohio) at an estimated cost of over \$37,000,000 for the purpose of manufacturing R-2600 engines. The Packard Motor Car Company engaged to convert a Detroit plant to make Rolls Royce V-1650 (Merlin) engines, two-thirds for the British, one-third for the United States. The original plan called for an expenditure of \$20,000,000 divided in the same ratio, and the United States' portion was processed in September at \$8,000,000. Allison Division, General Motors Corporation, Indianapolis, made an equally large expansion. NDAC managed to bring in the Ford Motor Company in September, as a licensee of Pratt and Whitney, to build a modified version of the P & W R-2800 engine. Ford was to have a new plant adjacent to its River Rouge plant at Dearborn, Mich., originally estimated to cost \$21,712,120.43. The Lycoming Division,

11. Memo for William S. Knudsen, by R. P. Patterson, US/W, copy inclosed in ICM, Chief, Pat. Div., to Chief, IPS, 10 April 1941, in Facil. Br., RCS, Ford Motor Co. Ypsilanti correspondence.

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AMFES-40

78

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Aviation Corporation, got an emergency facilities contract in amount of \$1,578,991.31 to tool up its plant in Williamsport, Pa., to make R-680 engines for training planes.

A few of the companies named above chose to finance their own expansions and amortize the costs for tax purposes, most notably Allison Division. Most of them, however, applied for government financing. The earlier contracts were of the emergency-plant-facilities (EPF) type, but shortly thereafter DPC financing asserted its superior attractiveness. The amounts of the first contracts were usually points of departure rather than absolute limitations; seldom did a company keep within the original estimate. Large as were the costs of these early expansions, they were small compared with costs of some of the later ones.

As soon as the companies got their contracts or letters of intent, or even earlier, they hastened to begin construction and to place their orders for machine tools. Similar expansion was being made for the production of other items of munitions, such as ordnance and naval vessels. Orders for the new defense plants, in addition to above-normal peacetime demands, put a strain upon the machine-tools industry, especially the more favored firms. The industry was loath to expand lest the boom should not last. It drew heavily upon subcontractors and, perhaps in an effort to stave off compulsory priorities, began of its own accord to give priorities to orders for defense plants. The public began to speak of a "machine-tools bottleneck," the first of a long list of bottlenecks.¹² The fact did not escape notice, however, that it was only the general

12. New Republic, 103:780 (9 Dec. 1940).

~~RESTRICTED~~

AAPHS-40

79

machine tools industry which was being pushed; the so-called "captive" tools industry, that is, shops that served particular branches of manufacture (most notably the automotive), had not yet been drawn into defense work in any large way.

At this juncture came demands that our airplane programs be increased. The Battle of Britain with its revelations of the effectiveness of bombing put new emphasis on the need for bombers. Defense Commissioner Knudsen spoke of 12,000 bombers, a number not included in current programs. At the height of the presidential campaign, President Roosevelt promised Great Britain 20,000 airplanes.

On 15 October Knudsen appeared before a meeting of automobile and truck manufacturers in New York City, called at his instance,¹³ and on the 25th before a larger meeting in Detroit which included also representatives of the body manufacturers, the parts and equipment manufacturers, and the tool and die makers for the industry.¹⁴ He told the assembled manufacturers that the vastly expanded airplane industry would shortly be overtaxed, "and the bottleneck is tools." Specifically he asked the manufacturers to give "consideration" to subordinating model changes in 1941 to the needs of the airplane program. He asked them "to tackle the possible dies and stampings for four thousand 4-motor bombers, weighing 40,000 pounds gross, and eight thousand 2-motor bombers weighing 24,000

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- 13. Account of New York meeting and call of the Detroit meeting in Automobile Manufacturers Assoc., President's Defense Bulletin No. 1, 17 Oct. 1940, copy on file in ATSC Historical Office.
 - 14. Full report of Detroit conference by an AC officer, 29 Oct. 1940, in Lyon, Book 48, also Auto. Manufs. Assoc., President's Defense Bulletin No. 2, 25 Oct. 1940 and subsequent numbers. See App. 6, below, for Knudsen's statement in Detroit.

AEPES-40

80

pounds gross, assembling to be done by airplane manufacturers" and to "consider not only pieces but sub-assemblies." He asked for a steering committee of four from the automotive industries to work with two men from the airplane manufacturers in studying the production problems involved in transferring manufacturing "from bench to machine." He asked for a survey of "equipment now in place" for die work and of "plant facilities available for jig assembly of minor assemblies such as wings, ailerons, tail surfaces, rudders, etc." He asked for an investigation of the forgings situation, both aluminum and steel, and of facilities available for machining such forgings. Knudsen said nothing at these meetings about new facilities. The understanding was that the companies would need no new buildings and for the time, at least, would use tools already on hand and such tools as their own tool and die makers could provide. Later, when the tools situation should have eased, they might get new machine tools.¹⁵

It is to be noted that Knudsen did not ask the automotive industry to convert for airplane production in any wholesale fashion. He did not ask the industry to curtail production of motor vehicles in any degree. His objective, as stated, was a limited one.

The record indicates that the initiative for the automotive program, limited as it was, came from Knudsen himself rather than the Air Corps or the War Department. The Air Corps had asked for two new government-owned bomber plants for stand-by purposes, one for assembling heavy bombers,

15. Report of 20 Oct. 1940, par. 8c, in Lyon, Book 48.

AIFES-40

81

the other mediums. Knudsen proposed utilizing the automotive companies to make parts and insisted that the companies which were to operate the assembly plants must have orders both to enlist their interest in the plants and to build up working organizations. The Air Corps, more or less reluctantly, went along.¹⁶

The makers of motor vehicles, at the New York meeting, pledged themselves "to render their productive facilities available to the National Defense Program to the extent that these may be utilized" and resolved "That in this period the manufacturers of motor vehicles, the tool and die makers and automotive body producers should subordinate work on automotive model changes to the necessities of the Defense Program and specifically to aviation procurement."¹⁷ At Detroit the assembled manufacturers created an "Automotive Committee for Air Defense," which, in turn, was to develop an organization to make the requested surveys and production studies. The government bore the expense. Wright Field and the Glenn L. Martin Company sent numbers of detailed drawings and actual parts to Detroit, which were exhibited to eligible persons at the headquarters of the Automotive Committee.¹⁸ The Committee retained W. F. DeGroot, aeronautical engineer, as technical adviser.¹⁹ The manufacturers

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16. The Air Corps' part in the inception of the so-called Automotive Program can be traced in Lyon, Book 48. See especially memo for R. P. Patterson, S/W, by Maj. Gen. H. H. Arnold, 4 Oct. 1940; memo for S/W by General Arnold, 26 Oct.; and "Notes on the Construction of Aircraft Facilities," filed as of 14 Oct.
 17. Printed text of "A Resolution Offering Automotive Industry Facilities . . . Adopted at a Meeting in New York City, October 15, 1940," copies in ATSC Historical Office and Lyon, Book 48. The italics have been supplied.
 18. Auto. Manufs. Assoc., President's Defense Bulletin No. 3, 30 Oct. 1940; interview with E. A. Burd, Manuf. Methods Br., RCS, who served as a Wright Field representative.
 19. Auto Manufs. Assoc., President's Defense Bulletin No. 6, 5 Nov. 1940.

AFHS-40

82

were informed that the B-26 and the B-24 had been tentatively approved for standardized construction of subassemblies by the automobile companies.

The actions of Knudsen and the motor-vehicle manufacturers, which were perhaps too well played up by the press, stirred public imagination and caused great expectations.²⁰ They no doubt also had something to do with the announcement of the "Reuther Plan."

In December 1940 Walter Reuther, an official of the CIO United Automobile Workers of America, outlined a plan whereby, he said, the automobile industry within six months could be turning out fighter planes at the rate of 500 a day and that without interfering with normal production of motor vehicles. His plan was predicated on the over-expansion of the automotive industry. He said the industry was equipped to turn out 8,000,000 cars and trucks a year but actually produced only 4,000,000. The essential features of the Reuther Plan were these: (1) forgoing the customary model changes for the automotive year 1942 in order to release the tool and die makers for tooling up the plants for aircraft production, (2) "pooling" the machine tools of the industry so that specific tools could be moved from one plant to another as needed, and (3) formation of a management-labor committee to supervise the institution and working of the plan.²¹

It is evident that from the viewpoint of the procurement authorities the Reuther plan was based upon misconceptions. First, the aid of the automotive industries was being sought for the production of bombers rather

20. Business Week, 2 Nov. 1940; New Republic, vol. 103, p. 659 (11 Nov. 1940), and p. 868 (23 Dec. 1940).

21. Time, 30 Dec. 1940, p. 13; New Republic, 104:236 (17 Feb. 1941).

AFHS-40

83

than fighters. Second, the Air Corps felt morally bound by agreement to employ the automobile companies only as subcontractors of the aeronautical firms. Third, the procurement authorities were not envisaging the need for production of aircraft in such vast numbers as Reuther claimed to be possible. However, the Reuther plan had obvious merits. That the automobile industry had great surplus capacity was commonly known. Its tool and die makers were not currently engaged in defense work although they were badly needed. And a large proportion of automotive tools could be adapted to aeronautical work. This Knudsen had already assumed. It had already been demonstrated in several individual cases, where firms had taken subcontracts for airplane parts and had worked production right into their regular production lines.²² It was amply demonstrated when, after the attack on Pearl Harbor, the automobile industry was forced to convert and did so to a remarkable degree and in a remarkably short time.²³ Certain high officials in the War Department and the NDAC were said to be favorably impressed by the Reuther plan, but eventually it was rejected in toto.

The automotive concerns were not drawn very far into defense work before the declaration of war in December 1941. The industry produced more cars and trucks in 1941 than in any former year of its history except 1929 and did not taper off production until late in the year. It thereby used materials, skilled labor, engineering talent, and highly able managers that might otherwise have been employed in the production of munitions. The

22. K. T. Keller, president of Chrysler Corp., told the Detroit meeting of Chrysler's experience. Report, 29 Oct. 1940, in Lyon, Book 48.
23. Polow, pp. 120-124.

ANES-40

84

industry tooled up for 1942 models and until tooling was complete (about October 1941) largely withheld its tool and die makers from defense work. In the main, insofar as automotive concerns were drawn into defense work at all before Pearl Harbor, they got new tools and new plants, although there were numerous cases of partial conversion.²⁴ What was true of the automotive industry was also true of the other durable goods industries that produced for the competitive civilian market.

As the defense program lagged and especially after the outbreak of war, when people became more aware of deficiencies, there were criticisms and re-criticisms over the delay in conversion and demands that responsible heads roll. Where lay the fault? The explanation was not simple.

For one thing, in the fall of 1940 and for months thereafter, the Air Corps, as one service, simply did not have adequate designs for all-out production, although presumably it could provide them as fast as facilities could be provided.²⁵ Engineers were working almost night and day.

Automobile factories could not be used for airplane assembly plants, at least not without extensive alterations. They did not have great enough clearances or long enough assembly lines. If new assembly plants must be built, there was no great point in hastening conversion of the automobile factories for the purpose of making parts and subassemblies; for it would take considerably longer to build and equip the new assembly plants. Enudsen estimated the time at 20 months.²⁶ It actually

24. S. Rept. No. 480, 77 Cong., 1 sess., app. II, pt. 5, pp. 191 ff. (Truman Committee).

25. Numerous documents in Lyon, Book 48, dealing with choice of planes for the automotive program.

26. Memo for AS/W by Maj. Gen. H. H. Arnold, 4 Oct. 1940, in Lyon, Book 48.

took several months longer.²⁷

To some extent the government plans of financing facilities contributed to contractors' preference for new construction as distinguished from conversion. For reasons already stated the DFC plan of financing had become the preferred plan. But DFC did not like to assume rehabilitation costs such as those of moving partitions and strengthening floors in privately owned buildings, for such costs were 'non-recoverable.' Under some pressure DFC consented to accept such costs to an amount not in excess of 5% of the total cost of a project. DFC, as well as the War and Navy Departments, refused generally to pay reconversion costs, that is to put contractors' buildings and machinery back in their former state after the emergency should have ended.

The aircraft companies, holding the prime contracts, did not propose to subcontract work as long as there was any reasonable possibility of doing it in their own plants or in plants they could induce the government to provide them.²⁸ They were especially anxious not to subcontract to companies that might learn to be postwar competitors.

The automobile manufacturers were naturally loath to give up any part of the best business they had had for years. One company could not or would not convert and forgo car production and lose customers unless all would do so pari passu. One company could not refrain from making 1942 model changes unless all its competitors would agree to do the same.

27. Below, pp. 223-224.

28. Business Week, 8 June 1940, pp. 51-54; pamphlet, Factors Which Affect Increased Production and Unit Costs of Military Aircraft, Engines and Accessories, a report of the . . . National Research Council Committee on Aircraft Production . . . , 9 July 1940, pp. 19, 25.

In short, nothing but government compulsion could bring about wholesale conversion of the automotive and other durable goods industries. And to that neither NDAC, OFA, nor the departments were willing to resort in any effective fashion before our formal entrance into the war.

Public opinion was befuddled and divided on the conversion issue. The automotive companies gave out that only 10% or 15% of their tools could be used in other sorts of production²⁹ and that their plants could not be adapted to the assembly of wings, tails, and noses. They managed to raise the "socialistic" bogey by playing up Reuther's proposal of "pooling" tools and his demand for labor participation in planning.³⁰ Reuther certainly did not speak for all of labor. It was perhaps the more common labor view that defense work should utilize new facilities and currently idle buildings and absorb the labor currently unemployed before making inroads upon active industry.³¹ A large section of the public, including elements strongly interventionist, insisted we could have both guns and butter.³² The President was understood to hold the contrary view and to prefer guns; but he did not intervene.

Although there was no wholesale conversion of the automotive and other durable goods industries for over a year, the Knudsen Automotive Program was carried through in modified form.³³

It was decided to build four bomber assembly plants, two for assembling

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29. The actual percentage in June 1942, after a large measure of conversion, was over 66, according to the Automotive Council for War Production as quoted in Business Week, 13 June 1942, p. 15.
30. "The Reuther Plan--Up for a Revival," in Business Week, 6 Dec. 1941.
31. New Republic, vol. 103, pp. 800 (18 Dec. 1940), 883 (30 Dec. 1940).
32. Ibid., vol. 103, p. 474 (7 Oct. 1940), vol. 104, p. 251 (17 Feb. 1941).
33. The successive changes can be followed in Lyon, Books 48, 42B. See also note 10, above.

AAFHS-40

87

heavy bombers and two for mediums, instead of one plant for each type as originally planned. The change was made because it was feared the cities originally selected as sites could not furnish adequate labor for plants so large as they must be if only two were to be built. There is an implication in the documents also that officials believed four plants in four towns would make it easier to step up production if that should prove desirable. The two medium bomber plants were designed with large enough clearances to permit change-over to production of heavy bombers. All were planned on a large enough scale to permit them to meet their schedules with only one eight-hour shift. The automotive companies enlisted in the Knudsen Program got new plants and machine tools to a considerably greater extent than Knudsen intended at the start.

According to the Knudsen plan as finally worked out, the Glenn L. Martin Company was to operate the government-built assembly plant at Omaha and there assemble 100 B-26 medium bombers a month from parts and subassemblies to be manufactured by the Chrysler Corporation in Detroit, the Hudson Motor Car Company, Detroit, and the Goodyear Aircraft Corporation, Akron. It was understood that engines, propellers, and many items of equipment would be made elsewhere. Chrysler, Hudson, and Goodyear were to get DPC financing for new tools and rehabilitation of buildings but not for new buildings. Chrysler, however, undertook to erect a new building and finance it privately. Martin was to retain engineering control. North American Aviation was selected to operate the second medium-bomber assembly plant at Kansas City, Kans., where it undertook to assemble 100 B-25's a month from parts and subassemblies to be made by North American itself, Fisher Body Division of General Motors Corporation, and other subcontractors to be marshalled by Fisher.

AAVES-40

88

Body got DFC financing for new tools and rehabilitation costs for plants in Detroit, Muncie (Ind.), and Memphis.

Tulsa and Fort Worth were selected as sites for the two heavy-bomber assembly plants. Douglas Aircraft was chosen to operate the Tulsa plant and Consolidated Aircraft Corporation the one at Fort Worth. Each was to assemble 50 B-24 bombers a month from subassemblies to be made by the Ford Motor Company. Consolidated, which was already making B-24's in San Diego, was to have engineering control. Ford Motor was to make 100 "knockdown" sets a month consisting of complete wings, complete tail, main landing gear, nose landing gear, and fuselage. It was to have DFC financing to the amount of \$2,303,000 for conversions in its River Rouge Plant, Dearborn, and to the amount of \$7,054,254 for a new plant at Willow Run, near Ypsilanti, a small town 32 miles west of downtown Detroit. Almost certainly Ford was already planning to try out mass production methods on complete bombers, although this does not appear in available records. Within a few weeks of the original arrangements, the company requested and received permission to abandon the proposed conversions at River Rouge and concentrate all the operations at Willow Run. It is also to be noted that Willow Run was far enough from Detroit to permit the construction of an airfield, a feature of no use to a subassembly plant.³⁴

The several automobile companies involved in the Knudsen Program were

34. Wibel [Ford] to Asst. Chief, Mat. Div., att. Contracting Officer, 3 Feb. 1941, and Exec., AF, to Exec., Mat. Div., Wash., 8 Feb., in Facil. Br., RCS, Ford-Ypsilanti Corres.; notes by Lt. Col. P. Schneeberger on conference with Maj. James H. Doolittle, Asst. Supt., CPD, 28 Feb., and Col. W. F. Volandt to Ford Motor Co., 28 Feb., in Facil. Br., Ford Dearborn Corres.; numerous documents in Facil. Br., MCS, Ford-Ypsilanti file, notably memo for R. P. Fatterson, US/w, by Donald Nelson, 17 Feb. 1941.

given large educational orders to enable them to gain familiarity with problems of aircraft manufacture before entering upon quantity production.³⁵

Intricate negotiations were required to complete the arrangements that have been described in preceding paragraphs.³⁶ The government had to persuade each of the aircraft companies involved to accept the particular automobile companies as subcontractors. The aircraft company and its subcontractors, with government representatives sitting in, had then to negotiate agreements as to (1) what parts and subassemblies each was to make, (2) the licensing of the subcontractors to use aircraft patents, and (3) the flow of engineering information from one to another. In the case of the B-26 tie-up the negotiations involved five parties--the government, Martin, Chrysler, Hudson, and Goodyear. The negotiations on the government side were largely conducted by Dr. George Mead, Chief of the Aeronautical Section of NDAC (later OMA). Only after these negotiations were well advanced was it possible for IAC, Wright Field, to process the applications for facilities.

The choice of Omaha, Kansas City, Tulsa, and Fort Worth as sites for the government-owned assembly plants may be ascribed to several considerations.³⁷ These cities were in surplus labor areas. They were not likely

35. Legislation Relating to the AAF Materiel Program, 1939-1944, p. 69.

36. Not all on record. General outlines can be gained from memo for R. A. Lovett, AS/W for Air, by Brig. Gen. O. P. Echols, on "Negotiations . . . Bomber Automobile Program," 7 April 1941, in Lyon, Book 42B1; Maj. J. E. Doolittle to Asst. Chief, Mat. Div., 9 Jan. 1941, in Facil. Br., RCS, WF, Ford Dearborn Corres.; IOM, Maj. K. B. Wolfe to Chief, Mat. Div., 17 Jan., *ibid*; Ford Motor Co. to Col. W. F. Volandt, 13 March, *ibid*; transcript of telephone conversation between Lt. Col. K. B. Wolfe and Messrs. Ebel and Rowland of Glenn L. Martin Co., Facil. Br., RCS, Ford-Tpsilanti Corres.

37. Memo, for Board of Officers appointed to select sites, 26 Oct. 1940, in Lyon, Book 37; memo for Maj. Gen. H. H. Arnold, by Brig. Gen. G. H. Brett, "History of the Fleet Case," 27 Dec., in Lyon, Book 37; numerous documents in Lyon, Book 48.

AAPHS-40

90

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to have as heavy future demands made upon them by the defense program as the more industrialized regions. Assembly required a smaller proportion of highly skilled mechanics than did parts manufacture, and therefore assembly plants could more safely be located in areas less given to heavy industry. These cities possessed comparatively good flying weather and wide-open spaces for flying fields. And other things being equal, the government preferred to locate such factories deep in the interior for strategic reasons, especially if they were to be retained after the emergency as stand-by factories. Of course, as is usual in the location of such important installations, chambers of commerce and other interested parties exerted what pressure and influence they could to secure the location for their respective cities. These particular plants were planned in a substantial enough style to be kept for stand-by purposes.

Provision for engine manufacturing capacity for both the Automotive Program and the earlier programs was made concurrently with provision for airframe capacity. Washington authorities selected Buick Motor Division, General Motors Corporation, to manufacture 5,000 additional Pratt and Whitney R-1830 engines (for B-24's and other planes), of which 3,000 were to go to the British. Buick was to have a new DPC plant, originally processed in the amount of \$31,075,150. The proposed site was changed from Flint, Michigan, home of Buick's principal works, to Melrose Park, near Chicago, to avoid the labor congestion already threatened in the Flint area. The Wright Aeronautical Corporation plant at East Paterson, N. J., was expanded to increase production of R-1820 engines (for B-17's and others). Studebaker Corporation was brought in to produce R-2600 engines (for B-25's). It was to have three large new DPC plants located at Chicago,

~~RESTRICTED~~

AAFHS-40

91

~~CONFIDENTIAL~~

South Bend, and Fort Wayne; the three were originally processed in the amount of \$49,786,149.

The new facilities for the Automotive and other early programs were set up on a generous scale as compared with the supplies contracts connected therewith. They were designed to build within short periods the numbers of planes or engines the contracts called for and to achieve these heavy schedules while operating at considerably less than maximum capacity. Many were expected to meet their schedules with two 8-hours-per-day, 40-hours-per-week shifts or the equivalent. The purpose of using this basis is obvious. It was anticipated that, if put on a three-shift basis and given some additional tools, the plants could increase their rates of production by 25% or 30%.³⁸

Almost before negotiations for facilities to meet the Automotive Program were complete, new programs were adopted which called for still further expansions. On 11 March 1941, the "E" or "First Defense Aid" program was approved, calling originally for 9,894 planes distributed among the various classes. On 5 April the "C" or "Automotive" program was approved in an enlarged form (5,025 bombers), and in June the "D" or "12,000" program (12,856), the latter including 726 superbombers. As indicated above it was not so much the numbers of planes ordered as it was the schedules that determined the capacity requirements. The total capacity goal was by March increased from 50,000 planes a year to 60,000. The goal for heavy bombers was raised from about 200 a month to 400 a month, and the capacity goals for light bombers, fighters, and other types were

38. Notes by Lt. Col. P. Schneeberger on telephone conversation with Lt. Col. F. M. Hopkins, Jr., 1 June 1941, in Pacil. Br., ECs, Gen. Procd. file.

~~CONFIDENTIAL~~

AAFHS-40

92

considerably increased, although not in the same proportion.³⁹

For these new programs it was not deemed necessary to seek many new contractors for airframes and engines. It was considered advisable to expand the facilities of companies already holding contracts. And since most of the new facilities already contracted for were still incomplete, in some cases not even begun, there was no great difficulty in adapting plans and specifications.⁴⁰ The authorities were able to secure a somewhat larger proportion of conversions than earlier.

Boeing was to get a comparatively small expansion in Seattle to permit increased production of B-17's and eventually to build B-29's, and a large new DPC plant at Wichita for making B-29's (\$17,500,000). Douglas Aircraft was authorized to build a new plant in Long Beach (\$11,254,000) for making B-17's under license from Boeing. This would release Boeing capacity for producing B-29's. Vega Aircraft Corporation, Burbank, Calif., by this time a subsidiary of Lockheed, was also brought in to round out the B-17 combination and was allowed a large expansion with DPC and special-facilities-contract financing. New B-17 facilities were planned so that they could be shifted to production of B-29's when that plane should be ready for production. Ford Motor Company was authorized to enlarge Willow Run by about 200%. It was now scheduled to make 150 "knock down" sets of B-24 subassemblies, instead of 100, and to make 200

39. Notes by Col. A. J. Lyon, 14 March 1941, with reference to secret memo by R. A. Lovett, dated 21 Feb. 1941, in Lyon, Book 42B1.

40. There is a quite complete summary of these expansions in "Detroit's War Load," Business Week, 17 Jan. 1942, pp. 16 ff. See general references in note 10; notes by Lt. Col. Schnoeberger on Program "E", 10 May 1941, in Facil. Br., RCS, LF, Ford-Ypsilanti Corres.

~~RESTRICTED~~

AAFES-40

93

complete, "fly-away" planes a month. The assembly plants operated by Douglas and Consolidated at Tulsa and Fort Worth were enlarged to assemble 75 B-24's each a month instead of the original 50. They were designed to be shifted to making B-32 "Dominator" when that plane should be ready for quantity production. Of these expansions, the highest government priority was given to Ford's Willow Run and Boeing's Wichita.⁴¹

The new programs called for greater engine building capacity as well. Buick agreed to convert some of its Flint plant buildings, at a cost processed at \$10,267,048, in order to increase its production of R-1830 engines from 500 to 800 a month. Ford Motor was requested to increase its schedule for R-2800's from 300 to 600 per month and to further enlarge its new Dearborn engine plant (about \$14,000,000). Chevrolet Motor Division, General Motors Corporation, was now brought into the airplane-engine picture and engaged to construct two new DFC plants, one at Buffalo and the other at Tonawanda, N. Y. (\$37,161,530.10) for the purpose of building P & W R-1830 engines. Jacobs Aircraft Engine Company's plant, at Pottstown, Pa., was to be greatly enlarged (\$13,056,327). Jacobs made engines for training planes.

As soon as they had made arrangements for facilities for airframes and engines under any program, the procurement agencies turned to finding capacities for landing gear, propellers, turrets, and the numerous other items that go into complete military planes. The general story is similar to that for airframes and engines. At the outset a few companies held the patents and had the designers and the manufacturing experience. They

41. IOW, Brig. Gen. O. P. Dehols to Asst. Chief, Mat. Div., 1 May 1941, Annex 4, Facil. Br., ISC, Gen. Inced. file.

AEPES-40

94

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desired to retain their monopolies. Their facilities were usually expanded until it appeared unwise to dilute their managerial and engineering staffs any further. When the government succeeded in inducing them to license other concerns and to subcontract a portion of their work, they sought to throw the work to subsidiaries or favored subcontractors. The latter found difficulties about conversion and applied for new facilities.

When Major Wolfe, Chief of Production Engineering Section, Wright Field, had established the Production Control Branch in June 1939, the designated chief, R. F. Trimbach, told him that oleo struts would be the most critical item.⁴² He was not far wrong. Two firms, Cleveland Pneumatic Tool Company and Bendix Products Division, Bendix Aviation Corporation, South Bend, Ind., made practically all the struts and held most of the patents. Both received large expansions. In the spring of 1941, in connection with the enlarged programs, PEG went on a hunt for new sources and managed to bring in Delco Products Division, General Motors, Dayton, Ohio; Ford Motor Company, in its River Rouge Plant; the A. O. Smith Corporation, Milwaukee; the Menasco Manufacturing Company, Burbank, Calif.; and, on the insistence of Knudsen, the Hughes Tool Company, of Houston, Texas.⁴³ All required new tools. Hughes got virtually a new factory. These new concerns were brought in as suppliers of struts to the aircraft companies. Bendix and especially Cleveland Pneumatic opposed bringing in outsiders. Materiel Division had particular difficulty in persuading the Glenn L. Martin Company to transfer its order

42. Interview with R. F. Trimbach, 26 Oct. 1944.

43. Manuf. Methods Br., PEG, file 452.024; notes of Lt. Col. Schneeberger on conference with Maj. F. W. Hopkins, Jr., 1 Feb. 1941, in Facil. Br., Process. Proceed. file; TWX's Facil. Sect., Wash., to PEG, WF, 22 Jan., Echols to Asst. Chief, 27 Jan., and Facil. Sect., Wash., to IFS, in Facil. Br., PEG, Hughes Tool Co. Corres.

AAFES-40

95

for B-26 struts from Cleveland Pneumatic to Hughes Tool.⁴⁴

Early orders for gun turrets⁴⁵ went to Bendix Products Division and Sperry Gyroscope Company, Brooklyn. Sperry, for one, made many different items and held many patents. Its facilities were greatly expanded, and it was loaded with orders to the limit of its possibilities. Sperry was naturally most anxious not to lose control of anything. It accepted Briggs Manufacturing Company, of Detroit, as a licensee to make turrets. Briggs got a new DFC plant (\$8,848,542.54) but could not give satisfactory assurance about meeting schedules and was indisposed to do enough subcontracting. Materiel Division was anxious to bring in other sources and decided on Emerson Electric Company, St. Louis, and Steel Products Engineering Company, Springfield, Ohio. Sperry and Briggs resisted strongly. Finally Materiel Division "cracked down," Col. K. B. Wolfe bearing the brunt, and forced Sperry to turn over three types of turrets to be placed as Materiel Division might choose.⁴⁶ Emerson was authorized to build a large DFC plant (\$10,529,175), and Steel Products Engineering was given a smaller expansion. Still later General Electric Company came into the turret program in a large way and got new or enlarged facilities at several locations.

44. Lt. Col. K. B. Wolfe to Martin Co., 21 June 1941; Hughes Tool to Martin, 29 July; Martin to Chief, PWS, 8 Aug.; Chief, PES, to Martin, 26 Sep.; and transcript of telephone conversation between Maj. Orval Cook, PES, and Glenn L. Martin, 1 Oct.; all in ATSC Contract files, Contract DA-46.

45. "Development of Aircraft Gun Turrets in the Army Air Forces," draft AAF Historical study.

46. See especially transcripts of telephone conversations under dates of 25, 28 Aug., 24, 25 Sep., 1941, in ATSC 473.5 Gun Turrets; Memo. Rpt. Prod.-H-239, 20 Aug. 1941, in Manuf. Methods Br., RSC, file 411.1, Facil.

AAFHS-40

96

Prime contractors were able to find good reasons for not letting out a larger proportion of the work and to put various obstacles in the way. They could not find suitable subcontractors. If firms were suggested to them, they did not trust the managements, or did not believe the men could work to close enough tolerances, or could not arrange terms. If persuaded to license other firms, they often delayed sending the proper drawings and production models. Colonel Wolfe once put the matter tersely in a telephone conversation: "Well, these subcontractors have gotten a lot of run-around from these prime contractors, and we're breaking it up here as fast as we can. It has been a long-drawn-out proposition, but we've really got this . . . crowd now."⁴⁷ However, the difficulty of finding suitable subcontractors was often very real.

Various agencies tried their hands at spreading defense work more widely and employed diverse methods and, perhaps, had somewhat different motives.

One method of approach was to make industrial surveys to uncover capacities. In the earlier part of the emergency period, the second half of 1940 especially, a number of general surveys were made to discover capacities for making one or another article or material. The surveying agency in each case assumed that no previous surveys had been made or that they had been inadequate. In some cases the agency was correct in its assumption. In others it was merely ignorant of what had been done before, and people who had worked in the old Industrial Planning offices were

47. Transcript, Sep. 24, 1941, in ZTC 473.5. All standard reasons or excuses for inability to find suitable contractors are illustrated in letter, Asst. Comptroller [company] to Contract Distrib. Sect., OFM, att. E. P. Haines, 17 Nov. 1941, in Facil. Br., ICS, OFM file.

A/PES-40

97

frequently pained to see their extensive files of information on American industry neglected by newcomers. Surveys were usually made by the questionnaire method. Some were made by Aeronautical Section, NDAC. Others were made by IPS or PES, Wright Field, sometimes of their own motion but more often upon request of NDAC, the OJEW, the Chief of Materiel Division, or someone else in Washington. Some were made by outside agencies anxious to be helpful. On one early occasion, R. W. Clark, of the NDAC Aeronautical Section asked the chief of IPS to find out what idle machine tools could be made available for Air Corps facilities. The chief of IPS, in reply, gave data from an earlier partial survey and suggested that Clark attempt to get further information through chambers of commerce. "If you can not do it, let me know," he wrote, "as I may wish to put it up to some other Government Agency."⁴⁸ Some surveys duplicated others in whole or part. They began to be harassing to business, and it became necessary to do a better job of coordinating.⁴⁹

Donald Nelson, as Coordinator of Defense Purchases, adopted a different approach to the problem of spreading defense work. He secured the establishment, in each of the more important Federal Reserve System banks, of an office to act as an intermediary for bringing prime contractors and prospective subcontractors together. The offices kept lists of prime contractors and contracts and began to assemble lists of prospective subcontractors and what they were prepared to do. The lists were largely duplications of lists already assembled by district procurement

48. 25 Oct. 1940, in Facil. Br., RCS, Gen. Corres. file.

49. IOI, Tech. Exec., Mat. Div., Wash., to Tech. Exec., I.F., 26 Oct. 1940, in Facil. Br., RCS, Gen. Corres. file.

offices. The banks were prepared to supply the subcontractors with working capital. Jesse Jones, Federal Loan Administrator, announced that Reconstruction Finance Corporation would make loans to contractors at 1 $\frac{1}{2}$ %. Private bankers protested that this would be unfair competition; Jones then modified his offer to the extent of confining it to prime contractors.⁵⁰ Nelson engaged Joe and Francis Trecker, specialists in subcontracting, to assist in breaking down prime contracts into logical components for subcontracting and to advise in regard to scheduling of deliveries. When OFM was organized, it took over the Defense Contract Service as the Contract Distribution Section and appointed R. L. Mehornay, Kansas City furniture man, to head it. He employed industrial engineers to ferret out possible subcontractors and bring them into the offices.⁵¹

In general the Defense Contract Service was based upon the premises that prime contractors and potential subcontractors were desirous of finding each other and that the "little fellows" must have loans to provide working capital. To the extent the premises were sound, the service could be helpful. Some small shops, perhaps, had not been seeking defense work either because they did not know the possibilities, or feared government "red tape," or had exaggerated fears of government tolerances. A "production clinic" held in Buffalo in May 1941 was said to have had good results. Here prime contractors and government counselors sat about a large room with their blue prints and other exhibits. Potential subcontractors came in and talked things over, and some of them got contracts.⁵² There were numerous other production clinics, especially in the

50. Business Week, 25 Jan., 23 April 1941.

51. See also New Republic, 104:63, 178 (20 Jan., 10 Feb. 1941).

52. Business Week, 24 May 1941.

AFIS-40

99

Eastern Procurement District, and their sponsors were gratified by the results.⁵³ But the premises on which Defense Contract Service was based were correct only to a degree. Small manufacturers, like the larger ones, preferred not to take defense orders if, because of doing so, they must refuse orders from civilian customers.

Business spokesmen took cognizance of the drive for subcontracting. More "flag waving" would not promote it, they said; and they suggested that the government make it worthwhile for prime contractors to subcontract (1) by increasing their delivery schedules to the point where they must subcontract to meet them and (2) by paying bonuses, that is higher prices, for accelerating production. This the Under Secretary of War refused to countenance at the time.⁵⁴

In April 1941 a Special Senate Committee, commonly known as the Truman Committee, began an investigation of the national defense program. The circumstances of the appointment as well as the wording of the resolution by which it was initiated indicated that it would be concerned principally with costs, profits, geographical distribution of defense plants, and charges of discrimination against little business in awarding contracts.⁵⁵ It was not so much concerned in this early period as later over the lagging of the defense program. To insist, as did the committee, on spreading work by giving contracts to "little fellows" and at the same time to look askance at cost-plus-a-fixed-fee contracts involved

53. See file on the subject, in Facil. Capacities Br., EPD, 337, Conferences: Defense Production Clinics.

54. Business Week, 15 March, 10 May 1941.

55. S. Res. 71 (1 March 1941), 77 Cong., 1 sess.; S. Rept. No. 480, pt. 5, 77 Cong., 2 sess., pp. 1, 37, 191-99.

AAFHS-40

100

a degree of inconsistency; for, if contracts were to go by competitive bidding, the big concerns were more likely to get them, and, speaking generally, the less subcontracting they planned to do the lower they could bid.

Perhaps with a view to demonstrating a proper regard for the interests of small concerns, the OUSW organized a Facilities Division, later Contract Distribution Division, in its Planning Branch, headed by Lt. Col. R. M. Hare. Since the branch neither signed nor reviewed contracts, its functions were principally informative and exhortatory.⁵⁶

Meanwhile, the Air Corps, as one of the supply services, had been developing a somewhat different and perhaps more practical approach to the problems of spreading defense work.

There can be little doubt that Materiel Division would have preferred to place a limited number of prime contracts for a limited number of items and leave it to the prime contractors to conduct, in the manner to which businessmen are accustomed, all the multitudinous negotiations connected with placing subcontracts and buying parts, accessories, and equipment⁵⁷ --- negotiations for which at the outset Army procurement staffs were inadequately trained, to say the least. They would thus have also left to prime contractors the whole difficult task of scheduling the production of accessories and equipment so that they would arrive at the assembly plants on time and not so far ahead of time that they would clutter up the stock rooms.

56. Directive, Brig. Gen. Charles Hines, Dir., Plan. Br., OUSW, n.d., copy in ltr., Lt. Col. Laird to Chief, IPS, 6 June 1941, in Facil. Br., RCS, Gen. Corres. file.

57. See, e.g., report of a committee appointed by Col. W. F. Volandt, Asst. to Chief, Mat. Div., for use by C/AC and Chief, Mat. Div. in testifying before the Truman Committee, 26 March 1941, par. 3; in Lyon, Book 69

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At the beginning of industrial mobilization, if a prime contractor represented that he could not produce the required number of articles without such and such new facilities, the sections at Wright Field were hardly in a position to contradict him with expert knowledge. If he asserted that a suggested subcontractor was not competent to do the work, they had to defer to his judgment. If a contractor or subcontractor promised to meet a given schedule, they were not in good position to assess his promises. As time went by and Wright Field built up its staffs with production engineers, machine tools men, and business men, it became more competent in these matters. The sections learned to insist on the percentage of subcontracting they deemed advisable as a condition of letting contracts or financing new facilities and to rely on their own judgment as to the competence of subcontractors. And they learned to schedule production more scientifically--for example, to refuse to accept unrealistic schedules.

