ARMY AIR FORCES HISTORICAL STUDIES: No. 62

THE MODIFICATION OF ARMY AIRCRAFT IN THE UNITED STATES 1939–1945

AIR HISTORICAL OFFICE
Headquarters, Army Air Forces

UNCLASSIFIED

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Air Historical Office
Headquarters, Army Air Forces
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FOREWORD

The present study, covering the modification work carried on by both the Materiel Command and the Air Service Command, is based, so far as the former of these two commands is concerned, on the ATSC Historical Monograph, "The Modification of Aircraft: Procedures, Policies, and Problems," by Mrs. Virginia G. Toole of the ATSC Historical Office, Wright Field, Ohio. Data pertaining to the modification work performed by the Air Service Command (later by the Air Technical Service Command) were added by Capt. Robert W. Ackerman of the Administrative History Branch, AAF Historical Office. The study is based primarily on the files available at Wright Field and does not attempt to include a comprehensive account of supervisory activities at Headquarters, AAF. This is one of a series of AAF materiel monographs the others of which deal with various phases of materiel development, maintenance, and supply.

Readers familiar with the subject matter of this study are invited to contribute additional facts, interpretations, and criticism.

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Chapter I

INTRODUCTION

"Modification" is a term applied to a continuing process in the Army air arm—namely, the effecting of technical changes in aircraft for the purpose of correcting defects, improving combat performance, or incorporating equipment necessary to adapt the aircraft to a particular function.[1] The present history is concerned with the modification program that was developed during the period 1939-1945 within the United States in response to the exigencies of World War II.[2]

In time of war, the need for modifications was, of course, far more urgent than in time of peace. In general, wartime modification requirements originated in[3]

1. Demands for improvements bearing on combat efficiency from the theaters of operations.
2. New equipment and improvements in design brought forth by the research and development agencies of the air arm.
3. Proposals for improvements in performance advanced by the manufacturers.

The tendency in modifications during peacetime was toward improvements in flying safety, and suggestions for such changes were normally initiated either by the research laboratories maintained by the air arm or by the manufacturers.

The vast scope of wartime modification needs is indicated by the fact that during World War II nearly 100 per cent of the bombers and

50 per cent of all other airplanes coming off the assembly lines required some degree of modification before they could be declared fit to carry out their missions in competition with enemy aircraft.[4] It is significant that the combat modifications of the B-29 assumed such importance that a special organization—the B-4 section of the 20th Air Force—was set up in AAF Headquarters to expedite and superintend the performance of the work.[5] During both war and peace, however, an active program of modification which would bridge the gap between production and the most recent developments was indispensable to the effectiveness and the flexibility of the Army air arm. Such a program had to provide not only for airframes and engines, but also for necessary changes in items of Government furnished equipment like automatic pilots, flux gate compasses, and radio apparatus.

By no means were all the changes in aircraft and engines prescribed by technical directives classified as modifications. That is, the numerous alterations performed by base and depot maintenance personnel in accordance with Technical Orders—the so-called Technical Order compliances or changes—must be exempted from this category.[6] An example of such minor changes was the requirement that washers be placed on a certain bolt in the landing gear torque knee of AT-10 airplanes to prevent failure of that mechanism.[7] Alterations of this sort were normally prescribed with a view to remedying defects or forestalling failures which had become the subject of a number of Unsatisfactory Reports.[8] Presumably because they involved less work and could be accomplished by base maintenance personnel or by air depot mechanics during overhaul, they were not

considered modifications.

Although it is difficult to make a hard-and-fast distinction, modifications, on the other hand, generally involved a considerable amount of work and effected a more basic change in the airplane. The process of modification may be considered, indeed, an extension of the factory production line. The first B-29's to come out of the factories could not be thrown into the Pacific war until they had been subjected to long months of modification, including the installation of additional fuel tanks and of AN/APG-13 radar equipment. Further, the newly developed R-3350 engines, which powered the B-29, underwent many revisions to improve cooling and reduce the fire hazard.[9] The features just mentioned came to be built into later production models by the factories themselves, but, in the meantime, new changes, such as snap-opening bomb bay doors,[10] were found necessary, and the modification process continued.

The modifications incorporated in Army aircraft were indicated by appropriate changes in the block and series, and even in the type and model, designations. For example, the B-24J, after being equipped with a different life raft and tail turret and a later type of sight for the waist guns, was given the block number "15" and was thereafter known as the B-24J-15, to distinguish it from the B-24J-10, the next earlier block of B-24J's. The series letter was changed upon the adoption of modifications affecting structure, primary armament, or engine performance ratings. Thus, the B-17F, after the installation of a chin turret, was designated the B-17G. Airplanes were even converted into new types by extensive changes. After receiving photographic modifications, the B-29 became

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a different type and model, the F-13...

Basically, the process by which the proposed modifications were translated into requirements remained the same during the history of the Army air arm. Defects of one sort or another, particularly in new airplane models like the F-2, were always being discovered by the using organizations, and advice of such difficulties was given to the Materiel Division and the contractor, both of whom attempted to devise changes which would remedy the defects. When a change was officially adopted, deviations in the original specifications were granted by the Materiel Division and the contractor began incorporating the change in any aircraft still being produced. Airplanes already delivered to the air arm were modernized by the service organization as a rule, the contractors furnishing the necessary parts, drawings, and instructions--sometimes

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at no additional cost to the Government.

Notice to the effect that service organizations, particularly the air depots, were to perform certain modifications was most often issued in the form of a Technical Instruction (TI) or a Technical Letter. A typical modification directive was a Technical Instruction which pertained to the alteration of B-25D and G airplanes for observation purposes during 1943. Some of the prescribed changes were the installation of .50-cal. machine guns to be operated from the pilot's cockpit, the removal of the belly turret, the installation of K-20 cameras in the observer's and waist gunner's positions, and the addition of another transmission channel to the frequency range of the command radio set, the SCR-274. In all, 17 individual changes were listed, but, in view of the different requirements

of the various theaters of operations and the continental commands to which the B-25's were to be assigned, not all the changes were to be accomplished on any one airplane or group of airplanes.[14]

Modifications, such as those listed above, were accomplished not only in well-equipped shops and depots in the United States, but also in the various combat theaters by the service commands of the overseas air forces, the insular air depots, servicing teams sent out by manufacturers, and even squadron maintenance personnel. This study, however, does not cover the very extensive modification work performed at overseas stations; nor does it include a treatment of the modification of guns, cameras, automatic pilots, and other items of equipment. The heavy costs of modification are likewise omitted from the discussion because of the incomplete state of the necessary records.[15] The present study, then, is concerned with modifications of AAF airplanes which were performed within the continental United States by modification centers, manufacturer-operated or otherwise, and by service organizations, particularly the air depots, during the period 1939-1945. Rather than on details of headquarters organization and administration, the emphasis is placed on the actual performance of modification and on the evolution of wartime policies and technical data pertaining to the whole modification program.

Chapter II

MODIFICATION PRIOR TO 1939

The modification of Army aircraft first came to be a pressing problem during World War I, at which time the demand for technical changes became so numerous that to introduce them all into the factories would have seriously dislocated production schedules. Although a good deal of confusion existed as to how such changes should be accomplished, the adoption of the British modification plan in September 1918 helped to regularize the situation.[1] In accordance with the British plan, a special modification board passed on proposed modifications and classified them as (1) changes essential to flying safety, (2) improvements in performance, and (3) improvements not of vital importance but valuable to the airplane. Class I modifications were introduced into the aircraft factories immediately, but the other two classes, being of a less urgent nature, were put into effect at whatever time seemed least likely to upset production schedules.[2] Modifications performed during World War I, for example, included the conversion of DH-4's, originally designed as bombers, to reconnaissance airplanes by eliminating dual controls and bombing mechanism and providing windows in the floor and both sides of the fuselage.[3] In 1919, a Lepere model was modified to serve as a photographic airplane. A square hole was cut in the bottom of the fuselage behind the observer's cockpit, and uprights and cross-struts were built into the airframe at this point to hold the camera

[illegible] operations.[4]

The modification policy in effect in the 1930's provided that the Material Division at Wright Field would coordinate and study all proposals for changes in aircraft design, but that approval of the Office, Chief of Air Corps, was necessary before the actual work could be performed.[5] This policy continued in effect until 1940, when it was changed to the extent that the Material Division was authorized to negotiate for the accomplishment of modifications before approval had been formally given by higher headquarters. Also, modifications at that time were limited to improvements in flying safety and to changes in design necessary to remedy deficiencies revealed by flying operations or by the combat experience of foreign nations with similar equipment.[6]

The modifications authorized during the twenty-odd years between the two world wars were performed both by the aircraft manufacturers and by service or operations of the Army air arm. Among the manufacturers, the Boeing Aircraft Company reworked 63 airplanes for use in forest patrol work in 1930,[7] and the Martin Company repaired and overhauled certain bombers the next year.[8] The conversion of DH-4's to BM-4's during the 1920's was undertaken jointly by manufacturers and the Air Depots.[9] In 1939 the Air Depots, despite the fact that they were fully engaged in their overhaul schedules, were assigned several modification projects.[10]