On 16 December 1940, Colonel Wolfe, chief of Production Engineering Section, announced the formation of a Scheduling and Priorities Unit in his section.⁵⁸ It shortly became the Production Surveys Branch. The branch dealt with contractor-furnished equipment (CFE). Among its wide variety of functions were the following: (a) to find new subcontractors and to divert subcontractors from one prime contractor to another; (b) to study subcontractors' productive capacities and see that their schedules were in accord; (c) to initiate necessary action for the expansion of facilities for contractor-furnished equipment; and (d), in general, to try to expedite its production.⁵⁹ Other branches of PES were doing similar

58. ATSC 321.9, Scheduling and Priorities Unit.

59. PES OM No. 41-55, 26 April 1941.

AFHS-40

102

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things in the field of government-furnished equipment (GFE). The Production Control Branch, headed by R. F. Trimbach, continued to find new sources.⁶⁰

As the defense program slowly gathered volume, other problems arose. The machine-tools bottleneck continued, and shortages appeared of some materials required in munitions production. The authorities upon whom priorities powers had been conferred began to employ them, at first very cautiously, to keep the tools and materials flowing. Donald Nelson, Administrator of Priorities in NDAC, announced in September 1940 that he would depend on a voluntary system of priorities.⁶¹ Edward R. Stettinius, who when OPM was established became the head of its Division of Priorities, continued this system for a time. On 28 February 1941, he gave priority to all defense plant machine tools orders.⁶² This did not bring into the defense program the "captive" tools makers. Then gradually Priorities Division began to give priorities to orders for aluminum, magnesium, and other materials to be used in defense work. It extended "automatic" priorities to all orders to which the Army-Navy Munitions Board assigned preference ratings.⁶³ OPM gained an agreement from the automobile industry to make a 20% cut in production after 1 August 1941 and not to retool for 1943 models. Some concerns engaged in civilian production saw the drift and overbuilt their inventories to the detriment of their competitors and the defense effort.

60. Memo for J. H. Whitaker, by E. P. Haines, Div. of Contract Distribution, OPM, 27 Oct. 1941, in Facil. Br., HPS, OPM file.

61. Business Week, 21 Sep. 1940, p. 5.

62. Ibid., 8 Feb. 1941, p. 14. Early history of priorities can be followed in Code of Federal Regulations of the U. S., sup. 1940, title 32, ch. IX; ibid., sup. 1941, title 32, ch. IX.

63. Memo for US/H and US/H, 12 Feb. 1942, in Facil. Br., HPS, A-NMB file.

The Defense Plant Corporation made notable contributions to easing the machine tools stringency by tools pools and "rental" agreements. The tools pools were merely a device for keeping the tools-building industry running full blast. Tools builders were naturally hesitant to build tools in advance of orders. Therefore, DPC placed lump orders for specific quantities and types of tools likely to be required in expanding defense industry. Then as such machine tools were approved by IFG and other agencies for purchase by manufacturers and for emergency-plant-facilities contracts and DPC leases, and as the manufacturers placed their orders with the builders and accepted deliveries, the builders reduced the DPC orders in like amounts.⁶⁴ The DPC and the Materiel Division also worked out a most flexible arrangement whereby DPC-owned, Air Corps-sponsored tools could be transferred from one contractor to another.⁶⁵

In May 1941 the Air Corps presented some of its procurement difficulties to the President.⁶⁶ Machine tools would probably be the greatest bottleneck of the expanded program, it stated. Moreover, the automobile industry was "consuming large quantities of materials which are used in the manufacture of aircraft and aircraft equipment. It is believed that a further curtailment of automobile production in this country is necessary for the successful prosecution of this program, not only in the making available of machine tools; but in the conservation of raw materials."

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64. Hans A. Klagsbrunn, Counsel of DPC, "Some Aspects of War Plant Financing," American Economic Review, XXXIII, no. 1, pt. 2, sup. (March 1943), p. 126.
65. Development can be traced in great detail by documents in Facil. Br., RGS, Gen. Proceed. file. See especially TTX, Facil. Sect., Wash., to IFG, AF, 5 June 1941, giving agreement between R. A. Lovett and C. J. Durr, of DPC, 3 June.
66. ICM, Brig. Gen. O. P. Echols, Chief, Mat. Div., to Asst. Chief, 1 May 1941, with attached copy of a letter to the President and annex 4, "Facilities," in Facil. Br., RGS, Gen. Proceed. file.

AFHS-40

104

In July, Leon Henderson, director of the Office of Price Administration and Civilian Supply (OPACS), acting with doubtful authority, tentatively" ordered the automotive industry to cut its production of 1942-model passenger automobiles and light trucks by 50%.⁶⁷ OPM resented the action, and the President stepped in. He increased the power of OPM over priorities by requiring the several other departments and agencies with statutory priority powers to coordinate with OPM. He transferred control over civilian supply from OPACS to OPM, paring OPACS down to OPI. To give other agencies concerned a voice in priorities matters, he created a Supply, Allocations, and Priorities Board (SPAB), and gave it authority to determine the policies and rules under which OPM might exercise its powers of establishing priorities and allocations. SPAB was composed of the Director and Associate Director of OPM, the Secretary of War, the Secretary of the Navy, the Director of Lend Lease, the Administrator of CPA, and the Chairman of the Economic Defense Board (Vice President Henry Wallace), who was named chairman.⁶⁸ Donald Nelson became head of the Priorities Division, OPM, and Executive Director of SPAB. Nelson and SPAB greatly modified Henderson's order limiting automobile production but in general pushed priorities and allocations more vigorously than they had been pushed before.

Eventually the use of priorities for defense orders for materials in which there were shortages began to slow down industries that used such

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67. Business Week, 26 July, p. 7. See Code of Federal Regulations of the U.S., sup. 1940, title 32, ch. IX, pts. 976, 981, for revised and supplementary orders.
68. Executive Order 8675, 23 Aug. 1941, Code of Federal Regulations of the U.S., sup. 1941. Later the Federal Loan Administrator was added to SPAB. See also Michael Straight, "Donald Nelson Takes Over," New Republic, vol. 105, 329 (15 Sep. 1941).

materials in civilian production. Firms which had been unable or unwilling to build up inventories or had neglected to do so were hit first. Some communities were affected more than others. About August 1941 the public began to hear of "priorities unemployment" and "distressed communities." Manufacturers who before had shunned defense orders now sought them and even demanded them. Those people who had been calling for wider distribution of defense work as a means of speeding up the preparations for a war they saw coming were now joined by others more concerned to keep factories busy, labor employed, and their communities prosperous. The charge was now more frequently heard that the O.P. or, more often, the Army and Navy "brass hats" did not want to give contracts to little fellows and discouraged subcontracting. Publicists invited attention to the facts that 75% of defense work had been awarded to 56 big corporations and that they had subcontracted only a small proportion.⁶⁹

O.P. took cognizance of the new interest in contract distribution and elevated its Contract Distribution Section to the status of a Division reporting directly to Director Knudsen. The President issued an executive order instituting it.⁷⁰ The preamble of the order stated the objects to be:

"to provide for the more effective utilization of existing plant facilities for defense purposes; the conversion into defense production of civilian industries affected by priorities and raw materials shortages; the alleviation of unemployment caused by the effects of such priorities and shortages; the local pooling of facilities and equipment; subcontracting; and the wider diffusion of defense contracts among the smaller business enterprises in every part of the nation."

69. Business Week, 23 Aug. 1941, p. 15.

70. Executive Order 8891, 4 Sep. 1941; Code of Federal Regulations of the U.S., sup. 1941.

AFHS-40

106

Under Secretary of War Patterson acknowledged that the War Department shared responsibility for alleviating "distress" in industry caused by the displacement of workers and materials due to defense measures. OPM and the War and Navy Departments made an agreement in regard to methods to be employed in alleviating distress in industry.⁷¹

According to their agreement, when and if OPM should certify to them that a community was threatened with priorities unemployment, the departments would award contracts there on a noncompetitive basis at prices not more than 15% higher than those of the latest competitive contracts. The departments would employ negotiated contracts to a greater extent than formerly to accommodate small firms which could not compete on even terms with larger. Into contracts with the stronger concerns they would insert provisions requiring the subcontracting of a percentage of the work, and the agencies would withhold priorities, if necessary, to enforce such provisions. They would encourage small concerns to pool their resources, tools, and skill and make joint bids. The Justice Department ruled that such pooling would not constitute a violation of the anti-trust laws.⁷²

One consequence of the materials shortage and the new turn of public opinion was that procurement agencies could take a firmer tone in insisting that contractors must subcontract to a greater extent and must convert their old facilities rather than expect new buildings and new tools. IPS at Wright Field received instructions to scrutinize applications for new facilities more rigorously and was warned that it was becoming more difficult

71. Quoted in IOM, Asst. Tech. Exec., WP, to sect. chiefs, 5 Nov. 1941, in Facil. Br., RCS, Process. Proceed. file.

72. John Lord O'Brien, Gen. Counsel to the Attorney General, 30 Sep. 1941.

AAFHS-40

107

to get approvals from CPM.⁷³ The OUSW issued instructions on 5 September 1941 that contracts requiring extensive new construction should not be entered into without its specific authority, and, in general, there was a tightening up on new facilities and an emphasis on conversion all along the line.⁷⁴ When, in November and December 1941, CPM sent three Defense-Special trains about the country exhibiting defense materiel that was being manufactured, Wright Field received far more requests for orders than it could meet.⁷⁵

When the attack upon Pearl Harbor came in December 1941, the Army Air Forces were certainly not prepared for total war. They had fewer than 3,000 tactical planes on hand, of which a large percentage were unfit for modern combat. The production rate for tactical planes of all types was about 850 a month and for heavy bombers 50. Not one of the new plants authorized after June 1940 and designed to build combat planes had yet produced a single plane; and none of them was destined to get into full production before 1943.⁷⁶ Fortunately this statement does not apply to existing airplane plants whose expansion had been authorized in the summer or autumn of 1940. The conversion of the durable-goods industries had only well begun before 7 December 1941. Representatives of the automotive industry testified at the turn of the year that only one-fifth of its

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73. Chief, Facil. Sect., Office, Chief, Mat. Div., to LRS, 4 Sep. 1941, in Facil. Br., RCG, Gen. Proceed. file.
74. Memo for chiefs, supply arms and services, by Brig. Gen. H. K. Rutherford, Exec., OUSW, 26 Sep. 1941, *ibid*.
75. LCI, Capt. H. K. Brumbaugh and Lt. J. J. Friedmann to Col. A. E. Jones, Chief, Contract Sect., "Report on Ok. Rail Exhibits," 27 Dec. 1941, in Manuf. Methods Br., RCG.
76. Monthly Factory Deliveries of Aircraft by Contract and Program, prepared by Statistical Control Office, ATSC. (Title has varied slightly from time to time.)

AFHS-40

108

workers were engaged in war work. The Special Senate Committee Investigating the National Defense Program concluded that, if military cars and trucks be excluded, the automotive companies had produced only 266,303,000 of defense materiel in 1941; the wholesale value of automobile production for 1939 had been \$2,918,030,000, nearly 11 times as large.⁷⁷ In the words of one official, our defense program on the eve of war depended upon "newly improvised factory units, the surplus energy and imagination of our finest management groups, who are still occupied with their regular responsibilities, and upon labor forces recruited largely from the unemployed."⁷⁸

77. S. Rept., No. 480, pt. 5, 77 Cong., 1 sess., p. 33.

78. Stacy May, Dir., Research and Statistics, OPI, as quoted in New Republic, 105:577 (3 Nov. 1941).

AAFES-40

Chapter VI

FACILITIES PROCUREMENT IN THE EARLY MONTHS OF THE WAR

Immediately after the Japanese attack upon Pearl Harbor the Materiel Division instructed manufacturers producing AAF materiel to go upon a maximum production basis. In case this should involve overtime for workers and, consequently, time-and-one-half wages, Materiel Division undertook to adjust prices to meet the increased costs.¹ This move had been contemplated from the start and was expected to increase production 20% to 30%.

At the same time the Industrial Planning Section, Wright Field, wrote all contractors whose facilities had been expanded under Army Air Forces sponsorship to submit their requests for the extra machine tools necessary to bring their plants to maximum capacity. Upon request of Production Engineering Section, it did the same also for other contractors working on AAF materiel.² Materiel Division also instructed contractors who were then engaged in building facilities with government funds under AAF sponsorship to put construction upon a 24-hour schedule. In this case, too, it undertook to bear the increased costs of acceleration.³

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1. Memo by R. P. Patterson, 8 Dec. 1941, in Facil. Br., RCS, Gen. Proceed. file.
 2. Notes by Col. P. Schneeberger, 11 and 13 Dec. 1941, *ibid.*; circ. ltr., 15 Dec. 1941, in Facil. Br., RCS, Ford-Ypsilanti Corres.
 3. Notes by Col. Schneeberger on telephone conversation with Chief, Facil. Sect., Mat. Div., Wash., 9 Dec. 1941, and notes, 13 Dec., in Facil. Br., RCS, Gen. Proceed. file; form telegram to contractors, 13 Dec., Ford-Ypsilanti Corres.

AAFIS-40

110-

The Navy Bureau of Aeronautics followed the lead of the Materiel Division in the matters mentioned.⁴ Defenso Plant Corporation readily agreed to approve increased costs involved in this expediting program.⁵ Expedition was logical and had been anticipated.

Shortly before Pearl Harbor it was the belief that the period of new construction was about over, that not many more new facilities would have to be provided. And shortly after the attack, Under Secretary of War Patterson instructed the services to hold new construction to the absolute minimum and to do all possible to convert plants to war work that were idle because of materials shortages.⁶ This policy--if indeed it was a considered policy--was abandoned almost as soon as stated, and the AAF and other services launched upon an extensive new program of expansion and "green grass" construction.

The policy of expansion seems to have been inspired by several considerations. The war loomed bigger than it had when our entrance was only prospective. It had come earlier than expected. The need for planes was more immediate. Winston Churchill and Lord Beaverbrook, the British Minister of Munitions, who rushed over after the United States' entry into the war, urged a larger air force. And, it seems there were those in high authority who still overestimated the difficulties of conversion and the advantages of entrusting management to the established, experienced aeronautical companies, notwithstanding the fact that their managerial

4. IGI, Lt. Col. F. W. Hopkins, Jr., to Chief, ICS, 24 Dec. 1941, in Facil. Br., RCS, Gen. Proceed. file.

5. R. P. Patterson to Jesse Jones, 9 Dec. 1941, *ibid.*; Col. P. Schneeberger to Sen H. Husbands, Pres., DFC, 17 Dec. 1941, *ibid.*

6. TWA Brig. Gen. O. P. Echols, Chief, Mat. Div., to Asst. Chief, WF, 17 Dec. 1941, in Facil. Br., ICS, Gen. Proceed. file.

AFHS-40

111

staffs were being stretched to the breaking point. At any rate the authorities decided to double the capacity for building heavy bombers and to greatly increase the capacity for making dive bombers and other types of planes.⁷

In mid-December the Director of OPI announced that six new bomber assembly plants would be constructed.⁸ On 22 December officials of Wright Field and Aircraft Section, OPI, in conference in the Materiel Division offices in Washington, arrived at tentative decisions on a long list of new constructions and extensive expansions.⁹ Some of these were vetoed by Knudsen or Patterson and others were modified in the process of negotiation.¹⁰ Most of them went through. Projects were cleared in advance by the Plant Site Board of OPI.¹¹ Negotiations were brief, and processing was greatly expedited both at Wright Field and Washington. The OPI Priority Division gave the projects high priorities for 7,000,000 tons of construction steel.

Under the new facilities-expansion program, North American Aviation was chosen to operate a new DFC plant at Dallas, originally estimated to cost \$23,935,000.¹² It was to build B-24's. Fisher Body Division of

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7. Memo for Brig. Gen. O. P. Echols by Robert A. Lovett, 14 Dec. 1941, in Office, Dep. AG/AS ICS, Facil. file; notes by Col. P. Schneeberger, 27 Dec. 1941, in Facil. Br., RCS, Ford-Ypsilanti Corres.
 8. Business Week, 20 Dec. 1941, p. 29.
 9. T. P. Wright's minutes, copy in Office, Dep. AG/AS, ICS, Facil. file.
 10. Brig. Gen. O. P. Echols to Asst. Chief, WF, 27 Jan. 1942, in Facil. Br., RCS, Gen. Proceed. file.
 11. ICM, Exec., Mat. Div., Wash., to Asst. Chief, WF, ibid.
 12. Data to support this statement and the similar statements which follow in regard to other projects have been collected from various sources, chiefly notes on conference in Brig. Gen. O. P. Echols' office, 22 Dec. 1941, in Facil. Br., RCS, Process. Proceed. file; correspondence with the various companies, in Facil. Br., RCS, under names of respective companies; a report of the transactions of Facil. Br., Procur. Div., WF, to 1 May 1943, copy in ATSC Historical Office; AF Facilities Expansions, Status, Progress, and Performance, a monthly report prepared by RCS.

AAFEC-40

112

~~CONFIDENTIAL~~

General Motors was designated to build complete B-29's and B-29 sub-¹³assemblies in a new plant at Cleveland. This plant was to be built by the Corps of Engineers, and it eventually cost about \$20,000,000. Bell Aircraft Corporation was selected to operate a new B-29 assembly plant to handle the subassemblies made by Fisher. The Bell plant, also to be built by the Corps of Engineers, was located at Marietta, Ga. It eventually cost over \$51,000,000. Douglas Aircraft Corporation was designated to assemble medium cargo planes in a plant to be built by the Engineers in Oklahoma City. This plant cost approximately \$44,000,000. Douglas was also selected to make C-54 heavy transports in a big government-owned plant to be built near Chicago. Curtiss-Wright Corporation was authorized to construct a new DPC-financed plant at Kenmore, N. Y., to be employed in making C-46's. Republic Aviation Corporation was engaged to build and operate a new DPC plant at Evansville, Ind., and to greatly enlarge its plant at Farmingdale, Long Island. It was to make P-47's in both places. Under the new expansion program, also, all the big aircraft companies were authorized to make further large extensions of their existing facilities.

Before the United States entered the war the smaller airplane companies had been given only small expansions or, as was true in most cases, none at all, and were expected to operate chiefly as subcontractors of the larger concerns. They were now loaded with orders and given new plants or considerable extensions. Among those small companies were Aerona, of Middleton, Ohio; Beech, of Wichita; Bellanca, of New Castle, Del.; Fairchild Aviation Division, with a new DPC plant at Burlington, N. C.; Globe,

13. It did not actually build complete B-29's; the plan was changed in this respect. Plans for all plants were subject to change, of course.

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113

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of Fort Worth; Howard, of St. Charles, Ill.; McDonnell, of Memphis, Tenn.; and Northrop, of Hawthorne, Calif. These small companies, with the exception of Northrop, made trainers or light transports.

Under the new facilities-expansion program also, the principal government-financed airplane engine plants were greatly enlarged--Allison, Buick, Chevrolet, Ford, Studebaker, and Wright. Dodge Division of the Chrysler Corporation, which had been getting Ordnance contracts principally, was now called upon to build and operate a vast new DFC plant in Chicago. With later expansion this plant eventually had a floor area of 6,793,606 square feet, cost over \$173,000,000, and became the largest AAF-sponsored project--larger than Willow Run. Continental Aviation and Engine Corporation got a big new DFC engine plant at Muskegon, Mich. Somewhat later the Wright Aeronautical Corporation was authorized to build a very large new DFC plant at Woodridge, N. J., for the purpose of making R-3350 engines (for B-29's and B-52's), and to make a still larger extension of its Lockland, Ohio, plant. The Woodridge plant was originally estimated to cost \$1,846,714, and the Lockland extension, \$98,120,000.

In early 1942 extensive expansions and new constructions were authorized also of facilities for the manufacture of other sorts of AAF material, notably superchargers, generators, magnetos, piston rings and other machined parts, steel forgings, and instruments.

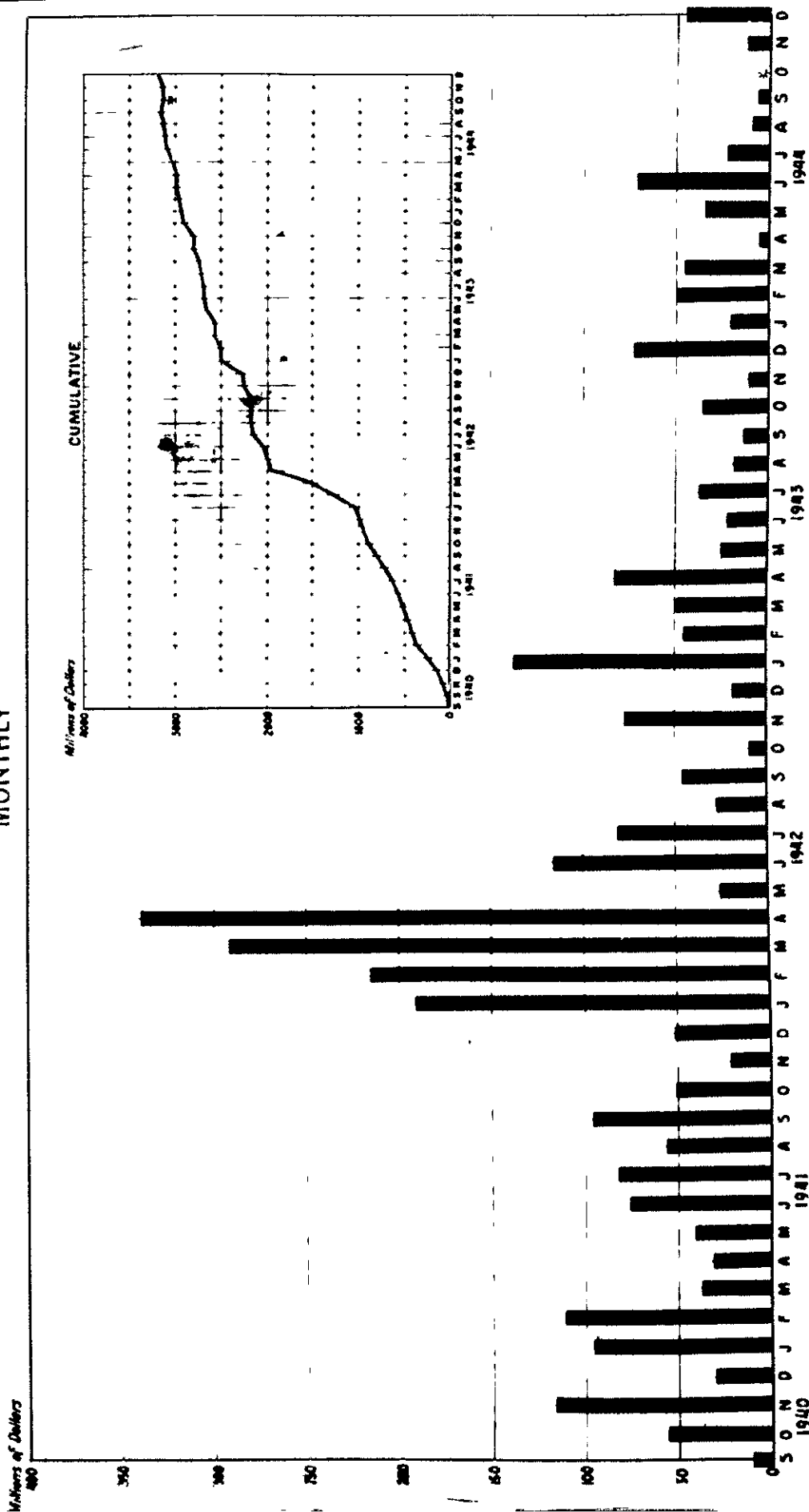
In general the floor space authorized in 1942 to be added to AAF-sponsored facilities was greater by about 16% than that authorized in 1941. The actual construction in 1942 was far greater than in 1941, for many of the facilities authorized earlier were built or completed in 1942, while many of those authorized in 1942 were also built in that year. Much the

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Procurement Division

DOLLAR VALUE OF FACILITY EXPANSION PROJECTS PROCESSED BY RCS

MONTHLY



* See to correspondence of procurement submitted
to the Procurement Division, Department of Defense
on 10/10/44, 10/11/44, 10/12/44, 10/13/44, 10/14/44, 10/15/44, 10/16/44, 10/17/44, 10/18/44, 10/19/44, 10/20/44, 10/21/44, 10/22/44, 10/23/44, 10/24/44, 10/25/44, 10/26/44, 10/27/44, 10/28/44, 10/29/44, 10/30/44, 10/31/44, 11/1/44, 11/2/44, 11/3/44, 11/4/44, 11/5/44, 11/6/44, 11/7/44, 11/8/44, 11/9/44, 11/10/44, 11/11/44, 11/12/44, 11/13/44, 11/14/44, 11/15/44, 11/16/44, 11/17/44, 11/18/44, 11/19/44, 11/20/44, 11/21/44, 11/22/44, 11/23/44, 11/24/44, 11/25/44, 11/26/44, 11/27/44, 11/28/44, 11/29/44, 11/30/44, 12/1/44, 12/2/44, 12/3/44, 12/4/44, 12/5/44, 12/6/44, 12/7/44, 12/8/44, 12/9/44, 12/10/44, 12/11/44, 12/12/44, 12/13/44, 12/14/44, 12/15/44, 12/16/44, 12/17/44, 12/18/44, 12/19/44, 12/20/44, 12/21/44, 12/22/44, 12/23/44, 12/24/44, 12/25/44, 12/26/44, 12/27/44, 12/28/44, 12/29/44, 12/30/44, 12/31/44

Approved by: [Signature]
Procurement Division
Department of Defense

greater part of the authorizations of 1942, about 65%, came in the first four months of the year.¹⁴

It was two or three months after Pearl Harbor before the conversion of the durable goods industries for war production was undertaken in a large way.

The Supply, Priorities, and Allocations Board and the Office of Production Management still moved slowly and cautiously. They were still undecided as to the extent of conversion that was possible and desirable and still had no plan as to the way to bring about conversion. For that matter, the services themselves had no conversion plans except to place orders and to supply the machine tools that might be applied for.¹⁵ Management was naturally still loath to take the losses it would incur during a conversion period and feared dispersion of foremen and skilled labor. It was anxious about reconversion costs and sought a government commitment to assume them. Small businesses, knowing they would experience greater difficulties than large concerns in getting orders and in converting, demanded preferential treatment. Many labor leaders still feared widespread unemployment during a transition period and loss of old jobs and seniority rights.¹⁶

Meanwhile, as interest shifted from peaceful pursuits to war, public

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14. Percentages derived from AAF Facilities Expansions, Status, Progress, and Performance, a monthly report prepared by RUS. See chart following.
 15. Materiel Division made its first significant move to initiate a survey of the auto industry, 19 Jan. 1942. Brig. Gen. G. C. Kenney, Asst. Chief, to Dist. Supervisor, CPD, in Facil. Br., RCS, Gen. Corres. file.
 16. Divergent views are well summarized in S. Rept. No. 10, 78 Cong., 1 sess., pt. 4, app. 3, pp. 81-82 (Truman Committee, 18 June 1942); speech of William D. Knudsen, before N. Y. Div. of Commerce, copy in Facil. Br., CPD, 337 Conferences: Defense Production Clinics; see also Business Week, 21 Dec. 1941, pp. 15-16; ibid., 21 Feb. 1942, p. 17.

demand for conversion and for the curtailment of the less essential industries grew. Various influential people in OPM and out, of whom Donald Nelson was best known, began to insist that the way to secure conversion was to force it by cutting off supplies of materials for production for civilian use. Curtailment became almost imperative in the case of the automobile industry, for one, when the Japanese overran the Malay States and the Netherlands East Indies and deprived us of our principal sources of raw rubber.

In early January 1942, OPM assembled another conference in Washington of the automotive industry.¹⁷ The conference spent most of its time threshing over the old straw of the year before. Labor again presented the Reuther plan, and representatives of management spent much of their energy in denouncing it. To be sure, the original Reuther plan was designed to enable the automotive industry to build 500 fighter planes a day while continuing normal production of motor vehicles; but Reuther had adroitly modified his plan to fit the changed circumstances. However, the conference did reach the important agreement that production of automobiles was to stop on 1 February and of light trucks for civilian use, on 1 March. The conference also agreed to the appointment of a seven-member management-labor committee with an outsider, C. E. Ching of the rubber industry, as chairman to advise OPM on the conversion of the automotive industry.

A few days after the automotive conference closed, the President abolished SPAB by executive order and created the War Production Board.¹⁸ WPB was given the same membership as SPAB but larger powers and a different

17. Business Week, 10 Jan. 1942, p. 15; ibid., 17 Jan. p. 16; New Republic, vol. 106, pp. 72-73 (19 Jan. 1942); New York Times, 5-9 Jan. 1942.

18. Executive Order 9024, 14 Jan. 1942, Code of Federal Regulations of the U. S., cumulative sup., title 3.

AMHS-40 (Error in pagination. Text continued from p. 115.)

119

organization. The chairman alone was to exercise the authority of the Board, and the other members were to give him "advice and assistance." The WFB chairman was given authority to determine the policies, plans, and procedures of the several federal departments and agencies in respect to the production and procurement of war materiel and of facilities and to issue such directives in regard thereto as he might deem necessary and appropriate. He was to perform the functions and exercise the powers of SPAB. He was to supervise OPI and "direct such changes in its organization as he may deem necessary." The Army-Navy Munitions Board, which had clashed with SPAB on various occasions, was not abolished but was subordinated to WFB by a provision of the executive order that thereafter it should report to the President through the chairman of WFB. The President appointed Donald Nelson as chairman. On 24 January, presumably at Nelson's instance, the President formally abolished OPI and transferred its personnel and functions to Nelson's office.¹⁹ By usage the entire organization, not merely the board, came to be called WFB. The net sum of all these changes was to transform OPI into WFB with a new head and enlarged powers and to reduce SPAB to the role of an advisory board.²⁰ On 7 April the President also subordinated the Office of Price Administration to the chairman of WFB.²¹

The new chairman of WFB did not immediately make any drastic changes in the personnel or policies of the organization. But, with the support

19. Executive Order 9040, *ibid.*

20. See *Business Week*, 17 Jan. 1942, p. 14; *ibid.*, 24 Jan. 1942, p. 5; *New Republic*, 108:105 (26 Jan. 1942); *New York Times*, 15 Jan. 1942, p. 141.

21. Executive Order 9125, Code of Federal Regulations of the U. S., cumulative sup., title 3.

METS-40

120

of public opinion and the force of circumstances, he pressed harder for conversion and began slowly to clamp down on new construction of war plants.

Various industries were curtailed or stopped in their production for civilian use one by one through late winter, spring, and summer of 1942. The time and extent of curtailment in each case was usually the resultant of a process of "pulling and hauling" within WPB. The Advisory Committee for the industry, technically advisory to the branch chief for the industry in the Bureau of Industry Branches, normally fought against curtailment and for continued production. So also usually did the Industry Branch. The commodity branches in the Materials Division, insisted on drastic curtailment to save critical materials. The Division of Civilian Supply, which had been created to guard civilian interests, and, strangely enough, the Labor Division, both usually contended for early curtailment. When cases were taken to Nelson himself he usually supported curtailment.²²

By and large, when the automotive industry got its stop order, a mad rush ensued. The services simply "shovelled" out contracts, and, of course, they authorized the necessary conversion expenditures. All were anxious to avail themselves of the brains, skill, and machines of the largest aggregation of metal-working capacity in the world. For reasons already stated, the AAF got the largest share. The several automotive concerns took all the orders they could get and reasonably expect to handle with the

22. Business Week, 21 Feb. 1942, pp. 17 ff.; S. Rept. No. 10 78 Cong., 1 sess., pt. 4, app. 3, pp. 79-80, reviewing charges made by Robert R. Guthrie, who resigned from WPB in protest against alleged interference of dollar-a-year men with the curtailment program.

AFES-40

121

aid of their regular subcontractors and suppliers, whom they proposed to take care of after themselves. On 7 December 1941, it was estimated, the auto industry held orders for war materiel amounting to 4,000,000,000 and was producing at the rate of only 500,000,000 a year. By 1 June 1942, according to reports, it had 14,000,000,000 in orders, and it was expected to produce materiel during the year valued at 5,250,000,000.²³ In general the several services dealt with each concern separately, and each concern looked out for itself. But some effort was made both by a government and organized industry to guide the process of conversion and see that it was done in an orderly manner.

WPB Chairman Nelson sent Ernest C. Hanzler, a former automobile production man, to Detroit with large powers to act for WPB. Hanzler undertook to find out what the various manufacturers preferred to make and were best prepared to make for the services and to help distribute orders in the most logical manner.²⁴ Knudsen, who had been commissioned as a lieutenant general on 28 January 1942, also went to Detroit to assist in his new capacity as Director of Production in the Office of the Under Secretary of War.

The automotive industry organized the Automotive Council for War Production, with Alvan Macauley as president. This council represented six powerful organizations of long standing, namely, the Automobile Manufacturers Association, the Automotive Parts and Equipment Manufacturers

23. Business Week, 13 June 1942, p. 15.

24. Ibid., 31 Jan. 1942, pp. 15 ff.; E. C. Hanzler to Chief, Mat. Div., through Dir. of Purchases, OUSW, 3 March 1942, in Facil. Br., RCS, Gen. Proceed. file; memo by F. Eberstadt, AHB, 19 Feb. 1942, giving lists submitted by Hanzler, in Facil. Br., RCS, Policy file.

LAFES-40

122

Association, the Automotive Tool and Die Manufacturers Association, the National Standard Parts Association, the Motor Equipment Manufacturers Association, and the Society of Automotive Engineers. The council through committees made a survey of the machine tools of the industry and circularized the report as well as lists of tools desired by individual manufacturers. It also undertook to bring manufacturers and tool and die makers together and to act as a clearing house for information on production methods. The council hesitated to sponsor tools pools, but individual manufacturers sold and rented tools to one another to a considerable extent. Furthermore, DPC-owned machine tools were transferred from one contractor to another under procedures already described. The council likewise worked out a plan for the loan of workers from plants idle during conversion and for their return without loss of seniority rights.²⁵ Thus some features of the Reuther plan were measurably realized. Organized labor was given no representation in the Automotive Council for War Production. However, big automobile companies that had been fighting the unions now came to bargain as required by law and war contracts, with the United Automobile Workers of America.

The actual conversion of the auto industry, once it was undertaken, was effected in a remarkably short time.²⁶ The same motives that formerly had led management and labor to fear conversion and to procrastinate spurred them now to hasten the process, reinforcing their patriotism

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25. TIX's, Col. A. M. Drake, Sup., CPD, to Asst. Chief, Pat. Div., 19, 31 Jan. 1942; report of Lt. Col. C. S. Irvine and Maj. W. L. Winston on trip to Detroit and Toledo, 9, 10 Feb. 1942; notes by Col. P. Schneoberger, 23 Feb. 1942, all in Facil. Br., RCS, Gen. Procd. file; Business Week, 31 Jan. 1942, p. 15; *ibid.*, 20 June 1942, p. 52.
26. Graphic account by Marc A. Rose, "Detroit: Million Man Arsenal," *Reader's Digest*, May 1942, pp. 13-18, condensed from *Forbes*.

AFHS-40

123

instead of running counter to it. Where necessary, costly machinery was set out in the weather, covered only by heavy coats of grease. Intricate installations were cut to pieces with acetylene torches. Engineers worked night and day setting up new production lines. The 50 engineers and executives of one plant worked from 7:00 A.M. to 9:00 P.M. seven days a week for a month. A Ford Motor Company executive asked Brig. Gen. K. B. Wolfe not to give his company any more orders for a while; his engineers were going to the hospital.²⁷ While conversion was proceeding, great schools were put into operation to train workers for their new work.

Labor leaders and others had feared that the conversion of the automobile industry would throw 360,000 people out of work for months in the Detroit area. The actual number never exceeded 150,000, and by spring the number of unemployed was shrinking rapidly. The demand for construction workers, the actual work of tooling up, and the training schools, as well as the speed of conversion, all helped to keep the numbers down. Soon Detroit was talking of the necessity of bringing in 200,000 workers from the outside and of employing women in far greater numbers than ever before.

The ingenuity and resourcefulness exercised in converting plants were remarkable. New machinery was installed, to be sure; but of 198,000 pieces of automotive machine tools and equipment listed by the Automotive Council, 66% were being operated in war work by June 1942, and 3% more were earmarked for the purpose.²⁸ Work on new articles often was started

27. Transcript of telephone conversation, 3 March 1942, in Facil. Br., RCS, Ford-Ypsilanti Corres.

28. Business Week, 15 June 1942, p. 15.

on improvised production lines with whatever tools were available during the time while the regular production lines were being set up in the same or neighboring buildings.

The speed and comparative ease of the conversion of the automotive industry do not prove that an advance plan for orderly conversion would not have been desirable. They do prove that many of the fears and objections which delayed conversion, while not groundless, were greatly exaggerated. They also prove that any plan for conversion would be deficient that does not place reliance on the ingenuity, resourcefulness, and initiative of people in the plants to be converted.

Conversion of other durable goods industries proceeded in a fashion similar to that of the automotive industry, but with less fanfare. The household washer and ironer industry, for one, received public notice for extensive pooling of tools. WPB organized a Conversion Section in its Division of Industrial Operations, and IAC, Wright Field, established an Industrial Conversion Unit.²⁹ These units were helpful. Mostly, however, conversion was a matter of the exercise of judgment on the part of procurement authorities in placing orders, the exercise of judgment by contractors in accepting work they were competent to do, the use of ingenuity and skill by engineers and operatives in adapting equipment, and the application for and provision of DFC-owned machine tools in the normal manner.

One important change was made in the rules of government financing of facilities that operated to make conversion somewhat more attractive to manufacturers. DFC, whose financing had otherwise proved the most attractive

29. AMCC 321.9, IAC, 29 May 1942.

AFHS-40

125

form, had been averse to financing nonrecoverable items of cost (such as those of moving partitions, strengthening floors, and repairing roofs in privately owned buildings) and had adopted the rule that it would not approve such rehabilitation costs in excess of 5% of the total cost of the project. Upon insistence of IFS, it now agreed to rise its limit to 10% and to consider on their merits special cases in which a still higher percentage might be advisable.³⁰

Manufacturers continued also to press for government assumption of reconversion costs, that is, the costs of putting converted plants back into their pre-conversion condition at the end of the war. Most of the responsible officials at Wright Field were favorable. However, Maj. R. C. Harmon, chief of Facilities Branch, Contract Section, gave an adverse opinion, based not on law but on policy.³¹ The matter was referred through the Under Secretary of War to AFPC, which decided against assumption, and DFC accepted the decision.³² Allowance of reconversion costs logically appears legitimate and certainly would have expedited conversion. However, it would have led to all sorts of practical difficulties, for example, disputes as to what constituted pre-conversion condition; disputes over whether machines alleged to have been injured by moving and storage in the

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30. TWX, IFS, WF, to Facil. Sect., Office, Chief. Mat. Div., Wash., 3 Jan. 1942, in Facil. Br., RCS, Process. Proceed. file; memo for Col. W. F. Volandt, by W. S. Ege, CUSW, 17 Feb. 1942; report, 18 Feb. 1942, of trip to Washington and conferences with Ege, CUSW, and Snyder, of DFC, by Maj. W. L. Winston; report, 21 March 1942, of Maj. R. C. Harmon to Chief, IFS, on conferences with DFC Counsel (Klagsbrunn and O'Hara) and memo of agreement reached, all in Facil. Br., RCS, Gen. Proceed. file.
31. Mat. Div. Contract Sect., CM No. 43-32, 9 Feb. 1942, in AFSC Law Library.
32. Notes by Maj. W. L. Winston on conference with Maj. Harmon et al, 30 Jan. 1942; notes by Capt. J. H. Bray on policy adopted by DFC and AAF, 13 Feb. 1942; memo for Col. W. F. Volandt, by W. S. Ege, CUSW, 17 Feb. 1942; all in Facil. Br., RCS, Gen. Proceed. file.

MTHS-40

126

process of conversion should be replaced by new ones. Further, it appeared extremely unlikely that manufacturers at the end of the war would care to put their plants back into their prewar condition; they might hope to start peacetime production again with improved facilities. A few companies had bargained effectively enough earlier in the emergency to get reconversion provisions in their contracts with the Air Corps. These provisions proved most troublesome.

In general the AAF, the War Department, the DFC, and other government agencies, in their efforts to expedite industrial mobilization during the first few months after we entered the war, all lowered the safeguards they had erected to protect the public purse.

A few days after the outbreak of war the Chief of the Materiel Division requested DFC to expedite construction of facilities. DFC promised to do so and offered the suggestion that the division relax many of its "rigid requirements."³³ Colonel Schneeberger put up quite a battle for his standards but was overruled for the most part. An agreement was reached that IFS, in processing applications for facilities, would liberalize its estimates of costs by increasing the allowance for "contingencies" to 10% for land and land improvements, 20% for buildings, 15% for machinery and equipment (the biggest schedule), and 10% for portable tools and motor vehicles. The DFC resident engineers were authorized to permit expenditures to the full amounts of the estimates, including allowances for contingencies, without securing approval of the sponsor. They might allow substitution of special-purpose for general-purpose tools; the former would

33. TTX Pacil. Sect., Office, Chief, Mat. Div., Wash., to Chief, IFS, 17, 17 Dec. 1941, in Pacil. Fr., ICS, Process. Proceed. file.

AAFES-40

127

have less resale value. They might allow, without AAF approval, payment of premiums for accelerated deliveries of tools and construction material and payment for overtime work on construction, even though such costs would cause overruns. They might allow contractors to purchase equipment and secure construction of buildings on a cost-plus-a-fixed-fee basis.³⁴ All these relaxations, and other minor ones not listed, were calculated to increase costs and did.

In general during the "hectic period" that followed the declaration of war, the authorities relaxed their rigid scrutiny of applications for government financing. They took manufacturers' estimates with little question and approved overruns, retroactivity, and "bail-outs" almost as a matter of course. The Facilities Section, in the Office of the Chief of the Materiel Division in Washington, showed impatience with IPC for not processing applications faster, although IPC was breaking all its former records and never achieved the same speed in later periods. On one occasion the Chief of Materiel Division instructed IPC to "start building right now and justify later";³⁵ and on 1 April, just before WFB cracked down, he once more gave the injunction "to process first and justify later."³⁶ On 15 January 1942, the chief of the Facilities Section, Office of the Chief of Materiel Division, set 31 January as the deadline for "everyone of these new expansions" to be in the hands of the approving agencies.³⁷

34. Memo for M. S. Lee, GCS., by Col. M. P. Volandt, 7 Jan. 1942 and reply, 10 Jan. 1942, in Facil. Br., RGS, Process. Proceed. file; notes by Lt. Col. Graham, Chief, Facil. Br., IFS, 21 Jan. 1942, TXX's LRG to Facil. Sect., Wash., and reply, 26, 27 Jan. 1942, in Facil. Br., RGS, WF, Gen. Proceed. file; memo for Priorities Br., WFB, about 5 Feb. 1942, in Facil. Br., IFS, WFB file.

35. TXX, Facil. Sect. to Chief, IFS, 29 Dec. 1941, in Facil. Br., RGS, Process. Proceed. file.

36. TXX, Facil. Sect., Wash., to Chief, IFS, ibid.

37. ibid.

A FIB-40

128

Some what later, while conversion of Detroit was at full tide, he again urged haste in processing; his office had "stopped out on a limb," he said, and signed letters of intent for over \$250,000,000 of machine tools for over 100 projects.³⁸

Before the entry into war the Materiel Division had hesitated to approve the financing of facilities that might not be needed. Now it hesitated to disapprove facilities that might be needed. The chief of FES, on one occasion, sent the chief of IPS a quantity of estimates of requirements for government-furnished equipment, upon which IPS must base estimates of new facilities requirements. The chief of FES explained that he had added 35% for contingencies, 25% (of 135%) in anticipation of the "President's Program," and a sufficient additional percentage (of 139%) for spares to bring the total to 225% of the current program.³⁹

About 1 April, WFB and the War and Navy Departments began definitely to tighten up on the construction of new facilities. On that date the Army-Navy Munitions Board issued a list of critical materials that might not be used in construction at all. WFB and the departments declared a virtual moratorium on new plant construction for all services except the Army Air Forces.⁴⁰ For the AAFC they forbade permanent types of construction unless they were absolutely necessary and required that steel be eliminated from specifications as far as possible. The Under Secretary

38. TWE's to Chief, IPS, 1, 4 April 1942, in Facil. Br., RCS, ibid.

39. LOM to Brig. Gen. A. W. Vanaman, CG, Mat..Gen., 22 April 1942, in Facil. Br., RCS, Gen. Proceed. file.

40. Prod. Br., SOS, Office Order No. 5, 5 May 1942, in Facil. Br., WFS, Policy file, and Facil. Br. RCS, Gen. Proceed. file.

AFES-40

129

of war set up a special committee under the direction of M. J. Madigan to make an "exhaustive study" of requests for new buildings and to "police" construction already approved.⁴¹

The chief of IFS protested. He asserted that all manufacturers in presenting their appendix "A"s were "conscious" only of the use of steel and few of them knew of the "use of wood." He thought engine and propeller plants, the operating departments of large airplane plants, and in general buildings for high precision fabrication or for processes involving extra fire hazards should all be built of steel skeleton or reinforced concrete. He was concerned especially about the big Dodge engine plant at Chicago, which, he implied, he hoped would be retained as a stand-by factory after the war.⁴² Madigan made only small concessions as to steel and indicated that no building would be countenanced that was planned for a longer life than from 7 to 10 years. General Denols carried the matter to Donald Nelson and came away with the impression that the policy was fixed and the end of new construction was approaching.⁴³ The IFS Facilities Branch accordingly adopted the evaluation rules and the close scrutiny necessary to justify its projects to higher authority.⁴⁴

In May the public learned that Donald Nelson had directed that the war-

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41. TTX Res. Div., Mat. Comd., Wash., to Chief, IFS, 17 April 1942, in Facil. Br., RCS, Process. Proceed. file. Resources Division succeeded Facilities section. In March 1942 Materiel Division became Materiel Command and Wright Field became Materiel Center. Brig. Gen. A. W. Vorseman was designated Commanding General of Materiel Center with his office at Wright Field.
 42. TTX's to Chief, Res. Div., Wash., 20 April and 11 May 1942, in Facil. Br., RCS, Gen. Proc. d. file.
 43. TTX Chief, Res. Div., Wash., to Chief, IFS, 12 May, *ibid.*
 44. Facil. Br., IFS, Memo. No. 47-13, 13 May 1942, in Facil. Br., RCS, Process. Proceed. file.

AFHS-40

130

plant-expansion program be reviewed and curtailed.⁴⁵

In the latter half of 1942 the AEF was able to meet some of its needs for facilities by taking over a number of plants that had been working on Ordnance contracts. It had been found that, under current programs, Ordnance had more facilities than necessary for certain items.⁴⁶

Before the end of the war came there were to be more new constructions and expansions of facilities for making AEF materiel, some of them large ones. In general such additions were made necessary by the changing demands of war rather than lack of over-all capacity. There was to be a continued large demand for machine tools. There was some relaxation of the rigid requirements for approval of projects as the materials situation eased. But the period of hurried building of new war plants over the face of the land and of feverish conversion was over or, rather, would be over as the expansions and conversions authorized early in 1942 should near completion. Of the total sum of government funds authorized for facilities under AEF cognizance to the end of 1944, nearly 54% was authorized in the year 1942; and much the greater part of this percentage was authorized in the first few months of the year. Only 22% of the total sum was authorized after the end of 1942.⁴⁷

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45. See Richard Lee Strout, "America Enters a Shortage Economy," New Republic 106:818-19 (15 June 1942).
46. Notes by Col. F. Schneeberger, 14 July 1942, on conference in office of Col. H. D. Burnside, FEC, 13 July 1942, in Facil. Br., RCS, Gen. Proced. file; numerous documents in Manuf. Methods Br., RCS, file 411.1, July and later; ICN, Col. C. S. Irvine, Exec., Prod. Div., to CG, Mot. Comd., 14 Oct. 1942, in office, Dep. AG/AS, IAS, Facil. file.
47. Percentages derived from AEF Facilities Expansions, Status, Progress, and Performance, a monthly report prepared by RCS; report of the Transactions of Facil. Br., Procur. Div., AF, to 1 May 1943, copy in AFTC Historical Office. Also see the chart opposite p. 135.

The decision in the spring of 1942 that the time had come to put less material and labor into buildings and machine tools and more into the actual production of munitions obviously could have been little more than a guess, at least as far as facilities for making AAF materiel were concerned. Airplane assembly and airplane engine plants authorized in the spring of 1942 could not reasonably be expected to get into full production before late the next year. Time might show we had too many or too few facilities for the needs of the armed forces or for the available materials or labor. Setting up war plants could not be an exact science.⁴⁸ The demands of warfare could not be forecast with accuracy. Manufacturers were making unfamiliar articles. They would have to employ much new labor. They could not estimate accurately what their production rates would be. One thing is certain: responsible officials preferred to err, if err they must, on the side of an excess of facilities rather than on the side of a deficiency.

In late summer 1942 there was a tendency to tighten up also on financing new machine tools for converted plants. Too much high-grade steel required for special parts was found going into new tools.⁴⁹ It was found also that manufacturers, preferring to get new DPC-owned tools, were withholding their own tools from government work. Some thought was even given to commandeering or drafting the "thousands" of available machine tools that were not being employed.⁵⁰

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- 48. Excellent statement on this point by Lt. Gen. Brehon B. Somervell, CG, ASF, in memo for the US/AF, 11 June 1943, in S. Rept. No. 10, 78 Cong., 2 sess., pt. 16, pp. 173-34.
 - 49. TXX Res. Div., Wash., to I-C, att. Tools Br., 13 July 1942, in Facil. Br., RCS, Gen. Proceed. file.
 - 50. Notes by Col. F. Schneberger, 1 Aug. 1942, on conference in Cleveland between AAF and Ordnance, in "Manuf. Methods Br., RCS, 411.1

~~CONFIDENTIAL~~

The hazards of actual war made it seem prudent to camouflage our more important war plants located near the coasts and to make provision for "blackouts." It was also necessary to guard against sabotage and espionage in war plants throughout the country, and for this purpose high, heavy-steel wire fences were erected and other devices provided. The costs had to be borne by the government, and, after some discussion, it was decided to finance them as "facilities."⁵¹ It would be all but impossible to determine how many millions of dollars were spent for camouflage and blackout, which, with some possible exceptions for blackout on the very seaboard, events proved to have been entirely unnecessary. But there was no way of knowing beforehand that they would not be necessary, and authorities dared not take the risk of omitting them. The fencing absorbed hundreds of thousands of tons of steel that was badly needed for munitions and machinery. IFS sought to hold expenditures for all these items to a minimum. On 1 May 1942 Lt. Gen. Brehon B. Somervell, Chief of the Services of Supply, forbade further use of chain-link fences.⁵²

Fortunately it was not necessary in this country, as it was in some of the other nations at war, to build mobile plants and underground airplane factories. The Boeing plant in Seattle, which made B-17's, seemed especially vulnerable. In the earlier part of the war a complete set of stand-by tools, jigs, dies, and drawings for making the bombers was assembled at an interior point, Dallas, and kept up to date. After the

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51. Col. P. Schneeberger to Pres. Sam Husbands, DPO, 17 Dec. 1941; and opinion of Maj. R. C. Harmon, Facil. Br., Contract Sect., 8 Jan. 1942; in Facil. Br., PCS, Gen. Proc. file.
52. Directive to chiefs of supply services, and IOI, Maj. J. C. Vaughan, Asst. Chief, Res. Div., Wash., to Chief, ICS, 7 May 1942, in Facil. Br., PCS, Gen. Proc. file.
- ~~CONFIDENTIAL~~

ALRES-10

133

emergency had passed, some of them were sent to the Vega plant at Burbank, Calif., and used in production.

Procurement officers during the rapid mobilization of industry in 1942 did not entirely forget principles of distribution of war plants and war work. But they did not allow principles to interfere with expediting production.

It had been an item in W-44 plans not to erect munitions factories within 200 miles of the boundaries unless there were compelling reasons for doing so. For a time after 7 December the GUSW was inclined to enforce the rule strictly for the strips along the seacoast. However, the desirability of putting plants where skilled labor and metal-working industries were located was nearly always considered a compelling reason.⁵⁴ Except that partly because of strategic principles the big government-owned bomber plants were built deep in the interior, considerations of strategy affected the distribution of AAF-sponsored projects but slightly.

The task of spreading war work among small concerns as well as large ones and thus utilizing their management, labor, and machines proved considerably easier after our entrance into the war than it had been before. The procurement authorities had much greater leverage. They controlled the flow of materials, machine tools, and labor. They let the contracts under which most of the manufacturing of the country was to be done. For most concerns it was government work or little or no work at all. The government owned a large part of the tools. As a last resort, procurement

53. Interviews with R. W. Trimbach, Chief, and L. M. Burdick, Project Officer, Manuf. Method Br., GOS.

54. See, e.g., notes by Col. F. Schmoeberger, 10 Jan. 1942, in Exec. Br., Gen. Proc. file.

AMES-40

134

authorities could seize and operate factories, shops, and mills, and they now had the support of public opinion for their measures. Under the circumstances a government request to a prime contractor to subcontract a specified portion of the work to a particular subcontractor was almost tantamount to an order to do so. Large concerns were often interested in taking care of their regular subcontractors and suppliers and, in fact, often recommended expansion of subcontractors' facilities.

Outside the services, efforts were continued to give small concerns special help to offset assumed or recognized disadvantages in competition. On 1 April 1942 the President issued an order authorizing the RFC and the Federal Reserve System banks to make loans up to 100% of requirements to companies engaging in war work, for the purpose of providing working capital and meeting conversion and materials costs.⁵⁵

The services already had authority to advance contractors as much as 30% of the amounts of supplies contracts.⁵⁶ In June Congress created a Smaller War Plants Corporation (SWPC), and provided it with a capital of \$150,000,000.⁵⁷ This corporation was empowered to seek and accept prime war contracts and sublet the work to small plants, to make loans to small concerns, and to provide financial and engineering aid to shop pools that such firms might form. SWPC was authorized to certify small businesses to the procurement authorities as competent to handle specific jobs; that is to say, SWPC could virtually order the services to let specified contracts to specified firms.

Donald Nelson, SWPC chairman, chose to construe the SWPC Act as a war measure rather than a relief measure. He said:

55. Business Week, 4 April 1942, p. 7.

56. Id. above, p. 28.

57. Public Law No. 603, 77 Cong., approved 11 June 1942; 56 Stat. 361.

"What we have in the Smaller or Plants Corporation is a mechanism to help us increase the total quantity of essential goods needed in this war rather than a relief agency. If it should unfortunately develop that outright relief measures for small business are necessary, it must be realized that a mechanism other than SWFC must be found for extending such relief."⁵⁸

SWFC itself operated in a conservative manner and did not try to force the services to let contracts to concerns not competent to handle them. The AAF Materiel Command (the Materiel Division had been so redesignated in March 1942) held no brief either for or against small business as such. It was interested in getting materiel made as expeditiously as possible. It did prefer, other things being equal, as had been noted, to keep the number of prime contracts to a minimum and let prime contractors break down the jobs and distribute the work to subcontractors.

To summarize, the transition from preparation for possible war to conditions of actual war did not necessitate any considerable changes in legislation relating to mobilization of industrial facilities. Nor did it require any fundamental changes in organization or procedure. The ground work had been laid before the war. It did, however, give a new urgency to measures for industrial expansion and brought a change in the public attitude toward them. It enabled the authorities to use methods and devices which, although they were permitted by law, they had hesitated to employ before the actual outbreak of war.

58. Quoted in Business Week, 18 July 1942, p. 82.

AFES-40

CONFIDENTIAL

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Chapter VII

PROBLEMS OF FACILITIES MANAGEMENT

As the demands of defense and then of war increased, the government was drawn farther and farther into the whole field of production control. It not only found it necessary, as has been seen, to give some defense orders preference over others, to give war work priority over production for civilian use, and to tell contractors with whom they must subcontract or place supplies orders and to what extent. It also found it necessary to regulate the flow of materials, parts, and labor to the war plants and even to concern itself with the internal organization, the shop management, and the manufacturing methods of the concerns engaged in defense or war production.

The government could not avoid such regulation. It had undertaken to provide a large proportion of the facilities and was therefore entitled to be satisfied that they were being operated to capacity and in an efficient manner: the more efficiently they were run, the fewer new facilities must be provided. The government was paying for the products of the facilities and therefore had a financial interest in seeing that they produced as economically as possible under the circumstances. It had the great overriding obligation of seeing that munitions were produced in sufficient quantities and of proper qualities to meet the requirements of the armed forces. It could not permit factories to be idle because of maldistribution of tools, materials, or labor.

~~CONFIDENTIAL~~
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The task of insuring an adequate flow and the proper distribution of materials, machine tools, and standard components became increasingly difficult through 1941 and on through 1942. Divergent views developed as to policies and methods. These, at least in part, were the cause of conflicts over jurisdiction. The most serious organizational difficulties and inter-office quarrels that have occurred at Wright field were involved with materials control and the very closely related problem of scheduling production. Also the principal misunderstandings between the Materiel Command and AFB arose over the same matters.

The early system of controlling the distribution of tools and materials by priorities largely broke down under increasing strains. The demand for machine tools remained great all throughout 1942 and the first months of 1943, and the demand for fabrication materials and components increased greatly as new plants came into operation. Some contractors were slow in placing orders for tools and materials. Others overbought tools and managed to build up excess inventories of materials and parts, thereby increasing the difficulties of their fellows. Favored tool makers had great backlogs of orders, while others were even yet not fully employed. To some extent the supply services themselves contributed to the bottlenecks by competing for priorities for their respective contractors and by over-scheduling the production of components, equipment, and spares.¹ It is evident that overproduction of some items might result in underproduction of others if such excess items absorbed the machine tools and critical materials needed for the others. And the shortage of essential parts, components,

1. See G. Rent. No. 10, 78 Cong., 1 sess., pt. 4, pp. 7 ff.; Col. F. M. Powers, Administrator of ASU, to aircraft manufacturers, 24 April 1942, in Certifications Unit, ACS, Proceed, file.

or equipment would keep otherwise complete planes, guns, and tanks out of action.

It will be recalled that in December 1940 Col. K. B. Wolfe, chief of Production Engineering Section, had established a Scheduling and Priorities Unit in his section.² It soon was renamed the Production Surveys Branch, perhaps to distinguish it from the Aircraft Scheduling Unit, which OPM shortly established. Production Surveys Branch dealt with the production of contractor-furnished equipment. Among its numerous duties with regard to such equipment were those of making surveys to discover capacities, scheduling the production of manufacturers, and interceding on behalf of AAF contractors with Priorities Division, OPM, in matters of priorities and allocations of machine tools and materials of which there were critical shortages.³

In March 1941 OPM established a unit at Wright Field⁴ that was soon known as the Aircraft Scheduling Unit (ASU). It was set up with the approval of the War Department and the Joint Aircraft Committee (JAC) of the Army, Navy, and British Air Commission. ASU was headed by an administrator designated by OPM and a representative each of the Army Air Forces, the Navy Bureau of Aeronautics, and the British Air Commission. The ASU functioned for the whole aircraft industry of the country. It was authorized to exercise control over all contractor-furnished aeronautical equipment (CFE) as well as over

2. Above, p. 101.

3. PES CM No. 41-55, 26 April 1941.

4. To be precise, it was located in downtown Dayton. The Materiel Division outgrew accommodations at Wright Field, and for a time a number of units were located in the city. All are referred to for convenience as being at Wright Field.

AAFHS-40

139

all critical materials allotted to the aircraft industry, and to allocate them within the industry. It was to discover all critical shortages of GFE and all difficulties that were calculated to delay aircraft production. It was to conduct surveys, when authorized by OPM, to discover what the industry's capacity and requirements were. It was to conduct surveys, when authorized by OPM, to discover what the industry's capacity and requirements were. It was to receive from the industry its requests for machine tools and forward them with recommendations to OPM. It was also to advise the supply services represented, that is, Materiel Division, Navy Bureau of Aeronautics, and the British Air Commission, of allocations made of orders for critical items of government-furnished equipment and assist them upon request in overcoming critical shortages therein. Finally it was to refer to OPM disputes between the aircraft industry and other industries.⁵

The ASU undertook to perform its functions through the personnel of the services and particularly that of Production Surveys Branch, PES. Production Surveys Branch thus functioned in two capacities, as a branch of PES and as a unit of OPM. Such an arrangement was authorized by the presidential order establishing OPM. It was economical of manpower. Unfortunately it was also likely to lead to disputes and misunderstandings.

The line of division of authority between the supply services and ASU was not drawn very distinctly at first. The directive setting

5. Memo for manufacturers of aircraft and aeronautical equipment by Merrill C. Meigs, Chief, Aircraft Sect., OPM, 5 May 1941, in ATSC 321.9, Scheduling and Priorities Unit.

up ASU was revised and re-revised.⁶ Bitter quarrels occurred between ASU and PES over jurisdiction and policy, particularly over scheduling and requirements. ASU believed PES was overscheduling. PES felt that ASU was encroaching unnecessarily on its preserve.⁷

Quarrels also occurred between Production Surveys Branch, PES, and Requirements Branch, IPS, over the making of industrial surveys. The latter was making such surveys by authority of OPM. Production Surveys Branch claimed to be the sole authorized surveying agency for the aircraft industry. Indeed, it had at one time been so designated by OPM.⁸

In an effort to end such disputes, the Chief of Materiel Division, upon request of OPM and the Under Secretary of War, transferred Production Surveys Branch from PES to IPS with all its functions in connection with ASU, on 16 December 1941. The Chief of IPS or someone designated by him was to serve as the Army member of ASU.⁹ IPS was as

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6. See, e.g., memo cited in footnote 5; TI No. 686, Office, Chief, Mat. Div., Wash., 28 March 1941, in ATSC 321.9, S and P Unit; IOM, Maj. E. W. Rawlings to Chief, Mat. Div., 22 May, inclosing proposed revision of "Directive and Instructions for the Operation of the OPM, SU, Aircraft Sect., WF, Dayton", *ibid.*; Change No. 1, Mat. Div., GO #5, 17 Nov. 1941, Directive Establishing Scheduling Unit, in ATSC Contract Files, 321.9, ASU.
 7. IOM and memo, Lt. Col. K. B. Wolfe to Chief, Mat. Div., 18 Oct. 1941, in ATSC 321.9, S and P Unit; IOM, Maj. J. F. Early, Chief, Prod. Surveys Br., to Asst Chief, Mat. Div., 31 Oct., *ibid.*; IOM, Lt. Col. K. B. Wolfe to Chief, Mat. Div., 11 April, 1941, *ibid.*
 8. OPM Admin. Order No. 1, 28 Feb. 1941, in Facil. Br., Res. Div., M&S, OPM file; IOM, Maj. J. F. Early to Chief, PES, 1 July 1941, ATSC 321.9, S and P Unit; IOM, Maj. E. W. Rawlings, Chief, Budget Office, to Chief, PES, 10 July, *ibid.*; IOM, Chief, IPS to Chief, PES, 4 Aug., *ibid.*; IOM, H.C.T., Prod. Surveys Br. to Chief, PES, 31 Oct., on division of responsibility between IPS and Prod. Surveys Br., *ibid.*
 9. IOM, Brig. Gen. O. P. Echols, Chief, to Asst. Chief Brig. Gen. G. C. Kenney, 16 Dec. 1941, in ATSC 321.9, IPS; transcript of telephone conversation, Lt. Col. F. M. Hopkins, Jr., and Col. P. Schneeberger, 17 Dec. 1941, in Facil. Br., RCS, Gen. Proced. file; notice, 8 Jan. 1942, signed Brig. Gen. G. C. Kenney, Asst. Chief, Mat. Div., in ATSC 321.9, IPS

AAFHS-40

141

much disposed to dispute in principle the jurisdiction of ASU as PES had been; but practical working relations were improved, at least for a time.¹⁰

The IPS transformed Production Surveys Branch, when it came over, into the Materials Control Branch.¹¹ Shortly it divided the branch and established a separate Machine Tools Branch.¹² ASU, on its part, established a Tools Committee, a sort of little ASU, to work with and supervise the Machine Tools Branch. It consisted of one representative from WPB, one from Materiel Division, and one from the Navy Bureau of Aeronautics. The committee bore the same relation to the Machine Tools Branch that ASU proper bore to Materials Control Branch. Navy Bureau of Aeronautics personnel were brought into the Machine Tools Unit as well as into Materials Control Branch.

Under the system as it developed, the Machine Tools Branch and the Tools Committee functioned for the entire aircraft industry.¹³ They surveyed the industry, compiled its requirements, and presented them through military channels to WPB. WPB allocated the country's entire machine-tools production to the various services and to industries engaged in production for civilian use. The Tools Committee,

10. See, e.g., notes by Lt. Col. D. A. Graham, Chief, Adm. Br., IPS, 11 Jan. 1942, on basic authority for ASU, in Facil. Br., MCS, Gen. Proc'd. file.

11. IPS OM No. 72, Amend. No. 1, 31 Jan. 1942, *ibid.*

12. IPS OM No. 84, 23 Feb. 1941, in ATSC 321.9, IPS.

13. Account based chiefly on Maj. H. E. Sage, former Chief Tools Br., "Tools Unit, MCS, Past and Present", ms. lent to the author; written account of his duties by C. T. Scheble, Civilian Chief, Tools Unit, MCS, and interview, 20 Oct. 1944; interview with Capt. L. L. Bushong, Chief, Allocations Sub-unit, Tools Unit, 20 Oct. 1944; and unsigned memo on procedure of Plant Facil. Sect., Navy Bur. of Aeronautics, in Facil. Br., MCS, Gen. Proc'd. file; numerous documents in ATSC 360.01/317, Policy, Critical Shortage Reports; detailed charts showing authority and functions of ASU, in ATSC Historical Office.

AAFHS-40

142

through the Tools Branch, in turn allocated the tools allowed the aircraft industry in general among the Army, the Navy, and the British for their respective facilities, and also to civilian aircraft production -- the little that was left of it.

The committee and the branch, that is, in practice the branch, employed various expedients to make the available tools go around and to overcome critical shortages.

For one, they assigned the "urgency standing" numbers to machine tools orders on Priorities Division form "PD-3A." Urgency standing numbers were still useful to a degree.

Another expedient employed by Tools branch during the period when demand for tools was greatest was "status" reports. Manufacturers were required to submit such reports at intervals. The status report was designed to disclose surplus tools and to compel contractors to study their tools requirements more carefully rather than to "make a guess and multiply by two." The device was eventually abandoned because it required a closer follow-up by plant inspections than the limited staff could accomplish.

Other expedients to aid in distributing tools involved the use of form ASU-29, "Request for Improved Delivery," commonly called "Critical Shortages." The manufacturer first applied to the AAF or Navy factory representative, who undertook local action, if possible. The factory representatives were handicapped by the necessary JPB rule that the services might not make direct contact with machine tools builders. If local efforts to remedy the critical shortage proved unavailing, the ASU-29's were forwarded to Machine Tools Branch, right Field.

Tools Branch, in such cases, might attempt diversion. That is, by direct contacts or through WPB, which kept a master list of all the tools built or being built in the country, it might find another manufacturer who was having tools built similar to those requested but who would not need them so soon as the contractor who had submitted the critical-shortages report. The Tools Branch then requested the second manufacturer, if found, to let the first contractor have priority. If consent was secured -- and it was, for the second contractor might also require favors sometime -- Tools Branch sent the proper notice to Tools Division, WPB, Washington, which issued a "Diversion Order" to the tools builder.

If diversion did not appear feasible or desirable as the method of relieving a particular critical shortage, Tools Branch might effect a transfer of tools from a contractor who had surplus tools or temporarily idle tools. If the tools desired were privately owned, the branch persuaded the one contractor to sell, lease, or lend them to the other. If the tools were owned by DPC, as in the great majority of cases they were, the branch persuaded the lessee to release them; and DPC, whose concurrence in the transfer must of course be secured, either lent, rented, or sold them to the other manufacturer. Eventually transfer of tools became the principal corrective measure and, after the war plants were once fairly well tooled up, the principal function of the Machine Tools Branch.

It is obvious that this system of controlling machine tools required the keeping of intricate records. Tools Branch, according to its own admission, did not have a satisfactory system of records

AAFHS-40

144

until after the most difficult period ~~was~~ over. It was very hard to keep tools lists up to date when so many tools and so many agencies were involved, not only central offices but district procurement offices as well.

It may also be obvious that WPB was the proper agency to keep the master tools list and to exercise general control. Machine-tools builders frequently served all branches of industry. They built machinery for manufacturers who were producing goods for civilian use as well as those engaged in producing munitions and supplies for the armed forces. A large proportion of the machine tools, perhaps a half, were general-purpose tools capable of being used in more than one branch of industry.¹⁴ Often several manufacturers had their names on the waiting list for the same tool. Not only did the manufacturers compete for tools, but the supply services also competed on behalf of the manufacturers over whom they had cognizance. A naval officer engaged in tools control listed as one of his duties that of watching to see that other services did not "filch" the Navy's tools. It was difficult to keep over-zealous representatives of the services in check.

The IPS Materials Control Branch, working with and under ASU, did much the same things and in much the same manner with regard to contractor-furnished equipment and materials for fabrication purposes that the Machine Tools Branch and the Tools Committee did for machine tools. They too functioned for the entire aircraft industry of the country. The work of their landing Gear Sub-Unit in procuring oleo

14. Estimate of Capt. G. G. Hathaway, formerly of Tools Unit, RCS.

struts may be taken as typical of their activities and methods.¹⁵

The Landing Gear Sub-unit compiled the numbers of struts of various types required. This was a simple operation of derivation from the monthly schedules of airplane deliveries. Only the determination of the proportion of spares was difficult: WPB sought to keep it down in the interest of economy of materials and labor; the AAF sought to keep the proportion up to preserve a margin of safety. The numbers once determined, the sub-unit advanced delivery dates 60 days over the delivery dates for applicable planes in order that there be no delays in the assembly plants. Then the unit allocated strut production among the strut manufacturers and fixed their monthly schedules. This involved meetings with representatives of the companies and often involved changes in schedules after contracts had been signed and production begun, for manufacturers could not always meet accepted schedules. If a shortage of facilities appeared, the sub-unit recommended expansion through ASU to Facilities Branch, IPS. The unit also acted as a clearing house for problems of the strut makers, coordinating with other branches and units at Wright field. For example, it used its good offices with Machine Tools Branch to expedite deliveries of tools.

Other individual items of GFE and various materials became the charges of other units and sub-units of Materials Control Branch. Aluminum and magnesium, both raw and semifabricated, were so important in aircraft construction and shortages were so critical that their

15. Memo on oleo strut production, 11 May 1942, by William E. Cogelback, consultant, inclosed in letter, T. P. Wright, Asst. Chief, Aircraft Sect., WPB, to Maj. Gen. O. P. Echols, 20 May 1942, in H&S, Ech., "Struts-WPB"; numerous documents in AISC 360.01/317, Policy, Critical Shortage reports.

AAFHS-40

146

allocation was entrusted to a special branch, established in April 1942 and renamed the Light Metals Branch the following month. It too functioned with ASU for the entire aircraft industry in a manner similar to that of the Materials Control Branch for other items. The functions and working of the Light Metals Branch are described in detail in another study.¹⁶

Unfortunately the inherently great difficulties of determining requirements, allocating, and scheduling were augmented, to a degree impossible to determine, by organizational changes and experimentations, especially at Wright Field. Changes and frictions may have been largely inevitable under conditions of sudden assumption of new responsibilities and mushrooming growth. Quicker and more impetuous officers were likely to become impatient with the cautious and methodical approach of some of their fellows.

In February 1942, shortly after the transfer of Production Surveys Branch to IPS, PES established a follow-up organization with the general function of expediting production by work in the field. The chief of PES contemplated that it would gradually assume most of the current follow-up functions not only of PES but also of IPS, the Budget and Fiscal Office, and "perhaps supplement, but not entirely supplant," those of the Contract Section.¹⁷ Circumstances alter cases, but it is contrary to a general principle of good administration to

16. AAF Historical Study (in preparation), "Light Metals and Other Critical Aircraft Materials . . ."

17. IOM, Chief, PES to Asst. Chief, Mat. Div., 20 Feb. 1942, in ATSC 321.9, Prod. Div.

AAFHS-40

147

set a unit to correcting the work of other units of coordinate or higher rank.

On 1 April 1942, PES, IPS, and units of the Budget Office were combined into a Production Division, "in order to improve efficiency."¹⁸ The former chief of PES, as senior in rank, became the chief of the new division. At the same time a new Production Control Section (PCS) was established in the Production Division. The new section was instructed to "follow up" the "basic program" through PES, IPS, and Contract Section by liaison with the branches thereof until the contracts should have been released.¹⁹ This came close to giving one section supervision over the activities of organizations of coordinate or higher rank. Contract Section was of equal rank with Production Division. PCS also was given a number of duties that largely duplicated those of units of IPS. Budget Office managed to retain the functions supposed to be transferred to PCS. IPS resisted attempts of PCS to encroach on its prerogatives and was supported by ASU.²⁰

In June 1942 a conference of representatives of the AAF, the Navy Bureau of Aeronautics, and WFB agreed upon a new method of determining the aircraft industry's requirements for raw materials. The conference requested the establishment of a unit in the Administration Branch of IPS to administer the plan. The chief of the Production Division

18. Mat. Comd. GO #5.

19. Prod. Div. OM No. 42-12, 23 May 1942, in ATSC 321.9, Prod. Div.; ICM, Col. W. D. Eckert, Exec. for Prod. Control, Prod. Div., to CG, Mat. Gen., 27 Oct. 1942, ibid.

20. Col. Don Hutchins, Chief, PCS, to Army Member, ASU, 17 Oct. 1942, and numerous other documents in ATSC 321.9, Prod. Control.

AAFHS-40

148

vetoed the arrangement and required the establishment of a Production Requirements Plans Branch in IPS, "for the purpose of coordinating and effectuating all activities of all Branches of the IPS and other Division activities pertaining to PRP." He designated the chief of the new branch, a civilian persona non grata to the chief of IPS in this case.²¹ This action virtually deprived the chief of IPS of supervisory control over one important phase of his section's activities.

The formation of Production Division did not result in improved coordination between PES, PCS, and IPS, the three sections. On one occasion in August 1942, the chief of PCS proposed a committee composed of members from the three sections to coordinate their activities in the matter of computing the requirements of the aircraft industry and to prevent duplication of effort by the sections. Coordination of the three sections was properly a Production Division staff function. The chief of IPS assented to the formation of the proposed inter-sectional committee subject to the sweeping proviso that it should not affect the scope of the actions and responsibilities of the several sections and that the current functions of Requirements Branch, IPS, remain with that branch in their entirety.²²

In February 1943 WPB decided to institute allocation and scheduling of the production of 28 "common components," of which there appeared to be critical shortages. It assigned nine of these critical

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21. Memo for Dep. Dir. Prod. Div., WPB, by Chief, Navy Bur. of Aeronautics, 8 June 1942; T.X, Exec., LM&D, Wash., to CG, Mat. Gen., 13 June; IOW, Chief, Prod. Div., to Chief, IPS, 13 June; all filed in ATSC 321.9, Prod. Div.
22. Notes by Col. P. Schneeberger, 12 Aug. 1942, in Facil. Br., RCS, Gen. Proced. file.

common components to ASU, Wright Field, for administration, namely, actuating cylinders, spark plugs, starters, carburetors, magnetos, generators, gears, fittings and valves, and fuel and hydraulic pumps. In the case of these components, it was decided that ASU should function through PCS rather than through IPS as it did in the case of machine tools and critical materials.²³ This deviation further complicated the administrative pattern.

Lack of proper coordination within Production Division, between Production Division and Contract Section, and perhaps between Wright Field and Washington resulted in a breakdown of the machinery for forecasting needs for further expansion of facilities for producing AAF materiel. After the transfer of Production Surveys Branch from PES to IPS in December 1941, the function of determining necessity for expansion rested with IPS,²⁴ but IPS was largely dependent upon Contract Section, Production Engineering, and Production Control for information with regard to programs. To one of several requests for an estimate of future facilities expansion needs, in August 1942, Colonel Schneeberger, chief of IPS, replied that he could not give one because his section "has no advance ideas of what requests will come in until they come in."²⁵

Production Control Section underwent frequent reorganizations

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23. PCS OM No. 43-166, 15 April 1943, in ATSC 321.9, Prod. Div.; Col. E. M. Powers, Administrator, ASU, to Chief, Prod. Div., 9 April 1943, ibid.
 24. IOM, Col. P. Schneeberger to Chief, PES, 2 Feb. 1942, Facil. Br., RCS, Gen. Proced. file.
 25. ICM to CG, Mat. Comd., att. Chief, Res. Div., 27 Aug 1942, in Facil. Br., RCS, Gen. Proced. file.

AAFHS-40

150

that were very conducive to inefficiency. Its organization was in an almost constant state of flux. In spite of its difficulties in acquiring functions, it assembled a personnel of over 1,000. It could not keep them all effectively occupied.²⁶

In May 1943, after both Production Division and IPS (which meanwhile had been renamed Production Resources Section) had acquired new chiefs,²⁷ organizational conflicts and difficulties were resolved. Col. Orval R. Cook, the new chief of Production Division, acting on an earlier suggestion of Brig. Gen. Arthur W. Vanaman, Commanding General of the Materiel Center,^{27a} appointed two trained executives to make a study of FCS to see if it could not profitably be combined with IPS (or PRS). They reported that such a consolidation would eliminate duplication and overlapping of functions and would improve relations between Materiel Command on the one hand and ASU, WPB, Aircraft Resources Control Office (described below), War Manpower Commission, and the Navy on the other.²⁸ By a Production Division office memorandum of 19 June 1943, Colonel Cook consolidated Production Control Section, Production Resources Section, and Manufacturing Methods Section (described below) into a Resources Control Section (RCS). Some of

26. IOM, Brig. Gen. Arthur W. Vanaman, CG, Mat. Cen., to Chief, Prod. Div., 18 March 1943, in ATSC 321.9, Prod. Div.

27. Col. P. Schneeberger was retired in September 1942 because of ill health. Brig. Gen. K. B. Wolfe left Wright Field in February 1943 to take charge of the special B-29 project. In June he was placed in command of the 58th Bombardment Wing.

27a. The Materiel Division at Wright Field was redesignated the Materiel Center in March 1942.

28. Report of Col. H. R. Herod and E. W. Rawlings to Col. O. R. Cook, 24 May 1943, in ATSC 321.9, Prod. Div.

A.PHS-40

151

the units of the former PCS were absorbed into RCS. Others were disbanded. The clear implication of the report of the officers who made the study of PCS and of the actions taken with regard to it is that PCS should never have been organized in the first place.