Occasionally, minor changes not authorized by technical directives were performed by flying organizations at the request of pilots, often

in the interests of making tactical airplanes more comfortable for long cross-country flights.[11] This practice was specifically forbidden in 1928, but the Material Division, because of its test and experimental responsibilities, was exempted from the terms of the directive.[12]

During the 1930's, a number of modification projects were carried out. The Fairfield Air Depot, for example, converted P-12C's to P-12D's by the installation of a different engine, the R-1340, in 1930 and 1931.[13] In 1932, the same airplane, the P-12D, underwent further modification when the engine ring cowl was strengthened,[14] and it was later found necessary to provide a more satisfactory fastener for the engine ring cowl.[15] In 1934, a P-26A airplane nosed over, causing the collapse of the pilot's headrest and the tail mast. All P-26A's in the possession of the Air Corps were thereupon grounded and the delivering of production aircraft of this model from the factory was halted until suitable modifications could be devised and accomplished.[16] The next P-26's delivered after 10 April 1934 all carried these improvements, and modification of service aircraft of that model was accomplished by Air Corps bases under the supervision of factory representatives.[17]

The C-10B airplane likewise underwent several changes. In March 1936 a new counterweight bracket installation on the aileron torque tube was designed by the manufacturer, and approval of the Material Division was necessary before the change could become effective.[18] Later in the same year a number of C-10's were modified to permit installation of navigation equipment, including a plotting table and bench, compass, turn indicator, and the like.[19]

Chapter III

THE EVOLUTION OF THE [illegible], 1939-1942

Modifications for the Allies

The modification work accomplished on aircraft released to foreign governments by direct sale and under lend-lease agreements during the so-called "Phoney Period," 1939-1941, and later, was an important step in the evolution of the whole aircraft modification program. The interest of European governments in purchasing American-made equipment increased considerably after the declaration of war by Britain and France in September 1939, and as of May 1940, U.S. manufacturers were committed to build more than 3,300 airplanes for the Allies.[1] Delivery of many of the aircraft ordered by the Scandinavian countries, the Low Countries, and France was made impossible after the spectacular German advances of April, May, and June 1940, and the United States Government repossessed much of this equipment for the use of the Air Corps. Some airplanes were in the hands of the manufacturers; others, prepared for shipment or en route to their destinations, were taken over at docks and railroad stations. Thereafter, Great Britain was the principal foreign customer and remained so throughout the war.

Early in the defense period, there was considerable hesitation over selling late U.S. models to foreign governments. The release policy was later liberalized, but the manufacturers whose products were approved for foreign sale were generally required to perform modifications on aircraft for the Air Corps in return for the relaxation of restrictions.

Thus, when the sale abroad of certain combat aircraft was approved, the manufacturer agreed to provide 116 A-20's and A-20J's beginning in to the Air Corps with leak-proof fuel tanks and armor-plate protection, similar to the equipment incorporated in export airplanes.[2] Again, using determined B-17 for the Air Corps by installing armor plate and .50-cal. guns in return for governmental approval of a foreign contract for 250 airplanes,[3] and the North American Aviation Company, after the release of one of its aircraft to a foreign purchaser, agreed to furnish the Air Corps two airplanes without cost.[4] Another condition attached to "foreign releases" was that the United States Government be furnished complete information as to combat performance of American-made equipment, obviously an important factor in the modification program.[5] Negotiations between the foreign purchasing commissions and the manufacturers were generally monitored by Air Corps personnel, apparently to see that these conditions were met.[6]

Manufacturers' contracts with foreign governments generally specified technical changes that were considered necessary better to adapt U. S. aircraft to use by foreign pilots and crews. Thus, the P-36's built for the French were equipped with French armament, instruments and accessories,[7] and 200 P-39's ordered by the British in July 1940 were to be modified to permit the installation of British radio equipment and tires.[8] Many modifications were requested by the British to improve combat effectiveness. Several such changes were made in the 20 B-17's allotted to Britain in 1940: leak-proof fuel tanks were installed; the control system was altered; and the armor plate, tow shackles,

automatic pilot, and cockpit were changed.[9] The 9 L-24's transferred to the British under Lend-Lease early in 1941 likewise required certain combat changes: British camouflage and markings were to be applied, the guns were to be positioned differently, duplicate hydraulic lines and braking systems installed, the outer-wing panels reinforced, and the like.[10]

Some airplanes constructed under foreign contracts were later reassigned to the Air Corps, as already indicated, and inasmuch as many of them had received special modifications, further changes were necessary before they could again be used by U.S. pilots. In November 1940, for example, certain P-35's, which had been built for Sweden, were ordered to the Philippine Air Depot for modification to U.S. specifications.[11] Again, immediately after Pearl Harbor, the Materiel Division was directed to outline all the modifications needed for the conversion of 300 British P-31's for U.S. use. These changes affected radio installations, armament, identification devices, and bombing equipment.[12]

Although the U.S. aircraft sent to England and other theaters of operations had received basic modifications, additional changes, resulting from current experience in combat with the latest enemy equipment, were very often found to be necessary. Such changes are normally accomplished by the British in their own installations. As early as April 1940, however, U.S. manufacturers were urged by the British-French Joint Purchasing Commission to establish "modification depots" at various places in Europe and the Near East where their own engineers and mechanics could effect the latest technical changes on airplanes with which they were completely familiar. It was pointed out that U.S. manufacturers could in this way protect "their good name," and that U.S. personnel

would obtain experience under wartime conditions which would be valuable for future design and production of aircraft."[13] After the signing of the Lend-Lease Act, 11 March 1941, the ever increasing flow of U.S. aircraft to Europe prompted the President to advise the establishment by manufacturers of such foreign depots for maintenance and supply as well as for modification work.[14]

Maj. Gen. George H. Brett investigated the problem of establishing modification activities in England during the latter part of 1941, but the explosive beginning of the war with Japan was responsible for a considerable delay in the establishment of overseas depots.[15] Further, U.S. participation in the war made apparent the necessity for establishing modification centers in the United States. Such centers would be primarily devoted to preparing AAF aircraft for combat, but it was hoped that most of the operational changes desired by the British could also be performed in this country. On their part, the British foresaw a period, prior to the full operation of the U.S. modification centers, when their own modification facilities would be heavily taxed by the increasing number of aircraft that were arriving in England.[16]

The Use of Airline Facilities as Modification Centers

The final decision to provide modification centers in the United States was made shortly after Pearl Harbor, and on 10 January 1942 the Materiel Division was directed to prepare a plan for such installations.[17] In these facilities, modifications were to be performed on aircraft allocated to the Navy and beneficiary governments as well as on AAF aircraft.

One important reason for haste in activating the centers was to provide space to accommodate the aircraft rolling off the assembly lines at a rapidly increasing rate. To leave great numbers of new airplanes parked near the factories, complete except for modifications, was found to be very bad for the morale of workers who were constantly being exhorted to increase their output.[18] The recommendation urged the immediate establishment by the Air Corps of a number of centers for the accomplishment of all operational changes in American-built aircraft.[19] Since these centers were ultimately to be more or less permanent installations operable by aircraft manufacturers, the companies were requested to submit their proposals so that construction could begin.[20]

The important work of modification could not, however, be postponed while the new facilities were being planned and constructed, and, as a temporary expedient, the maintenance shops of various commercial airlines were pressed into service. Such installations, because they were equipped with airfield, buildings, machinery, and tools and were staffed by experienced airplane mechanics, were quickly ready to the needs of the modification program. On 18 June 1942 a list of ten eligible airlines shops at which modification could be performed pending the establishment of permanent centers was drawn up as follows:[21]

MODEL OF AIRPLANE INVOLVED	FACILITY
B-24D	American Airlines, El Paso (pending establishment of a center by Consolidated Aircraft Company at either Tucson or Fort Worth)
B-17E, B-17F, -20	United Airlines, Cheyenne (pending establishment of a center by Boeing Company at either Wichita or Seattle)

MODEL OF AIRCRAFT MODIFIED (Contd.)	FACILITY
C-24, C-47, C-53, C-54	Transcontinental and Western Air, Inc., Kansas City or Los Angeles (pending establishment by Douglas Aircraft Company of a center at Tulsa or another location)
C-47	American Airlines, LaGuardia Airport, New York
Special radio installations on all models	

Most of the above installations and others not on the list were activated very quickly until, by May 1942, 10 airlines shops were performing modifications.[22] Perhaps the earliest of the projects completed in the airlines shops was the modification in February 1942 of 14 C-53's for the British at the Memphis shop of the Chicago and Southern Airlines. In general, only limited, temporary construction was authorized at the airlines shops,[23] the two exceptions being the large construction projects at United Airlines, Cheyenne, designated as the modification center for all Boeing C-17's,[24] and Northwest Airlines, St. Paul, where C-24's were modified.[25] It was intended that airlines facilities would be returned to airlines use as the permanent centers came into production toward the close of 1942. The volume of modification work came to be so great, however, that some airlines shops were retained through 1944.[26]

Establishment of the Modification Centers

As soon as the airlines facilities were in full production as modification shops, there was little for private firms for the so-called

permanent modification centers and to fix the administrative responsibilities for the undertaking. The authorization for the establishment of the modification centers, issued 18 February 1942, set forth their functions as follows: to make airplanes operationally suitable to a customer other than the one originally intended; to prepare airplanes for special missions; to install equipment for combat operations; to make last-minute adjustments; and to remedy shortages of equipment not available when the airplanes left the factory.[27]

It was further decided that funds for the construction of the centers would be made available from appropriations entitled "Expediting Production of Equipment and Supplies for National Defense." Site boards were then selected to find locations in the vicinity of the various aircraft plants.[28] Actual construction of the hangars and shops for the permanent centers was made the responsibility of the Corps of Engineers, and the completed centers became War Department property operated under lease arrangements by the prime aircraft manufacturers. The relatively small amount of construction required at airlines facilities was normally handled by the owners of the property under Defense Plant Corporation contracts.