Meanwhile an attempt had been made to solve the jurisdictional difficulties that had obtained among higher authorities in Washington over the control of ASU in particular and aircraft production in general. The solution was principally the creation of the Aircraft Resources Control Office (ARCO) of Aircraft Production Board.

The establishment of ARCO came about in this fashion: In September 1942, Charles E. Wilson, vice chairman of WPB, had been given the special assignment of eliminating the bottlenecks which were retarding the production of aircraft. Wilson secured the establishment of the Aircraft Production Board,²⁹ APB was composed of C. E. Wilson himself, as chairman; Lt. Gen. W. S. Knudsen, representing the Under Secretary of War; Maj. Gen. O. P. Echols, representing the AAF; Admiral E. M. Pace, Jr., representing the Navy Bureau of Aeronautics; and T. P. Wright, of Aircraft Production Division, WPB, as recorder. APB thus itself became a little WPB for the aircraft industry. APB in turn, by order of 19 February 1943, established ARCO as its executive agency in all matters of manpower, materials, and machine tools. This order was confirmed by WPB.³⁰

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29. WPB Gen. Admin. Order No. 2-72, 9 Dec. 1942; Henry L. Stimson to Donald Nelson, 28 Nov. 1942, in Dep. AC/AS, L&S, Lovett file; Lt. Gen. H. H. Arnold to Nelson, 22 Nov. 1942, *ibid*.
30. WPB Gen. Admin. Order No. 2-82, 3 March 1943, copy in Facil. Br., RCS, Gen. Proced. file. The establishment of ARCO involved many conferences and adjusting of conflicting opinions and interest.

upon metal-working establishments, engineers, and workers in general and especially those with experience in precision fabrication. Consequently, as has been shown, there was a strong tendency on the part of the AF and other services to pour orders into communities where such industry had been conducted while leaving other communities comparatively neglected. This created labor shortages, housing shortages, and transportation difficulties in some places while leaving surpluses of labor and housing in others. The erection of numerous new plants in locations remote from workers' residential districts also contributed to labor dislocations. As early as 2 March 1942 the Plant Site Board, WPB, declared that no further expansions would be considered for the Detroit area.³¹ It could not enforce the rule. By May the Flint, Saginaw, Indianapolis, and Buffalo areas also had critical labor shortages.³²

Taking cognizance of labor shortages and dislocations and the inequalities of demand upon various communities, the President created a War Manpower Commission (WPC) on 18 April 1942.³³ It consisted of representatives of the Departments of War, Navy, Agriculture, and Labor, the WPB and its Labor Division, the Selective Service System, and the Civil Service Commission. Thus the Manpower Commission contained spokesmen for all the great branches of the national economy.

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31. T.X., Facil. Sect., Office, Chief, Mat. Div., Wash., to Chief IPS, Manuf. Methods Br., RCS, in RCS facil. file.
 32. T.X., Res. Div., MM&D, Wash., to Chief, IPS, 17 April, in Facil. Br., RCS, Process, Proced. file; Chief, IPS, to Dist. Sup., CPD, 17, 25 April 1942, *ibid*.
 33. Executive Order 9139, Code of Federal Regulations of the U.S., cumulative sup., title 3.

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Practically ARCO did the staff work in Washington for ASU, Wright Field, representing the latter before the various WFB divisions, and acted as liaison between WFB and APB on the one hand and the Joint Aircraft Committee of the Army, Navy, and British Purchasing Commission on the other. ARCO was headed by a Director, designated by APB, a representative each of the Army Air Forces and the Navy Bureau of Aeronautics, and a recorder. The staff consisted of personnel drawn from the Army Air Staff (especially from the Resources Division of the Materiel Command), the Navy Bureau of Aeronautics, and Aircraft Production Division of WFB. The last named unit was abolished as such. Thus ARCO was for limited purposes and to a limited extent a merger of portions of WFB, the Army Air Forces, and the Navy Bureau of Aeronautics, with WFB the dominating ingredient. Its pattern of organization was the same as that of ASU, Wright Field.

In brief the creators of ARCO and ASU sought to resolve jurisdictional disputes among agencies and certain coordination difficulties by combining portions of those agencies while leaving the agencies otherwise intact and functioning in their former manner. Although such creations violate all the standard principles of administrative organization, ASU and ARCO were successful, perhaps because the WFB ingredient dominated. All the basic policies and procedures employed by ASU and by ARCO had been developed before the latter was established. ARCO may have helped to improve administration.

The manufacture of airplanes, airplane engines, accessories, and instruments, as well as other munitions industries, put a premium

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AAFHS-40

154

~~CONFIDENTIAL~~
Paul V. McNutt, Federal Security Administrator, was appointed chairman.

The AAF Materiel Command was a claimant agency for industrial manpower. As such it continued for a time to attempt to place orders with concerns and in localities best qualified to meet them and, in the main, considered that the responsibility for distributing war work equitably among localities and industries and for minimizing labor dislocations, housing shortages, and other stresses and strains rested with MGC and other agencies. However, Materiel Command found it necessary to establish units to present the labor requirements of AAF contractors, to attempt to improve labor utilization in aircraft factories, and to deal with other labor matters. Its activities in these respects are described briefly in the next chapter.

As the war's demands increased, the government found it advisable to concern itself with the internal organization, the shop management, and the actual manufacturing methods of the concerns engaged in war production.

The Materiel Command had abundant opportunities to impose conditions and offer suggestions with regard to management and methods. Contracting officers could require firms with organizational weaknesses to strengthen their organizations as a condition of being awarded contracts--to replace an incompetent plant superintendent, for example. The project engineers in PES, who were responsible for designs, specifications, and changes therein, were in an excellent position to make suggestions as to manufacturing methods. The function of scheduling production included making investigations to see why accepted schedules were not being met and reducing schedules if necessary.

~~CONFIDENTIAL~~

AMFHC-40

155

In consequence, it included the authority to demand changes in management and methods as a condition of retaining schedules. The processing of applications for new machine tools gave Facilities Branch, IPS, the power to insist upon improved use of tools already installed as a condition of the receipt of more tools. The inspectors, who accepted or rejected the articles as they came from the production lines, could make valuable suggestions to manufacturers as to how they might improve their own inspection systems and manufacturing methods all along the lines and thus reduce rejections at the end with advantage both to the government and themselves.

In general, contractors were competent and knew what they were about. Industry supplied the great bulk of the ideas and improvements. Government interference was occasional and corrective rather than constant. Perhaps the best thing the representatives of the services did in this regard was to gain ideas from the best-run establishments and carry them to the less efficient ones.

Some of the best work in the field of shop management and manufacturing methods insofar as Materiel Command was concerned was done by the Manufacturing Methods Staff. The staff consisted of a number of civilian production engineers all of long shop experience, headed by E. F. Trimbach. It had been first organized as Production Control Branch, FES, and as such performed a variety of duties, which have already been described.³⁴ It became the Manufacturing Methods Branch in PCS when that section was established in April 1942.³⁵ In November

34. See p. 53.

35. Prod. Div. CM No. 42-79, 19 May 1942, in Manuf. Methods Staff, MCS, Prod. Div. CMs file.

1942 it was elevated in rank, becoming the Manufacturing Methods Section, Production Division.³⁶ In the reorganization of June 1943, it was reduced in rank and was attached to the Industrial Service Branch in the new Resources Control Section.³⁷ Its specialty was making investigations of plants that were having production troubles and recommending corrective measures. It made literally scores of such investigations.³⁸ Other units of Materiel Command also possessed individual production engineers of outstanding ability. For example, and without disparagement of others, Capt. G. G. Hathaway, long in the Machine Tools Branch, was reputed by his colleagues to be one of the best tools men in the entire country.

General Knudsen, Director of Production in the OUSW, in his frequent tours of airplane factories was able to make most valuable suggestions as to shop practices. WPB officials likewise made occasional inspections of aircraft plants and suggested corrections.³⁹ On one occasion WPB organized a group of production specialists to assist the services in remedying urgent production difficulties that were beyond their scope.⁴⁰ There will be occasion later to mention numerous labor utilization studies that were made after manpower

36. Prod. Div. CM No. 43-183, 17 Nov. 1942, *ibid.*

37. RCS Notice, 8 July 1943, in ATSC 321.9 Prod. Div.

38. Reports, filed by numbers in Manuf. Br., RCS.

39. See, e.g., report of G. W. Herkner, Tools Br., WPB, on inspection of West Coast airframe plants, 27 May 1942, in Facil. Br., RCS, Gen. Proced. file.

40. C. E. Gary, Regional Office, WPB, Cleveland, to Col. W. R. Herod, Exec., Prod. Div., WF, 19 Feb. 1943, in Manuf. Methods Br., RCS, Facil. file.

shortages became critical.⁴¹

One expedient adopted in 1942 that greatly expedited aircraft production was the establishment of modification centers.⁴² Essentially an aircraft modification center was any establishment more or less regularly engaged in making changes in aircraft after they came off the assembly lines of the airplane plants. In the nature of the case, modification centers employed hand tools to a much greater extent than did the regular aircraft factories; their methods were "quick and dirty."⁴³

The first aircraft modification centers were established to make necessary changes in aircraft that had already been accepted and were presumably ready for action. After the disasters at Pearl Harbor and Clark Field, the government took over a large number of planes that had been built on account for foreign governments and desired to substitute in them standard American instruments and armament. Likewise, early combat experience showed that our planes had sad deficiencies; for example, the B-17 had no tail guns. Such deficiencies had to be corrected if possible.

In the emergency, the Materiel Division practically commandeered the maintenance and repair depots of commercial airlines for the purpose. By utilizing the skilled mechanics, the buildings, and the tools of the airlines, it avoided interrupting the regular work of the aircraft companies, which were then being pressed to the limit.

41. See pp.

42. Modification centers are treated in JAF Historical Study (in preparation), "The Modification of Aircraft, Procedure, Policies, and Problems."

43. See article by Paul Gallico, "Quick and Dirty," in Saturday Evening Post, 9 Oct. 1943, pp. 9 ff.

AAPHS-40

158

The modification centers thus established were often used also in the early part of the war to install equipment that had arrived too late for the assembly lines. The scheduling of the production of equipment, both GFE and CFE, was far from scientific in those days. To hold the planes at the aircraft factories until the tardy items should arrive would cause congestion. Furthermore, the sight of numbers of idle planes about the factories was likely to depress the morale of workers, who had been told how badly their planes were needed at the fronts.

As time went by the AAF found a more legitimate function for modification centers.⁴⁴ That was to make prior to acceptance of planes from the manufacturers desired changes which could not be economically introduced into the regular production lines. Experience in combat, transport, and training constantly suggested desirable changes in aircraft, thousands of them. To insist upon provision in the production lines for these changes as soon as they were conceived would have kept the lines in a constant state of retooling and made the use of quantity methods of production very difficult. Some of the changes were not needed in all the planes of a given model but only in those destined for particular theaters or special missions. Furthermore, it took a long time for an airplane to go through the production lines of aircraft factories; and retooling would effect changes only in those

44. Report of Lt. Col. Signer for Col. B. I. Boatner, Chief, Special Projects Sect., to Chief, Prod. Div., on Functions and activities of the Special Projects Sect., 5 Jan. 1943, in ATSC 321.9, Prod. Div.; Prod. Div. CM No. 43-246, 13 Jan. 1943, and Exhibit A attached; Lt. Allan R. Scholm, "Superfortress Modification", in Air News, Jan. 1945, pp. 45-46.

planes or parts that had not already passed the particular stations in the lines in which the retooling had been done. On the other hand to introduce none of the changes into the production lines and leave all to be made with hand tools later would largely have deprived the AAF of the benefit of quantity methods of production. Many changes could not be made with hand tools at all after a plane was complete. The solution was a compromise. Aircraft companies were required to incorporate changes in various stations on the production lines after an agreed-upon "block" of the part or assembly concerned, say 50, had passed. Other desirable changes, not caught thus, were left to be made in the modification centers. Modifications of this last class may be said to have become almost a normal part of the process of manufacturing aircraft. Most of the modifications in the later part of the war were of this type.

As time went by, the hastily mobilized maintenance depots of the commercial airlines gave way to modification centers built and equipped for the special purpose. The AAF sponsored the construction of 19 of them, which together cost over \$75,000,000. Of these, 16 were constructed by the Corps of Engineers and three under the DPC and EPF plans of financing.⁴⁵

When the modification centers were operated by the airline companies or other independent concerns, the tasks of scheduling the ever-changing jobs of the centers, coordinating their work and that of the manufacturers, and preventing the latter from leaving too many things for the

45. AAF Facilities Expansion, Status, Progress, and Performance, monthly report prepared by RGS.

AMTH3-40

160

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modification centers to finish were most difficult and tedious. The AAF found it advisable as time went by to entrust the operation of the modification centers to the companies that assembled the airplanes and to require that modifications, insofar as then determined upon, be incorporated before the planes were accepted. This new "single-acceptance" policy had the added advantage of utilizing for modification the technical competence of the staffs of the manufacturers that made the planes.⁴⁶

Some of the modification centers were located so close to the assembly plants that the planes could be towed from one to the other. Others were remote. For example, the B-24's made by Ford Motor Company in the Willow Run plant, near Ypsilanti, Mich., were flown to Birmingham, Ala., for modification.

Modification Centers were handled at Wright Field as a special project, and the administrative work was parcelled out among sections and branches in a manner different from the usual procedure. The problem of getting the first centers organized in a hurry was "dumped into the lap" of Lt. Col. Bryant L. Soatner, chief of Special Projects Branch, PES. He "bulled it through." As the project grew his branch retained control, enlisting the aid of other sections and branches as needed. In October 1942, General Wolfe converted the branch into the Special Projects Section of Production Division, and modification matters were assigned to the Modification Center Branch.⁴⁷ This branch in turn became the Aircraft Modification Section in February 1943,⁴⁸ and later underwent additional organizational vicissitudes.

46. Mat. Cond. FOM No. 152-2, 6 June 1944, "Modification", in ATSC 452.1, Airplanes, General, Modification.

47. Prod. Div. CM No. 43-123, 10 Oct. 1942, in ATSC 321.9, Prod. Div. report of Lt. Col. Signer, 5 Jan. 1943, *ibid*.

48. Prod. Div. CM No. 43-271, 1 Feb. 1943, *ibid*. ~~RESTRICTED~~

AMHS-40

Chapter VIII

FACILITIES PROCUREMENT, 1943-1944

The volume of expansion of AAF-sponsored industrial facilities authorized in the later part of the war was small as compared with that of the earlier part of the emergency period. In 1943 the principal limiting factor was not so much estimates of airplane requirements as materials shortages and, especially, labor shortages. By 1944 the AAF found itself with an over-all excess of industrial facilities. The principal tasks of facilities procurement officials were then to provide for the limited expansions that were still necessary in special cases, to avoid financing unnecessary expansions, and to make proper disposition of surplus facilities.

The machine-tools bottleneck in setting up facilities and getting them into operation had been virtually eliminated by the end of 1942 or early 1943. The construction materials shortage was sufficiently alleviated by the middle of 1943 to give little more concern. Measures taken to alleviate tools and materials difficulties have already been described. The labor bottleneck developed later than the other two and outlasted them.¹

Local and area labor shortages appeared as early as the spring of 1942. Shortages became increasingly serious as more and more of

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1. It is not intended to attempt a detailed analysis of the manpower problem in this study. Labor in the aircraft industry is the subject of another monograph in this series. But it seems necessary for the sake of clearness to show in a general way why labor became a bottleneck to facilities procurement and later ceased to be one.

LAFHS-40

162

the new plants went into operation. By early 1943 processing officers at Wright Field had to be especially careful to supply complete and satisfactory labor data in their processing interoffice memorandums (IOMs) if they were to get their projects by the Facility Clearance Board, WFB.² By June the Materiel Command was acutely aware that labor shortages and problems were holding back production in numerous plants producing AAF materiel.³ As the summer went by, all discussions of further expansions turned on the availability of manpower. The chairman of the new Industrial Facilities Committee, WFB, arranged to have a member of the War Manpower Commission present at all meetings.⁴ In September the Resources Control Section, Wright Field, established an Industrial Manpower and War Housing Office to collect information on labor conditions.⁵ The Comptroller's Office was given responsibility for collecting manpower statistics from AAF contractors and recommending action to be taken with regard to labor matters.⁶ Labor continued to be a limiting factor in aircraft production until the spring of 1944, as well as a deterrent factor in facilities expansion, at least in the more congested areas.

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2. IDC, Lt. Col. George H. Moriarty, Chief, Indust. Res. Br., RCS, to Chief, Facil. Unit, 9 March 1943, in Facil. Br., RCS, Process. Proced. file.
 3. IOM, Col. E. L. Rawlings, Chief, RCS, to Chief, Personnel Sect., Mat. Comd., 8 June 1943, in Facil. Br., RCS, Gen. Proced. file.
 4. Memo for Dist. Supervisors by C. W. Chapman, 3 Aug. 1943, ibid.
 5. IDC, Maj. J. L. Bowling, Chief, Facil. Unit, to Maj. A. P. Evans et al, 22 Sep. 1943, in Facil. Br., RCS, Process. Proced. file.
 6. IOM, Col. A. D. Eckert, Comptroller, to Col. O. R. Cook, Chief, Prod. Div., 21 Sep. 1943, in AFSC 321.9, Prod. Div.

The reasons for labor shortages are easier to analyze in retrospect than they were during the confusion of the times.⁷

It took time to recruit labor. Workers had to be forced out of civilian industries that were being progressively curtailed and drawn into new plants and jobs. Housewives had to be enticed from their homes. People who had never before worked for wages had to be persuaded to change their attitude. For reasons already stated, the new war industries were not distributed about the country in the same proportions as the workers they sought to utilize. Therefore, workers had to be brought from the surplus labor areas into the neighborhoods of the war plants. They were deterred from moving by disinclination to leave homes and families, by shortage of houses, apartments, and rooms, by lack of recreational opportunities, and by general unsatisfactory living conditions in the congested areas near the war factories.

During the period of rapid construction of new industrial facilities a great number of workers were not available for work in the factories because they were employed at high wages in constructing other plants and the hundreds of cantonments, posts, air fields, and other installations for training and defense that were being provided. Many workers were engaged in constructing war housing and installing utilities in the vicinities of new war plants and Army and Navy posts.

7. The analysis which follows is based largely on Aeronautical Monthly Progress Report No. 3, Trouble Chart, prepared by the Office of the Comptroller, Mat. Comd.; U.S. Dept. of Labor, Bulletin No. 800, War-time Development of the Aircraft Industry, prepared by the Div. of Construction and Public Employment (Nov. 1944); Manuf. Methods Staff reports on visits to plants, in Manuf. Methods Br., RCS, ATSC files 004.06, Labor Utilization, 004.06, Labor Statistics, and 004.06, Labor Requirements; Ford-Ypsilanti Corres. in Facil. Br., RCS.

As late as October 1942 Donald Nelson estimated that from one-fifth to one-fourth of our total war effort was going into construction.⁸ In May 1943 a WPB vice chairman asserted that in the three years 1940-42 inclusive almost \$38,000,000,000 had been expended upon facilities of all sorts and less than \$43,000,000,000 upon actual munitions. Thus in the three years 90% as much effort had gone into construction as into production of munitions.⁹ Likewise hundreds of thousands of civilians, who might otherwise have been employed in munitions factories, were employed on military posts and bases or in providing services of various sorts for the military and civilian personnel of such military installations.

As a consequence of conditions described, the absentee and turnover rates were high in munitions factories as compared with rates in peacetime industry. The average absence rate in airframe, engine, and propeller plants in 1943 was 7.3%, and the separations in that year were 68.6% of total employment. Simple voluntary "quits" amounted to 49.9% of total employment. Most of the remaining separations were occasioned by Selective Service. Employers fired comparatively few war workers. "Immigrant" workers, tired of poor living conditions and separation from families and friends, quit their new jobs to look for other jobs nearer their homes. Many women workers followed their men folk, when the latter were drafted, and took up residence in the

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8. Donald Nelson to Henry L. Stimson, 20 Oct. 1942, copy in Facil. Br., WSG, WPB file.
9. Ralph J. Cordiner, "A Review of Facilities and Construction," 4 May 1943, a statement for presentation to WPB, ibid.

AMFHS-40

165

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vicinity of the camps. Women new to industry took time off to go shopping. Arrangements for care of their children often broke down, and they had to take time out to make other arrangements. People took time off to visit their old homes or to visit boys in the camps. New workers unaccustomed to factory discipline and fatigue took time off to rest. There was considerable illness due to unusual strains, changed eating habits, and inadequate housing.

When the new plants went into operation, the great majority of the workers were inexperienced in the particular operations they were called on to perform. A large proportion were untrained and undisciplined in industrial labor of any sort. The rapid turnover already mentioned aggravated this condition. Management too was often green. And, even if not inexperienced, it required time to get kinks out of the production lines. There were often too many workers at some stations or in some departments and too few in others; the consequence was that some workers were idle while waiting on their fellows. As has been noted, there was difficulty about the flow of materials, parts, and equipment from suppliers, subcontractors, or the government, with consequent enforced idleness while waiting for the delayed materials or parts. Because of untrained workers and inadequate inspection systems along the production lines, the percentage of final rejections was high. As a result of all these inefficiencies, it usually took far more man-hours to build a plane, an engine, or a propeller in a new plant than it had taken in an established plant, on the basis of whose experience the new facilities had been set up. Managers "bulled" production through by sheer force of numbers. This

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A.F.H.-40

166

~~CONFIDENTIAL~~
method was, to be sure, not uncommon in new plants even in peacetime. But when early in the war hundreds of concerns were using it at the same time, it entailed a tremendous demand for labor. Ineffectiveness was greater perhaps in aircraft factories than in other munitions plants because in general the operations were less similar to those in which engineers and hands had been employed before.

Then, too, there was for a while considerable hoarding of labor, just as there had been hoarding of materials. Many managers hired more people than they could utilize at the time because they hoped to get more contracts or increased schedules later. They thus contributed to the labor difficulties of their competitors and helped to create both local and national shortages.¹⁰

Contractors were not under strong incentives to pare down their labor requirements or, if they could get labor, to improve efficiency. Many contracts were of the cost-plus-fixed-fee type; the government paid the hands. And in cases of fixed-price contracts, the prices had been placed so high that there was little incentive to try to cut costs. Nearly all of the added profits that might be made thereby would have to be repaid to the government in the form of income and excess profits taxes.

All these factors and conditions that militated to produce the labor bottleneck were partially offset, to be sure, by a few other factors which operated the other way. Hours were lengthened, and, although productivity per worker was not thereby increased in proportion, it was increased. Improvement in wages was another factor.

10. See S. Rept. No. 10, 78 Cong., 2 sess., pt. 16, pp. 23 ff.

~~CONFIDENTIAL~~

AAFS-10

167

Not only were rates per hour increased but workers' total wages were increased considerably by the extension of hours, by the payment of time and one-half for hours in excess of 40 per week, and by more steady employment. Increased wages were the most powerful aid to recruiting. The fact that labor's no-strike pledge was remarkably well kept also helped ease the situation. But since both direct and indirect loss of man-hours from strikes had been even in normal times only a comparatively small, although by no means inconsequential, percentage of the total of man-hours employed, the no-strike pledge could be only a minor factor in increasing the total of man-hours of work.¹¹ Finally, the national peril no doubt was an incentive to management and labor alike to work harder.

Various temporary and localized measures were taken in the attempt to ease the stresses and strains of labor recruitment. Most of them were of the nature of trying to prevent the services from pouring new contracts and new facilities into favored areas or towns faster than the communities could absorb the workers that must be brought in. This was the course taken by WPB. It was also the course of the War Manpower Commission. WMC looked upon itself as a service agency whose function was to find the labor and supply it where needed. But it had

11. Man-hours of labor lost both directly and indirectly from strikes in industry in 1943 are estimated to have amounted to about 0.25% of total man-hours worked. This may be compared with an absentee rate in the aircraft industry of 7.3%, nearly 30 times as great.

AAFHS-40

168

to try to impose some restraints on too great a concentration of war work in certain areas. Such concentration, if uncontrolled, would defeat the very purpose intended. It would have prevented concerns with orders from getting the labor with which to meet their schedules.

In December 1942 MAC published a classification of labor market areas. Group I covered overcrowded areas. In these areas no new contracts should be placed and no expiring contracts should be renewed if facilities were available elsewhere. In Group II were areas in which large-scale recruiting was going on and which were having or had had substantial immigration. In these areas only contract renewals at current levels should be made if additional facilities required could be found elsewhere. In areas of Group III new contracts might properly be placed if they could be completed within six months. Group IV, a sizable list, covered areas still open to placement of new contracts and new facilities.

Beginning in September 1943, WPB set up Area Production Urgency Committees (APUC) in areas of critical labor shortages. All agencies concerned, including Materiel Command, were represented on these committees. Thereafter area or district offices had to obtain clearance from the appropriate APUC for any new contracts or facilities which Materiel Command proposed to place in the area.¹²

Because of the construction materials shortage and more especially the labor shortage, the AAF had to forgo, particularly during the period from late 1942 through 1943, a number of prospective expansions

12. WPB Gen. Admin. Order No. 2-126, in Facil. Br., I&S, Policy file; Chief, Res. Div., I&S, to CG Mat. Comd., att. Lt. Col. G. H. Moriarty, Chief, Indust. Service Br., ACS, 15 Oct. 1943, in Facil. Br., ACS, Gen. Proced. file.

LAFHS-40

169

that it had looked upon with favor. Some of them it carried to the point of getting informal vetoes from the Facility Clearance Board, WPB.¹³ The few major expansions that were approved during the period of critical labor shortages were mostly for the production of new types of planes, engines, or other items which the turns of the war had demonstrated to be critically needed. Efforts were made to locate these new facilities in surplus labor areas.

A great need developed for heavy cargo planes to carry supplies to South America and the Caribbean and across "the hump" to China, to expedite the transport of key personnel and valuable repair parts to the combat zones, and to evacuate wounded. In November 1942 the Higgins Aircraft Corporation was authorized to build an extensive factory near New Orleans with LFC financing for the purpose of making C-76 transports of plywood construction.¹⁴ The original estimate of cost was \$23,735,000. New Orleans was not a critical labor area. In July 1943 the Fairchild Aviation Division, Fairchild Engine and Airplane Corporation, was given an SF contract to build a plant at Hagerstown, Md., for making C-82 heavy transports. The cost was estimated at \$3,596,290.

The decision to increase production of B-29 long-range, heavy bombers, with their large assemblies and numerous new type instruments

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13. T.A. Res. Div., memo, to Administrator, ASU, 10 Feb. 1943, and reply, 11 Feb., in Facil. Br., ACS, Ford-Wpsilanti corres.
 14. This statement and similar statements that follow about other companies are based on data gained from AAF facilities expansions, Status, Progress, and Performance, a monthly report prepared by ASU; correspondence filed by name of company and project, Facil. Br., ACS. Higgins did not, in fact, build C-76's. Not all facilities were employed for the purpose for which they were originally planned.

AAFHS-40

170

and accessories, called for extensive retooling of many plants and some new construction. In May and June 1943 the A. O. Smith Corporation was authorized to build a new plant in Milwaukee and to do extensive retooling of its existing facilities in Milwaukee and St. Paul for the purpose of producing propeller blades for the B-29's. The authorized costs of all were over \$23,000,000. The Murray Corporation, Detroit, was engaged in August 1943 to build a DFC plant at Scranton, Pa., at a cost of \$5,748,000, for making Superfortress outer wings. Scranton, considered a labor-surplus town, was chosen although the AAF had hoped that Ordnance would release a Fisher Body plant in Flint for this project.¹⁵ The General Railway and Signal Company, of Rochester, N. Y., was given tools for making remote-controlled turrets. The Ranger Aircraft Division got a new DFC plant at Jamaica, Long Island, to make supercharger auxiliary power units at an authorized cost of \$8,892,760.

Other considerable expansions or retoolings were necessary to initiate production of the new attack bomber, the A-26 "Invader." The government plant at Tulsa, operated by Douglas, was retooled for the purpose at a cost of over \$3,000,000.

The construction of four of the big modification centers was authorized after 1 October 1942, for reasons already given. The four were located in Denver, Birmingham, Tulsa, and Oklahoma City, cities which were not experiencing labor shortages.

During the period of great labor stringency there were also

15. Memo for Maj. Gen. O. I. Echols by Brig. Gen. F. M. Hopkins, Jr., 12 July 1943, in office, Dep. AC/AS L&S, Facil. file.

AAAFHS-40

171

numerous authorizations for the purchase of new tools or for minor structural changes and additions that were deemed necessary or desirable to round out new facilities, to permit augmented production, to convert plants for war work, or to facilitate change-overs from production of one type or model to production of another. Most of the changes of these classes did not require the employment of additional labor, although many did.

Gradually the labor stringency was overcome or disappeared. By January 1944, the worst was over. Thereafter there was no over-all shortage in the aeronautical industry or for that matter in munitions industries as a whole. There were, to be sure, local shortages here and there and sporadic shortages in various areas because of sudden increases in demand for particular items or too great a release or loss of workers to nonessential industries.

Several conditions and numerous agencies, public and private, contributed to this elimination of the labor bottleneck. Recruiting programs were successful. High wages continued to attract. Thousands entered war industries in the hope of avoiding conscription into the armed forces. Dependents of servicemen often found it necessary to eke out incomes. Living conditions in industrial areas became less of a deterrent when new houses were built, people learned to let out rooms and apartments, and people became more accustomed to crowding. Absenteeism declined a little from a high reached in December 1943.

In selected representative segments of the aeronautical industry employment rose as follows:¹⁶

Jan. 1940 ... 77,500	Jan. 1943 ... 1,028,000
Jan. 1941 ... 194,000	Nov. 1943 ... 1,326,000
Jan. 1942 ... 460,000	Jan. 1944 ... 1,308,000

Employment in the industry was at its peak in November 1943. The number of workers in manufacturing industries as a whole increased from 8,192,000 in 1939 (annual average) to 13,988,000 (estimate) in September 1943, an increase of 70%. The increase in the number of man-days worked in manufacturing was even more impressive; it was 89.6% greater in 1943 than in 1939. The number of people in all gainful nonagricultural occupations in the country rose from 37,400,000 in July 1940 to 45,100,000 in July 1943 and was 43,600,000 in March 1944 (estimated). These remarkable increases in employment had been attained despite the fact that by January 1944 well over 10,500,000 people were in the armed forces. Included in the figures for gainfully employed were members of the Civil Service. The number of people in the Federal Civil Service increased by 1,772,000 between 1940 and 1944 and decreased by so many the number available for war industry.¹⁷

As construction of new facilities, both industrial and military, tapered off in 1943, construction workers were released for work in

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16. Derived from Aircraft Program Progress Report, a monthly publication prepared by Office of the Comptroller, Mat. Comd., IAF; and U.S. Dept. of Labor, Bulletin No. 800, Wartime Development of the Aircraft Industry, p. 5.
 17. Figures from Statistical Abstract of the U.S., 1943, pp. 139-40, and World Almanac, 1943, pp. 46, 662. The decline between July 1943 and March 1944 in number gainfully employed was a little greater than the normal seasonal decline.

manufacturing. Construction activity declined uninterruptedly from a peak of \$1,468,000 during August 1942 to an estimated \$361,000,000 during December 1943.¹⁸

Improved efficiency in war industries likewise was an important factor in overcoming labor shortages. As the efficiency of workers improved with experience, it took fewer of them to produce a given number of planes. Their skill increased, and those comparatively new to industry became less subject to fatigue. Management also learned by experience. Engineers were able with time and effort to get kinks out of production lines and to introduce labor-saving devices and methods. As has been noted, the Materiel Command, through its Management Methods Staff and other units, was able to make a noteworthy contribution in the matters of factory management and manufacturing methods.¹⁹

Workers' morale improved as the war became of more absorbing interest. Especially after our troops went into action in various theaters and longer casualty lists began to come in, people settled down better to the grim task of winning the war. The "slow down", a common method used by labor to make the work go around, became less evident, and apparently labor became less hostile to the introduction of labor-saving devices as full employment was attained. Management-labor relations were improved somewhat. Labor incentive schemes were successfully introduced in a number of aircraft factories.

Materiel Command did not venture far into the difficult field

18. Bureau of Planning Statistics, WFB, War Construction and Facilities Summary, 31 Oct. 1943 (pamphlet).

19. See p. 155.

AAFHS-40

174

of labor relations, preferring to leave it to the regular civilian agencies.²⁰ However, Factory Representatives were instructed to make timely helpful suggestions and to cooperate with civilian agencies. Intelligence officers concerned themselves not only with disloyalty among plant personnel but also, to some extent, with influences detrimental to workers' morale.

Various measures taken by WFB and the AAF to regulate the flow of materials, parts, and articles of equipment to the plants were also conducive to increasing their productivity by reducing the amount of enforced idleness. Such measures have already been briefly described. Improved scheduling of production by ASU and Materiel Command by helping to stabilize industry also contributed to increasing the effectiveness of the plants.

Unfavorable publicity directed at manufacturers was perhaps the most effective remedy for labor hoarding. Also effective in this regard, as well as in improving labor utilization generally, were labor utilization studies and the establishment of labor ceilings.

Labor utilization studies were made by several agencies, the majority by the War Manpower Commission.²¹ One of the first and most influential -- a study of North American Aviation's Dallas plant -- was made by the Senate Special Committee Investigating the National Defense Program, the "Truman Committee."²² A number of studies were

20. Statements of policy in AAF Representatives Manual, issued by the AAF Mat. Comd., edition of 1 Jan. 1944, sect. 313, "Personnel-Contractor."

21. WMC had completed 1500 by 3 March 1944. S. Rept. No. 10, 78 Cong., 2 sess., pt. 16, p. 24.

22. Ibid., pp. 25-27.

made by Materiel Command Procurement District officers. A few were made upon request by outside, independent surveying agencies. Some were made by WMC and Procurement Districts in collaboration.²³ The initiative in arranging for a study might be taken either by WMC or Materiel Command; but WMC had to obtain the permission of the Assistant Chief of Air Staff for Materiel, Maintenance, and Distribution, Washington, to make a study in a factory under AAF cognizance. No cases of refusal have been noted. Materiel Command frequently requested WMC to make studies. Procurement Districts secured the approval of the Comptroller, Wright Field, before initiating utilization studies.²⁴ Labor utilization studies proved valuable in the respect that they revealed to management and procurement officers the weak spots in plant organization and suggested local corrective measures.²⁵ They were useful also to officials charged with the establishment of labor ceilings.

Labor ceilings for plants employed principally on AAF contracts were established in the following way: A contractor submitted his labor requirements to the Comptroller, Wright Field. The latter revised the contractor's estimate, using information gained chiefly from formal and informal labor utilization studies and also using projections of "progress curves." Progress curves had been secured by plotting the

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- 23. Table of surveys of 23 AAF-sponsored facilities, file date 12 Jan. 1944, in ATSC 004.06, Labor Utilization.
 - 24. Col. W. D. Eckert, Comptroller, Mat. Comd., to Dist. Supervisors, 21 Jan. 1944, WMC Area Div. Senior Utilization Consultant to Maj. H. A. Orr, Indust. Relations Sect., AAF, Dayton, 7 Mar. 1943, ibid.
 - 25. See, e.g., Maj. J. M. Delaney, Comptroller, to Dist. Supervisor, WMPD, 24 April 1944, on results of the WMC Manpower Utilization Survey of Emerson Electric Mfg. Co., St. Louis, ibid.

increasing productiveness of many factories engaged in various types of work as they had gained experience and solved difficulties. The projections, of course, merely represented reasonable expectations of further improvement. The Comptroller sent his revision back to the District, which sought the comments of the manufacturer. The Comptroller then made his final revision and sent it to MMC, which set the ceiling for the plant in question.²⁶

The establishment of a labor ceiling gave a contractor further reason for trying to improve plant efficiency. The sum of the ceilings of the plants in a community presumably determined the labor requirements for the community. The process might well reveal that communities which had been presumed to have all the war contracts they could handle could accommodate more and might safely be allowed new facilities.

Also effective, perhaps, in promoting efficiency in war plants were the renegotiation of war contracts, the substitution of fixed-price contracts for cost-plus, and more realistic price determinations in general.²⁷

It will be recalled that cost-plus-fixed-fee contracts had been authorized in the first place and many of the type had been signed because neither manufacturers nor procurement officers had any way of

26. Process illustrated in numerous documents in ATSC 004.06, Labor Requirements. See, e.g.s., Maj. J. M. Delaney, Comptroller, to Dist. Sup., WFD, 19 Feb. 1944, in regard to labor requirements of Douglas Aircraft Co., Long Beach; and Maj. Delaney to Dist. Supervisors, 5 July 1944.

27. The documents on these subjects at Wright Field are as voluminous as those on the whole subject of facilities expansion. A summary of the issues involved in renegotiation may be found in S. Rept. No. 10, 78 Cong., 2 sess., pt. 16, pp. 40-64.

AAFH3-40

177

forecasting costs in new operations and under wartime conditions with any degree of accuracy. Furthermore, many of the early fixed-price contracts had named prices that were little more than shrewd guesses and that made liberal allowances for anticipated production difficulties and feared wartime inflation. Experience soon showed that some of these early contracts -- most of them in fact -- permitted excessive profits. As they learned more about the actual costs of munitions production and as wages and other costs were stabilized to a degree by the establishment of wage and price ceilings and other controls, it became possible for procurement officers to determine fair prices more scientifically and to bargain more effectively with contractors.

The matters of contract renegotiation, price adjustment, and price determination are very complicated. They required extensive organization, special procedures, and bodies of rules and principles. It is not within the province of this study to discuss them. Suffice it to say that considerable progress was made in reducing prices and profits. Nothing could be achieved that approached the results of free competition in normal times in fixing prices and profits. But insofar as the prices paid the more efficient concerns were brought within reasonable approach of costs and, especially, the prices paid the firms that had shown themselves less efficient were brought more into line with those paid more efficient firms, price readjustment must have contributed some incentive to manufacturers to improve efficiency in production.

The proportions in which various measures and conditions promoted efficiency cannot be determined. Of the result there can be no doubt.

AAFHS-40

173

In airframe plants, for example, in January 1943 it required on the average 2.3 man-hours of direct labor per pound of airframe accepted. This ratio was reduced rather steadily from month to month until in July 1944 it required slightly less than one man-hour per pound of airframe. Thereafter the average ratio remained almost stationary until the end of the year.²⁸ There can be little doubt, however, that it would have been reduced still further had it not been for numerous change-overs in many plants from one type of plane to another and for the emphasis placed on types with a high labor ratio, notably the B-29.

Careful studies made by the Analysis and Planning Branch, Statistical Control Office, Materiel Command, revealed quite a strong similarity in the progress curves of different airframe plants. The number of man-hours per plane was very high when a new plant first went into production or even when an experienced plant changed over to the production of a new plane. The number fell off sharply during the first few months and then more and more slowly as the months went by, but normally continued to decline even after one and one-half or two years of continuous production of the plane. That is, the number of man-hours per plane continued to decline provided schedules were maintained; a drastic reduction in schedules adversely affected the curve. The table below illustrates increase of efficiency in four plants working on three different aircraft. Consolidated had had

28. Figures given in this and the subsequent paragraph and in the table on p. 179 are taken from tables and charts in issues of two monthly publications of Materiel Command prepared by the Office of the Controller, namely, Aircraft Program Progress Report and Estimated Operating Ratios in the Airplane Industry.

AAFHS-40

179

considerable experience in building B-24's before the first date given. Ford Motor Company had completed its first B-24's in September 1942, and Republic, its first F-47's in March 1942. Boeing, Wichita, had completed its first B-29's in July 1943. The slight recessions shown by three plants near the end of the year may be attributed to reduced schedules and model changes. The ratios should not be used to compare companies or planes; there were too many diversities, for instance in methods of reporting and use of machinery, which affected plant figures.

DIRECT MAN-HOURS PER POUND OF AIRFRAME

Month	Ford Motor Willow Run B-24	Consoli- dated San Diego B-24	Boeing Wichita B-29	Republic Farmingdale F-47
Jan. 1943	5.03	1.11	--	3.82
Feb. 1943	2.52	1.10	--	2.78
Mar. 1943	1.77	1.04	--	2.49
May 1943	1.03	0.92	--	1.90
July 1943	1.13	0.87	--	1.70
Sep. 1943	0.81	0.70	5.60	1.62
Nov. 1943	0.70	0.67	3.23	1.62
Jan. 1944	0.56	0.63	2.60	1.42
Mar. 1944	0.52	0.52	2.36	1.38
May 1944	0.56	0.50	1.55	1.12
July 1944	0.38	0.50	1.39	0.99
Sep. 1944	0.32	0.64	1.13	1.02
Dec. 1944	0.36	0.60	0.86	1.16

With the machine tools bottleneck, the materials bottleneck, and the labor bottleneck whipped and with productive efficiency in the factories and shops still rising, it would have been possible to continue to enlarge programs and increase production of munitions and supplies in proportion, and this without further curtailment of production for civilian use, which had by no means reached rock bottom. Fortunately the exigencies of the war did not require all-out production of

AAFHS-40

180

~~CONFIDENTIAL~~

munitions and supplies. There were occasions, to be sure, when demand at the fronts for some items outran production at home, but such conditions were due to miscalculations. In general we had more industrial capacity than the war required. We could have fought on a considerably bigger scale if the war had demanded it, at least after about November 1943.

In the case of airplane production under AAF cognizance, the official forecast at the beginning of 1943 for production during the year was 99,373 airplanes of all classes. Actual deliveries were 68,194.²⁹ This disparity was due largely to failure of new plants to get into production as early as expected and to improve schedules as rapidly as anticipated. In fact many important plants did not hit their full stride at all during 1943, partly because of delays in recruiting labor. But the fact that production did not meet the forecast was to some extent due also to cutbacks that were made in some contracts even that early because the planes they called for were not needed in such large numbers.

The actual deliveries in 1944 amounted to 71,154, only 4.4% greater than those of 1943. To be sure the total weight of planes produced in 1944 was greater by 46.9% than the weight of those made in 1943,³⁰ and weight is a better index of production than numbers. Furthermore, change-overs in 1944 seem to have been more labor-consuming than those of 1943. But there is no doubt that 1944 production could have been

29. Monthly Factory Deliveries of Aircraft by Contract and Program, a Mat. Cond. report prepared by RGS.

30. Statistics on poundage have been supplied by ATSC, Management Control, Statistical Control Office. See chart, app. 5.

~~CONFIDENTIAL~~

greatly increased had it been deemed necessary to do so. Programs were actually reduced and production held down. The number of employees in facilities under AAF cognizance declined from 1,311,000 at the beginning of the year to 1,045,500 at the end, that is, by 20.15%.³¹ Although there were concerns that failed to get all the hands they required to meet schedules, most of them laid off hands and there was a notable reduction in third shifts. There can be no doubt that the number of workers could have been maintained at the figure for January or even increased if it had been considered necessary to do so.

As a consequence of increased efficiency in the plants, reduced programs, and a limited amount of expansion, the AAF came to have an excess of industrial facilities available for its use. There were signs of an impending excess of facilities even before all the early major projects had gone into operation and before the idea of the progress curve had been fully grasped. A surplus of machine tools in some localities was noticed as early as August 1942,³² and the following month IPS, Wright Field, learned that some facilities provided under AAF sponsorship were not being used at all and some not for producing AAF materiel.³³ In March 1943 the Chief of Staff, Materiel Center, wrote the chief of the Production Division telling of cutbacks impending and advising of the need for close coordination between Production

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31. Aircraft Program Progress Report, monthly, cited in note ; U.S. Dept. of Labor, Bulletin No. 800, War-time Development of the Aircraft Industry, p. 5.
32. IOM, Col. F. H. Hopkins, Chief, Mes. Div., Office, Chief Mat. Comd., to IPS, LF, att. Tools Br., 25 Aug. 1942, referring to letter, USA to DFC, in Facil. Br., ACS, Gen. Proc'd. file.
33. Col. F. Schneeberger, Chief, IPS, to Dist. Supervisor, JFD, 5 Sep. 1942, ibid.

Engineering Section, Production Control Section, and Contract Section to see that cutbacks be made first in facilities not already too far along to be economically terminated.³⁴ In April WPB sought assurance that full utilization was being made and would be made of all production machinery, as a condition of clearing new projects.³⁵ The Truman Committee began to look into the matter of excess capacity. In a meeting of his L&D staff, General Echols expressed concern that "we may become over-expanded" and that "we have more capacity than we think we have."³⁶ Ralph J. Cordiner, a WPB vice chairman, estimated in May that in metal-products industries generally, plant utilization was only about 60 hours a week.³⁷ The prewar mobilization planners had considered full utilization to be 120 hours a week. On 21 May 1943 the new WPB Industrial Facilities Committee heard the view expressed that we had an over-all surplus of tools and construction.³⁸ It was estimated that there were between 30,000 and 50,000 surplus DFC-owned machine tools in the country. Before the end of the year all concerned frankly recognized that we had an over-all surplus of facilities unless the war should take an unexpected turn for the worse.

After it was established that there was an over-all excess of AAF facilities, there was another definite tightening-up in processing applications for expansions. Particularly it was necessary to certify

34. 9 March 1943, ibid.

35. Col. E. W. Rawlings, Chief, P&S, to Dist. Supervisor, WPD, 7 April 1943, ibid.

36. 30 April 1943, ibid.

37. "A Review of Facilities and Construction," copy in Facil. Br., M&S, WPB file.

38. Brig. Gen. F. M. Hopkins, Jr., Chief, Res. Div., L&D, to Administrator, ASUW, 19 May 1943, in Facil. Br., M&S, ASU file.

~~CONFIDENTIAL~~

that no other floor space acceptable for the purpose was available within the district and that tools intended to be purchased new could not rather be procured from surplus tools lists.³⁹

However, even after the general excess of facilities had been recognized, there was considerable further expenditure for facilities. Most of it was necessary.

Under the uncertain conditions of war and of putting new industries into operation it had been impossible to forecast requirements or production with any degree of accuracy. It could easily turn out, and indeed did, that although after a given date there was an excess of facilities in general, there was a deficiency for producing particular items.⁴⁰

Some models of planes, engines, or items of equipment became obsolete as the war progressed, and their production was discontinued. The plants then had to be retooled for the production of new models or different articles. Retooling was expensive. Often subcontractors' plants had to be retooled as well as the parent plant. Occasionally it was advisable to retool one factory for a change-over from one plane to another and at the same time retool another plant to carry on the production of the displaced plane on a reduced scale. Even changes in design required new tools.

39. IMZ, Col. W. H. Herod, Acting Chief, RCS, to Dist. Supervisor, MPD, 12 Feb. 1944, in Facil. Br., RCS, Gen. Proced. file; IOM, Col. A. C. Harmon, Chief, Facil. Br., Procur. Div., to Chief, RCS, ibid.

40. For an excellent statement of this point see memo for US/.. by Lt. Gen. Erehon B. Somervell, CG, ASF, 11 June 1943, S. Rect. No. 10, 78 Cong., 2 sess., pt. 16, pp. 178-84.

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

The AAF also found it necessary to conduct an elaborate experimental program to keep up with or ahead of our enemies. This program necessitated considerable expenditure for facilities.

As time went by, machine tools and equipment in war plants wore out and had to be replaced. Experience dictated plant alterations or additions. New labor-saving devices and processes were invented whose installation was justified even though it rendered good machinery and equipment surplus. For a time in 1944 an effort was being made to establish better in-plant feeding facilities, rest rooms, etc. with a view to improving working conditions and thus keeping workers in the plants. The President personally intervened in behalf of these latter classes of facilities expenditures.⁴¹

To some extent, however, the continued expenditures for facilities may be attributed to the yielding to pressure. The pressure from contractors for new facilities with government financing was very great and hard to withstand. All who got government contracts seemed anxious to have new machinery or new buildings or both. To some extent the pressure for new facilities was prompted by the natural desire of people who must meet production schedules to have ample floor space and ample machinery of the best sorts with which to accomplish their jobs. To an extent it was prompted by a desire to get facilities in wartime for postwar use in competitive industry. The implication is,

41. Franklin D. Roosevelt to Donald Nelson, 22 Dec. 1943, copy in Facil. Br., Res. Div., M&S, Policy file; Gen. H. H. Arnold, CG, AAF, to CG, Mat. Comd., 23 June 1944, citing directive of the President to the S/W, 22 Dec. 1943, in Facil. Br., MCS, Ford-Ypsilanti Corres.

~~CONFIDENTIAL~~

of course, that manufacturers expected to exercise their options at the end of the war and expected to buy in the government-supplied facilities at bargain prices. Evidence of the extent of the pressure for new facilities is given in the next chapter. It is mentioned here only by way of showing why the government continued to provide new facilities after there was a recognized excess.

The largest single authorization for a "green-grass" plant made late in the war was for one to be constructed by Continental Aviation and Engine Company, of Muskegon, Mich.⁴² The authorized cost was \$40,000,000. The plant was to manufacture V-1650-3 (Merlin) engines, of which there was a critical shortage. This type of engine was used in the P-51, which had proved one of our most effective fighters. About the same time, in January 1944, Packard Motor Company was authorized to build, at an originally authorized cost of \$7,421,717, a factory in Toledo for the manufacture of engines of the same type. These new engine plants could not possibly be got into full production until sometime in 1945. In July 1944 the General Electric Company was engaged to convert a Navy turbine plant in Syracuse at a cost of over \$25,000,000 for the manufacture of I-40 jet-propulsion engines.

Most of the other very considerable authorizations of the late war period were for extensive retoolings. In June 1944 Buick contracted to retool both in Melrose Park (Chicago) and Flint at an estimated cost of \$18,239,847 for the purpose of making R-2000-9 Pratt and Whitney engines. In September Allison Division, General Motors Corporation,

42. See footnote 14 above.

Indianapolis, was authorized to retool and make a small extension at a cost of over \$12,500,000 to enable it to build I-40-3 engines. Even tooling a factory for making comparatively minor parts often involved a great deal of money. For example, Graham Paige Motors Corporation, Detroit, got \$5,270,405 of government funds to convert a factory for the purpose of making master connecting and articulating rods for R-2600 engines.

The total expenditures authorized during the 13 months from December 1943 to December 1944, inclusive, for directly government-financed facilities was \$269,200,583. This was 8.7% of the total for the whole emergency period up to 31 December 1944. The expenditures recommended for amortization under the tax-amortization plan amounted to approximately \$50,100,000 during the same period. This was 8.4% of the total recommended during the whole emergency period up to 31 December 1944.⁴³ These expenditures were sizable considering the over-all excess of facilities.

At the same time that these late, limited expansions were being made under circumstances described, procurement agencies were beginning to tackle the job of disposing of surplus facilities. They were terminating contracts in a fairly large way, guardedly releasing war contracts to produce for the civilian market, and selling or storing

43. Figures derived from AAF Industrial Facilities Expansion, Status, Progress, and Performance and AAF Industrial Facilities Expansions by Type of Financing, the second a summary of the first, monthly publications prepared by MCS; a tabulation of recommendations of certificates of necessity made by MCS; a report of "the transactions of the Facilities Br., Procurement Div., AF . . . to May 1, 1943", copy in ATSC Historical Office. See chart opposite p.

AAFHS-40

187

surplus tools in considerable numbers. The disposition of excess facilities called for changes in organization, new procedures, and new sets of principles. Even in its early stages it raised the issues involved in demobilization and planning our postwar economy. Industrial demobilization will be the subject of a later study.

AAFHS-40

Chapter IX

PROBLEMS IN ORGANIZATION AND ADMINISTRATION

Changes in organization for facilities procurement were minor in the later part of the war. The district organizations were built up and given larger functions. WPB extended its control. Administration continued to be very difficult.

As the war went on it became both more necessary and more practicable to increase the duties and responsibilities of Procurement District officers in the matter of facilities procurement. In the earlier part of the emergency, as we have seen, the chief burden had been to allocate the larger concerns among the services and to expand their facilities. This required centralized planning. The big companies preferred to deal directly with Washington or Wright Field. Since the facilities were still to be built for the most part from the ground up, their applications and their appendix "A"s could be analyzed about as well at Wright Field as on the spot. Haste was urgent. In the later period, big expansions were comparatively few, and the principal job was to analyze the hundreds of applications that came in for small extensions here and there, minor alterations and improvements, the addition of new tools and equipment, the transfer of tools from one contractor to another, and the disposition of surplus tools. These applications required local investigation to verify statements. In the earlier period the districts had inadequate, untrained staffs. It took time to add personnel and train them. Procedures had been in process of development;

AAFHS-40

189

larger use of the district organizations would have complicated the process.¹ Gradually district staffs were built up. Once procedure had been definitely established, it was easier to utilize the districts.

The process of conferring functions upon the districts was a gradual one. It is true that Maj. Gen. Charles E. Branshaw, who became Commanding General of the Materiel Command on 27 March 1943, made "decentralization" a definite policy. He hastened a process already begun and made Wright Field more "decentralization" conscious.² As early as 21 February 1942, Brig. Gen. George C. Kenney, Assistant Chief of the Materiel Division, had urged the District Supervisors to expand their follow-up organizations as rapidly as possible and, among several things, to keep a close check upon facilities in process of construction.³ On 24 March 1942, Col. R. W. Propst, Assistant Chief of IPS, Wright Field, gave instructions that the District Supervisors be informed of facilities expansions immediately the take-out letters had been signed.⁴ IPS gradually developed the practice of referring specific matters connected with expansions to the districts for investigation until it became almost routine to do so.⁵ When allocation of tools and materials and other methods of production control were instituted, it was necessary to utilize local representatives to investigate need of contractors for tools, to collect bills of materials, to take such local action as was practicable for relief of critical shortages, and do a variety of other things.⁶

1. See pp. 58-60.

2. History of the AAF Materiel Command, 1943, pp. 2-4.

3. In Facil. Br., RCS, WF, Gen. Proced. file.

4. Note for staff, ibid.

5. IDC, Lt. Col. R. Shawhan, Chief, Facil. Br., to Exec. Office, IPS, 11 Aug. 1942, draft of directions to Procur. Districts on functions in regard to facilities, in Facil. Br., RCS, Gen. Proced. file.

6. See pp. 141-146.

On 10 November 1942 representatives of IPS, the Technical Executive, and representatives from the procurement districts agreed, in a conference at Dayton, on a list of activities to be handled by the districts. In addition to those functions mentioned in the preceding paragraph, the district Industrial Planning Sections, upon notification by IPS, Wright Field, that facilities expansion was necessary, were to locate concerns and plants that seemed to meet requirements. Wright Field would select the ones to be expanded. Then the districts would receive the applications and appendix "A"s and forward them with recommendations to Wright Field. However, if the applicants preferred to send in their applications direct they might do so. Also the District Supervisors through the Factory Representatives were to determine need for additional tools applied for, whether or not the operations concerned could rather be accomplished by subcontracting without new tools, and, in case need for additional tools should be indicated, whether or not the tools could be secured by transfer from other contractors rather than by purchase of new ones.⁷ Shortly thereafter Production Resources Section (IPS with a new name) Wright Field, took the further step of requesting written reports from the district Production Resources Sections (technically from the District Supervisors) on every application for directly financed facilities that came from their respective districts.⁸ In May 1943 PRS, upon the insistence of General Branshaw, took the final step of requiring that all applications for direct government

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7. IOM, Col. Alden R. Crawford, C/S, Mat. Gen., to Col. E. W. Rawlings, Chief, IPS, 18 Nov. 1942, in ATSC, 321.9, IPS.
8. IOM, Col. E. W. Rawlings to Asst. Tech. Exec., 29 March 1943, in Facil. Br., RCS, Process. Proced. file.

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financing be first presented to the district offices.⁹ Later in the month the districts were also given the regular function of conducting investigations in connection with applications for necessity certificates under the tax-amortization plan of financing.¹⁰

As the distribution of functions was finally worked out and embodied in a Materiel Command directive on 30 November 1943,¹¹ the applicant for facilities was to present his application to the district. The district was then to consult Wright Field as to whether, "in the light of the over-all aircraft program," the proposed project should be accepted for processing. If the query should be answered in the affirmative, the district Resources Control Section would prepare the processing letter and forward it to Resources Control Section, Wright Field (RCS had meanwhile succeeded PRS). RCS would check the papers, and, if desirable, revise them and send them to Washington, as theretofore. An exception to the rule was that in case of certain large projects that were scattered through several districts—for example, the Curtiss-Wright suppliers project—the applications were still to come direct to Wright Field, which in turn would refer such matters to the districts for investigation as it might deem necessary. District officers had also gained authority to approve, independently of Wright Field, transfers of funds from one schedule of a final appendix "A" to another, provided the total of such transfers did not exceed \$25,000.¹²

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9. Col. E. W. Rawlings, Chief, PRS, to Dist. Supervisor, CPD, 5 May 1943, in Facil. Br., RCS, Gen. Proced. file.
10. IDC, Lt. L. L. Bushong, Chief, Certifications Sub-Unit, to Maj. J. L. Bowling, Chief, Facil. Unit, 18 May 1943, in Fac. Br., RCS, Gen. Proced. file, attached to letter of 5 May.
11. FOM 87-1, in Publications Sect., AGO, ATSC.
12. Col. W. R. Herod, Acting Chief, RCS, to Dist. Supervisor, WPD, 27 Nov. 1943, in Facil. Br., RCS, Process. Proced. file.
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AAFHS-40

192

~~TOP SECRET~~

District officers also gained authority independent of Wright Field to approve items of expenditure of "continuing-capital-expenditure" funds. The use of these funds is described below.

Considerable difficulty was encountered in effecting "decentralization."¹³ Experienced personnel had to be sent out to the procurement districts. Officers from the districts had to be brought to Wright Field for training. Wright Field officers did not always trust the findings of district officers and continued on occasion to send trusted agents out to see for themselves. The district officers on their part were inclined to resent overruling by Wright Field and to feel that they should be accorded larger independent powers.

Decentralization from Wright Field to the procurement districts had its counterpart in decentralization within the districts. An effort was made to give larger responsibilities to Area offices and to Resident Representatives. Decentralization within the districts was also accompanied by stresses and strains.

It is evident that the term "decentralized" is a misnomer as applied to the organization just described. Nor is the phrase "decentralized operations and centralized control," which was often used at Wright Field, much more accurate as a description, at least as far as facilities procurement was concerned. Not only did district officers operate under policies, directives, and procedures formulated by Wright Field or by

13. IDG's, Maj. J. L. Bowling to Lt. Col. G. H. Moriarty, 3 June 1943, Roy Meisinger to Maj. Bowling, 4 June 1943, Maj. Bowling to Lt. Col. Moriarty, 27 Oct. 1943, in Facil. Br., RCS, Gen. Proced. file; Stenographic report of WF conference of 11-13 Jan. 1944.

~~TOP SECRET~~

AAFHS-40

193

higher authorities, but they had quite limited authority to act on their own responsibility. Their principal functions were to observe, investigate, report, and recommend, and to inform contractors of action taken by higher authorities. Materiel Command did not delegate as large a share of responsibility to its local representatives as did DPC and the Corps of Engineers, for example, to theirs. To be sure, district officers frequently exercised greater authority in practice than they were supposed to on paper. They frequently gave assurances to contractors on which the latter proceeded to act, and then Wright Field was morally bound to approve because the contractors had "acted in good faith."

The channels of communication employed between Wright Field units and district units should not be allowed to conceal the essential features of the organization. For example, a letter from Facilities Unit, RCS, Wright Field, to Facilities Unit, RCS, Central Procurement District, was written in the name of the Commanding General, Materiel Command, to the District Supervisor, CPD, attention of the Facilities Unit, RCS. If an officer of the last named unit sought information from a contractor, his channels were through the District Supervisor and the AAF Resident Representative in the contractor's plant, or if there was no factory representative, the AAF Area Representative. Practically, to be sure, much business was done directly by telephone, with only "important" messages being confirmed by letter through channels. The use of channels was necessary to enable District Supervisors and Factory Representatives properly to coordinate and

AAFHS-40

194

supervise the activities of the personnel of their districts and plants. Technically, with exceptions, they were responsible for all the official acts of their subordinates.¹⁴

Changes of some importance as regards facilities procurement also occurred in organization at Wright Field. On 6 April 1943 the headquarters of the Commanding General of Materiel Command were moved from Washington to Wright Field. The designation "Materiel Center" was dropped. General Echols retained his staff and remained in Washington as Assistant Chief of Air Staff for Materiel, Maintenance, and Distribution (MM&D). On 17 July 1944 Materiel Command was united with Air Service Command into AAF Materiel and Services. Lt. Gen. William S. Knudsen was designated Director and Maj. Gen. B. E. Meyers, Deputy. At the same time the designation of the controlling staff in AAF Headquarters, Washington, was changed from Materiel, Maintenance, and Distribution to Materiel and Services.¹⁵ Effective 31 August the combined commands were redesignated Air Technical Service Command.¹⁶ The office of Chief of Engineering and Procurement was established at Headquarters, ATSC, to direct most of the operating functions of the former Materiel Command.¹⁷ Brig. Gen. K. B. Wolfe (soon to be a major general), was designated chief, shortly after his return to Wright Field to become Commanding General, Materiel Command.

In the reorganization which accompanied the establishment of ATSC,

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- 14. One exception was contracting officers in matter of administration of contracts. AAF Representatives Manual, issued by AAF, Mat. Comd., edition of 1 Jan. 1944, sect. 241.
 - 15. AAF GO #10, 17 July 1944, and AAF Reg. No. 20-43, 17 July 1944.
 - 16. ATSC Reg. No. 20-1, 1 Sep. 1944.
 - 17. ATSC Reg. No. 20-17, 1 Sep. 1944.

the Procurement, Production, and Inspection Divisions of the former Materiel Command were united into a single Procurement Division, with Brig. Gen. O. R. Cook as chief.¹⁸ In the new division most of the units of the former Procurement Division and former Production Engineering Section were combined and integrated into a single Production Section. The production engineering functions proper of the former PES went back to Engineering Division. Resources Control Section was left for the most part intact. The former Inspection Division became Quality Control Section in the new Procurement Division.

Insofar as procurement of facilities was concerned, the principal effect of the reorganization was to end the old difficulties of coordinating the activities of the former Procurement Division and the old PES. Several references to these difficulties have been made. In general, it may be noted, the organization of the new Procurement Division restored the main features of the organization as it existed before April 1939, before the then existing Procurement Section had been divided into Production Engineering, Contract, and Inspection Sections. Thus, by the time the war was in its later stages and the more difficult procurement problems solved, organization had made a full cycle.¹⁹ This fact does not necessarily prove, however, that the division of the prewar Procurement Section should not have been made in the first place.

As late as February 1945 Procurement District organization was still in process of being altered to conform to the new organization at Wright Field.

18. ATSC Reg. No. 20-19, 1 Sep. 1944, and appendixes.

19. Procur. Div., ATSC, Annual Report, 1944, pp. 3-6.

The organization and procedure in Washington for reviewing applications for direct government financing also underwent changes as the war progressed. It would be tedious and confusing to recount all the successive changes; most of them were minor. In general, organization and procedure were simplified and, as in other fields, WPB asserted its authority to a greater degree. From May 1943 to the present writing the organization and procedure have remained comparatively stable and may be briefly described.²⁰

The processing interoffice memorandum (IOM) went from RCS, Wright Field, to Resources Division, MM&D (or, after 17 July 1944, Materiel and Services). It there first received the attention of the Facilities Branch, Resources Division. If it was approved, the branch wrote a letter of approval for the signature of the chief of Resources Division. If he approved, the letter went over the desk of his deputy to the AC/AS, MM&D. If the latter approved, the letter went back to Facilities Branch, which prepared a letter for the Facilities Committee, WPB, or, as later named, the Construction Requirements Committee.

The Facilities Committee, WPB, was composed of a representative each of Army Air Forces, the Navy Bureau of Aeronautics, Ordnance, the Maritime Commission, WMC, SWPC, etc., and it was headed by a representative of WPB. The chairman had all the authority; the other members acted only in an advisory capacity. Minor projects were acted upon by the chairman or by an assistant without being submitted to the Committee.

20. TTX, Brig. Gen. F. M. Hopkins, Jr., Chief, Res. Div., MM&D, to Administrator, ASU, WF, 21 May 1943, in Facil. Br., RCS, Gen. Procd. file; report of C. B. Chapman, 21 June 1944, on trip to Washington, ibid.; remarks of C. B. Chapman in stenographic report of WF conference of 11-13 Jan. 1944, pp. 95-96.

AAFHS-40

137

The Facilities Committee had a Projects Essentiality Division which made an independent investigation of projects. When an application and an appendix "A" came to RCS, Wright Field, copies were sent at once to the Facilities Committee, for the attention of the Projects Essentiality Division. The Division made its investigation, utilizing WPB regional offices and the information on file in WPB Washington offices. Therefore, when the Facilities Committee met, it had the results of two independent investigations before it. RCS, Wright Field, had to "keep on its toes."

After the Facilities Committee had approved a project, it informed RCS and DFC by letter. If DFC informally approved, Resources Division took the project to the OUSW for final approval and for the take-out letter, as formerly.

Changes in organization and organizational terminology should not give an unjustified impression of instability in administration of facilities matters. Key men had long tenures as a rule. General Echols, AC/AS, Materiel and Services, had served in that capacity or its equivalent since November 1940. Brig. Gen. Frederick M. Hopkins, Jr., Chief of Resources Division, M&S, had served in that position or its equivalent from the very beginning of facilities expansion in the national emergency, rising meantime from the rank of major. Col. J. C. Vaughan, assistant chief of Resources Division, and Maj. M. M. Hay, chief of Facilities Branch, Resources Division, had been Hopkins' right-hand men in facilities matters almost from the start. At Wright Field, Colonel Schneeberger, long Chief of IPS, retired in September 1942. Others had longer tenure. Col. E. W. Rawlings, his successor, served almost as long and had been more or less directly concerned with

facilities previously. Col. George H. Moriarty, who succeeded Colonel Rawlings as chief of RCS in July 1944, had been concerned with facilities since he came to Wright Field in 1940. Lt. Col. J. L. Bowling, chief of the Industrial Service Sub-Section, RCS, had been concerned with facilities equally long. Maj. Travis G. Walsh, chief of Facilities Unit, came in at an early date to evaluate structures. Two civilians, C. B. Chapman and F. M. Opitz, through a long portion of the period bore the brunt of deciding whether particular expansions proposed were essential. Other men equally deserve mention for service and tenure. Those named have been mentioned to support a point. Tenure in WPB units concerned with industrial facilities was only slightly less stable.

The Facilities Committee of WPB also acted upon applications for "necessity certificates" for facilities to be financed under the tax-amortization plan. Administration of the tax-amortization laws became more difficult as time went by. In this field, too, WPB saw fit to extend its authority and activities at the expense of the War and Navy Departments. The story of its encroachment and assumption is most illuminating in several respects.

In the earlier part of the emergency period, when the problem had been one rather of finding facilities to finance than of avoiding the financing of unneeded facilities, Materiel Division as sponsor had attempted to persuade contractors to choose the tax-amortization plan of financing rather than the DPC or EPF plan.²¹ IPS at Wright Field and the staff in Washington scrutinized applications for necessity

21. Interview with Maj. R. L. Pastner, Asst. Chief, Facil. Office, RCS, 13 Nov. 1944.

AAFHS-40

109

certificates much less closely than they did applications for direct financing.²² They recommended certification for 100% of cost as a matter of routine, without being too careful to assure themselves that the plants would be employed exclusively in defense work. Materiel Division was also quite easy-going in the matter of establishing necessity for expansion. Normally the contractors went ahead and constructed their facilities on verbal assurance that the facilities would be needed--the assurance coming from someone at Wright Field or in a District Procurement office or, as likely as not, from a prime contractor. And normally in such cases Materiel Command would recommend certification, even though there was no actual necessity, if convinced that the contractors had "acted in good faith" in assuming the need.

There were several reasons for this easy-going behavior on the part of the procurement authorities. Tax amortization did not cut into the appropriations of expediting-production funds, which the services were trying to make go as far as possible. Procurement officers believed, unwarrantedly, as it turned out, that since under the amortization plan manufacturers financed facilities themselves at the outset and would never recover the full amounts, they would exercise sufficient diligence in keeping costs down. Some project officers apparently assumed that because tax-amortized facilities took no money out of the Treasury -- only kept it from going in -- they did not cost the government anything.²³ Staffs in the earlier years were too small to scrutinize everything rigidly anyway.

22. Notes on telephone conversation with OUSV, by Lt. Col. P. Schneeberger, 27 Dec. 1940, Certif. Unit, RCS, Gen. Proced. file; interview with C. G. Grimmett, Chief, Certif. Unit, RCS.

23. Capt. L. L. Bushong, former Chief of Certif. Unit, RCS, stated that he had to combat the idea. Interview, 20 Oct. 1944.

Congress contributed to the benevolent attitude. The original tax-amortization law required the issuance of the necessity certificate before 5 February 1941 in case of facilities begun or acquired between 10 June 1940 and that date and before beginning of construction or acquisition in case of facilities begun after that date. A House Resolution approved 30 October 1941 provided that contractors would be eligible for tax amortization if the certificate should be issued before 1 December 1941 or within six months after beginning of construction, whichever date was later.²⁴ This provision brought in a number of applications from contractors who had forgotten to apply within the original time limits. The resolution also repealed the provision requiring approval of necessity certificates by the Advisory Commission to the Council of National Defense as well as by the Secretary of War or the Secretary of the Navy. The effect of this latter liberalization was partly nullified, however, by an Executive Order directing OPM to set up an advisory Tax-Amortization Committee to assist the secretaries in examining applications involving more than \$250,000 and in determining questions of policy.²⁵

After the authorities had tightened up greatly on new facilities with direct government financing in the last half of 1942, tax amortization became much more popular with contractors than theretofore. Congress again came to their aid. By an amendment of Section 124 of the Internal Revenue Code approved 21 October 1942, Congress moved the beginning of the emergency period back in retrospect

24. Public Law No. 285, 77 Cong., 30 Oct. 1941; 55 Stat. 757.

25. "Regs. Prescribed by the Sec'y of War and the Sec'y of the Navy . . . Governing the Issuance of Necessity Certificates," filed 18 Feb. 1942 in Certif. Unit, RCS, Proced. file.

AAFHS-40

~~CONFIDENTIAL~~

201

from 10 June 1940 to 1 January and extended the tax-amortization privilege to include individuals and partnerships, in addition to the corporations originally provided for.²⁶ This new provision meant that corporations would now be eligible for necessity certificates on facilities begun or acquired between 1 January and 10 June 1940 and that individuals and partnerships would be eligible on facilities begun between 1 January 1940 and 21 October 1942 provided, in both cases, they made application before 21 March 1943. The provision brought in a flood of applications, especially just before the deadline.

It was not until the summer of 1943 that any strong effort was made to hold down industrial expansion under the tax-amortization plan. On 14 August Under Secretary of War Patterson issued a memorandum on the subject.²⁷ The second quarter of the year had shown a marked increase in applications, he said. The need for manpower and materials required curtailment of construction. Private expansion should not be "encouraged" except in those "relatively few cases" where additional facilities were essential. Processing officers should recommend denial unless necessity was clearly established.

On 5 October 1943 the President signed an amendment to War Department and Navy Department regulations requiring that necessity for expansion be established before the beginning of construction and that it also be determined that private financing, rather than direct

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26. Public Law No. 753, 77 Cong. sect. 155; 56 Stat. 849; IOM, Col. R. G. Harmon, Chief, Facil. Br., Contract Sect., to Chief, IPS, 11 Nov. 1942, in Certif. Unit, RCS, Proced. file.
27. Memo for CG's, AAF and ASF, in Facil. Br., RCS, Gen. Proced. file.

~~CONFIDENTIAL~~

AAFHS-40

202

government financing, would be to the advantage of the government.²⁸

In accord with the intent of the amendment, the Under Secretary of War instructed ASF and AAF to persuade contractors to accept DPC financing rather than ask for tax amortization. This change in policy was based on the logical presumption that, since apparently the war was far along, the resale value of DPC plants currently begun would be greater than the portion of the cost not amortized under the tax-amortization plan -- about 15% to 20%. Pursuant to this change in policy, the Facilities Unit, Wright Field, adopted the rule that recommendation of necessity certificates would be denied in those projects which Mr. Van Vechten, the DPC representative in the Unit, should declare eligible for DPC leases. In view of the surplus of DPC tools, recommendation of necessity certificates for purchase of new tools would not be made except in special cases.²⁹

Contractors protested the new rules. They quite logically contended that, if they had already begun construction before 5 October with the presumption that they would have six months in which to establish essentiality, they should still be allowed the six months. They gained this point.³⁰ They also managed to get a statement from Tax Amortization Branch, OUSW, that the branch would approve applications for certificates in spite of the rules, if Wright Field would write a letter ("predetermination" letter) saying that the new facilities

28. Memo for CG's, AAF and ASF, by US/W, 5 Oct. 1943, in Facil. Br., RCS, Gen. Proced. file.

29. Draft by Capt. L. L. Bushong, Chief, Certif. Sub-Unit, 29 Oct. 1943, in Certif. Unit, RCS, Proced. file.

30. Chief, Prod. Div., WPD, to Chief, Mat. Comd., Att. RCS, 18 Dec., and 1st Ind., Chief, Tax Amortization Br., OUSW, ibid.

concerned were part of an over-all expansion started more than six months before 5 October.³¹ WPB at first flatly rejected this last relaxation, but later accepted it.

On 17 December 1943, WPB took over the issuance of necessity certificates from the War and Navy Departments except that the departments might continue to act on applications filed prior to 17 December for facilities begun or acquired before 5 October.³² The loophole proved a big one. Word must have got around that WPB was taking over and would "clamp down," for RCS, Wright Field, received nearly twice the normal number of applications during October and November.³³ RCS continued to process applications for necessity certificates on behalf of Tax Amortization Branch, Facilities Bureau, WPB, as well as the exceptional cases for the CUSW, but under more rigid rules.

In general the War Department and the supply services found it more difficult to hold a tight rein on facilities than did WPB. Their first responsibility was to supply munitions for the armed forces in adequate quantities. It was natural for them to prefer to err on the side of an excess of facilities and to try to keep the good will of the manufacturers. Furthermore, organizations set up to find and expand facilities may have found it hard to reverse the direction of their efforts. WPB, although it too was responsible for promoting war

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31. Col. W. R. Herod, Acting Chief, RCS, to Chief, Facil. Br., Procur. Div., 22 Oct. 1943, ibid.
32. Exec. Order 9406, in Federal Register, 8:16,955; memo by Capt. C. C. Clark, Res. Div., MM&D, on telephone conversation with Col. G. H. Foster, Chief, Tax Amortization Br., Purchases Div., ASF, 2 Dec. 1943, in Certif. Unit, RCS, Proced. file; announcement by Col. Foster of the change with copy of the E.O., 17 Dec., ibid.
33. TWX, Col. W. R. Herod to AC/AS, MM&D, 2 Feb. 1944, in Certif. Unit, RCS, Proced. file.

AAFHS-40

204

production, was also charged with arbitrating between the demands of the armed forces and civilian needs. Being a civilian agency, it was more sensitive in the matters of the cost of the war and our postwar economy.

In March 1944 WPB hit upon the expedient of certifying for tax amortization a percentage less than 100% of the estimated cost of the proposed facilities in cases where contractors were unwilling to accept DFC financing. The percentage varied from 35 up, depending upon the probable postwar utility of the facilities: 35% for those fully able to compete in producing for peaceful uses, a larger percentage for those more specialized for war production. The 35% was merely an estimate of the increase in costs of wartime construction and tools over costs in the base period 1937-1939 inclusive.³⁴

The expedient seems to have been a good one. One applicant, for example, was offered a recommendation for 50% certification but was told he was eligible for DFC financing. He then changed his mind and applied for DFC.³⁵ In this particular case, it is interesting to relate, the applicant made the mistake of also increasing his estimate from \$274,000 to \$441,000 and, as a consequence, got nothing. After a few months of experience, WPB decided that in general 35% certification was preferable to government financing.³⁶

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34. Notes by Capt. L. L. Bushong on telephone conversation with M. E. Bowlus, WPB, 14 April 1944, ibid.; WPB Sup. No. 1 to Gen. Program Circular No. 33, "Criteria for Preparation of Necessity Certificates," inclosed in IOM, Brig. Gen. F. M. Hopkins, Jr., to Lt. Col. G. H. Moriarty, 16 May 1944, ibid.
35. Documents in Certif. Unit, RCS, under name of applicant.
36. TTX, Dir., ARCO, to Capt. L. L. Bushong, 18 May 1944, in Facil. Br., RCS, Gen. Proced. file; "Some Notes on Tax Amortization," by J. L. Lincoln, Tax Amortization Br., WPB Facil. Bur., 21 Aug. 1944, copy in Certif. Unit, RCS, Proced. file.

For reasons not apparent the War Department instructed the services not to recommend a percentage to WPB but only to recommend as to need for more facilities.³⁷ Facilities Unit, RCS, continued to recommend percentages. In fact it often recommended two percentages, (1) the percentage of the proposed facility's product expected to be for war purposes and necessary to the war effort and (2) the percentage of the first percentage deemed proper for tax amortization. For example, if a proposed facility would be used 50% for war production and 50% for civilian goods and should be deemed fully competent to compete with similar plants after the war, RCS might recommend certification of 35% of 50%, that is, 17.5% of the total cost for tax amortization.