With the structure of the Army Air Forces, administrative control of modification and the modification centers was divided between Headquarters, AAF and the Materiel Command. Responsibility for issuing requirements for every modification was the duty of the Directorate of Military Requirements, established in March 1942 as the headquarters

agency charged with translating theater desires into requirements for procurement.[29] The theater demands themselves were usually formulated by special modification committees set up by the overseas air forces. These committees reported to the Commanding General, upon combat performance, the technical deficiencies of particular airplanes and recommended improvements that could be performed either in the modification centers or the factory production lines. Many alterations were devised and accomplished by the service organizations of the overseas air forces.[30] In the United States, supervision of the actual performance of the work and of the modification centers was the responsibility of the Materiel Command.

More specifically, modifications were normally initiated and carried out as follows:

The Directorate of Military Requirements. This office received requests for modifications from theaters of operations, Materiel Command laboratories, manufacturers, and other sources. The requests were analyzed by the Modification Section and certain of them were selected as approved requirements for AAF airplanes. The requests were then forwarded to the Materiel Command for action.

The Materiel Command. The Special Projects Branch, after coordination with the Airplane Branch of the Production Engineering Section and other units, prepared and issued the necessary Technical Instructions describing the work to be accomplished. The availability of the required materials and equipment was also investigated. The project was then assigned to a modification center or centers. If modification center capacity was found to be insufficient, the Air Service Command was re-

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quested to schedule some of the work at one or more of the air depots. The Materiel Command also sent project officers to the centers to assist with engineering problems and to visit sources of supply. 32 The Procurement Districts of the Materiel Command also assumed some of the administrative responsibilities for the operation of the modification centers in the sense that the district supervisors were in charge of the inspection of the finished product and of the preparation of the monthly status report.

The Modification Centers. The centers accepted the airplanes as they were ferried from a "pre-modification pool," usually by the Ferrying Command, performed the required work, and then released the completed airplanes to the Ferrying Command for transfer to a staging area or to storage. Stationed at each of the centers was an AAF resident representative whose duties included assisting the contractor with his relations with the air forces, placarding the completed airplane to indicate what modifications had been performed, and executing a certificate after the final acceptance of the airplane. He was further expected to observe the efficiency of the contractor's operations and to check the adequacy of his purchase orders. Upon request of the resident representatives, the district supervisors assigned properly qualified inspectors to the centers, and if such personnel were not available, the requests were forwarded to the Materiel Command for action. Another functionary assigned to the centers was the AAF inspector-in-charge, who served as the assistant to the resident representative or in his stead. The primary duty of the inspector-in-charge, however, was supervision of the 33 inspectors and the inspection procedures within the modification centers.

The foregoing description applies particularly to aircraft destined for use by the AAF. It must be remembered, however, that the modification centers also performed work on aircraft allocated to the Navy and to AAF foreign customers as well. Inasmuch as only a few airplane types were used in common by the Navy and the AAF, the Bureau of Aeronautics absorbed a very small proportion of the total output of the Materiel Command modification centers. During 1942, for example, the only work performed for the Navy was the modification of 26 B-24's by the Fort Worth Consolidated-Vultee Modification Center in November and December.[34] For the eight foreign countires to which aircraft were released during 1942, modifications were completed on nearly 700 airplanes. The two largest customers were Britain and Russia, just as during the remaining years of the war, and 10 different models of airplanes were involved.[35] In 1940 contracts between foreign governments and U.S. aircraft manufacturers covered the modifications which the foreign air forces considered necessary, as has already been pointed out. In general, this arrangement continued even after the Lend-Lease Act in March 1941 had determined that, in order to provide better control of allocations, foreign governments should deal with manufacturers only through the AAF. Thereafter, manufacturers produced aircraft for the Allies under AAF contracts, and the modifications written into the contracts were performed just as on aircraft allocated to the AAF.

During the tremendous haste of the early part of 1942, modification contracts with airlines were made for a period of time, usually six months, for a given number of airplanes, and for costs estimated by the contractor.

such figures could only be rough approximations, however, and the contractors were generally paid on the basis of audits.[36] Later, the operation of the government centers was covered by cost-plus-fixed-fee contracts in which adjustments were made for the Government Furnished Equipment (GFE) and Contractor Furnished Equipment (CFE) supplied by the modification centers.[37]

On the basis of some months of experience with the modification centers, modification was redefined in August 1942 and the administrative responsibilities of the Materiel Command were stated more positively. Modification was defined as "any change in structure, arrangement, method of operation, or part, minor, or addition of such accessory equipment as will alter the military characteristics and/or tactical utility and operation of the aircraft." It was further stipulated that combat airplanes would be delivered from the factories in as nearly operational condition as practicable, but that modification centers would accomplish such changes demanded by the combat organizations as had not yet been introduced into the production lines. The emphasis on factory production of airplanes as nearly operational as possible and the more careful definition of modification were probably inspired by the feeling that more changes should be accomplished in the factories. In general, Air Service Command installations, such as the depots and subdepots, were not to perform modifications or changes in aircraft structure except when called upon to do so by the Materiel Command.[38] As will be shown, recourse to Air Service Command assistance in keeping up with the steadily

increasing volumes of the modification program was necessary from the first.

The construction of the permanent centers lagged during 1942 because of the slowness of the site boards in submitting reports, the difficulty of obtaining building materials, and occasional legal problems.[39] Nevertheless, 10 centers, exclusive of the airlines facilities (already discussed), were in production by the end of 1942. The Lockheed Center at Dallas began functioning in a small way in February 1942, but the other nine did not get well started until November of that year. Before the end of the war, 18 centers were operated by the manufacturers. Of these, 12 were government-built installations, whereas the other six occupied factory space which was usually the property of the manufacturer.[40]

Modification Center Projects, 1942

With the ever-increasing number and variety of changes made necessary by experience in combat as well as with the limited time which overseas commitments allowed for such work, the Director of Military Requirements found it necessary to distinguish between "necessary" and "desirable" modifications. Thus, a sort of priority rating was established early during World War II when the British policy of classifying modifications was adopted. "Necessary" modifications, of course, were those considered essential for the combat readiness of the aircraft and they were accordingly given first priority. If time and materials were not available for accomplishing these changes, however, the Director of Military Requirements could decide to release the aircraft to combat units without modifications. The "desirable" changes were to be performed if at all

practicable. No special release was required from the Director of Military Requirements if it were necessary to deliver airplanes to overseas units before such changes could be completed.[41]

In practice, almost all the changes accomplished by the modification centers and the air depots were necessary changes, and releases had to be secured for the military airplanes that were needed before the alterations could be finished. That is, there proved to be very little time for [illegible] changes.[42] The term "quick and dirty" (see Figure 1, opposite this page) was sometimes applied to modifications because they frequently had to be performed on the basis of a limited amount of information and [illegible] time. Consequently, a good deal of improvisation became necessary—changes were made, so to speak, with tin snips and stove bolts[43]—and the results were not so smooth and finished as a well-engineered factory job. On the other hand, pains were always taken to insure that the work was safe and functional.

The principal types of modifications carried out at the several modification centers during 1942 were (1) armament changes; (2) installation of radio, radar, and identification equipment; and (3) winterization changes. A discussion of these types of modifications follows:

Armament Modifications. The problem of armament modification arose immediately after Pearl Harbor when it was found necessary to convert airplanes originally allocated to the British [illegible] to use by the AAF. This [illegible] originally allocated to the British [illegible] could fire British ammunition only, had [illegible] British [illegible] American [illegible]. In general, the [illegible] installation of [illegible] .50-cal. and .30-cal. [illegible]

"QUICK AND DIRTY" . . . . by Boyd

"Remember? I Warned You About Stopping Off at the Mad Center!"

Figure I

on such airplanes as the Lockheed Hudson are feature. The change from .30 to .50 caliber, however, the problem was not an overnight accomplishment for an overnight requirement.[45]

During the first year of activity, the majority of airplanes modified were B-17's, B-24's, and B-25's. The armament changes on these airplanes were determined by the requirements of the various combat theaters, and the changes in general consisted of increasing the number and the caliber of the weapons on each airplane, increasing ammunition supply, and adding more armor as protection against flak. In order to facilitate preparing airplanes for combat duty, the Engineering Section listed armament items that could be used in the allocated aircraft with the least number of changes to the structure and other parts and without seriously disturbing the balance of the airplane.