The assumption by WPB of authority to issue certifications of necessity, occasioned minor changes in procedure as far as Materiel Command was concerned. Applications were filed with district WPB offices instead of with the Tax Amortization Branch of the OUSW as formerly. Those of interest to the AAF were sent by the district WPB offices to the nearest AAF Resident or Area Representative, who made an investigation and forwarded applications and findings to his Procurement District. The district investigated each case and forwarded the application and a letter with its recommendation as to priority for construction materials to the chief of Projects Rating Branch, Aircraft Production Board (WPB), Washington. The Procurement District also sent copies of these documents to RCS, Wright Field, together with its recommendations as to the necessity for the proposed

37. TTX, Gen. H. H. Arnold to CG, Mat. Comd., att. RCS, 24 March 1944, ibid.

facilities. Facilities Unit, RCS, sent its recommendations to Tax Amortization Branch, Facilities Bureau, WPB.³⁸

No matter what the policies, the organization, or the procedure, no matter how many agencies double checked each other, or how many superior officers or staffs of higher echelons reviewed the findings of subordinates or lower echelons, individuals had to grapple with individual cases. The pressure was great and the ramifications many.

Perhaps enough has been said already about the difficulties of determining necessity, evaluating plans and specifications, analyzing estimates of costs, and forcing prime contractors to subcontract. There were other problems of administration of facilities expansion that should be considered. Most of them, not all, were especially difficult during the latter part of war, when the pressure was greatest for new facilities with a view to postwar use.

One problem that always arose in connection with financing those new plants that were located, as many were, beyond established factory areas was the problem of "off-leasehold expenditures."³⁹ These were expenditures for the construction of connecting highways, railroad spurs, power and light lines, telephone lines, gas mains, water mains, sewers, and other utilities. It was the policy of the federal government to induce the contractors or the utility companies and the municipalities that stood to profit by the extensions to bear the cost. However, the government most often had to finance construction initially, and always, as was proper, had to guarantee the utility companies or

38. IOM, Capt. L. L. Bushong to Chief, Facil. Br., Procur. Div., att. Capt. R. L. Pastner, 24 Feb. 1944, in Certif. Unit, RCS, Proced. file.

39. AAF Contract Handbook (Revised Edition), 15 July 1943, 800.7.

AAFHS-40

207

~~CONFIDENTIAL~~

municipalities against loss. When the government financed construction, expenditures were charged to expediting funds rather than supplies funds and were classed as "non-recoverable." It was legal to use supplies funds but impracticable because of the impossibility of apportioning them equitably among several contracts.

Private utility companies commonly constructed their extensions under either the cancellation or the refund type of contract. Both types were adaptations of contracts employed by the companies in dealing with private customers and occasioned no special difficulty. Under the cancellation type the utility company financed the extension on condition that, if the government (or its successor) should cease to use the service before the expiration of five years, the latter would pay as a cancellation charge that percentage of the cost which the unexpired portion of the period should bear to five years. Under the refund type of contract the Government bore the entire cost of construction initially and the company agreed to refund during three and one-half years that percentage of the monthly bills which was estimated to be necessary to return the whole cost by the end of the period. This contract had the disadvantage of requiring difficult negotiations over the estimates of probable use.

Extensions of municipally-owned utilities for which service charges were commonly made, such as water and light, were constructed under arrangements similar to those made with private utility companies. It was different with highways and airfields.⁴⁰ Seldom was it possible to persuade local governments or even the state governments, which

40. Stenographic report of WF conference of 11-13 Jan. 1944, pp. 103, 105.

AAFHS-40

208

collect gasoline taxes and licenses, to bear any considerable share of the costs. The excuse was, of course, that the highways and airfields would not be used after the war.

In the cases of DFC and EPF facilities, the negotiations with the utilities companies and the municipalities were usually, and wisely, left to the lessees. Fortunately for harassed procurement officers, utility rates were publicly regulated and no one could bind the government to pay higher.

A most difficult matter to handle throughout the entire period was "overruns." Technically an overrun was an excess of cost of a facility (over the amount of the DFC or EPF contract) not due to changes in plans and specifications. Many overruns were entirely legitimate. They were caused by rising labor, materials, and tools costs or by needs for equipment and machinery not foreseen by either the manufacturers or the procurement officers. Many overruns were occasioned otherwise, however. Contractors sometimes underestimated costs to facilitate getting their applications approved, knowing full well that the government could not back out once construction was well under way. Occasionally, it appears, the processing officers reduced applicants' estimates unrealistically in the hope of giving them greater incentive to keep costs down. Overruns were occasioned also by careless letting of construction contracts on the part of the lessees. Many times they were the product of an accumulation of numerous minor changes here and there, any one of which might plausibly be considered to fall within the scope of the project but all of which taken together modified it considerably and made it more valuable for postwar use.

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AAFHS-40

209

Such minor changes included "trim" or "embellishments," which were most often made in administration buildings. One company, for example, managed to get a three-story, black marble facade and marble railings for the stairways.⁴¹ Embellishments also included such things as carpets, Venetian blinds, private dining rooms, elaborate landscaping. Such embellishments caused more public criticism, because more obvious, than other items of extravagance. Their cost might actually be far less than that, for example, of employing a more expensive type of construction than was supposed to be employed in temporary or "semi-permanent" buildings. Some companies added the embellishments and vanities at their own expense after they had been disallowed by the processing officers.⁴² The public did not know this. Once Colonel Schneeberger suggested that lessees who put their own money into embellishments should be required to put up signs saying so.⁴³

Overruns graded insensibly into "bail-outs." Technically a bail-out was an unauthorized change in plans or specifications which nevertheless was allowed retroactively by the authorities. One manufacturer, for example, in applying for a bail-out without using the term, explained that the floor area was larger than originally planned, the structural specifications for the test area had been changed, and the following

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41. Supporting documents are filed in Facil. Br., RCS, under name of the company. This item and numerous others in the remainder of this chapter are typical, and to name the individual company would serve no useful purpose.
 42. Maj. R. C. Harmon, JAGD, Chief, Facilities Branch, Contract Section, Material Division, gave an opinion that this was permissible provided the contractor agreed that the costs were non-recoverable unless he should exercise his option at the end of the emergency. IOM to Chief, IPS, 11 July 1941, in Facil. Br., RCS, Gen. Proced. file.
 43. IDC, 9 Feb. 1942, ibid.

AAFHS-40

210

important additions had been made: a chip and oil storage house, a pump house, a mezzanine floor over part of the office area, two guard look-outs, increased blackout. Another lessee, whose project was a large one, increased his floor area by 500,000 square feet over that called for by the appendix "A."

Many of these unauthorized changes were justified. During the hectic weeks just after the attack on Pearl Harbor, especially, everybody connected with facilities was in a hurry. There was no time to prepare careful plans. Plans were avowedly incomplete. Construction was often started and plans prepared as the work progressed. Lessees were given to understand that the government expected them to go ahead and use their judgment and it would foot the bills. It is doubtful that many took advantage of relaxation of correct procedure in those dark days. There were other cases in which contractors honestly felt that the public interest required that they make changes and additions without waiting on official red tape; and perhaps occasionally public interest did so require.

There can be little doubt, however, that the great majority of unauthorized additions were prompted by a desire to get, at public expense, better facilities than the sponsors had intended to allow them. This was especially true of the later period, when people were more prone to look forward to their postwar competitive position. When and if lessees in such cases were reprimanded for going ahead without authorization and threatened with refusal to allow the excess expenditures, they always had a ready justification. The AAF Resident Representative had given verbal assent, it might be said, or the project officer had suggested it would be a good thing, or General Such-and-Such

AAFHS-40

211

had visited the plant and had said "go ahead and use your judgment."⁴⁴ In the vast majority of cases the government had to bail the manufacturers out. It needed their production. It was extremely difficult to tell with assurance when they were not "acting in good faith." More likely than not, someone along the line had given verbal assent; and, while that was not a contract, it might create a moral obligation. At least, presumably, the DPC Resident Engineer, or the AAF Area Representative, or both had seen what was going on and had acquiesced. In fact staffs were often too small to be able to see everything, and they could not always have prevented headstrong executives from going ahead even if they had seen.⁴⁵

One special form of bail-out was for plant sites. Not commonly, but in too many cases for comfort, lessees took advantage or tried to take advantage of their position of agency to unload land in excessive amounts at excessive prices. Colonel Schneeberger spent much energy trying to pare down land costs, although in general land was a small item compared with buildings and machinery. A District Supervisor, CPD, raised the question as to who should initiate appraisals. He asserted that lessees were acting in collusion with friends who had sites to sell to get high appraisals.⁴⁶

Facilities officers learned that war plants are never complete.

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44. See remarks of Lt. Col. G. H. Moriarty, Chief, Indust. Res. Br., RCS, in stenographic report of WF conference, 11-13 Jan. 1944, p. 33.
45. IOM, Chief, IPS, WF, to Chief, Facil. Sect., Office, Chief, Mat. Div., Wash., 16 Feb. 1942, defending his section for not preventing additions being made without authorization; in Facil. Br., RCS, Gen. Proced. file.
46. Maj. Ray D. Smith to Asst. Chief, Mat. Div., att. IPS, 17 Jan. 1942, attached to IOM, 27 April 1942, in Facil. Br., RCS, Gen. Proced. file.

AAFHS-40

212

As soon as plants began to approach completion under the original contracts, or sooner, most of the lessees began applying for changes and additions. They discovered things that had been "overlooked" in the original appendix; and in the early days, when so many manufacturers were undertaking production of unfamiliar articles, many things had indeed been overlooked both by contractors and processing officers. Then they found they required air conditioning for their processes, larger stock rooms, greater office space, another parking lot, a winter-test hangar, a new water main, or new machine tools for special purposes. A change in the design of the article to be made or an increase in the monthly schedule was almost certain to bring requests for new facilities.

It was most difficult to know what additions to allow and which to disallow. Officers were very hesitant to deny requests for additional facilities if there was any likelihood whatever that denial would delay production of articles badly needed in combat or even that delay might plausibly be attributed to such denial. Some applicants were most persuasive and importunate. Some gave Materiel Command the "rush act." They delayed sending in their applications until the last moment and then urged haste because winter was coming on or production was being held up. One one occasion, when the general superintendent of a large concern learned that an application was being unfavorably considered at Wright Field, he wired General Branshaw as follows: "Our request for a building . . . has been turned down. . . . If we are wrong in supposing that you want us to meet 8L Program, we should be notified."⁴⁷ He got

47. Memo by Donald D. Davis, Chairman, Facil. Com., WPB, 11 July 1944, copy in Facil. Br., RCS, Gen. Corres. file.

AAFHS-40

213

his building. The bigger the company the more likely it was to get its applications approved.

A special problem in the field of amendments to facilities contracts was the practice of coming in for extra tools after "cut backs." Prime contractors whose schedules had been reduced would attempt to keep their plants going full tilt nevertheless by bringing in work that formerly had been subcontracted. They accordingly applied for special-purpose machine tools for the new processes. The policy of Materiel Command in such cases was to find new work to absorb the excess capacity if possible but, at any rate, to insist that the proportion of subcontracting remain the same. Additional machinery would be denied. But the matter was hard to police.

There was, of course, even in a completed new plant a continuing need for expenditures for capital items. For example, it might be necessary to replace broken or worn-out machine parts, to alter the arrangement of production lines, to move partitions, to replace broken dishes and lost cutlery in the shop cafeterias. To have gone through the whole processing procedure every time such a capital expenditure became necessary would have been most tedious and time consuming for all concerned. To obviate the necessity for doing so, the device was hit upon of setting up a special "continuing-capital expenditures" fund for each of the larger projects.⁴⁸

48. The device seems to have been suggested originally by representatives of Douglas Aircraft and Curtiss-Wright Corporation, and the essential features were worked out by Col. P. Schneeberger, Chief, IPS, and L. B. Waugh, Counsel of DPC. Notes by Col. Schneeberger, 5 Nov. 1941 and 3 Feb. 1942; Col. Schneeberger to Waugh, 5 Feb. 1942, both in Facil. Br., RCS, Ge. Proced. file.

AAFHS-49

214

After the device had been perfected, it was the practice to set up the fund by the usual processing procedure for a year at a time. The amount was fixed by negotiations with the lessee and was a percentage not over 5% of the previously approved total cost of the project. Expenditures for items within the permitted classes might be approved by the District Supervisor and the DPC Resident Engineer without reference to higher authority in case of DPC facilities or by the supervisor alone in case of EPF or SF contracts. The fund might not be used for any new structure costing more than \$25,000 nor for camouflage, new administration buildings, or cafeterias. It might, however, be used for alterations or expansions of such items. The fund was divided into quarters for quarterly periods. An unexpended balance from one quarter might be carried over into the next quarter year; but funds designated for a later quarter year might not be used in an earlier.⁴⁹ On the whole the device worked very satisfactorily.

Applicants for facilities, especially the bigger firms, whose applications had been denied at Wright Field frequently appealed to Washington. They were often successful. Cases have been noted in which the reversal seems to have been against the clear weight of the evidence. No doubt there were pressures or special considerations of policy involved that do not appear in the record. Applicants sometimes told district officers they might as well recommend approval, for "the skids are all greased" at Wright Field. They then told Wright Field officers they might as well approve, for their projects had been given the "green light" in Washington.⁵⁰

49. AAF Mat. Comd. FOM No. 87-2, 8 March 1944.

50. Stenographic report of WF Conference, 11-13 Jan. 1944, p. 33.

AAF

215

It may be remarked that approval of contractors' applications for reimbursement for expenditures even by auditors and contracting officers did not guarantee repayment. Claims had still to run the gauntlet of the General Accounting Office and would be disallowed if contrary to law or regulations. For example, cost-plus-a-percentage-of-cost contracts were expressly forbidden by law. Architects had commonly charged lessees a percentage, say 4%, of the amount of the facilities contract. Presumably that was allowable because the fixed sum fixed the fee. However, architectural firms had also claimed the same percentage on overruns. That, in the event, could not be allowed, because, while again an amendment to a facilities contract to take care of overruns could fix the fee, the prospect of the added fee could have been responsible for the overrun. Some lessees have let general construction contracts on a cost-plus-a-percentage basis. This would appear to have been a clear violation of the law.⁵¹ As another example, standard DPC, EPF, and SF contracts allowed the lessee a fixed fee (usually \$1.00) and his actual expenses for constructing a facility but did not permit reimbursement for any portion of his overhead. The question as to just what constitutes overhead is a nice one. It is very likely that, if and when the General Accounting Office disallows claims, some concerns will appeal to the Court of Claims and litigation will drag on for years.⁵²

It perhaps goes without saying that, with such a strong demand for government-financed facilities, occasional contractors or their overzealous agents might be tempted to hold out special inducements to get

51. Contract Sect., WF, OM No. 42-71, 18 March 1942, in ATSC Law Library.

52. Interview with Maj. R. L. Pastner, Asst. Chief, Facil. Office, RCS, 11 Nov. 1944.

AAFHS-40

216

their applications approved. Indeed instances in which bribes were both offered and taken have been reported in the public press. It is not the intention of this study to attempt an estimate of the extent of venality in connection with facilities procurement, only to suggest that the demand for facilities was great enough to occasion some. It is confidently believed that the number of cases of corruption in its grosser forms was relatively small.

Perhaps much more common and more costly to the public purse have been the more subtle and less heinous forms of corruption. Project officers who knew the ways of the world and wished to keep their judgment clear had to be careful from whom they accepted favors. Section and branch chiefs had to be aware of the off-duty habits of subordinates. One project officer stated that he likedsteaks as well as anyone but he had to live with himself the rest of his life and "could not afford to sell out for a juicy steak." One large concern, with a DPC plant far from the down-town district, repaired an unused school building that had been damaged by fire and fitted it up as a club for the officers on the AAF Resident Representative's staff. There was no official intervention although there may have been lifting of eyebrows. One company furnished and decorated a couple of brick houses near its plant and rented them at a "nominal" rental to officers of the Factory Representative's staff. In this case all concerned seem to have been somewhat obtuse as to the purpose or at least the effect. When it seemed desirable to move the houses because they appeared to be flight hazards, the company protested. A high executive called a high-ranking officer at Wright Field and told him that the houses were rented to a couple of "your delightful lieutenants" at a "nominal" figure and he did not want them disturbed.

AAFHS-40

217

The high-ranking officer, in turn, called Washington and supported the protest. He mentioned the occupancy of the houses, "which is swell for us, and makes the officers convenient to the plant and everything else." The District Supervisor also thought it was to "our interest" to have the officers there.

One reason that Wright Field officials were disinclined to give larger powers of independent action to local representatives was that they too often acquired the "factory point of view." An explanation which district and factory representatives gave for being liberal in their recommendations and allowances was that "we have to live with the companies." Colonel Moriarty, when chief of Industrial Service Branch, RCS, once suggested that it might be wise to limit Resident Representatives to a one-year tour of duty in a plant and then move them on.⁵³

Speaking by and large, putting the matter baldly, manufacturers used all the methods customary in competitive business to secure the facilities they desired. The fact that, under the DPC, EPF, and SF plans of financing, the lessees constructed or acquired facilities as agents of the government seems not to have affected general behavior greatly. Facilities officers had to assume, and did assume, that it was the contractors' job to get the best bargains from the government they could and that it was their own job to protect the public interest as best they could, employing methods imposed by Army and Civil Service standards. Maj. J. L. Bowling, then chief of the Facilities Unit, put it thus: "If we don't look out for the interests of the AAF budget, nobody else will."⁵⁴ The major probably intended to cast no reflections.

53. Stenographic report of WF Conference of 11-13 Jan. 1944, p. 36.

54. Transcript of telephone conversation with Oscar Sjöholm, EPD, 3 March 1943, in Fac. Br., RCS, Gen. Proced. file.

AAFHS-40

218

In general the facilities project officers, all of whom had had business experience, felt that businessmen in general dealt with the government in an honorable and creditable manner.

Materiel Command experience seems to indicate that there is no advantage in putting facilities procurement officers in uniform and no disadvantage per se. Some of the best have been business men, production engineers, and architects secured by the reserve-officer route. Some of the best have been civilians with similar training. The civilians probably would have been in uniform if they could have met Army age and physical standards. In general too great reliance on men in the military service would have been undesirable, for, Army standards of age and physique being what they are, there would have been considerable lowering of the age and experience level. The principal qualifications for procurement officers in the facility field seem to be reliability, acumen, and business and production-engineering training and experience.

The men, whether in uniform or out, who labored away year after year at the unspectacular task of procuring facilities, and not too many facilities, and maintained their zeal and kept their records and consciences clean deserve every praise.

AAFHS-40

Chapter X

THE MEASURE OF ACHIEVEMENT IN FACILITIES EXPANSION

If the money value of machinery and equipment utilized be taken as the criterion, the aeronautical industry under AAF cognizance was expanded by about 700% between September 1940 and the end of 1944.¹ If the ability of plants to turn out airplanes, measured by weight, in a given time be taken as the criterion, the industry was expanded by about 1,900%.² If the fighting power of the airplanes that the plants could produce be taken as the basis of comparison, the percentage of expansion was almost astronomical. September 1940 is the date when the government definitely began to expand defense industries. By that date the aeronautical industry had already been expanded considerably over its capacity as of September 1939, when war broke out in Europe.

But capacity at the end of 1944 is not the most significant figure. The war was in its later stages before all this expanded capacity was available. More significant are the capacities available when planes were needed for preparations, reinforcements, and replacements.

It is not proposed to discuss aircraft capacity in relation to specific military requirements throughout the period. But it is believed

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1. An estimate by the author. No way is known to determine the proportion accurately if, as they should be, the value of the machinery in converted plants and the pro rata value of machinery in plants working only part time on aeronautical materiel be included.
 2. Also an estimate insofar as percentages of capacity at which plants were operated at the two dates are involved. Weights are known with reasonable degree of accuracy.

AAFHS-40

220

the simple table on the next page is very suggestive in this regard. In reading the table it should be borne in mind that in September 1940 the industry was still making many commercial airplanes and was operating at about 60% of capacity. It was still operating at less than capacity in November 1941. By June 1944 it was again operating at something less than capacity. It should also be kept in mind that the life of a tactical airplane is quite limited, and therefore that the cumulative totals in columns 4 and 5 are not numbers of airplanes available on the dates indicated. The numbers given are for airplanes produced under Army cognizance only, although the inclusion of airplanes built under Navy cognizance would not change the proportions significantly.³

The total weight of airplanes produced under AAF cognizance in 1943 was 126.1% greater than that of those produced in 1942. Both years were years of war, and in both, the aircraft industry was operating at capacity or very near it. The total weight of airplanes produced in 1944 was 46.9% greater than that of 1943 and 232.1% greater than that of 1942, but the industry did not operate at capacity in 1944.⁴

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3. Numbers are from Monthly Factory Deliveries of Aircraft Actual from [the period], and Estimated Future Deliveries, Army Cognizance Only, prepared by Mat. Comd., Office of the Comptroller (the title has varied slightly from time to time, and the office preparing the report has also varied.); Daily Report of Aircraft Acceptances and Deliveries, prepared by ATSC, Statistical Control Office; Aircraft Acceptances, Factory Deliveries, and Departures from the U.S. by Type, Model and Recipient Country . . . for Period January, 1941-December, 1943, Inclusive, prepared by Analysis and Planning, Aircraft Delivery Unit, Statistical Control Office, Mat. Comd.
 4. Weights supplied by Statistical Control Office, ATSC. See app. 5 (chart).

AAFHS-40

221

TABLE I

Date	Rate of Production per Month, Tactical and Trainer.	Rate of Production per Month, Tactical Only.	Rate of Production per Month, Heavy Bombers only.	Cumulative Total of Tactical Planes.	Cumulative Total of Heavy Bombers only.	Estimate of Capacity to Produce Planes, by Poundage.
Sep. 1940. Government Expansion Program Begun	490	260	9	3,058	56	100%
Nov. 1941. Last Month before Pearl Harbor and Stalingrad	1,740	850	51	7,940	291	210%
Nov. 1942. Invasion of North Africa	3,835	2,175	288	28,017	2,483	430%
Aug. 1943. First Raid on Schweinfurt	5,498	3,913	895	56,816	8,168	870%
June 1944. Invasion of France	5,790	5,210	1,523	107,176	21,204	2,000%

AAFHS-4.0

222

During the calendar years from 1940 to 1944 authorizations were made of expenditures for facilities under AAF cognizance as indicated in Table 2. Only direct financing is included. If certificates of necessity under the tax-amortization plan were also included, percentages would be a little higher for 1942, 1943,*and 1944 and correspondingly lower for 1940 and 1941.⁵

TABLE 2

Year	Amount Authorized to be Expended	Per cent of Total for the Five Years
1940 ...	\$151,298,472	4.9
1941 ...	629,999,116	20.3
1942 ...	1,665,972,004	53.8
1943 ...	426,360,787	13.8
1944 ...	222,504,289	7.2

It will be noted from the table that well over half the authorizations were made in 1942 -- after we entered the war. Most of those made

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5. Amounts derived from AAF Industrial Facilities Expansion, Status, Progress, and Performance, monthly, prepared by RCS; a monthly summary of the report named, also prepared by RCS; and, for the earlier period, a "Report of the transactions of the Facilities Branch, Procurement Division, Wright Field, from the beginning of the existence of such Branch to May 1, 1943", copy in ATSC Historical Office. Also see the chart following p. 113.

AAFHS-40

223

~~Construction~~
in that year were made, however, in the first few months. In some cases construction started before formal authorization. In fact many of the authorizations were for "bail-outs" and "overruns." If figures for certificates of necessity were included, the table would distort the picture of inception of projects still more unfavorably. But in the majority of cases authorization preceded the beginning of construction or conversion. And once construction or conversion was begun, it took time to get the plants into full operation. The lag ranged up to three and one-half years. The majority of our war plants making materiel for the AAF got into operation in 1943, especially in the latter half of 1943.

From the moment a facilities contract was signed or a letter of intent executed, it took on the average over 31 months to build a new airplane assembly plant and bring it to full production.⁶ That is a long time in war. It took on the average 18 months to build the plant, equip it, and turn out the first acceptable plane. It took on the average eight months more to bring it up to one-half a full schedule. It then took from five to six months more to bring it up to full production.

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6. This statement and similar statements which are made in several succeeding pages are based on data derived from several sources. The most useful are: the publications cited in footnote 5, for dates of facilities contracts; the publications cited in footnote 3, for delivery rates by factories; and files of Facilities Branch, WCS, WAF, under names of individual concerns and factories. In a number of cases beginning dates for calculations of elapsed times have been used which were earlier than dates of facilities contracts or letters of intent. The object has been to calculate from the dates when the companies got their go-ahead signals. It has been unfortunately necessary to disregard the preceding period of preliminary negotiations because of indefiniteness.

AAFHS-40

224

Elapsed time varied. It took longer in case of plants designed to build big or especially complicated airplanes than in case of plants designed to make smaller or less complicated craft. The B-29 plants required about 40 months each; but "bugs" in the plane contributed to stretching out the time. The big C-54 plant in Chicago required nearly three years to get on full schedule. But it took only about two years on the average to build plants which were designed to make fighter airplanes and get them fully into operation.

The time required varied with the management. In fact a very few concerns were so slow in getting into production that their contracts were canceled before they had reached anything like their anticipated schedules, although the fault may not have lain entirely with management. Their projects have been omitted from the tabulations on which the averages given here are based. With these omissions, the range in time that may be attributed to differences in management was only a few months at most.

The time required to get a new assembly plant into operation varied with the state or stage of the designing of the plane. In general it took a few months longer where tooling had to be begun before the design was reasonably well established. It took a few months less to get a second new plant into operation for making a particular model than it did for the first. Elapsed time was a little less for plants begun later in the period than for those begun earlier, principally, perhaps, because of the easing of the machine-tools situation in 1943. But with all circumstances favorable -- management, location, design, former experience, tools supply -- it was possible to clip off more than two or three months from the average.

AAF

225

On the average during the emergency period it required about 21 months to expand a plant already producing a given model of plane and get it up to its proper enlarged schedule. But the average should not be taken too seriously, for the time depended a great deal on the scale of the expansion. In general the saving was made in the earlier stage of the process. It took about as long to get into full production after the first increase in output resulting from the expansion began to show as it took in entirely new plants to get on full schedule after the first acceptable plane came off the assembly line. The principal explanation of this fact is that in both cases there was the same problem of recruiting and training the necessary workers and supervisors.

It has taken on the average about 28 months in a completed and operating plant to make a change-over from one plane to another of a quite different model and to get into full production on the new plane, for example, to shift from the AT-6 to the P-51. This average is based on a relatively small number of cases -- six. The average time between the first accepted plane and a satisfactory schedule was the same as in the case of new plants going into production. However, it was possible in the six cases studied to taper off the production of the first plane, as the change-over was effected, in such a manner as to interrupt the full production of the plant, on the one model or the other, for only four or five months on the average. Thus, if the model originally produced was not obsolete during the period of change-over -- that is, if its production was not continued only to fulfill a contract and to keep the workers from dispersing -- the loss in production by reason of a change-over was relatively small. In case it should not have been considered worthwhile to continue the production of the

AAFHS-40

226

older model while tooling up for the newer, no doubt the process could have been speeded up considerably. There were no clear-cut instances of this character.

From the time the facilities contract was signed or a letter of intent executed, it took on the average 23 months to build and equip a new airplane-engine factory and get it into full operation. That, again, is a long time in war. It took about 14 months from "green grass" to the first accepted engine and about nine months more to get up to the schedules properly expected. As in case of airframe factories, the time varied with the type of engine the plant was designed to make, the size of the plant, the management, and other circumstances and conditions. It took 33 months to build the enormous Dodge Chicago factory and get it into full production. The production engineering difficulties for the R-3350 engine (for B-29's and other aircraft) were very great. Omitting this exceptional case, the range of elapsed time for new engine plants was from 20 to 24 months. The average time for new engine plants, it will be noted, has been about eight months shorter than the average time for new assembly plants. This was contrary to earlier expectations.

During the war it took about as long to convert an automotive engine factory and get it into full operation making airplane engines as it did to build a new plant and bring it up to its proper schedule. The explanation lies in the fact that it took as long to build the special-purpose machinery as it did to build the factory, and the factory could be built while waiting for the machinery.

However, considering all items of AAF materiel, it normally required considerably less time to convert plants than to construct new ones.

AAFHS-40

227

The saving depended principally upon the sorts of machine tools required and the extent to which those of the plants undergoing conversion could be utilized.

Whether by the process of new construction or by conversion, it took time to get our war plants into operation. The time was extended somewhat by the machine-tools and other bottlenecks. In retrospect, however, most men of business judgment seem to have been surprised and gratified by the speed with which industrial mobilization was accomplished, once it was undertaken in earnest.

Experience during the emergency has not entirely settled the question, much debated earlier, of the wisdom of relying on automotive companies to go over into the manufacture of airframes during war. Such companies certainly built all sorts of subassemblies with great success. The Ford Motor Company is the only automotive company, however, that undertook to make complete airplanes and did it successfully, in quantity.

It took the Ford Motor Company 18 months from the time it chose the site at Willow Run to produce its first accepted B-24. It took 38 months to achieve full schedule. Three aeronautical companies got plants for assembling B-24's into full operation in 25, 31, and 32 months, respectively.⁷ The Ford Motor Company had the advantage of being nearer centers of the machine-tools industry. It was located in an area having a larger proportion of labor skilled in mechanical trades. It had a highly capable managerial and engineering staff. On the other

7. North American Aviation, Dallas, Consolidated-Vultee, Fort Worth (government-built plant), Douglas Aircraft, Tulsa (government-built plant).

hand Ford experienced extraordinary difficulty in recruiting and maintaining an adequate labor force, because of the unfortunate location of the plant so far from adequate housing. It had to move much of the machinery that had once been installed in Willow Run to Detroit and elsewhere because of inability to find workers to operate it at Willow Run. Ford undertook to make more of the airplane in the plant (to do less subcontracting) than did the other contractors. Its schedule was stepped up several times, requiring alterations in the assembly lines. Consolidated-Vultee, which operated one of the new plants that made B-24's, had had earlier experience in making airplanes of this model. On one occasion a Ford official in explaining his company's delays "said that Consolidated had years of experience and experienced personnel."⁸

Time is not the only element on which to base comparison. Eventually the Ford Motor Company had the lowest ratio of direct man-hours per pound of airplane of all the companies making airframes.⁹ Furthermore, Willow Run was never used to full capacity after the bulk of the engineering difficulties had been overcome. This does not necessarily mean that Ford produced most economically of all. It had more expensive labor-saving machinery. Ford had hoped to introduce the quantity production methods of the automobile industry into the aircraft industry. It succeeded in doing so to a greater extent than any other company but

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8. Report of Col. G. S. Strong, Internal Security Officer, CPD, to CG, Mat. Cen., att. Tech. Exec., 13 Feb. 1943, in Facil. Br., RCS, Ford-Ypsilanti Corres.
 9. Aircraft Program Progress Report, monthly, prepared by Office of the Comptroller (later Management Control, Statistical Control Office); Estimated Operating Ratios in the Airplane Industry, monthly, prepared by same office.

not to the extent it hoped. The aeronautical companies with far larger orders than formerly also were able to utilize quantity methods to a greater extent than before. At least the Ford experience proves that automotive companies can go over into the production of airplanes and in a reasonable length of time produce them successfully.¹⁰

Of the government expenditures for facilities under AAF cognizance, 1940-1944, about 61% was for machinery and equipment, 35% for constructing and altering buildings, and 4% for land, land improvements, and miscellaneous items.¹¹ Machine tools were the big item and the first bottleneck.

Of the floor area utilized during the war for production of AAF materiel, 61.5% was provided by construction, either of new plants or of extensions of old ones, and 38.5% was provided by conversion of buildings previously erected.¹² It does not necessarily follow, however, that the amount of production was greater in the new structures.

The facilities employed at the end of 1944 in making AAF materiel were approximately 55% government owned, 45% privately owned.¹³

It cost the government on the average about three times as much per square foot in initial capital outlay to construct and equip new

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10. Statements in regard to Ford's record are based on voluminous Ford-Ypsilanti correspondence filed in Facil. Br., RCS, WF, and interviews of project officers in Facil. Br.,
 11. Careful estimate derived from figures broken down in a somewhat different way in AAF Industrial Facilities Expansions, Status, Progress, and Performance, monthly, prepared by RCS.
 12. Ibid. Proportions cover only facilities directly financed in whole or in part. Proportions for facilities privately financed under tax-amortization plan are believed to have been not greatly different.
 13. Careful estimate by an intricate process. It is believed that the precise proportions can never be determined.

plants as it did to convert old ones for the same purpose.¹⁵ The ratios varied greatly, though, with the items to be manufactured. The comparative costs to the government in the long run of employing new facilities and of employing old cannot now be determined. Perhaps they never can be. There are too many factors involved. These factors include what the government will receive for its war plants when it sells them, what it shall have received as rent for their use, what it shall have paid (in the form of higher prices) for the use of privately owned plants, what it shall have recovered in taxes from contractors in the two classes of plants, and the comparative prices paid for the products of plants of the two classes. And, after all, cost may be a matter of minor importance in an emergency as compared with time.

Some effort was made by procurement authorities in expanding facilities to distribute them equitably among regions and localities. However, this effort was concerned with war plants as a whole, not by categories. Table 3 shows the distribution by standard regions of direct government financing of AAF-sponsored aeronautical facilities as compared with the prewar distribution of the aircraft industry and of manufacturing in general.¹⁵ If financing under the tax-amortization plan were included, the Pacific region would make a somewhat better

14. Estimate derived from figures in AAF Industrial Facilities Expansions, Status, Progress, and Performance.

15. Column 1 computed from AAF Industrial Facilities Expansions, Status, Progress, and Performance; column 2 from Statistical Abstract of the U.S., 1943, p. 801; column 3 estimated from tables in Sixteenth Census of the U.S., 1940, Manufactures 1939, III (figures for several states are withheld from the tables).

AAFHS-40

231

showing in column 1. If financing under Navy auspices were included, the percentages in column 1 would be changed considerably.

TABLE 3

	(1)	(2)	(3)
Region	Authorized Costs of AAF-sponsored Facilities, 1940-1944, Percentage of Total	Value Added by Manufacturing in 1939, all branches, Percentage of Total	Number of Employees in 1939, Percentage of Total, Estimate
East N. Central	55.1	33.5	6.0
Middle Atlantic	21.0	29.8	19.9
West S. Central	7.4	3.3	0.0
West N. Central	5.3	5.5	3.1
Pacific	3.8	6.5	39.4
South Atlantic	3.8	9.1	12.8
East Central	1.7	3.4	0.0
New England	1.4	9.8	18.8
Mountain	0.5	1.1	0.0

Whether the war made any permanent change in the geographical distribution of the aeronautical industry remains to be seen. Most of the plants will have to be used for other purposes after the war. Some, particularly government-built plants in the West South Central and West North Central, will no doubt be retained by the government as stand-by plants. It may be that the factors which determined the distribution

AAFHS-40

232

of the industry before the war will reassert themselves after its close.

The total authorizations for AAF-sponsored aeronautical facilities with direct government financing amounted to \$3,096,134,668 to the end of 1944.¹⁶ Certificates of necessity were recommended to the amount of \$648,858,446.¹⁷ If we assume that eventually expenditures shall have equalled the authorizations — a safe assumption at the time of this writing — and that the government shall have borne 70% of the cost under the tax-amortization plan, then the government eventually shall have expended over \$3,550,000,000 for aeronautical facilities sponsored by the AAF and authorized by 1 January 1945. This is a sizable sum. But the sum is small (and part of it will be recovered) in comparison with the amount that shall have been expended for aircraft under supplies contracts. As of 1 January 1945, the government had spent and committed itself to spend over \$43,862,559,000 for aircraft and accessories under AAF contracts and commitments.¹⁸ The final total may be much greater.

16. AAF Industrial Facilities Expansions, Status, Progress, and Performance.

17. Total supplied by C. C. Grimmett, Chief, Certif. Unit, RCS.

18. "Status of Expenditure Program, Fiscal Year 1941, as of 30 June 1943," prepared by the Budget and Fiscal Office, Mat. Comd., for insertion in History of the Materiel Command, 1943, app. 1; "Status of Expenditure Program, Fiscal Years 1942, 1943, and 1944 as of 30 September 1944," prepared by same office, ATSC; "Status of Expenditure Program, Fiscal Year 1945 as of 31 December 1944," same office.

AFES-40

G L O S S A R Y

AAF	Army Air Forces
AAFR	Army Air Forces Resident Representative
AC	Army Air Corps
AC/AS	Assistant Chief of Air Staff
AFP	Authority for purchase
ALMB	Army-Navy Munitions Board
APB	Aircraft Production Board
APUC	Area Production Urgency Committee
ARCO	Aircraft Resources Control Office
ASC	Air Service Command
ASF	Army Service Forces
ASU	Aircraft Scheduling Unit, at WF
ASN	Assistant Secretary of War
ATSC	Air Technical Service Command
C/AC	Chief of the Air Corps
C/E	Chief of Engineers
CF	Central Files
CPE	Contractor-furnished equipment
CPD	Control Procurement District
CPFF Contract	Cost-plus-a-fixed-fee contract
DPC	Defense Plant Corporation
EPD	Eastern Procurement District
EPF Contract	Emergency-plant-facilities contract
FOI	Field organization memorandum
GFE	Government-furnished equipment
GMC	General Motors Corporation
IDC	Inter-deck correspondence
ID.	Indorsement
IOI	Inter-office memorandum
IPS	Industrial Planning Section, WF
JAC	Joint Aircraft Committee of the Army, Navy, and British Purchasing Commission
LI	Letter of instruction

ALFES-40

264

Mat. Cen.	Material Center
Mat. Comd.	Material Command
Mat. Div.	Material Division
ICPD	Midcentral Procurement District
IMS	Office of AS/IS, Materiel and Services
IMD	Office of AS/IS, Materiel, Maintenance, and Distribution
IMPD	Midwestern Procurement District
MDAC	Advisory Commission to the Council of National Defense
OSW	Office of the Assistant Secretary of War
OCAC	Office of the Chief of the Air Corps
CEM	Office for Emergency Management
OM	Office memorandum
OPA	Office of Price Administration
OP/CS	Office of Price Administration and Civilian Supply (predecessor of OPA)
OPM	Office of Production Management
OSW	Office of the Under Secretary of War
PCS	Production Control Section, WF
PES	Production Engineering Section, WF
PRS	Production Resources Section, WF
RCS	Resources Control Section, WF
Res. Div.	Resources Division, AS/AS IAMD (US)
RFC	Reconstruction Finance Corporation
SCO	Statistical Control Office
SEPD	Southeastern Procurement District
SP Contract	Special facilities contract
SPAB	Supply, Priorities, and Allocations Board
SWPC	Smaller War Plants Corporation
TI	Technical instructions
T.X	Teletype
USW	Under Secretary of War
WDSS	War Department General Staff
WF	Wright Field
WC	War Manpower Commission
WPB	War Production Board
WPD	Western Procurement District

ADP-40

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B I B L I O G R A P H Y

(Sources especially useful are indicated by asterisks.)

Official Publications and Documents of the
Federal Government, Excepting the Army Air Forces

* Code of Federal Regulations of the United States of America and
Supplement.

Indispensable for Executive Orders and for administrative
orders of various departments and bureaus.

Department of Labor, Bulletin No. 800, War-time Development of
the Aircraft Industry, Nov. 1944. Prepared by the Div. of Con-
struction and Public Employment.

Federal Register.

Useful to supplement the Code of Federal Regulations.

National Resources Planning Board, Industrial Section, Brenner,
Melvin A., Post-war Problems of the Aircraft Industry, Aug. 1943, a
preliminary report.

* Senate Reports, 77 Cong., no. 480, pts. 1-14; 78 Cong., no. 10, pts. 1-19.

Various reports of the Special Committee (Truman) Investigating the
National Defense Program.

Sixteenth Census of the United States, 1940, Manufactures, 1939, III.

Statistical Abstract of the United States, 1943.

United States Code, 1940 edition and supplements 1 (1941), 2 (1942), and
3 (1943).

United States Statutes at Large.

War Production Board, Aircraft Branch, Aircraft Report(s), commonly known
as the "Series Reports," (c)

These reports were issued at irregular dates beginning in 1940 (by
WPB). They are numbered in Arabic numerals for general subject and by
letters for sequence, and have various titles: e.g., No. 13-1, 15 March
1942, Airplane Manufacturing Capacity Based on Factory Areas.

AFES-40

236

Publications of the Air Technical Service Command
and its Predecessors

Recurring Reports

Aeronautical Monthly Progress Report No. 3--Trouble Chart.
Prepared by Office of the Comptroller, Mat. Comd., AF.

Aircraft Program Progress Report. Monthly. Prepared by SCO,
Mat. Comd., AF.

Especially useful for labor utilization. This report
was superseded by Labor Statistics for the Aircraft
Industry, listed below.

AAF Aircraft Procurement Programs, Fiscal Year Funds (Years),
Number of Aircraft on Program, on Approved Formal Contract,
on Approved Letter Contract, on A.F.P. or Unapproved Letter
Contract, on C.T.I. Releases, No Procurement Action, and
Number Accepted to Date. Monthly. Prepared by ECS, AF.

AAF Industrial Facilities Expansions by Type of Financing.
Monthly. Prepared by ECS, AF.

A summary of the next listed publication.

* AAF Industrial Facilities Expansions, Status, Progress, and
Performance. Monthly. Prepared by ECS.

Indispensable for this study.

Daily Digest of Aircraft Acceptances and Deliveries Compared with
JAC and ATSC Schedules. Prepared by SCO.

Useful to supplement the monthly reports listed below.

Daily Report of Aircraft Acceptances and Deliveries. Prepared
by SCO.

* Labor Statistics for the Aircraft Industry. Monthly. Prepared
by Manpower Office, Management Control.

Superseded by Aircraft Program Progress Report, listed above,
July, 1944.

Monthly Digest of Acceptances by Facility and Type of Airplane.
Prepared by SCO.

AA-ES-40

237

* Monthly Factory Deliveries of Aircraft, Actual (date) to Date, and Estimated Future Deliveries, Army Cognizance Only. Prepared by Prod. Control Br., Prod. Sect., Procur. Div.

Title and preparing unit have varied.

Operating Ratios in the Airplane Industry. Monthly. Prepared by Office of the Comptroller, Mat. Comd., AF.

Supplements Aircraft Program Progress Report and Labor Statistics for the Aircraft Industry, listed above.

Status of Expenditure Program Funds for Expediting Program, Fiscal Year (or Years)---. Monthly. Prepared by Budget and Fiscal Office.

Note: The ATSC Historical Office has an incomplete but quite adequate collection of the Recurring Publications listed above and also of the Occasional Publications listed below.

Occasional Publications

* Aircraft Acceptances, Factory Deliveries, and Departures from U.S. by Type, Model and Recipient Country Based on Contracts Active as of January 1, 1941 (Excluding Direct Navy, Navy Lend Lease and Commercial) for Period January, 1941 - December, 1943 inclusive. Prepared by Mat. Comd., AGO.

* AAF Contract Handbook. Prepared by the Judge Advocate, Mat. Comd., 2 vols. (Revised Edition), 15 July 1943.

This edition is more useful than later editions because it contains more citations of opinions and correspondence illustrating development of policy and procedure. Section 800 is especially useful.

AAF Representatives Manual, 1 January 1944. Prepared with the cooperation of the District Supervisors by Technical Information Br., Technical Data Laboratory, Mat. Div., Mat. Comd.

* Conference Held at Wright Field 11, 12, 13 January 1944 between Representatives of Procurement Districts and Personnel of Materiel Command Re: Facilities.

A stenographic report. Copy in ATSC Historical Office.

Procurement Division, ATSC, Annual Report, 1944.

* Transactions of the Facilities Branch, Procurement Division, Wright Field, from the Beginning of the Existence of such Branch to May 1, 1943.

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AFHS-40

238

Very useful in establishing dates and amounts of facilities contracts and recommendations for certificates of necessity.

Air Technical Service Command, Wright Field Files

Files of Adjutant General's Office, Publications Section

This branch has complete files of Materiel Division, Materiel Center, Materiel Command, and Air Technical Service Command GO's, OM's, FO's, Circulars, Notices, etc. These are essential for tracing development of organizations and functions.

Central Files

004.06, Labor, subheadings: Requirements, Statistics, Utilization

* 321.9, Organization, subheadings: Aircraft Scheduling Unit; Industrial Planning Section; Production Control Section; Procurement Division; Production Division; Scheduling and Priorities Unit

360.01/317 Policy, Critical Shortage Reports

Useful for operations of ASAC.

* 381, Mobilization Plans

381.4, Shadow Factories

452.1, Airplanes, General, Modification

473.5, Gun Turrets

Contract Files

Arranged by contract numbers. Useful for tracing negotiations relating to peculiar provisions of individual facilities contracts.

Files of ATSC Historical Office

Daily Diaries (activity reports) of Resources Division, AS/AS, WMD (after 19 July 1944, WMD), 31 March 1943 to 31 October 1944.

Microfilm copy. Original copy in AAF Historical Office, Washington.

* Lyon Project Record Books (cited as Lyon).

AFHS-40

239

Microfilm copy. These records are 119 "books" or files of documents on the activities of the Materiel Division assembled by Col. A. J. Lyon while he was Executive in the Office of the Chief of the Materiel Division, Washington. The last volume is a table of contents for preceding volumes. The documents are especially numerous for 1940 and the first half of 1941. The original collection with a few books missing is filed in AC/AS, WWS, Washington. The most useful "books" for this study were Nos. 10A, 10C, 22, 22A, 37, 41, 42, 42B, 42B1, and 48.

Files of Resources Control Section Procurement Division

Office of the Chief, Resources Control Section

300.5, Circulars

300.9, Functions of IFS (Previous Years)

Industrial War Plans Circulars

These files are slender but are valuable, especially for W-Day planning.

Facilities Branch

* General Correspondence

Really a policy file.

* General Procedure

Also contains much information on organization and policy.

* Processing Procedure

Contains much more than processing procedure.

* Manufacturers' files

Arranged by company and project. These files are very voluminous but are indispensable for specific projects.

Certifications Unit

* Procedure

This is a policy file as well.

* Manufacturers' files

Arranged by company and project.

AAFES-40

240

List of Recommendations of Necessity Certificates

Manufacturing Methods Branch

319.1, Memorandum Reports (of visits to plants)

411.1, Facilities

ATP file

Useful for notations recommending sources.

This branch has kept its files from the time of its organization as Production Control Branch, PCS, in June 1939. They are especially valuable for the period before Pearl Harbor, when the branch was the principal agency for finding new sources of production.

Air Technical Service Command, Eastern District Files

Historical Office

This office has collected and preserved important documents from the old Industrial Planning Office files.

Facilities Branch, Files of former Capacities Branch

322, Organization of Air Corps Units

337, Conferences: Defense Production Clinics

AT Headquarters, Washington, Files

Office, Deputy AG/AS, PPS

Facilities

Lovett

Contains correspondence relating to the establishment and functioning of AFS and ARCO.

Facilities Branch, Resources Division, AG/AS, PPS

Army-Navy Munitions Board

History

Investigations

AFHS-40

241

One only, a joint AAF-WEB investigation of the relations of IFB and AAF.

Manufacturers' Files

Arranged by company and project. Very useful to supplement similarly arranged files in Facilities Branch, PCS, AF.

National Resources Planning Board

Office Production Management

* Policy

Scheduling Unit

Victory Program

* War Production Board

Historical Monographs

AAF Historical Studies: No. 11, Distribution of Air Materiel to the Allies, 1939-1944, Controls, Procedures, Policies. Prepared by AC/AS, Intelligence, Historical Division, July 1944.

AAF Historical Studies: No. 22, Legislation Relating to the AAF Materiel Program, 1939-1944. Prepared by AC/AS, Intelligence, Historical Division, Nov. 1944.

History of the AAF Materiel Command, 1943. Prepared by ATSC Historical Office, July 1944.

History of the Army Air Forces Materiel Command 1923 through 1941. Prepared by ATSC Historical Office, Nov. 1943.

"History of the Babcock Aircraft Corporation, Deland, Florida." Prepared by ATSC Historical Office, 1944.

"Light Metals and Other Critical Aircraft Materials: the Participation of the AAF Materiel Command in the Expansion of Facilities, Production Control, Development, and Conservation of Light Metals and Other Critical Aircraft Materials during the National Emergency." Prepared by ATSC Historical Office, August 1944.

ALTS-40

242

Magazines and PeriodicalsNew RepublicNews WeekNew York Times, occasional issuesTime, occasional issuesMagazine Articles and Pamphlets, Unofficial

Automobile Manufacturers Association, President's Defense Bulletin, Nos. 1-6, 17 Oct.-5 Nov. 1940. Copies in Historical Office, ATSC.

Automobile Manufacturers Association, A Resolution Offering Automotive Industry Facilities . . . Adopted at a Meeting in New York City, October 15, 1940. Copy in Historical Office, ATSC.

Gallico, Paul, "Quick and Dirty," Saturday Evening Post, 9 Oct. 1943, pp. 9 ff. Deals with modification centers.

* Klagsbrunn, Hans A., "Some Aspects of War Plant Financing," American Economic Review, XXXIII, no. 1, pt. 2, sup., 119-27 (March 1943).

McLaughlin, Glenn E., "Wartime Expansion in Industrial Capacities," American Economic Review, XXXIII, no. 1, pt. 2, sup., 108-18 (March 1943).

"National Defense: the Sinews," Fortune, XXII, pp. 52 ff. (Oct. 1940).

National Research Council Committee on Aircraft Production, Factors Which Affect Increased Production and Unit Costs of Military Aircraft, Engines and Accessories, July 1940 (pamphlet).

Rose, Marc A., "Detroit: Million Man Arsenal," Reader's Digest, May 1942, pp. 13-18 (condensed from Forbes Magazine).

Scholz, Lt. Allan R., "Superfortress Modification," Air News, June 1945, pp. 45-46.

"The War Goes to Mr. Jesse Jones," Fortune, Dec. 1941, pp. 90 ff.

Wright, Theodore P., "50,000 Planes a Year. How Much? How Long?", Aviation, July 1940, pp. 34 ff.

AAWHS-40

243

Appendix 1

WAR DEPARTMENT
OFFICE OF THE CHIEF OF THE AIR CORPS
WASHINGTON

Revised Memorandum as Approved by
The Assistant Secretary of War on
December 5, 1940:

The Advisory Commission to the Council of National Defense has approved four plans for financing the expansion of industrial plant facilities required by the Joint Army-Navy Aircraft Procurement Program. Of these, Plan I calls for absolute Government ownership and Plan III calls for absolute private ownership. This memorandum deals only with Plans II and IV, which seek to combine Government financing of expansion of industrial plant facilities under Plans II and IV are being made to the War Department, the Advisory Commission of the Council of National Defense, and the Reconstruction Finance Corporation. It is believed to be essential that the departments concerned agree upon a definite method of handling such applications. The establishment of the following procedure by the departments concerned is therefore recommended:

1. All applicants shall be referred to the Office of the Assistant Chief, Materiel Division, Wright Field, Dayton, Ohio.
2. The Office of the Assistant Chief, Materiel Division, Wright Field, shall obtain from the applicant the information upon the basis of which a report can be prepared covering the following items:
 - a. Name of applicant.
 - b. Amount of proposed expansion in square feet, with location of expanded facilities or new plant.
 - c. Contemplated maximum capacity.
 - d. Labor requirements.
 - e. Power, transportation, water, and fuel requirements.
 - f. Extent to which the proposed expansion should be approved in principle as necessary and appropriate to the Joint Army and Navy Procurement Program.

AAFHS-40

244

In this connection the following factors, among others, should be considered:

- (1) Subcontractors should ordinarily be used to the maximum before expansion will be considered.
 - (2) If existing facilities are insufficient to achieve delivery schedules, resort may be had, where lawful, to splitting awards, and where the proprietary nature of the article makes one manufacturer the sole source of supply an effort should be made to arrange for licenses to other manufacturers.
 - (3) New plant facilities shall, where practicable, be located within the strategic area.
 - (4) The extent of the necessity of the proposed expansion in the case of applicants who are prime contractors with the Government shall be determined on the basis of supply contracts with the Government existing, in process of negotiation and in reasonable prospect.
 - (5) The extent of necessity of the proposed expansion shall, in the case of applicants who are subcontractors, be determined on the basis of supply contracts with prime contractors with the Government, which are actually in existence or under negotiation, or as to which a written statement of intention to negotiate signed by the prime contractor is furnished.
 - (6) The expansion should be analyzed on the basis of indices established by the Advisory Commission to the Council of National Defense to determine whether they are appropriate to the production requirements and whether the productive capacity of the expanded facilities in relation to the cost will be normal for the industry.
- g. The extent to which the applicant will be reimbursed in whole, or in part, for the cost of the proposed expansion of facilities under supply contracts with the Government or with prime contractors who have supply contracts with the Government. It should be noted that all such reimbursement, except normal depreciation, where necessary, in order to equalize competitive conditions, and except rental actually paid to the Defense Plant Corporation should be eliminated from supply contracts with the Government.
- h. The extent to which the proposed expansion of facilities will be used to fill orders which are not received from the Government or from prime contractors with the Government.

- i. The plan of financing recommended. In this connection the following factors should be considered:

- (1) Where the proposed expansion is in its entirety necessary for the fulfillment of supply contracts with the Government (existing, under negotiation, or in prospect) and the applicant desires to have the Government finance the expansion, either an Emergency Plant Facilities Contract (Plan II), or a lease of facilities from Defense Plant Corporation (Plan IV), is appropriate and the applicant should be permitted to take his choice, provided that the proposed expansion involves no building construction on land with which the applicant cannot reasonably be required to part. If the conditions set forth in the above proviso do not exist, then ordinarily Plan II alone is available.

Where supplies are purchased on a competitive basis and the expansion of the applicant's facilities is required, ordinarily if Plan II is employed the applicant should be required to accept reimbursement subject to the deduction of normal depreciation on the plant facilities involved or, if feasible, pay an equivalent rental, or if Plan IV is employed, he should be required to pay an equivalent rental, to the end that the applicant should not receive an unfair advantage over his competitors who are obliged to include such depreciation in their costs.

It should be noted that the Government cannot ordinarily be called upon to pay for plant expansion required to enable the applicant to perform existing Supply Contracts where those contracts do not expressly recognize the necessity for such expansion. In general, an applicant who has agreed without qualification to furnish supplies for a specified price, at a specified time, is in no position thereafter to seek reimbursement for plant expansion, or to have his plant expansion handled by Defense Plant Corporation unless some modification of his contract obligations is contemplated.

- (2) Where the proposed expansion is only in part necessary for the fulfillment of Supply Contracts with the Government (existing, in process of negotiation, or in prospect) and no question of subcontracting is involved, Plan IV may be preferable for the reason that the rental provisions of the lease can be adjusted so as to require the applicant to pay for the proportionate part of the proposed expansion which is not required for purposes of National Defense. If Plan IV

is not available because of the location of the new facilities, Plan II may be employed, provided that special provision is made for the payment of a proportionate amount to be deducted from the Government Reimbursement for Plant Costs. Attention is called to the last two paragraphs of (1) above, which are equally applicable here.

- (3) Where the proposed facilities are to be used in part for the fulfillment of Supply Contracts with the Government, and in part for the fulfillment of contracts with other contractors having prime contracts with the Government, or solely for the latter, the applicant should ordinarily not receive Government aid, unless he can satisfactorily establish that the proposed expansion will not be paid for by the prime contractors, and if he does receive Government aid provision should be made for the payment of a proportionate rental or for a proportionate deduction in Government reimbursement to the extent to which the prime contractors are paying for the expansion. In such cases either Plan II or Plan IV would seem to be appropriate within the limitations hereinbefore indicated as to location. Attention is called to the last two paragraphs of (1) above, which are equally applicable here.
- (4) Where the proposed facilities are required in part for the fulfillment of contracts with prime contractors with the Government, and in part for other business not connected with the Joint Army-Navy Aircraft Procurement Program, whether or not the facilities are also to be used in the fulfillment of prime contracts with the Government, the preferable method of Government financing would seem to be Plan IV. In general, Plan II would be appropriate in such a case only if special provisions for proportionate deduction from reimbursement or for payment of proper rental could feasibly be made. Attention is called to the last two paragraphs of (1) above, which are equally applicable here.
- j. The amount of money involved, with a statement in general terms as to items to be included, such as buildings, machinery, equipment, etc.
- k. Whether the applicant is in competition with other manufacturers.
3. The Office of the Assistant Chief, Materiel Division, Wright Field, shall prepare a report as outlined above, and forward

AAFHS-40

247

the same to the Office of the Chief of Air Corps.*

4. The Office of the Chief of Air Corps shall determine whether Plan II or Plan IV is the more appropriate, after giving due consideration to the relative merits of the respective Plans in the particular situation and after consultation with the Defense Plant Corporation and also, if the manufacturer desires, with the manufacturer, and shall proceed with the selected Plan after obtaining the informal approval of the Chairman of the Sites Location Board of the Office of the Assistant Secretary of War and of the Production Division of the Advisory Commission to the Council of National Defense.
5. In case Plan II is chosen the procedure to be followed shall be:
 - a. The Office of the Chief of the Air Corps shall immediately request the formal approval of the Chairman of the Sites Location Board.
 - b. The Chairman of the Sites Location Board shall obtain from the office of the Co-ordinator of Defense Purchases the formal recommendation of the Advisory Commission to the Council of National Defense. **
 - c. The Chairman of the Sites Location Board shall then forward the recommendation of the Advisory Commission to the Secretary of the Council of National Defense, who shall, if necessary, obtain the recommendations of the Council, and shall request the approval of the President.
 - d. Upon receipt of the approval of the President, the Fiscal Officer of the Office of the Assistant Secretary of War shall request the Chief of Finance to make available to the Office of the Chief of the Air Corps from funds appropriated to expedite production, and contract authorizations for that

*If it is determined by the Materiel Division, Wright Field, that the applicant is not entitled to financing under either Plan II or Plan IV, a report shall be made to the Office of the Chief of Air Corps, giving the name and address and type of business of the applicant and the reasons why such financing is deemed unjustified or inappropriate.

**The steps outlined in sub-paragraphs b, c, and d of this paragraph 5 presuppose the use of funds appropriated to expedite production by statutes requiring the recommendations and Presidential approval referred to. If other funds are available for use, such recommendations and approval may not be required.

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purpose, the sums required for the purposes of the proposed Emergency Plant Facilities Contract.

- e. Promptly upon the receipt of the preliminary approval of the Production Division of the Advisory Commission, the Office of the Chief of the Air Corps shall notify the office of the Assistant Chief, Materiel Division at Wright Field to proceed with final negotiation of an Emergency Plant Facilities Contract.
- f. The Office of the Assistant Chief, Materiel Division, Wright Field, shall obtain from the manufacturer detailed data and shall prepare an Emergency Plant Facilities Contract, to which shall be attached an Appendix A with schedules setting forth the details of the proposed expansion.
- g. The signature of the manufacturer shall be obtained, and if funds are available at Wright Field the signature of a Contracting Officer shall likewise be affixed. The contract signed by the manufacturer, and in appropriate cases, by the Contracting Officer, shall be forwarded to the Office of the Chief of Air Corps.
- h. Where the contract refers to the issuance of amortization certificates, the signed applications of the manufacturer for such certificates shall also be forwarded to the Office of the Chief of Air Corps with a report recommending issuance of:
 - (1) Necessity Certificate.
 - (2) Certificate of Government Protections as to the Emergency Plant Facilities Contract.
 - (3) Certificate of Non-Reimbursement under existing supply contracts with the Government.
- i. If the contract has not been signed by the Contracting Officer at Wright Field, then it shall be signed by a Contracting Officer in the Office of the Chief of Air Corps. In either event, it shall also be recommended for approval by the Chief of Air Corps, or the Acting Chief.
- j. The contract, together with the appropriate recommendations of the Air Corps as to the issuance of the amortization certificates, and the applications of the manufacturer therefor, shall be forwarded to the Purchase and Contract Branch of the Office of The Assistant Secretary of War

AAFHS-40

249

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which shall submit same to The Assistant Secretary of War for approval.

- k. The Purchase and Contract Branch shall forward all originals of the contract to the Office of the Chief of Air Corps.
 - l. The Office of the Chief of Air Corps shall forward the originals of the contract to the Office of the Assistant Chief, Materiel Division, at Wright Field, for distribution and administration.
 - m. The Purchase and Contract Branch shall forward the amortization certificates executed by The Assistant Secretary of War, and substantiating data, to the Office of the Coordinator of Purchases of the Advisory Commission for execution on behalf of the Advisory Commission.
 - n. Upon receipt of the executed certificates from the Advisory Commission, the Purchase and Contract Branch shall issue the same [?] to the Commissioner of Internal [?] Revenue and notify the Office of the Chief of Air Corps and the applicant.
6. If Plan IV is chosen the procedure shall be as follows:
- a. The Office of the Chief of Air Corps shall obtain the informal approval of the Chairman of the Sites Location Board of the Office of the Assistant Secretary of War and of the Production Division of the Advisory Commission to the Council of National Defense.
 - b. The Office of the Chief of Air Corps, with the assistance of the Contract and Purchase Branch of the Office of The Assistant Secretary of war, shall notify the Defense Plant Corporation and negotiations shall follow between the Office of the Chief of Air Corps, the Office of the Assistant Secretary of War, Defense Plant Corporation, and the applicant leading to the preparation of the following papers :
 - (1) Lease (or other agreement) between the Defense Plant Corporation and the applicant in question.
 - (2) Letter of cancellation addressed by the applicant to the contracting agency or agencies which has, or have, negotiated Supply Contracts which contain escape clauses, and to the particular officers who have issued Letters of Intention.
 - (3) An agreement in the form of a letter between the war Department and the Defense Plant Corporation with

respect to the reimbursement of the latter for the whole, or some proper proportion of the cost of the construction.

- c. The Office of the Chief of Air Corps shall request the formal approval of the Chairman of the Sites Location Board of the Office of The Assistant Secretary of War.
- d. The Chairman of the Sites Location Board shall obtain from the Office of the Co-ordinator of Defense Purchases the formal recommendation of the Advisory Commission to the Council of National Defense.*
- e. The Chairman of the Sites Location Board shall then forward the recommendation of the Advisory Commission to the Secretary of the Council of National Defense, who shall if necessary obtain the recommendations of the Council, and shall request the approval of the President.
- f. Upon the receipt of the approval of the President, the Fiscal Officer of the Office of the Assistant Secretary of War shall ask the Chief of Finance to make available to the Office of the Chief of Air Corps from funds appropriated to expedite production and contract authorization for that purpose, the sums required for the purposes of the proposed agreement between the War Department and the Defense Plant Corporation as to reimbursement.
- g. The applicant and the Defense Plant Corporation shall execute the lease and letters above outlined.
- h. A Contracting Officer in the Office of the Chief of Air Corps shall execute the agreement to reimburse, which shall then be recommended for approval by the Chief of Air Corps, or the Acting Chief.
- i. The agreement to reimburse shall be submitted by the Purchase and Contract Branch of the Office of The Assistant Secretary of War to The Assistant Secretary of War for approval.
- j. The approved agreement to reimburse shall be delivered to Defense Plant Corporation, which shall deliver to the Purchase and Contract Branch of the Office of the Assistant Secretary of War, copies of the lease.

*The steps outlined in sub-paragraphs (d), (e) and (f), of this paragraph 6 presuppose the use of funds appropriated to expedite production by statutes requiring the recommendations and Presidential approval referred to. If other funds are available for use, such recommendations and approval may not be required.

AAFHS-40

251

- k. The Purchase and Contract Branch shall forward copies of the lease and of the agreement for reimbursement, and the original of the letter of cancellation to the Office of the Chief of Air Corps.
- l. The Office of the Chief of Air Corps shall forward copies of the above papers (or the originals, in case of letters addressed to Wright Field) to the Office of the Assistant Chief, Materiel Division at Wright Field, with instructions to obtain from the contractor data for evaluation.
- m. The Office of the Assistant Chief, Materiel Division at Wright Field, in cooperation with the Defense Plant Corporation, shall obtain from the contractor full details as to the proposed expansion, and, pursuant to authority granted by the Chief, Materiel Division, shall, after evaluation of the data presented, authorize the contractor, with the approval of the Defense Plant Corporation, to proceed with construction and acquisition pursuant to the terms of the lease.

W. F. VOLANDT,
Colonel, Air Corps,
Assistant Chief Materiel Division.

AAFHS-40

252

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Appendix 2

July 11, 1941

BASIC PRINCIPLES FOR EXPANSION OF FACILITIES
WITH GOVERNMENT AID

1. The Air Corps will not enter into a contract with a prime or subcontractor to finance the acquisition or construction of additional emergency plant facilities, - land, buildings, machinery or plant equipment, - unless the following can be clearly demonstrated:

a. That the materials to be manufactured with the additional facilities are essential to the program of national defense.

b. That the major amount of the products are to be manufactured direct for the Army Air Corps, or are required by a subcontractor for the Army Air Corps.

c. That the existing plant facilities for the manufacture of such materials are inadequate.

d. That the additional facilities are essential to enable the prime contractor or the subcontractor to manufacture and deliver the materials in accordance with the terms of proposed contracts within the time specified.

e. That the additional facilities are the only practicable means of providing the necessary productive capacity.

2. The Government does not start industries from the ground up in order to obtain capacity required for the Defense Program. Where Government aid is authorized, it is ordinarily provided for those industries that are in being and are producing materials or services required for the Government, if their production is inadequate to meet the proposed requirements for the Defense Program, and if there is no other industry which can meet those proposed requirements without Government aid.

3. Emergency Plant facilities Contracts or Defense Plant Corporation leases to provide the extra capacity are not ordinarily entered into to restore working capital. Facilities contracts or leases for prime or subcontractors are made available only after careful investigation by the Air Corps.

The following to be added as paragraph 9, and present paragraph 9 renumbered paragraph 10 on or about September 15.

9. Government financial aid is not extended to facilities in order to enable them to fill orders on their books. The Company can hardly be expected to take orders in excess of its capacity to produce and then come to the Government for funds to meet any part of its backlog.

AAFHS-40

253

July 11, 1941

BASIC PRINCIPLES FOR EXPANSION OF FACILITIES
WITH GOVERNMENT AID - (CONT'D)

4. A company being expanded for the Defense Program must make it evident to the Defense Plant Corporation or to the War Department that it has adequate working capital to engage in production on the scale necessary to meet Governmental requirements. This working capital is not furnished by the War Department or the Defense Plant Corporation. Working capital must be secured by private loans, by borrowing from the Reconstruction Finance Corporation or other agency, from the company's own surplus capital, or by such advance payments on supply contracts as the company is able to obtain.

5. Maximum use must be made of a company's existing plant before expansion of that plant, erection of new facilities, or additional machinery or equipment are authorized by Government aid. This fact must be demonstrated beyond a question of doubt, and will be subject to thorough investigation by the War Department.

6. The expansion of facilities will normally be limited to prime producers and their most important subcontractors. The expansion of sub-contractors or vendors will not ordinarily be allowed, inasmuch as it is difficult to establish the necessity for same.

7. The Government does not enter into a contract or lease for erection of new facilities for a company that is operating in a leased building when that company proposes to relinquish its leased area and transfer its equipment into new quarters built at Government expense. If a company occupies leased quarters and requires expansion, it must continue to produce for the defense program in the leased area, nor does the Government authorize a company operating with leased equipment to cancel such a lease for the purpose of acquiring new equipment.

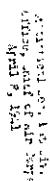
8. Expansion of facilities with Government aid is authorized only for the production of items that are standard with the Air Corps. No part of funds required, therefore, for expediting production may include costs for experimental work, development, or research. Machinery, plant equipment, or building construction required for routine testing of standard items is acceptable and may be included within facilities contracts or leases.

9. (See Addendum Sheet)

10. Prime producers, subcontractors, vendors, or sub-subcontractors that expand their facilities with their own funds in order to meet requirements for the Defense Program may receive benefit of certification, authorized by Sections 23 and 124 of the Internal Revenue Code, as amended by Title III of the Second Revenue Act - Approved Oct. 8, 1940. This certification allows costs applying to their expansion to be amortized over a period of five years, provided the costs of expansion are not included in the cost of the product.

- 2 -

Revised August 1, 1941



AAFH3-40

255

Appendix 4

MASTER AGREEMENT OF LEASE - DP Form #2

THIS AGREEMENT made and entered into as of this _____ day of _____ 194____, by and between Defense Plant Corporation (hereinafter referred to as "Defense Corporation"), a corporation created by Reconstruction Finance Corporation pursuant to Section 5d of the Reconstruction Finance Corporation Act, as amended, to aid the Government of the United States (hereinafter sometimes called the "Government") in its National Defense Program, and _____ (hereinafter called "Lessee"), a corporation organized and doing business under the laws of the State of _____;

WITNESSETH:

WHEREAS, the production of _____ for the Government and the expansion of capacity within the United States for such production are important in the interest of the National Defense Program; and

WHEREAS, the _____ Department has advised that the establishment of an additional plant for the manufacture and furnishing of such _____ at or near _____, having a productive area of approximately _____ (_____) square feet and the acquisition of additional machinery and equipment for use in said plant and in Lessee's existing plant (such machinery and equipment, exclusive of items commonly classified as expendable items, being hereinafter sometimes called the "Machinery"), are in its opinion necessary in the interest of national defense; and

WHEREAS, Lessee has acquired or proposes to acquire a site at or near _____, consisting of approximately _____ (_____) acres of land suitable for the location of such additional plant; and

WHEREAS, Lessee has entered into a contract or contracts with the Government or with suppliers of the Government in order to enable such suppliers to perform contracts with the Government for the manufacture and furnishing of _____; and the establishment of the additional plant above referred to and the acquisition of the Machinery to be provided hereunder are essential to enable Lessee to manufacture and furnish and to expedite the delivery of such products in accordance with said contract or contracts; and

WHEREAS, Lessee represents that, in the price charged the Government or any supplier for the Government for the manufacture and furnishing of such products, there have been eliminated all charges (including amortization and depreciation), exclusive of the rental, maintenance, taxes and insurance provided for herein, for the additional facilities to be provided for hereunder;

- 1 -

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AAFHS-40

256

NOW, THEREFORE, in consideration of the mutual covenants herein contained it is agreed by and between the parties hereto as follows:

ONE: Lessee agrees forthwith upon the execution of this agreement to convey or cause to be conveyed to Defense Corporation the plant site in fee simple, and Defense Corporation agrees to purchase such site. The title to the site and the price thereof shall be satisfactory to Defense Corporation.

TWO: Lessee agrees forthwith and from time to time to prepare, or cause to be prepared, and to submit to Defense Corporation and to the ____ Department for their approval such plans, designs, specifications, and schedules for the construction and equipment of the plant and the acquisition and installation of the Machinery (which shall indicate the estimated cost thereof, stating as to the Machinery the estimated price of each item), as they may require; and Lessee agrees, upon approval of such plans, designs, specifications, and schedules by Defense Corporation and the ____ Department, to proceed in accordance therewith and complete as soon as practicable the construction and equipment of the plant (hereinafter called the "Construction Program") and the acquisition and installation of the Machinery (herein after called the "Acquisition Program"). With the approval of Defense Corporation, Lessee shall have the right to make any alteration in the plans, designs, specifications, and schedules approved pursuant to this paragraph TWO, provided, that if such alteration will result in substantial delay in effecting, or a material alteration in the character of, the Programs or will increase the aggregate cost of said Programs beyond the aggregate amount of such estimates, Lessee shall likewise obtain from the ____ Department its approval of such alteration.

THREE: In carrying out the work to be performed by it under the Construction Program Lessee may employ such contractors and enter into such contracts with them as it may deem advisable, with the written approval of a designated representative of Defense Corporation.

FOUR: Defense corporation shall advance the funds necessary for carrying out the Construction Program, from time to time as the work progresses, upon requisition of Lessee approved by Defense Corporation. A representative of Defense Corporation authorized to approve such requisitions on its behalf shall be stationed at the site of construction during such times as Lessee may require.

FIVE: Lessee shall from time to time advise Defense Corporation, in writing, of the items of Machinery which Lessee shall propose to purchase for the purpose of the Acquisition Program and the estimated cost thereof, and shall forthwith proceed to purchase the same in the name and on behalf of Defense Corporation; provided, however, that no such items shall be purchased or installed if Defense Corporation shall object thereto within three (3) days of the receipt of such written advice. Defense Corporation shall, from time to time, furnish to Lessee such evidence as Lessee may request with reference to its authority to make such purchases on behalf of Defense Corporation.

AFHS-40

257

SIX: Lessee shall furnish to Defense Corporation and to the _____ Department a description of each item of Machinery so purchased so that it shall be capable of identification, and, to the extent practicable, each item shall be marked or stamped by Lessee in a way satisfactory to Defense Corporation so as to indicate Defense Corporation's ownership therein.

SEVEN: All bills of the vendors for Machinery purchased by Lessee for the account of Defense Corporation pursuant to the provisions hereof shall be promptly submitted by Lessee to Defense Corporation accompanied by a certificate of Lessee, executed by one of its officers duly designated for that purpose, to the effect that the items covered by such bills are included in and necessary in connection with the Acquisition Program, that the prices thereof are in its opinion fair and reasonable, and that such bills are proper for payment. Such bills, and other costs of the Acquisition Program when approved by Defense Corporation, shall be promptly paid by Defense Corporation.

EIGHT: In the execution of the Programs Lessee agrees to comply with, and give all stipulations and representations required by, applicable federal laws and further agrees to require such compliances, representations, and stipulations with respect to any contract entered into by it with others under such Programs as may be required by applicable federal law; and notwithstanding the generality of the foregoing, Lessee agrees further that in the performance of this agreement it will not discriminate against any worker because of race, creed, color or national origin.

NINE: No salaries of Lessee's executive officers, no fees of its attorneys, no part of the expense incurred in conducting Lessee's offices and no overhead expenses of any kind shall be included in the cost of the site or of the Programs, except that direct expenses of Lessee's officers or employees and fees of attorneys retained or employed by Lessee in connection with the acquisition of the site and the Programs may be so included to the extent approved by Defense Corporation.

TEN: Notwithstanding any other provision herein contained, the maximum amount which Defense Corporation shall be required to expend hereunder shall not exceed _____ Dollars (\$_____).

ELEVEN: Title to the site, buildings, and Machinery to be acquired hereunder shall, unless and until the same shall be transferred by Defense Corporation in accordance with the provisions hereof, be vested in Defense Corporation, and such Machinery shall remain personalty notwithstanding the fact that it may be affixed or attached to realty.

TWELVE: Subject to termination upon the terms hereinafter in this paragraph TWELVE provided, Defense Corporation hereby agrees to lease, and does hereby lease, the site, buildings, and Machinery to be acquired hereunder, to Lessee and Lessee does hereby lease the same from Defense Corporation for a term ending January 1, 1946, which term, upon its expiration, shall be automatically extended, subject to similar termination

AAFHS-40

258

for an additional period ending January 1, 1948. Defense Corporation and Lessee each agrees, upon the written request of the other, to execute and deliver such additional instruments of lease as may be necessary to carry out the provisions of this agreement.

This lease or any extension thereof under this paragraph TWELVE may be terminated by the parties hereto in the manner hereinafter set forth. At any time when substantial use by Lessee of the site, buildings, and Machinery shall be no longer required to enable Lessee to furnish the Government with products required by it, or to furnish suppliers of the Government with products in order to enable such suppliers to perform contracts with the Government, Defense Corporation may, with the written approval of the _____ Department, give written notice to Lessee that such substantial use is no longer required and that Defense Corporation therefore proposes the termination of the lease or extension thereof, and Lessee may give similar written notice to Defense Corporation and to the _____ Department stating that Lessee therefore proposes the termination of this lease or extension thereof. The lease, or extension thereof, shall terminate ten (10) days after receipt by Lessee of the notice from Defense Corporation above provided or after receipt by Defense Corporation and the _____ Department of the notice from Lessee above provided, unless within that time Lessee or the _____ Department, as the case may be, shall require by notice in writing or by telegraph to the other and to Defense Corporation, that the facts necessary to termination, as hereinabove provided, be submitted for determination by arbitrators, in which event the arbitrator to be appointed by the party giving the notice of arbitration shall be named in the notice, the arbitrator to be appointed by the other party to the arbitration (Lessee or the _____ Department, as the case may be) shall be named within five (5) days of receipt of such notice of arbitration, and an additional arbitrator shall, within five (5) days of the appointment of the second arbitrator, be selected by the two (2) arbitrators theretofore appointed, but if one of said parties shall have failed to appoint an arbitrator, the sole arbitrator shall arbitrate the question alone. If two (2) arbitrators shall have been appointed by the respective parties to the arbitration and shall have failed to select an additional arbitrator within the above stated time, the additional arbitrator shall be appointed by the Senior Judge of the Circuit Court of Appeals for the _____ Circuit, upon application therefor by either of said parties to the arbitration. The decision of a majority of the arbitrators so appointed, or if either party shall have failed to appoint its arbitrator, the decision of the sole arbitrator, shall be final and binding upon the Lessee, the _____ Department and Defense Corporation for all purposes. The cost of arbitration, except the cost of the arbitrator appointed by the _____ Department, shall be paid by Lessee. The arbitrators, or the sole arbitrator, as the case may be, shall give prompt notice in writing of the decision to the _____ Department, to Lessee and to Defense Corporation, and if the decision establishes that the facts necessary to termination exist, this lease, or extension thereof, shall terminate on the fifth day after the giving of notice of the decision.

AAFHS-40

259

THIRTEEN: In consideration of the covenants herein contained and as rental for the site, buildings and Machinery Lessee agrees to pay to Defense Corporation the following percentages of Lessee's aggregate net sales (whenever made) of all _____ and other products manufactured or furnished by Lessee (whether through the use of the plant and facilities, herein provided for, or through the use of any other plant or facilities now owned or hereafter acquired by Lessee) during each year of this lease or any extension thereof, beginning _____, 19____:

on the first \$ _____ of annual net sales or part thereof _____ %
 on the next \$ _____ of annual net sales or part thereof _____ %
 on the next \$ _____ of annual net sales or part thereof _____ %
 and on all annual net sales in excess of \$ _____ %

provided, however, that when the total amount of rental which Lessee shall be required to pay hereunder shall equal the amount expended by Defense Corporation under this agreement plus interest on each expenditure (such expenditures to include all direct expenses, without overhead, incurred by Defense Corporation in connection with the site, buildings and Machinery or in connection with this agreement) from the date thereof at the rate of four per cent (4%) per annum less an amount equal to interest at four per cent (4%) on each rental payment from the date of payment thereof, Lessee shall not be required to pay further rental. Such rental shall be paid quarterly not later than the twentieth day after the end of each quarter, beginning with the quarter ending _____, 19____, until all _____

and other products manufactured or furnished by Lessee during the period of this lease or any extension thereof have been sold or disposed of; such quarterly payments shall be calculated so as to exhaust during each year the brackets of annual net sales in the order hereinabove set forth. The term "net sales" as herein used shall mean gross sales less return sales, trade allowances and cash discounts.