The first priority in the modification project was assigned to the conversion of the B-25 to a convoy fighter, torpedo bomber, and ground attack airplane. Armament improvements for all versions of the B-25 were studied in June 1942, and Brig. Gen. James H. Doolittle endorsed the Materiel Center's proposal to install two fixed .50-cal. guns and one flexible .50-cal. gun in the bomber nose. Also, for ground attack purposes, B-25's were provided with 37-mm. cannon "bathtub" installations.[46] Later it was pointed out that some of the changes, particularly in armament, were still in the experimental stage and, while acceptable as interim measures in modification centers, might not be appropriate for production line aircraft. More refined changes were developed later, however, and incorporated

in th[illegible] short production lines. [illegible] projects[47] [illegible] still blocks of aircraft only.

In order to [illegible] aircraft through [illegible] modification [illegible] perfor- [illegible] on 1 [illegible] that all [illegible] would not include [illegible] unless the ori- [illegible] racks [illegible] accomplished at [illegible] the modification center. [illegible] to the rule [illegible] such [illegible] original [illegible] or [illegible] the [illegible] or required, [illegible] in[48] the air or on the ground.

[illegible] Radio, Radar, and Identification Radio Installations. Radio [illegible] identification [illegible] installations were given first priority [illegible] all other projects in the early [illegible] of the war because they [illegible] critical [illegible][49] [illegible] delivery of supplies by military [illegible] aircraft [illegible] involved [illegible] resources to [illegible] [illegible]. Further, many [illegible] in theaters of operations [illegible]. For such aircraft, [illegible] identification [illegible] (1) [illegible] in the top of the [illegible] (2) [illegible] panel cabin to [illegible] on heavenly bodies [illegible]; and (2) an opening with [illegible] later replaced [illegible] in the [illegible] through which a hinged flap in the fuselage in front of the cabin door through which a pyrotechnic pistol could be fired. It was further directed that all military transports be equipped in this manner so as to be usable in

foreign theaters as well as in domestic flights. The theory was that, so equipped, the aircraft would be interchangeable among the services.[50]

In July 1942, at General Arnold's request, the British ceased using the B-17 airplane in their coastal command and changed to the B-24 model. The principal modifications of the coastal command's B-24's were those required for the installation of the new 10-cm. radar search equipment, which was considered to be of great value in detecting surfaced submarines. There were two interchangeable versions of this equipment suitable for the B-24D, both of British design, and the British Air Commission arranged for the requisitioning and supply of these to the modification centers. Engineering assistance was offered also inasmuch as British technicians working with the AAF had considerable experience in development and installation. The urgency of this project is indicated by a statement made by the British Air Commission: "It will be realized that even a few extra patrol aircraft can make a very great impression on the shipping position as it is today."[51]

During 1942 and 1943 most of the radar installations were performed by the air depots, but the load later fell on the centers. In all, the centers accomplished approximately one-half the airborne radar installations despite a shortage of qualified personnel, both AAF and contractor, and the lack of specialized training and proper guidance in setting up and testing such equipment. Included in the earlier radio and radar modifications of aircraft were changes in existing installations and the addition of new equipment to perform special tasks. With the progress

of the war, the Aircraft Radio Laboratories participated in the development of a multitude of different types of radio and radar including blind-landing instruments, long- and short-range navigation installations, and radio and radar altimeters. During 1943 and 1944 the centers processing heavy bombardment aircraft installed radar "search gear" in a large percentage of the airplanes to enable them to locate an enemy target on land or sea, to identify the target as friend or foe, and to bomb through overcast or at night. By 1 March 1945 certain classes of radio and radar apparatus were being installed in the factories, but it remained the responsibility of the centers to complete the installation of specific types of equipment that were required in the various theaters of operations. At the Consolidated-Vultee Modification Center at Louisville, nearly 35 per cent of the airplanes modified for bombing carried a complete complement of radar search gear as well as the usual communications and navigational equipment.

Winterization of Aircraft. During the early months of 1942, attention at Wright Field was directed toward still another project, the winterization program. The pioneering work on such modifications was done in the engineering shops of the Materiel Command, and the results were tested by the Cold Weather Test Detachment at Ladd Field, Fairbanks, Alaska. The project was set up for the purpose of winterizing only those Russian airplanes which were to be ferried across Alaska and Siberia. In July 1944, however, it was found desirable to winterize all airplanes to be ferried to Europe across the North Atlantic as well as those delivered to Russia on the Alsib (Alaska-Siberia) route.[52]

The problem of preparing aircraft for operation under conditions of extreme cold was divided into three parts: (1) provisions to permit the satisfactory operation of the aircraft in flight, (2) modifications and equipment to assist in overcoming the hazards of icing, and (3) provisions for warming up the aircraft after it had remained on the ground for long periods in extreme cold. Typical problems that had to be solved by the Materiel Division were shrinking of parts of the aircraft at different rates depending upon whether the part was aluminum, steel, or rubber; the hardening of engine oil to stone; and the thickening of hydraulic fluid so badly. Hydraulic hose became brittle and snapped in the cold, and tires cracked like china. To protect the airplane against the effects of great cold, all major winterization requirements were developed, each the result of long and difficult months of research. Rather than in the airplanes themselves, the winterization changes were made in the engine and in various items of equipment to protect them and to permit their functioning at low temperatures.

In 1942, engineering personnel at Wright Field believed that considerable winterization work would have to be done at the last minute before airplanes actually departed for their ultimate destination, and that special modification centers would therefore be necessary for this project. Analysis of the six requirements, however, revealed that almost all the changes, except for the installation of snow-and-ice-tread tires, could be accomplished more economically at the regular modification centers along with other items of modification.

Administrative responsibilities of winterization were to be divided between the Materiel Command and the Air Service Command. The former

would be charged with the responsibility of installing all winterization items at centers until they could be standardized by the factories. Exceptions were those which would be harmful to the operation of the airplane when flying from a warm climate to a cold one, or those which were especially susceptible to wear and tear, such as the snow-and-ice-tread tires. The Air Service Command was to designate installation points in appropriate localities for the installation of snow-and-ice-tread tires, and such other items as experience might prove were more practically installed at the last minute.[54] It was later directed that all production combat and cargo types of aircraft accepted by the Government on or after 1 October 1942 should be winterized.[55] In order to achieve uniformity of purpose and control of this project, responsibility for the conduct of the entire winterization program on production aircraft was centralized in the Production Engineering Section of the Materiel Command. At that time winterization was regarded as the most important project confronting the Materiel Center.[56] To expedite procurement of materials and parts for the winterization program, aircraft manufacturers were directed to start immediate purchase from subcontractors and vendors of all articles included in the project installations approved by the Materiel Center representatives. Those items that could not be installed in the production lines immediately were purchased from the contractors and installed by the modification centers until arrangements could be made to incorporate them in the production lines.[57]

The proposal to convert B-24D's to transports was seriously considered at one time. In May 1942, General Song of the Chinese Army

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discussed with Wright Field officials the possibility of converting the Chinese allotment of B-24D's to transports because of the extreme need for long-range cargo aircraft along the Burma Road route. The technical problem of changing the bomber fuselage to a cargo carrier that would accommodate disassembled fighter airplanes had previously been studied, and it was believed that a B-24D so modified could fly from the United States to Hawaii carrying two knocked-down P-39's while retaining the original fuel tanks, the tail gun, upper turret, and hand-held nose gun. In spite of the technical feasibility of the project and the recommendation of Brig. Gen. H.B. Wolfe of the Materiel Command, the Chinese request was not acted upon.

The projects just discussed and other less important projects sent through the 10 modification centers during 1942 involved an impressive number of airplanes, as follows:

Total number of aircraft accepted	4,507
Total number of aircraft delivered	4,297
Number of aircraft in pool:	
Combat	1,006 1,500
Training	494 19
Average daily production	570
Approximate monthly production	

Modification functions of the Air Service Command and the Air Depots

Throughout the war years, but especially during the greater period, the modification of service aircraft—aircraft already on the possession of flying organizations—was largely accomplished at Air Service Command facilities, particularly by the depot repair departments of the several air depots. In addition, however, many production aircraft were sent

directly from the factories to the depots to receive the necessary changes and others were routed to the depots after undergoing certain alterations at the centers. Modifications of service aircraft at overseas stations, when found to be necessary, were usually accomplished by service group or depot group personnel. To facilitate this work, kits containing the required parts and drawings were assembled and shipped overseas by the Materiel Command.[60]

Directives already discussed provided that all modification orders were to be channeled through the Materiel Command, and that this Command should call upon the Air Service Command to handle work loads beyond the capacity of its modification centers. When assistance in meeting a deadline was required, then, the Special Projects section of the Materiel Command normally arranged with the Air Service Command (more specifically, with the Plans and Special Projects Branch of that Command) for routing production aircraft to certain depots where the work could be expeditiously performed. But many projects were allocated directly to the Air Service Command by the Directorate of Military Requirements in Washington, apparently to avoid any delays that might have resulted from following the prescribed channels of communication. The practice of bypassing the Materiel Command was occasionally the source of some confusion, inasmuch as the Special Projects section of that Command, which theoretically controlled all modification, was often unaware of projects that had been allocated directly to the Air Service Command depots.[61]

As already indicated, a good part of the modification work performed in the Air depots during 1942 was in connection with the installation

of radio and radar equipment. This situation resulted from the fact that the maintenance shops at the depots, particularly the Fairfield Air Depot, were much better supplied with experienced radio mechanics than the modification centers. A large variety of other projects was later allocated to the depots, however.[62] Accurate statistics are not available for 1942, but it would appear that approximately 50 per cent of all the aircraft that were sent to the depots underwent some sort of modification.[63] Hence, since more than 9,000 aircraft passed through the maintenance shops of the 11 depots during 1942, it may be assumed that as many as 4,700 to 2,[illegible] received modifications.

Problems of the Modification Program, 1942

From the outset it was recognized, as Brig. Gen. Bennett E. Meyers pointed out, that modification centers with a capacity equivalent to the output of the aircraft factories would have to be provided. "It is a gigantic job to accomplish," he continued, ". . . we can't win this war with this production line [illegible] in the middle."[64] The existence of certain basic requirements served to make the task even greater. One of these requirements was that all modifications of combat aircraft be accomplished [illegible] in this country in order to relieve overseas [illegible] of such work.[65] Another was that all B-17's, B-24's, B-25's, and B-26's should be modified immediately as they were produced by the manufacturers until such time as the modifications could be incorporated in the factory assembly lines.[66] In addition, shortages of material and [illegible] personnel hampered the program [illegible]

all other [illegible] the [illegible] effort.[67] [illegible], jurisdictional disputes [illegible] occasionally [illegible] quarters agencies other than the [illegible] to order the accomplishment of modi[illegible] of military [illegible][68] [illegible] fications.

The most important [illegible] factors affecting [illegible], however, [illegible][69] [illegible] early [illegible] the [illegible] in 1942, for [illegible] modifications [illegible] the [illegible] therefore, [illegible] per cent [illegible] than [illegible] incorporated in [illegible] production [illegible] line.[70] [illegible] certain [illegible] in [illegible] of [illegible] service [illegible] military [illegible] conditions [illegible] for [illegible] centers not [illegible] equipped [illegible].[71]

[illegible] the [illegible] policy of the [illegible] of [illegible] training [illegible] Col. [illegible], to [illegible] of [illegible] for modification [illegible] service [illegible] civilian [illegible] responsibility [illegible] introduced into the [illegible] of the [illegible] in the modification [illegible] line [illegible] modification centers.[72] Several factors, however, [illegible] policy during 1942: the con[illegible] in [illegible] production, the rise in the number of modi[illegible] in [illegible] production, the rise in the number of modi[illegible] and unexpected difficulties [illegible] specified for [illegible]

in foreign changes into their factory assembly lines.[73]

Four aspects of the modification program were subjected to criticism during 1942. Complaints were expressed about (1) the occasional failure to deliver modified airplanes to AAF organizations by the commitment date;[74] (2) deficiencies in Technical Order compliances and shortages of equipment on aircraft delivered to AAF organizations and prepared for shipment or for ferrying overseas;[75] (3) the fact that the same model of airplane sometimes received quite different modifications in different modification centers;[76] and (4) apparent idleness or overemployment at the modification centers.[77] In reply to such criticisms, the officers in charge of the program could point out that the deficiencies were due to causes beyond their control. In the matter of complaints about the unsatisfactory status of aircraft delivered to organizations which prepared them for transfer overseas, it was noted that, although the Materiel Command was responsible for the production and modification of aircraft since these functions were accomplished by the prime contractors and modification centers respectively, two other commands were involved in subsequent steps. That is, after the modifications were completed the airplanes were turned over to the Air Service Command for the installation of certain equipment. Thereafter, the combat organization received the airplane expecting to find it fully equipped and ready for shipment or ferrying except for last-minute preparations. Frequently, however, it was found that routine maintenance inspections and procedures and other servicing had been neglected and that items of equipment were lacking.

Further, Form [illegible] sheets prepared by pilots who flew the airplanes to the intransit depots often revealed mechanical irregularities. All these deficiencies were charged to the modification activities of the Materiel Command, when some of the blame belonged to other organizations. The modification centers were frequently unable to secure parts, and even AAF, in sufficient quantity to remedy shortages.[78]

For improving the service given airplanes as they progressed from the factories through modification to the combat organizations, better coordination was arranged by the Special Projects Branch of the Materiel Command.[79] Complaints about the quality of modification work and also about the fact that airplanes of the same model were sometimes receiving different modifications at different centers were investigated. Both the Director of Procurement and the Director of Military Requirements dispatched inspectors to such activities as the Kansas City Modification Center and the San Antonio Air Depot.[80] Thereafter it was stated that the inspection function at the modification centers would be more carefully supervised and that the directives describing the modifications to be performed would be made more specific and detailed for the use of the centers and the other facilities.[81] Further recommendations bearing on the efficiency of modification activities had to do with such minor matters as inordinate demands on the time of the AAF resident representatives and improper use of government automobiles.[82]

Another more basic suggestion for improving the modification program made by Brig. Gen. Bennett E. Meyers was to the effect that the number of

authorized changes should be more rigidly restricted.[83] To this, the Director of Military Requirements replied that adequate machinery for controlling modifications was already in existence. He illustrated this statement by describing how modifications of the B-25 and B-26 were adopted. One airplane of each type with all the changes required by the British was sent to Wright Field together with one of each type incorporating the armament and other changes approved by the Materiel Command. General Fairchild, Colonel Gartner, General Doolittle, whom General Arnold had put in charge of medium bombardment, proving Ground experts, and other technical personnel then studied every suggested change, including the test results and the number of man-hours involved in the work. Final decisions were made by General Fairchild.[84]

A good summary of the modification program at the close of its first year of operation was provided in a report by the Air Inspector in which it was pointed out that the delivery of aircraft from the factories to the modification centers was often unsatisfactory because of the lack of centralized control of this process. As a consequence, backlogs of work sufficient for steady, efficient production could not always be maintained at the centers. In addition, the Air Inspector believed that too much attention was accorded demands from combat forces and that hand-tailored modifications resulting from such demands should be stopped. He advocated that, before any directive was issued by higher authority, the requirements should be thoroughly coordinated with the Production Division. It was further suggested that field commanders should try to adjust their plans to the use of standardized equipment before demanding special modifications.[85]

Chapter IV

THE MODIFICATION PROGRAM, 1943-1945

Absorption of Modifications by the Factories

At no time during the war were technical changes picked up by the aircraft factories as readily as has been expected. At the Materiel Command it was believed that there had been too much facility in forcing certain modifications back into the factories. For example, the Glenn L. Martin Company at Baltimore had been induced to pick up several items which the Martin factory at Middle River steadily refused to incorporate in their assembly lines for the same model of airplane. Again, Consolidated-Vultee at Fort Worth absorbed certain changes, yet the plant at San Diego accepted none of them.

In this situation, which became critical in 1943, the Special Projects Section, the unit of the Materiel Command which processed modifications at that time,[1] suggested that the prime contractors be deprived of the right to decide if and when modifications should be moved back into their factories. Instead, this decision was to rest with a board to be composed of a representative of each of the following: the prime contractor, the Special Projects Section, and the Chief of the Production Engineering Division. The representative of the Production Engineering Division was to act as arbiter between the prime contractor and the Special Projects Section and his decision would be final.[2]

The slowness with which modifications were taken up by the factories as well as the areas of work rendered the release of the airlines facilities impossible, despite Colonel Norton's determination to make all

[illegible] modifications the direct responsibility of the prime contractors in their own centers.[3] [illegible] taken, the [illegible] of modification projects to Air Service Command installations [illegible] to be continued.

Expansion of the Modification Centers, 1943

In view of the closeness with which changes were [illegible] by the [illegible] factories, it became apparent that considerably greater modification capacity was required. For the study of the problems involved in such an expansion, a special committee was appointed in January 1943 at the [illegible] request of the Chief of the Materiel Command.[4] The committee was directed [illegible] [illegible] additional modification capacity was needed and to determine how much additional [illegible] more efficient administrative procedures. It was found [illegible] also to [illegible] that all bombers and cargo airplanes would be modified at the expenditure of [illegible] man-hours [illegible] in January 1943 [illegible] per cent [illegible] of the total output of aircraft [illegible] would require 500 man-hours per [illegible] [illegible] would be considered to [illegible] airplanes for modification. [illegible] In the course of its investigations, the [illegible] modification. [illegible] committee visited a number of modification centers, including [illegible] airlines [illegible] [illegible] representatives [illegible] The committee's report, submitted in February 1943, set forth [illegible] [5] [illegible] important [illegible] recommendations:

1. [illegible] problem of modification [illegible] understood. [illegible] [illegible] [illegible] for the [illegible] [illegible] be [illegible].

2. [illegible] modification [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

3. [illegible]

[illegible] with the [illegible] directly.'

[illegible] of the [illegible] recommendations [illegible] of a concrete expansion [illegible]:[6]

1. [illegible] are to be increased to [illegible] total of three [illegible], each 150 by 750 feet, together with all the necessary [illegible] improvements.