FOURTEEN: Defense Corporation, by notice in writing with the approval of the _____ Department noted thereon, may, in addition to all other rights with reference to termination under paragraph TWELVE hereof, cancel this lease, or extension thereof, in the event (a) all or substantially all of Lessee's contracts with the Government or with suppliers of the Government in order to enable such suppliers to perform contracts with the Government, at any time outstanding, for the manufacture and furnishing of _____ and other products shall be terminated or canceled prior to completion, or (b) the Government shall request priority with respect to the manufacture or furnishing of any products with the facilities to be provided hereunder, and Lessee shall fail or refuse to give such priority, or (c) a receiver or trustee is appointed for Lessee or its property, or Lessee makes an assignment for the benefit of creditors, or Lessee becomes insolvent, or a petition is filed by or against Lessee pursuant to any of the provisions of the United States Bankruptcy Act, as amended, for the purpose of adjudicating Lessee a bankrupt, or for the reorganization of Lessee, or for the purpose of effecting a composition or rearrangement with

AAFHS-40

260

Lessee's creditors, and any such petition filed against Lessee is not dismissed within sixty (60) days, or (d) of any violation of any of the terms, conditions or covenants of this lease or extension thereof by Lessee and the failure of Lessee to cure such violation within thirty (30) days from the giving of written notice thereof by Defense Corporation to Lessee. Upon the expiration, termination, or cancellation of this lease or extension thereof, Defense Corporation shall have the right to invoke any remedy permitted by law or in equity for the protection of its interests hereunder, and Lessee hereby expressly waives all rights which it may have to redeem or to be served with any further notice of Defense Corporation's intention to cancel or terminate this lease or extension thereof other than as herein provided.

FIFTEEN: Upon the expiration or termination of this lease or extension thereof pursuant to paragraph ~~THIRTEEN~~ hereof, or upon cancellation of this lease or extension thereof pursuant to clause (a) of paragraph ~~FOURTEEN~~ (unless such cancellation shall have been effected because of a violation by Lessee of the contracts referred to in said clause (a)), Lessee shall have and is hereby granted, for a period of ninety (90) days after such termination, expiration or cancellation (hereinafter referred to as the "Option Period") the right and option by written notice to Defense Corporation and to the _____ Department, to purchase all but not part of the site, buildings, and Machinery at the following prices:

- (a) If exercised within eight (8) months from the date of execution hereof, at the actual cost to Defense Corporation of the site, buildings and Machinery (including all direct expenses, without overhead, incurred by Defense Corporation in connection therewith or in connection with this agreement), plus interest thereon at the rate of four per cent (4%) per annum (such interest to be calculated on each item of disbursement made by Defense Corporation from the date thereof), less the amount of any rentals theretofore paid by Lessee to Defense Corporation pursuant to the provisions of paragraph ~~THIRTEEN~~ hereof, together with interest on each such rental payment from the date thereof at the rate of four per cent (4%) per annum; or
- (b) If exercised after eight (8) months from the date of execution hereof;
 - (1) At a price determined as provided in subparagraph (a) above; or
 - (2) At the actual cost to Defense Corporation of the site, buildings, and Machinery (including all direct expenses, without overhead, incurred by Defense Corporation in connection therewith or in connection with this agreement), less an amount representing depreciation, obsolescence, and loss of value due to use for national defense purposes for each year or fractional part thereof at the following rates for the following classifications

of equipment, which classifications shall be determined in connection with the various items as the construction and acquisition of the items comprising the Programs proceed:

1. Buildings, Improvements (fencing, paving, spur tracks, etc.) and Building Installations other than mechanical 5%
2. Installations (mechanical), Equipment, Machinery, Shop Fixtures, Laboratory and Test Equipment, Furniture and Fixtures, Trucks, etc 12%
3. Portable Durable Tools and Automotive Equipment 25%

provided, however, that the minimum residual value on all items shall be 15%

whichever is the higher.

During the Option Period Lessee shall have the right to negotiate with Defense Corporation and the _____ Department for the purchase or lease of the site, buildings, and Machinery, or any portion thereof, and, upon the establishment by the Lessee, Defense Corporation, and the _____ Department of mutually satisfactory terms and conditions, Defense Corporation will sell or lease, as the case may be, the property covered thereby to Lessee. Defense Corporation further agrees, to the extent that it lawfully may, that it will not sell the site, buildings, and Machinery or any part thereof to any party or parties other than another branch of the Government (in which event such sale shall be in all respects subject to paragraph TWENTY-SIX hereof) for a period of ninety (90) days following the expiration of the full Option Period unless it shall first have offered the same for sale to Lessee at a price equal to the best offer received by Defense Corporation and Lessee shall have failed or refused to purchase the same within thirty (30) days after the receipt of such offer. In the event of any sale to Lessee pursuant to the provisions of this paragraph, transfer of title shall be made without any representations or warranties whatsoever on the part of Defense Corporation.

SIXTEEN: So long as this lease remains in full force and effect Lessee shall procure and maintain at its cost insurance on the buildings and on the Machinery to be acquired hereunder against fire, windstorm, and such other hazards, in such companies, and in such amounts as shall be satisfactory to, or required by Defense Corporation. The policies evidencing such insurance shall be made payable to, and delivered to, Defense Corporation. In the event of loss under any of the policies, the proceeds may, upon the written request of Lessee promptly made, be used by Lessee for the repair, restoration, or replacement of the property damaged or destroyed, and to that end Defense Corporation shall promptly make available to Lessee the insurance proceeds received by Defense Corporation.

AAPHG-40

262

Any property acquired in replacement shall be the property of Defense Corporation and so identified and shall be subject to all the terms and provisions of this agreement.

SEVENTEEN: Lessee agrees to save Defense Corporation harmless against any liability whatsoever because of accidents or injury to persons or property occurring in the operation of the plant or the use of the Machinery by Lessee. Lessee also agrees that during the term of this lease or any extension thereof, it will procure and maintain at its cost public liability insurance and property damage insurance in such amounts and with such companies as Defense Corporation shall approve or require. The policies evidencing such insurance shall name Defense Corporation as an assured and shall be delivered to Defense Corporation.

EIGHTEEN: Lessee shall use reasonable care in the use and operation of the site, buildings and the Machinery to be provided hereunder and shall keep the same in good state of repair (ordinary wear and tear excepted), and upon the expiration, termination or cancellation of this lease or extensions thereof, and upon expiration of the Option Period, if any, Lessee shall forthwith yield, and place Defense Corporation in peaceful possession of the site and buildings and of all the Machinery to be provided hereunder free and clear of any liens and claims other than those resulting from claims against Defense Corporation; and if any of the Machinery shall be then located elsewhere than in the additional plant to be provided hereunder, Defense Corporation shall, in addition, have the right to remove, and upon the written request of Lessee, shall promptly remove, at its own expense, such Machinery, and if such removal shall not take place within sixty (60) days after such request, Lessee may remove the Machinery and place it in storage for the account and at the expense of Defense Corporation, and Defense Corporation shall have corresponding rights and Lessee shall have corresponding rights and obligations with respect to removal and storage of all machinery not owned by Defense Corporation that may then be located in the additional plant to be provided hereunder. Nothing contained in this lease shall be construed to permit Lessee to use or operate during the Option Period, if any, the site, buildings and Machinery to be provided hereunder, or any portion thereof, for the production of _____ or any other products, unless the consent in writing of Defense Corporation and the _____ Department to such use or operation shall have been obtained by Lessee.

NINETEEN: Lessee shall use such items of Machinery as it may designate in writing to Defense Corporation, in connection with the manufacture and furnishing of _____ and other products for the Government in any other plants of Lessee. Lessee may also, with the written approval of Defense Corporation and the _____ Department, lease or lend to any suppliers any item of Machinery, the lease or loan of which it may deem necessary for the performance by Lessee of its contracts with the Government. Any such lease or loan shall be upon such terms and conditions as Defense Corporation and the _____ Department may approve, and Lessee shall in no event by any such lease or loan be relieved of its obligations under the provisions of this agreement.

~~_____~~
TENTY: Lessee agrees to pay to the proper authority, when and as the same become due and payable, all taxes, assessments, and similar charges which at any time during the term of this lease or any extension thereof may be taxed, assessed or imposed upon Defense Corporation or Lessee with respect to or upon the site, the buildings, or the Machinery, or any part thereof, or upon the occupier thereof or upon the use of the site, buildings or Machinery. Lessee also agrees to pay all claims or charges for or on account of water, light, heat, power and any other service or utility furnished to or with respect to the site, the buildings or the Machinery, or any part thereof.

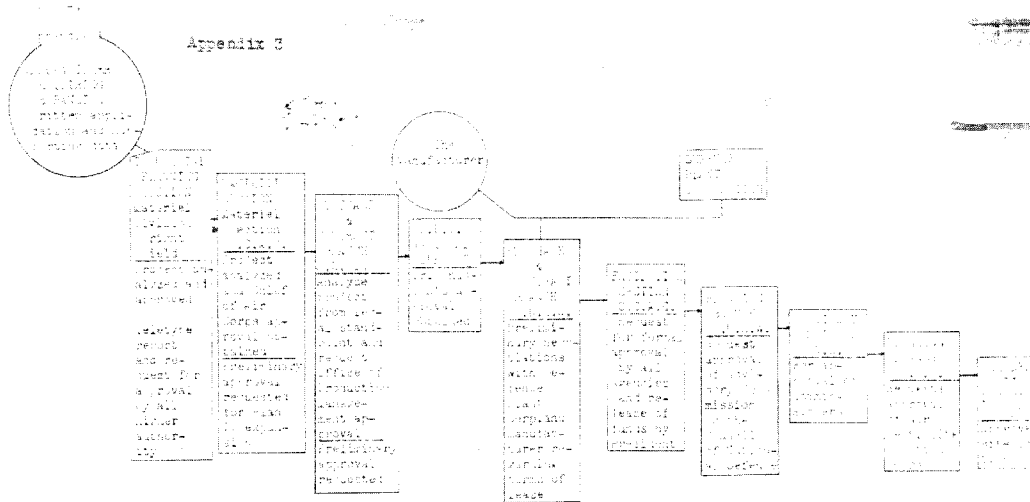
TENTY-ONE: In carrying out the Programs and in the operation of the plant and any of the Machinery to be acquired hereunder Lessee agrees to comply with all applicable State, municipal and local laws and the rules, orders, regulation and requirements of any departments and bureaus and all local ordinances and regulations and further agrees to indemnify and hold Defense Corporation harmless from any liability or penalty which may be imposed by local or State authority or any department or bureau thereof by reason of any asserted violation by Lessee of such laws, rules, orders, ordinances or regulations.

TENTY-TWO: Lessee agrees that it will not, without the prior written consent of Defense Corporation and the _____ Department, use such site, buildings, and Machinery for any purpose except for the manufacture and furnishing by Lessee for sale to others of _____ and of all other products. Lessee also agrees that as long as this lease or extension thereof remains in effect it will eliminate all charges (including all charges for amortization and depreciation), exclusive of the rental, maintenance, taxes and insurance provided for herein, for the site, buildings and the Machinery to be provided hereunder, from any price charged the Government or any supplier for the Government.

TENTY-THREE: So long as this lease or any extension thereof remains in effect, Lessee shall maintain a method of separate accounting of the sales of all _____, and of all other products manufactured and/or furnished by Lessee through the use of the plant and facilities herein provided for or through the use of any other plant or facilities now owned or hereafter acquired by Lessee, and agrees to make available to Defense Corporation and the _____ Department for audit and inspection, its records pertaining to the acquisition of the site and the Programs and the operations of the plant and any of the Machinery, the number of _____, and/or of all other products manufactured and/or furnished and sold as above stated, and the payments therefor. Defense Corporation and the _____ Department shall have the right to inspect the site, buildings and Machinery to be provided hereunder at all reasonable times during the continuance of this lease or extension thereof.

TENTY-FOUR: Lessee will not without prior written consent of Defense Corporation and the approval of the _____ Department sell, assign, or pledge this lease or any of its rights or obligations hereunder or sub-lease or permit the use by others of any of the property covered by this

Appendix 3



Statistical Sec. Mat. Div.
Office, Chief of Air Corps
April 8, 1941



AAFHS-40

264

lease, except to the extent permitted by paragraph NINETEEN hereof.

TWENTY-FIVE: The failure of Defense Corporation to insist, in any one or more instances, upon performance of any of the terms, covenants or conditions of this agreement shall not be construed as a waiver or a relinquishment of the future performance of any such term, covenant or condition, but Lessee's obligation with respect to such future performance shall continue in full force and effect.

TWENTY-SIX: It is contemplated that the site, buildings, and Machinery to be provided hereunder may be transferred and conveyed to another branch of the Government and, upon such transfer, the Government, acting through the _____ Department, shall succeed to all the rights, powers, privileges, discretion and obligations of Defense Corporation hereunder, retaining, however, all discretion and power of approval herein vested in the _____ Department. In the event of such transfer, Defense Corporation shall cease to have any rights, duties or obligations hereunder and all powers in Defense Corporation to give any notices, consents, or approvals or to raise any objections and the right of Defense Corporation to receive any notices provided for herein shall terminate and thereafter shall be vested in the _____ Department.

TWENTY-SEVEN: No member of or Delegate to the Congress of the United States of America shall be admitted to any share or part of this agreement or to any benefit arising therefrom.

TWENTY-EIGHT: whenever used herein, the term "_____ Department" shall mean the Secretary of _____ or _____ or any person authorized by or acting on behalf of any of the foregoing.

TWENTY-NINE: Any notice required to be given to the _____ Department under the provisions of this agreement shall, in addition to the requirements, if, any, of Paragraph TWENTY-EIGHT hereof, be addressed separately in writing to the Under Secretary of _____ and the Chief of _____, _____ Department, Washington, D. C.

[WITNESS CLAUSE -

To state date "as of" day and year in accordance with page 1, line 1 of this agreement]

Attest:

DEFENSE PLANT CORPORATION

Secretary

By _____
President

Attest:

Secretary

By _____
President

[Acknowledgments]

AAFHS-40

266

Appendix 6

NOT FOR PUBLICATIONenclosure No. 1
Defense Bulletin No. 2
25 Oct. 1940STATEMENT BY MR. KNUDSEN

Last Tuesday a week ago I appeared before a meeting of the automobile and truck manufacturers of the United States and asked that consideration be given to the subordination of model changes of 1941 to the needs of the airplane program which at present covers the period July 1, 1940 to April 1, 1942.

They granted the request for such consideration and the meeting today is for the purpose of discussing the needs of the program and means of execution.

The situation is frankly this: The present program calls for the delivery of some 33,000 airplanes by April 1, 1942. All plant expansion for this quantity is under way and the bottleneck is tools. Airplanes is a vague name for the product, as training planes weigh 4,000 lbs., and the biggest bomber, approximately 40,000 lbs. If we were to turn out 33,000 four thousand pound planes, there would be no problems, but only 30% are training planes, and the rest are combat planes and bombers.

Therefore you are asked to tackle the possible dies and stampings for four thousand 4-motor bombers, weighing 40,000 lbs. gross, and eight thousand 2-motor bombers weighing 24,000 lbs. gross, assembling to be done by airplane manufacturers. You are asked to consider not only pieces, but sub-assemblies for this quantity of planes. It should be remembered that planes to date have been more or less handmade and that, in order to transfer the operating to press and die work, production

AAFHS-40

267

studies will have to be made.

It is therefore proposed to secure floor space in Detroit, in charge of Air Corps officials from Wright Field, and to secure a set of parts for each plane as designed now with the corresponding drawings, and study such production changes as are necessary to transfer manufacturing from bench to machine. To accomplish this we ask that a steering committee of four be appointed which, with two from the plane manufacturers, push this vigorously.

It is also proposed that while the parts and drawings are being secured, these six men visit the two airplane plants where the bombers are now being manufactured in order to get the proper picture of the method of jiggling and manufacturing as now done in production.

It is proposed that a survey of equipment now in place be secured and as allocation of die work is made, the order for the required number of pieces follow the die order wherever possible so as to get immediate action after the try-out. Also a survey should be made of plant facilities available for jig assembly of minor assemblies such as wings, ailerons, tail surfaces, rudders, etc.

It is also desired that the steering committee investigate the forging situation, both aluminum and steel, plus the machining facilities available for such forgings -- there being a serious shortage at the moment of facilities of this order. In other words, we are trying to get from the industry a coordinated branch of our Washington setup to deal with sub-assemblies and pieces rather than the complete assembly as dealt with by us in Washington.

I need not stress how I appreciate the generous assistance offered by you gentlemen and the dire need for all the help we can get in order that the defense program may be successfully completed.

INDEX

A

A-20, 76
 A-26 Invader, 170
 "A" aircraft program, 25
 Act of 25 June 1940, 28-30
 Administrator of Priorities, NDAC, 102
 Advisory Commission to the Council of National Defense (NDAC), 30, 32, 35, 37, 39, 45-46, 50, 64-65, 77, 83, 86, 89, 200
 Advisory Committee, WPB, 120
 Aeronautical Sec., Production Div., OPM, 49, 62-63
 Aeronca, 112
 Agriculture Dept., 153
 Aircraft Modification Sec., 160
 Aircraft Production Board, WPB, 151-52, 205
 Aircraft Resources Control Office (ARCO), 150-52
 Aircraft Scheduling Unit (ASU), 138, 140-42, 144-47, 149-52, 174
 Airplane and Engine Sec., NDAC, 74
 Air Service Comd., 194
 Air Staff, 152
 Air Technical Service Comd., 194
 Akron, Ohio, 87
 Allison Div., General Motors Corp., Indianapolis, 77-78, 113, 185
 Area Production Urgency Committee (APUC), WTB, 168
 Area Representative, 211
 Army-Navy Munitions Board, 8, 102, 119, 128
 Army Service Forces, 202
 Arnold, Maj. Gen. H. H., 50, 62-63
 ASU-29 form, 142
 AT-6, 225
 Automobile Manufacturers Asso., 121

Automotive Committee for Air Defense, 81
 Automotive Council for War Production, 121-23
 Automotive Parts and Equipment Manufacturers Asso., 122
 Automotive Program, 16-18, 20-21
 Automotive Tool and Die Manufacturers Asso., 122

B

B-17, 75, 92, 132, 157
 B-24, 88, 90, 93, 111, 160, 179, 227-28
 B-25, 76, 87, 90
 B-26, 76, 87, 89, 95
 B-29, 92, 112-13, 169-70, 178, 224, 226
 B-32, 93, 113
 "B" aircraft program, 25
 Beaverbrook, Lord, 110
 Beech Aircraft Corp., 77, 112
 Bell Aircraft Corp., 76, 93, 112
 Bellanca Aircraft Co., 112
 Bendix Products Div., Bendix Aviation Corp., 94-95
 Biggers, John D., 49
 Birmingham, Ala., 160, 170
 Boatner, Lt. Col. B. L., 160
 Boeing Airplane Co., 75, 92, 132, 179
 Bowling, Lt. Col. J. L., 198, 217
 Branshaw, Maj. Gen. C. E., 189-90, 212
 Brett, Brig. Gen. G. H., 62 (n 42), 70
 Briggs Mfg. Co., Detroit, 95
 British Air Commission, 138
 British Purchasing Commission, 152
 Brooklyn, N. Y., 95
 Budget, Bureau of, 64
 Budget and Fiscal Office, 146
 Budget Office, 147

AAFHS-40

269

Buffalo, 76, 93
 Buick Motor Div., General Motors,
 90, 113, 185
 Burbank, Calif., 92, 94, 133
 Bureau of Industry Branches, WPB,
 120
 Burlington, N. C., 112

C

C-46, 112
 C-54, 112, 224
 C-76, 169
 C-82, 169
 Central Procurement District,
 District Supervisor, 211
 Certificate of Necessity, 56
 Chapman, C. B., 198
 Chevrolet Motor Div., General
 Motors Corp., 93, 113
 Chicago, Ill., 90, 113, 129, 226
 Ching, C. K., 115
 Chrysler Corp., 87, 89, 113
 Churchill, Winston, 110
 Cincinnati, Ohio, 77
 CIO United Automobile Workers of
 America, 82
 Civil Service Commission, 153
 Civil Service employees, 172
 Clark, R. W., 97
 Cleveland, 112
 Cleveland Pneumatic Tool Co., 94
 Coast Guard, 28
 Columbus, Ohio, 76
 Comptroller's Office, Wright Fld.,
 162, 175-76
 Congress, 25, 29, 36, 38, 134, 200
 Consolidated Aircraft Corp., 77,
 88, 93, 179
 Consolidated-Vultee, 228
 Construction Dept., QMC, 42
 Construction Requirements Committee,
 196
 Continental Aviation and Engine
 Corp., 113, 185
 Contract Distribution Div., OUSW,
 100
 Contract Distribution Sec., OPM,
 98, 105
 Contractor-furnished equipment
 (CFE), 138-39

Contract Sec., IPS, 52-53, 58,
 64, 66, 146-47, 149, 182, 195
 Conversion Sec., 124
 Cook, Col. O. R., 150, 195
 Coordinator of Defense Purchases.
See Nelson.
 Cordiner, R. J., 182
 Cost-plus-fixed-fee contract, 27-
 28, 36
 Council of National Defense, 30,
 45, 47, 64. See also Advisory
 Commission.
 Court of Claims, 215
 "Critical Shortages," 142
 Curtiss-Wright Corp., 47, 112,
 213 (n 48)

D

"D" program, 91
 Dallas, Tex., 76, 111, 174
 Dayton, Ohio, 138 (n 4)
 Dearborn, Mich., 77, 88, 93
 Defense Act of 2 July 1940, 30
 Defense Act of 28 June 1940, 28-30
 Defense Contract Service, OPM, 98
 Defense Plant Corp. (DPC), 31,
 39-41, 63-64, 67-69, 71, 73, 85,
 87-88, 90, 92-93, 95, 103, 110,
 113, 125-26, 131, 143, 170,
 197-98, 202, 204, 208, 215-17
 Resident Engineer, 211, 214
 Defense-Special trains, 107
 De Groat, W. F., 81
 Delco Products Div., General
 Motors, 94
 Denver, 170
 Detroit, 77, 79, 81, 87-88, 121,
 123, 128, 186, 228
Directory of Allocated and Reserved
 Facilities, 9
 District Supervisor, 69, 190, 214,
 217
 Div. of Civilian Supply, WPB, 120
 Div. of Purchases, OPM, 64
 Dodge Div., Chrysler Corp., 113,
 129, 226
 Douglas Aircraft Co., 76, 88, 92-
 93, 112, 170, 213 (n 48)
 Downey, Calif., 77
 Drager, W. L., 68

AAFHS-40

270

Durr, C. J., 31 (n 22)

E

"E" program, 91
 Eastern Procurement District,
 99
 East Paterson, N. J., 90
 Echols, Brig. Gen. O. P., 62,
 129, 151, 182, 194, 197.
See also Materiel Div.,
 Chief of.
 Economic Defense Board, Chairman,
 104
 Ege, W. S., 61, 68
 Emergency-plant-facilities (EPF)
 contract, 37-40, 64-66, 78,
 198, 208, 214-15, 217
 Emerson Electric Co., St. Louis,
 95
 Engineering Planning Sec., WF,
 52
 Engineering and Procurement,
 Chief of, ATSC, 194
 Engineers, Corps of, 42-43, 69,
 112, 159, 193
 Equipment Evaluation Unit, IPS, 56
 Experimental Engineering Sec., 52

F

Facilities Br., Judge Advocate's
 Office, WF, 58
 Facilities Br., Resources Div.,
 MM&D, 196
 Facilities Br. and Unit, IPS, 65,
 127, 129, 155, 193, 202, 205-06
 Facilities Com., WFB, 196-98, 206
 Facilities Div., OUSW, 100
 Facilities Expansion Br., IPS,
 55, 65
 Facilities Sec., Materiel Div.,
 60, 65-66, 127
 Facility Clearance Board, WFB,
 162, 169
 Fairchild Aviation Div., 112, 169
 Fairchild Engine and Aircraft
 Corp., 77, 169

Fair Labor Standards Act of 1938,
 33, 36
 Farmingdale, L. I., 77, 112, 179
 Federal Loan Administrator. See
 Jones.
 Federal Reserve System, 134
 Federal Security Administrator.
See McNutt.
 First Defense Aid Program, 91
 First Supplemental National Defense
 Appropriation Act 1941, 30
 Fisher Body Div., General Motors,
 87-88, 111-12
 Flint, Mich., 90, 185
 Ford Motor Co., 77, 88, 92-94, 113,
 160, 179, 227-29
 Fort Wayne, Ind., 91
 Fort Worth, 88-89, 93, 112-13

G

General Accounting Office, 215
 General Electric Co., 95, 185
 General Motors Corp., 46, 87, 94,
 112
 General Railway and Signal Co.,
 170
 Globe Aircraft Co., 112-13
 Goodyear Aircraft Corp., 87, 89
 Great Britain, 79
 Guthrie, R. R., 120

H

Hagerstown, Md., 77, 169
 Hare, Lt. Col. R. M., 100
 Harmon, Maj. R. C., 58, 125,
 209 (n 42)
 Hathaway, Capt. G. G., 156
 Hawthorne, Calif., 113
 Hay, Maj. M. M., 197
 Henderson, Leon, 48
 Higgins Aircraft Corp., 169
 Hillman, Sidney, 48-49
 Hopkins, Brig. Gen. F. M., Jr.,
 60-62, 197
 Houston, Tex., 94
 Howard Aircraft Corp., 113

AAFHS-40

271

Hudson Motor Car Co., 87, 89
 Hughes Tool Co., Houston, Tex.,
 94-95

I

I-40 jet-propulsion engine, 185-86
 Indianapolis, 77-78, 113, 186
 Industrial Facilities Com., WFB,
 162, 182
 Industrial Manpower and War Housing
 Office, 162
 Industrial Planning and Production
 Engineering Secs., 60
 Industrial Planning Div., 61
 Industrial Planning Sec., WF, 55,
 58-59, 60-61, 64, 69, 89, 96-97,
 103, 106, 109, 124-27, 132,
 140-41, 147-48, 181, 190, 198
 Assistant Chief, 189
 Industrial Service Br., MCS, 156,
 217
 Industrial Service Sub-Section,
 RCS, 198
 Industrial War Plans Sec., 8.
See also Industrial Planning Sec.
 Industry Br., WFB, 120
 Inglewood, Calif., 76
 Inspection District, 59
 Inspection Div., Materiel Comd.,
 195
 Inspection Sec., 52, 195
 Internal Revenue, Bureau of, 35,
 37
 Internal Revenue Code, 34

J

Jacobs Aircraft Engine Co., 93
 Jamaica, L. I., 170
 Joint Aircraft Com. (JAC), Army,
 Navy, and British Air Commission,
 138, 152
 Jones, Jesse, 31, 98
 Judge Advocate's Office, WF, 58
 Justice Dept., 106

K

Kansas City, Kans., 87, 89
 Kanzler, E. C., 121
 Keller, K. T., 83
 Kenmore, N. Y., 112
 Kenney, Brig. Gen. G. C., 189
 Klagsbrunn, Hans, 68
 Knudsen, Lt. Gen. William S.,
 46-47, 49-50, 62, 79-82, 84,
 86-87, 104-05, 111, 151, 156,
 194

L

Labor Dept., 153
 Labor Div., NDAC, 48
 Labor Div., OFM, 49
 Labor Div., WFB, 120
 Landing Gear Sub-Unit, 144-45
 Lend Lease, Director of, 104
 Libbey, Owens, and Ford, 49
 Light Metals Br., 146
 Lockheed Aircraft Corp., 76, 92,
 Lockland, Ohio, 77, 113
 Long Beach, Calif., 76, 92
 Lovett, R. A., 61
 Lycoming Div., Aviation Corp.,
 77-78

M

Macauley, Alvan, 121
 McDonnell Aircraft Corp., 113
 McNutt, Paul V., 154
 Machine Tools Br., IPS, 141, 144,
 156
 Machine tools Unit, 141
 Madigan, M. J., 129
 Manufacturing Methods Br., PCS,
 155
 Manufacturing Methods Sec., Produc-
 tion Div., 150, 155-56
 M-Day, 4-5, 25, 50, 55
 Marietta, Ga., 112
 Maritime Commission, 196

ALFHS-40

272

Martin, Glenn L. Co., 76, 81,
87, 89, 94
Materials Control Br., 141, 144-45
Materiel, Maintenance, and Distribu-
tion (AC/AS), 175, 182, 194, 196
Materiel and Services (AC/AS),
194, 196
Materiel and Services (command),
194
Materiel Center, 150, 181
Materiel Comd., 129 (n 41), 135,
137, 154-55, 162, 168, 173-75,
189, 191, 193-94, 205, 212-13,
218
Management Methods Staff, 173
Analysis and Planning Br.,
Statistical Control Office, 178
Commanding General, 193-94
Materiel Div., OCAC, 8, 51, 69,
95, 100, 109, 114 (n 15),
128-29, 138 (n 4), 139, 141,
150 (n 27a), 157, 198-99
Asst., 51, 97, 126-27, 189
Office of the Chief of, 51, 58,
127, 140
See also Materiel Comd.
Mead, Dr. Geo., 47, 49, 89
Mehornay, R. L., 98
Meigs, Dr. Merrill C., 49
Melrose Park, Ill., 90, 185
Memphis, Tenn., 88, 113
Menasco Mfg. Co., 94
Meyers, Maj. Gen. B. E., 55 (n 20),
194
Middle River (Baltimore) plant, 76
Middleton, Ohio, 112
Milwaukee, 170
Modification Center Br., 160
Moriarty, Col. G. H., 198, 217
Motor Equipment Manufacturers
Asso., 122
Muncie, Ind., 88
Murray Corp., Detroit, 170
Muskegon, Mich., 113, 185

N

National Defense Act of 1916, 29,
45

National Defense Advisory Commission.
See Advisory Commission.
National Defense Program, 81
National Labor Relations Act, 34,
36
National Standard Parts Asso., 122
Navy Bureau of Aeronautics, 70,
110, 138-39, 141, 147, 151-52,
196
Navy Dept., 37, 39, 48, 76, 85,
128, 144, 150, 152-53, 201, 203,
231. See also Sec. of Navy.
Nelson, Donald, 47, 50, 64, 97,
102, 104, 115, 119, 121, 129,
134, 164
New Castle, Del., 112
New Orleans, 169
North American Aviation, 76, 87,
111, 174
Northrop Aircraft, Inc., 113

O

Office of Asst. Sec. of War (OASW),
8-9, 51
Office of Asst. Sec. of War for
Air, 61
Office of Chief of the Air Corps,
(OCAC), 8, 64
Office of Coordinator of Defense
Purchasing, 48
Office for Emergency Management in
the Executive Office (OEM), 48-49,
Office of Price Administration
(OPA), 48-50, 62, 98, 102, 105-07,
119, 139-40
Administrator, 104
Office of Price Administration and
Civilian Supply (OPACS), 48, 104
Office of Production Management
(OPM), 48-50, 62, 98, 102, 105-07,
114-15, 119, 138-40, 200
Associate Director, 48
Director, 48. See also Knudsen.
Priority Div., 111
Office of Under Sec. of War (OUST),
61, 64, 107, 121, 156, 197, 203
Oklahoma City, 112, 170
Omaha, 87, 89

AAFHS-40

273

Opitz, F. M., 198
 Ordnance Dept., 130, 196

P

P-38, 76
 P-39, 76
 P-40, 76
 P-47, 77, 112, 179
 P-51, 225
 Pace, Adm. E. M., Jr., 151
 Packard Motor Car Co., 77, 185
 Paige, Graham, Motors Corp., 186
 Pastner, Capt. R. L., 58
 Patterson, R. P., 61-62, 106,
 110-11, 201
 PEM, Navy a/c, 76
 PD-3A, Priorities Div. form, 142
 Pearl Harbor, 107, 109
 Planning Br., OUSW, 64, 100
 Plant Site Board, 153
 Plant Site Com., 49
 Post Quartermaster office, 55
 Pottstown, Pa., 93
 Pratt and Whitney, 77
 President (Roosevelt), 25, 31,
 33, 36, 46, 48-49, 64, 86,
 134, 153, 184, 201
 President's Program, 128
 Priorities Div., OPM, 48-49, 138
 Procurement Div., Materiel Comd.,
 58, 195
 Procurement Sec., Materiel Comd.,
 52, 195
 Production Control Br., PES, 55,
 155
 Production Control Sec. (PCS),
 Materiel Comd., 147-51, 182
 Production Div., Materiel Comd.,
 47, 51, 147-50, 181, 195
 Production Div., NDAC, 47-48
 Production Div., OPM, 65
 Production Engineering Sec. (PES),
 WF, 52-53, 62, 66, 94, 97, 101,
 109, 138, 140-41, 146-49, 181-82,
 195
 Production Requirements Plans Br.,
 IPS, 148
 Production Resources Sec., IPS,
 150, 190

Production Surveys Br., PES, 101,
 138-41, 146, 149
 Projects Essentiality Div., 197
 Projects Rating Br., Aircraft
 Production Board, WPB, 205
 Propst, Col. R. W., 189
 Purchase and Contract Br., OUSW,
 61, 63
 Purchase and Contract Sec., OUSW,
 65
 Purchases Div., OFM, 49

Q

Quality Control Sec., Procurement
 Div., 195
 Quartermaster Corps, 42

R

R-680 engine, 78
 R-1820 engine, 90
 R-1830 engine, 90, 93
 R-2000-9 engine, 185
 R-2600 engine, 77, 186
 R-2800 engine, 77, 93
 R-3350 engine, 113, 226
 Ranger Aircraft Div., 170
 Rawlings, Col. E. W., 197-98
 Raw Materials Div., 48
 Reconstruction Finance Corp.,
 (RFC), 28-30, 37, 41, 71, 98,
 134
 Republic Aircraft Corp., 76, 112,
 179
 "Request for Improved Delivery,"
 142
 Requirements Br. (IPS), 140, 148
 Resident Representative, 210, 216
 Resources Control Sec. (RCS),
 150-51, 162, 191, 196-97, 205
 Resources Div., Materiel Comd.,
 129, 152
 Resources Div., MM&D, 196-97
 "Reuther Plan," 82-83, 115, 122
 Reuther, Walter, 82, 86, 115
 River Rouge plant, 77, 88, 94
 Rochester, N. Y., 170
 Rolls Royce V-1650 (Merlin) engine, 77

AAEHS-40

274

Roosevelt, President, 32, 79.
See also President.
 Ryan Aeronautical Co., 77

S

St. Charles, Ill., 113
 St. Louis, 76
 St. Paul, 170
 San Diego, 77, 88, 179
 Scheduling and Priorities Unit,
 101, 138
 Schneeberger, Lt. Col. Philip,
 55-56, 61-62, 67 (n 49), 68,
 126, 149-50, 197, 209, 211,
 213 (n 48)
 Schram, Emil, 31 (n 22)
 Scranton, Pa., 170
 Sears, Roebuck, and Co., 47
 Seattle, 75, 92
 Second Revenue Act of 1940, 34
 Second Supplemental National
 Defense Appropriation Act 1941,
 30
 Secretary of the Navy, 28-30,
 35-36, 48, 104, 200
 Secretary of the Treasury, 28
 Secretary of War, 28-30, 35-36,
 48, 65, 200
 Selective Service System, 153,
 164
 Senate Special Committee Investi-
 gating the National Defense
 Program, 99, 108, 174. See
also Truman Committee.
 Sites Location Board, OUSW, 63-65
 Smaller War Plants Corp. (SWPC),
 134-35, 196
 Smith, A. O., Corp., 94, 170
 Snyder, John, 68
 Society of Automotive Engineers,
 122
 Somervell, Lt. Gen. Brehon B., 132
 South Bend, 91
 Spaatz, Brig. Gen. Carl, 62 (n 42)
 Special-facilities (SF) contract,
 39, 214-15, 217
 Special Projects Br., FES, 160
 Sperry Gyroscope Co., 95

Steel Products Engineering Co., 95
 Stettinius, E. R., 46, 49, 102
 Structures Evaluation Unit, IPS,
 55
 Studebaker Corp., 90, 113
 Superfortress. See B-29.
 Supply, Priorities, and Allocations
 Board, 104, 114-15, 119

T

Tax Amortization Br., Facilities
 Bureau, WPB, 203, 206
 Tax Amortization Br., OUSW, 65,
 202, 205
 Tax Amortization Com., 200
 Toledo, 185
 Tonawanda, N. Y., 93
 Tools Com., ASU, 141-44
 Tools Div., WPB, 143
 Tools Unit, IPS, 56
 Trecker, Joe, 98
 Trecker, Francis, 98
 Trimbach, R. F., 53, 94, 155
 Truman Committee, 99, 174, 182.
See also Senate Special Committee.
 Tulsa, 88-89, 93, 170

U

Under Secretary of War, 64, 68,
 99, 125, 128-29, 140, 151, 202.
See also OUSW.
 United Automobile Workers of
 America, 122
 United States Steel Corp., 46

V

V-1650-3 (Merlin), 185
 Vanaman, Brig. Gen. A. W., 129
 (n 41), 150
 Van Vechten, C. C., 69, 202
 Vaughan, Col. J. C., 60, 197
 Vega Aircraft Corp., 92, 133
 Vultee Aircraft, Inc., 77

AAFHS-40

275

W

Wallace, Henry, 104
 Walsh, Maj. T. G., 198
 War Manpower Commission, 150,
 153, 162, 167-68, 174-75,
 196
 War Production Board (WPB),
 72, 115, 120, 124-25, 127-28,
 134, 137, 141, 144-45, 148,
 150-51, 153, 156, 164, 167-68,
 174, 188, 196, 198, 203-05
 Chairman, 119
 Wasp airplane, 47
 Waugh, L. B., 213
 Wichita, Kans., 75, 77, 92-93,
 112, 179
 Williamsport, Pa., 78
 Willow Run, Mich., 88, 92-93, 112,
 144, 179, 227-28, 160
 Wilson, C. E., 151
 Wolfe, Brig. Gen. K. B., 94, 96,
 101, 123, 138, 150 (n 27),
 160, 194
 Woodridge, N. J., 113
 Wright Aeronautical Corp., 77,
 90, 113
 Wright, T. P., 47, 151
 Wright Fld., 51, 53, 56, 59, 64,
 66, 81, 101, 106-07, 125, 129,
 137-38, 146, 149, 160, 162,
 176 (n 27), 188, 190-92, 194,
 202, 212, 214, 216

Y, Z

Ypsilanti, Mich., 88, 160
 Zone I, 7

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