2. [illegible] are to be [illegible].

3. [illegible] from [illegible] Corporation [illegible] proposal for modification [illegible] facilities [illegible] [illegible] provided [illegible] for [illegible] protection.

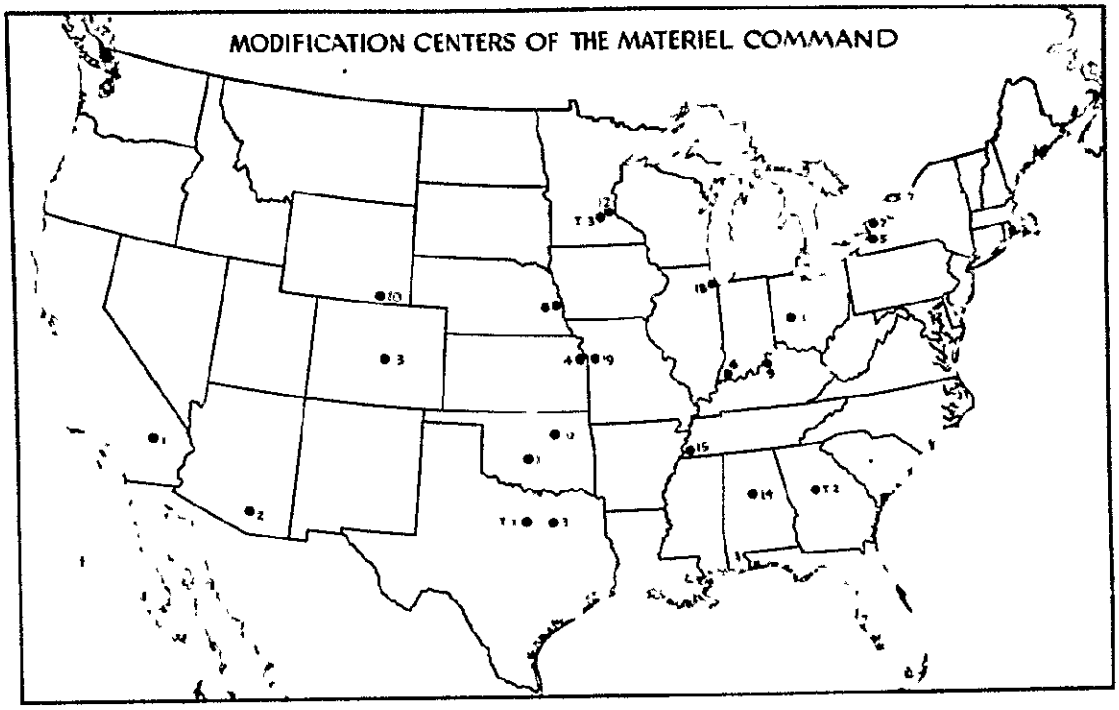
4. [illegible] be [illegible] with facilities [illegible] to those [illegible].

5. [illegible], all [illegible] to coordinate their activities with the [illegible] to [illegible] responsibility for the modification of their own [illegible] production either by direct [illegible] modification facilities or through subcontractors.

[illegible] of the physical expansion [illegible] carried out in 19[illegible], but the [illegible] until the [illegible] of 1944.

[illegible], in [illegible], the [illegible] district [illegible] for [illegible] of contract[illegible] for additional modification facilities. [illegible], [illegible] in [illegible] unnecessary [illegible] resulted, [illegible] direct [illegible] to expedite final

Maj.



Permanent Modification Centers	Contractor Operator	Location	Planes Being Modified
No. 1 Douglas-Daggett	Douglas	Daggett, Calif.	C-47, A-20G, C-47A
No. 2 Consolidated-Tucson	Consolidated	Municipal Airport #2 Tucson, Ariz.	B-24D, B-24L, C-87
No. 3 Lockheed-Dallas	Lockheed	Love Field, Dallas, Tex.	B-17F, B-34, P-38 C-60A, P-38, B-34
No. 4 North Am.-Fairfax	North Amer.	Fairfax Airport, Kansas City, Kans.	B-25C, B-25D, B-25J
No. 5 Curtiss-Wright-Buffalo	Curtiss-Wright	Municipal Airport Buffalo, N. Y.	C-46
No. 6 Republic-Evansville	Republic	Municipal Airport Evansville, Ind.	P-47B, P-47C, P-47G
No. 7 Bell-Niagara	Bell	Municipal Airport Niagara Falls, N. Y.	P-39
No. 8 Martin-Omaha	Martin-Nebr. Corp.	Fort Crook, Omaha, Nebr.	B-26
No. 9 Vultee-Louisville	Vultee	Standiford Field Louisville, Ky.	A-31C, A-35A; B-25C, B-25D.
No. 10 United-Cheyenne	United Airlines	Municipal Airport, Cheyenne, Wyo.	B-17F
No. 11 Northwest-Vandalia	Northwest Airlines	Municipal Airport, Vandalia, Ohio	Not assigned
No. 12 Northwest-St. Paul	Northwest Airlines	Municipal Airport, St. Paul, Minn.	B-24D, B-24L, B-25C, B-25D.
No. 13 Continental-Denver	Continental Airlines	Municipal Airport, Denver, Colo.	B-17F
No. 14 Birmingham	Bechtel-McCone Parsons Corp.	Municipal Airport, Birmingham, Ala.	B-24L
No. 15 Chicago & Southern-Memphis	Chicago and Southern	Municipal Airport, Memphis, Tenn.	C-47, A-20G, P-70, P-51A
No. 16 Douglas-Tulsa	Douglas	Municipal Airport, Tulsa, Okla.	A-24, B-24L, B-25C/D, YB-40
No. 17 Douglas-Oklahoma City	Douglas	Oklahoma City, Okla.	Being built
No. 18 Douglas-Chicago	Douglas	Chicago, Ill.	Being processed
No. 19 T.W.A.-Kansas City	T.W.A.	Municipal Airport, Kansas City, Mo.	B-25C, B-25D
Temporary Modification Centers			
No.T-1 Consolidated-Ft. Worth	Consolidated	Fort Worth, Tex.	B-24D, B-24K
No.T-2 Delta-Atlanta	Delta Airlines	Atlanta, Ga.	A-24
No.T-3 Mid-Continent-Minn.	Mid-Continent	Minneapolis, Minn.	A-36A, P-51

Figure 2

The Administration of Modification Activities at the Centers and the Air Depots, 1944-1945

Perhaps the most important trend to be observed in the modification program in 1944 and 1945 was the assumption of responsibility by the manufacturers for the modification of their own aircraft. The policy of shifting the management of the centers to the prime contractors was adopted because it was felt that such a change would provide the contractors with an incentive for accepting more modifications in their production lines and thus expedite[12] the delivery to operational units of 100-per-cent-complete airplanes.[13] In the past, the manufacturers had been responsible for working out the engineering details for so-called production changes only--that is, the improvements over "quick and dirty" methods in accomplishing changes that were introduced into the factory and applied to all subsequent production of a particular model. Under the new policy, the manufacturers undertook both the engineering of such changes in the modification center or centers processing their aircraft and also the direct management of the modification centers themselves. In other words, modification was done under the production contract with the prime contractor rather than under a separate open contract arrangement as heretofore. To assist the manufacturers, the Materiel Command, through the Production Engineering Section of the Production Division, thereafter sent them the directives prescribing all the modifications as they were approved.[14]

Important changes brought about in connection with contractor-[illegible] the old plan of dual acceptance gave way to a [illegible]. Prior to 6 June 1944, aircraft having the

parent factory were bought and accepted by the AAF and thus became government property. The AAF then flew the airplanes to the modification centers for alterations, and thereafter they were tested for the second time. In accordance with the new policy, aircraft passed directly from factories to centers and were inspected, tested, and accepted by the AAF only when all modifications were completed. This policy, practiced at various times during the whole modification program at centers situated at or very near to the parent factories, was extended after 6 June to all centers operated by the manufacturers. If a center was located at some distance from the factory, the airplanes were flown there under a "conditional acceptance"—that is, they were subjected only to a safe flying check at the factory.[15]

By the middle of 1944, most of the centers were operating under the supervision of the prime contractors. Contractor-management, however, brought with it a decided lack of flexibility so far as available modification capacity was concerned. Consequently, the United Airlines at Cheyenne, the Northwest Airlines at St. Paul, and the Bechtel-McCone-Parsons Center at Birmingham were retained as open-contract facilities under the management of the Materiel Command to provide for the spill-over from the other centers and for the accomplishment of special jobs.[16]

According to the institution in which they were performed, several varieties of technical changes were recognized: (1) the production changes introduced into the factories by the manufacturers, (2) modifications performed in manufacturer-operated centers, (3) modifications accomplished in centers operated by the Materiel Command,

[illegible] (4) Technical Order compliances accomplished in either the [illegible]tories or [illegible] odific tion [illegible] cilities.[17] [illegible] lis[illegible] o its [illegible] reference to [illegible] fact that [illegible] per cent of [illegible] modifications [illegible] accomplished by [illegible] ir Service [illegible] the installations.

In connection with the modifications [illegible] signed to the [illegible] ir Service Co[illegible], it should be noted that on 1[illegible] [illegible] rch 1944 [illegible] eneral [illegible] circul[illegible] that [illegible] of 25 [illegible] rch [illegible] all [illegible] odifications of production aircraft should be accomplished in the [illegible] modification centers and that such [illegible] should no longer be carried on in the depots and sub-depots. [illegible] principal reason [illegible] for th[illegible] change [illegible] that better control could be exercised over the pro[illegible] [illegible] fewer [illegible] ctiv[illegible] [illegible] to perform modifications. The directive was not [illegible][18] to [illegible] to work performed on service aircraft, however. In view of the [illegible] amount of modification work still in progress at the [illegible], the [illegible] to comply with the order involved many consulta-tions between [illegible] ateriel [illegible] and the [illegible] ir Service [illegible] in the course of which it [illegible] that [illegible] on certain [illegible] odification project[illegible] which had been prescribed by the Assistant Chief of [illegible] ir [illegible], [illegible] riel, [illegible], the distribution ([illegible] / [illegible], [illegible]) and [illegible] which the [illegible] odification unit of the [illegible] teriel [illegible] no knowledge. 19
It [illegible] further found that [illegible] ll [illegible] ir Service [illegible] modification projects involving production aircraft would be [illegible] per cent co[illegible]plete on 25 [illegible] rch [illegible] to transfer the [illegible] lications [illegible] involve [illegible] loss of motion. Accordingly, [illegible] ral [illegible] circular [illegible] this order. [illegible] [illegible] ndum [illegible] to [illegible] aircraft modification

scheduling of work at the modification centers and the air depots, [illegible] modifi- cation [illegible] in the past, the procurement dis- tricts [illegible] manufacturers in obtain- ing priorities [illegible] equipment.

[illegible] in 1945 certain modification procedures and concepts were [illegible] recent changes in [illegible] [illegible] by the [illegible] of the Air Technical Service Command, [illegible] modification contractor-[illegible] centers, [illegible] "Modification [illegible] facility, government- or contractor-owned, [illegible] accomplished [illegible] immediate tactical changes in aircraft after [illegible] the production lines and prior to their final delivery. The point at which the factory production line ended and modification began [illegible] determined by the [illegible] representative [illegible] and the contractor. As a general policy, it was stated that the pur- pose of modification facilities was to expedite the delivery of 100- per-cent tactically complete aircraft, but all basic modifications were to be introduced into the factory production lines as rapidly as pos- sible. Four types of modifications were defined: (1) "modification [illegible] type changes" [illegible] improvised "tin snips and stove bolt" alterations performed in centers as distinguished from the more [illegible] production engineering changes; (2) a "basic modification" [illegible] on all future production of a given model, such as [illegible] necessary improvement in a landing gear; (3) a "theater modifica- tion" was an alteration to be effected on all aircraft assigned to a [illegible]

particular theater of operations, such as winterization changes on airplanes for northern areas; and (4) a "special modification" was applicable to a limited number of airplanes being prepared for a highly specialized mission. The installation of weather reconnaissance equipment involved "special modifications."[26]

Modification plans looking to the cessation of the war in Europe were begun as early as the fall of 1944. These plans covered the cancellation of many projects then current, revision of the modification program applying to production aircraft, and special modifications to be performed on aircraft redeployed from the European and Mediterranean theaters to the Pacific.[27] At that time it was considered that changes on aircraft to be transferred from Europe to the Pacific could best be accomplished by service personnel in the European and Mediterranean theaters.[28] Because the European war dragged on somewhat longer than was expected, however, redeployment plans underwent changes.[29] For example, it was directed that all modification required as a result of the redeployment of aircraft to the Pacific would be performed in the United States, with the exception that those P-47's still in Europe would be remodeled at their overseas stations.[30] Two air depots, Sacramento and San Bernardino, were to act as "modification centers" in preparing aircraft for the Pacific theater.[31] The earlier plans to carry out other projects in the European and Mediterranean theaters were canceled apparently because the redeployment schedule provided for a more rapid flow of both men and aircraft out of these

thectors than had been anticipated. In addition to the P-47's receiving modifications in Europe, other P-47's stationed in the United States were ordered to the Evansville Modification Center at the rate of nine per day for automatic pilot installations and other changes.[32] Another important project designed to step up the tempo of the air war over Japan was the planned conversion of 111 F-3's to the photo reconnaissance model F-5G. This work was allocated to the Dallas Modification Center in July 1945.[33] Of perhaps greater importance than any of these projects was the modification of B-29's, which was being pushed through on the highest priorities at the Oklahoma City Air Depot and elsewhere.[34] Work on many of these programs had barely started by 14 August 1945 when the surrender of Japan was announced.

The volume of aircraft passing through the centers decreased sharply during the second half of 1944 as a result both of the cutting back in operations discussed above and of shifting the management of the centers to the contractors and encouraging the contractors to introduce more modifications into their production lines. The total number of AAF aircraft completed by the centers in December 1944 was less than one-fourth the total for June of that year (500 as compared with 2,100), although monthly deliveries of new aircraft from the factories during these months declined only about 3 or 4 per cent. The reduction in operations continued during the first eight months of 1945, and between July and November 1945 all the centers were officially closed down. The grand total of aircraft modified for the AAF during

35

1945 was over 6,500, but this was scarcely one-fourth the 1944 total. As might be expected, the aircraft modified for the Navy as beneficiary 36
government declined considerably, from 5,600 in 1944 to 800 in 1945. The number of aircraft modified at the depots likewise took off beginning in April 1944, although many of the projects carried on in these installations during 1945, especially recur modifications for the B-29, were complicated and difficult. 37 As the modification centers went out of existence one by one at the end of the war, the depots continued to perform the modification of service aircraft just as they had in the years before the war.

Important Modification Projects, 1943-1945

The modification centers and the air depots, as already indicated, together accomplished virtually all the modification work within the 38
continental United States. During the latter part of 1943, in fact, it is estimated that 45 per cent of the total work accomplished in the 39
aero repair departments of the depots consisted of modifications. 40
Some projects, such as the equipping of C-47's with tow brakes and 41
the alterations necessary to increase the range of pursuit aircraft, were allocated both to the modification centers and to the depots. A great variety of other projects was performed exclusively at the depots, however. At Fairfield during 1943, torpedo racks were installed on B-26's and supplemental armor on B-25's. Several B-17's were later converted into photographic airplanes, B-9's, and other airplanes were modified to serve as flying ambulances. In addition, a number of airplanes

[illegible] counterfeited [illegible] otherwise fitted out for the use of various generals.[42] At Middletown, among other projects, 6 B-24's were modified for antisubmarine work.[43] Extensive changes were made in the hydraulic system of 121 B-24's at Mobile between December 1943 and January 1945, and central fire control was installed in 160 B-24's by both Mobile and [illegible] for [illegible] in India in January 1944.[44]

At Ogden and [illegible], many airplanes were winterized, B-25's, P-38's, A-20's, and C-47's, [illegible] the latter except 2 B-25's were [illegible] in the summer of 1943.[45] P-39's were modified for reconnaissance training work in 1943 at San Antonio.[46] Many depots performed [illegible] for [illegible] installations and, in particular, [illegible] for [illegible] Oklahoma City.[47] Other [illegible] important [illegible] projects, including modification of [illegible] series, were accomplished at San Antonio.[48]

[illegible] of the projects came to be of great importance to the progress of the air war during the period 1942–1945 and thus deserve more [illegible] treatment. In particular, the development of desert-proofing modifications was essential to the successful air war in North Africa during the first months of 1943, the [illegible] program was of the [illegible] value to the strategic bombing of Germany, and combat [illegible] modified to serve as photographic [illegible] were indispensable in both the European and the Pacific theaters of operations.

<u>Desert-proofing Modifications.</u> The term "[illegible] temperature operations" [illegible] not [illegible] [illegible] [illegible] [illegible] [illegible] the modification [illegible] for [illegible] [illegible] [illegible] [illegible], such as North

initiated on 4 April 1942.[53] Other means of increasing range was explored, but the most important means for fuel capacity increases was jettisonable fuel tanks. The larger fuel tanks and fittings for jettisonable tanks were installed by the modification centers rather than built into the aircraft at the factory because the modification center therefore could more readily be removed should the need arise.

By 1943, it was considered that the long range extension program was the most important modification project being handled by the Materiel Command.[54]

> Our bombers are being called upon to make deeper daylight penetrations into industrial and military Germany, and these bombing attacks are being resisted by everything at the disposal of the German High Command, the most effective of which is defensive fighters. We must provide our fighters with sufficient fuel to enable them to accompany the bombers, to provide a protective umbrella of fighters. . . . Thus our bombing attacks can be made more devastating upon the enemy.

Modifications were developed to extend the range particularly of the P-51, P-38, and P-47. Measures included an increase in the integral, self-sealing fuel capacity of all three aircraft, and the development and production of pressurized, jettisonable, constant-run extension fuel tanks. In addition, the P-47's were equipped with wing-suspended bomb shackles of a type which permitted interchange of 150-gallon tanks with P-38's.[55] In this connection, it was reported that the dual droppable-tank feature of the P-38 has proved extremely valuable. On long flights two gas tanks were carried, for medium-length flights one tank and a 1000-pound bomb, and for short flights two 1000-pound bombs. The tactical advantages of this

flexibility was obvious. P-47's, Thunderbolt fighters, equipped with 75-gallon auxiliary gasoline tanks, were likewise badly needed for escorts in October 1943. [56] As the modification program continued, all standard modifications were incorporated into production lines as soon as practicable. Those of a special nature for a small block of aircraft were considered "theater" changes and performed at modification centers. To keep up with the heavy schedules, fifteen airplanes were modified simultaneously in nine centers. [57]

Photographic Modifications. The modification of aircraft to be used for photographic purposes was another important project. In July 1942, it was directed that the B-26's, B-25's, and B-34 airplanes be modified to accommodate special camera installations. Photo changes were to be introduced into the production lines as soon as possible. Other aircraft to receive camera modifications were the P-38, P-40, and P-51, each requiring a specific type of installation depending on the use for which it was intended. Once they had been converted into photo graphic reconnaissance models, these aircraft were given a new designation. Thus, the modified P-40 became the F-3, the P-51 the F-6, the P-24 the F-7, the B-17 the F-9, and the B-25 the F-10.

The modification of reconnaissance aircraft continued to be accomplished both in the factories and in the modification centers, and some installations were made in the field. That is, the necessary mounts and wiring were incorporated in the aircraft. Very often the cameras themselves were not immediately available and had to be shipped to

[illegible] sand and dirt [illegible] of the [illegible]

[illegible] used [illegible] (1) [illegible] or [illegible] (2) [illegible] fabric [illegible] would [illegible] fabric [illegible]

[illegible] it [illegible] 0.003 inch [illegible] sufficient for all [illegible]

[illegible] in 194[illegible], it [illegible] without air filters [illegible]

[illegible] [illegible] air [illegible], air [illegible], [illegible] or [illegible] [illegible], [illegible] [illegible] air [illegible], oil cool[illegible] air [illegible], and [illegible] [illegible]. [illegible] [illegible] in [illegible], the [illegible] of [illegible] air [illegible] than [illegible] [illegible] [illegible] to [illegible] the [illegible] [illegible] [illegible] [illegible].[50] [illegible] [illegible] resulted in [illegible] [illegible] aircraft [illegible], [illegible] [illegible] [illegible], so [illegible] [illegible] that air [illegible] [illegible] [illegible] were to be provided for all aircraft [illegible], [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] first [illegible]. [illegible] [illegible] air [illegible] [illegible] [illegible] [illegible] [illegible] in [illegible], [illegible] of [illegible] [illegible] to [illegible] [illegible] [illegible] [illegible] modification centers until such time [illegible] [illegible] in [illegible] [illegible] [illegible] [illegible] [illegible] or [illegible] in production [illegible]. [illegible] aircraft [illegible] for use in desert [illegible] [illegible] not [illegible] [illegible] air [illegible] [illegible] [illegible] [illegible] to [illegible]. [illegible], [illegible] [illegible] [illegible] [illegible] [illegible] were [illegible] in [illegible] aircraft. [illegible] cont[illegible] [illegible] [illegible] to the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].[51]

[illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] for [illegible] [illegible] air[illegible] in the [illegible] [illegible] [illegible]. [illegible] from the various the[illegible] of [illegible] [illegible] [illegible] for [illegible] aircraft [illegible] [illegible] [illegible] conference in [illegible] [illegible]'s office [illegible] 1942, [illegible] shortly thereafter research on the problem was [illegible] [illegible] [illegible].[52] [illegible] [illegible] [illegible] [illegible] [illegible] formally

initiated on 1 April 1942.[53] Other means of increasing range were explored, but the most important were fuel capacity increases and jettisonable auxiliary fuel tanks. The larger fuel tanks and fittings for jettisonable tanks were installed by the modification centers rather than built into the aircraft at the factory because the modification center changes could more readily be removed should the need arise.

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The modification of reconnaissance aircraft continued to be accomplished both in the factories and in the modification centers, and some installations were made in the field. That is, the necessary mounts and wiring were incorporated in the aircraft. Very often the cameras themselves were not immediately available and had to be shipped to

foreign countries where they were to be used.[58]

Later Modification Problems

The expansion of the modification program in 1943 and subsequent developments were attended by numerous difficulties of which only a few could be treated in the foregoing discussion. One important problem was that of improving the quality of both the workmanship and the inspection in the modification centers. Deficiencies in these matters were attributed to a lack of sufficiently trained, competent personnel for the rapidly expanding program.[59] Training courses for aircraft inspectors and interservice coordination of inspection methods were initiated by the Materiel Command in an effort to remedy the difficulty. At the same time, the Materiel Command protested that to ascribe all technical failures and shortcomings in completed aircraft to the modification centers was unjustified inasmuch as many of these deficiencies could be traced to poor maintenance, inexperienced pilots and operating personnel, and similar factors.[60] Further, it was unrealistic to expect the aircraft inspectors, the majority of whom had had less than one year's experience, to detect all flaws in workmanship.[61]

The second problem, a perennial difficulty in the modification program, was the slowness with which aircraft were completed and delivered to the using organizations. It was recognized that, to expedite the completion of aircraft, the number of authorized changes to be performed in the factories and centers would have to be subject to stricter control than that exercised by the Director of Military

[illegible]-52

requirements. Several measures were inaugurated in the effort to reduce the number of changes. During 1943, for example, requests for changes coming from the several directorates in AAF Headquarters were reviewed and screened by a committee set up by the Materiel Command. This committee was composed of technical representatives of the Engineering Division, the Production Division, the [illegible] Aircraft [illegible] [illegible]. 63 Another measure to restrict the [illegible] of modifications was taken in September 1943 when the Chief of the Air Staff directed that all requests for such changes be authorized by his office and, further, that production changes on all aircraft be frozen. 64 A month later, the freeze order was revised so that it [illegible] production changes which were specifically authorized by the Deputy Chief of Air Staff. 65

That the control measures just outlined did not expedite the delivery of fully modified aircraft to the combat theaters to the satisfaction of all concerned is indicated by the fact that, as late as [illegible] 1945, the [illegible] of the [illegible], [illegible] [illegible], Committee [illegible] [illegible] (CO[illegible]) attempted to collaborate on a system of [illegible] priorities. [illegible] 66 [illegible] tion centers were closed before [illegible] could be [illegible] best.

Not only the number of alterations to [illegible] but also the [illegible] with which many modifications [illegible] in modification centers [illegible], in [illegible], in the [illegible] of [illegible]

flying

Center

[illegible] in [illegible] criticism [illegible] such estimates [illegible].[69] [illegible] director of [illegible] [illegible] to [illegible] [illegible], in [illegible] [illegible] orders [illegible] due to [illegible] difficulty [illegible] to [illegible] aircraft to the various [illegible].[70] This view was corroborated [illegible] report of 4 April 1943 to [illegible] instruction [illegible] to the [illegible] to the Air Force [illegible] which [illegible] 1,175 aircraft [illegible] [illegible] such information, [illegible] to the main [illegible].[71]

[illegible] the [illegible] in the [illegible] more rapidly than the production of [illegible] aircraft. [illegible] difficulty of the more recent [illegible] in [illegible] production [illegible].[72] [illegible] could not be [illegible] fair index to the efficiency of [illegible].[73]

During 1944, in addition to the continuing [illegible] discussed [illegible], some difficulty arose over the [illegible] to continue the [illegible] of all production aircraft to the [illegible] such [illegible] entirely [illegible] reduced [illegible] specification [illegible] first [illegible] for [illegible] effective [illegible] control of the [illegible].

whole program. As already pointed out, however, it was found that the air depots were heavily committed and the work load still too great to allow full compliance with this directive.

Redeployment and demobilization programs pertaining to modification were worked out during the latter part of 1944 and the early months of 1945. To some extent, however, these plans were invalidated by the fact that they were based on erroneous conceptions as to the duration of both the European and the Japanese wars.

Chapter V

C[illegible]

It is not too much to say that on the success of modification depended the fate of the entire aircraft production program of World War II. That is, mass production methods, the prime requisite of which is stability of design, were possible only because, beginning where the assembly lines left off, there were industrial facilities flexible enough to tailor the necessary improvements and changes in the finished aircraft. [illegible], the aircraft which reached the combat theaters in mass production quantities were fitted with the latest equipment and [illegible] otherwise altered in accordance with the climate, the [illegible] to be flown, and the [illegible] of the [illegible] who flew them [illegible].

At various times during the period 1942-1945, there were 20 [illegible] modification centers [illegible]. The centers varied widely in capacity, the largest, the [illegible] Birmingham Center, employing over 4,[illegible] persons at its peak in April 1944.[1] During the period 1942-1945 a grand total of nearly [illegible],000 aircraft underwent modifications, of which number [illegible], or [illegible] per cent, [illegible] for the [illegible] and the remainder [illegible] for the Navy [illegible] [illegible] facilities [illegible] [illegible] to [illegible] per cent of the [illegible] during 1944 [illegible] aircraft which [illegible] production [illegible]

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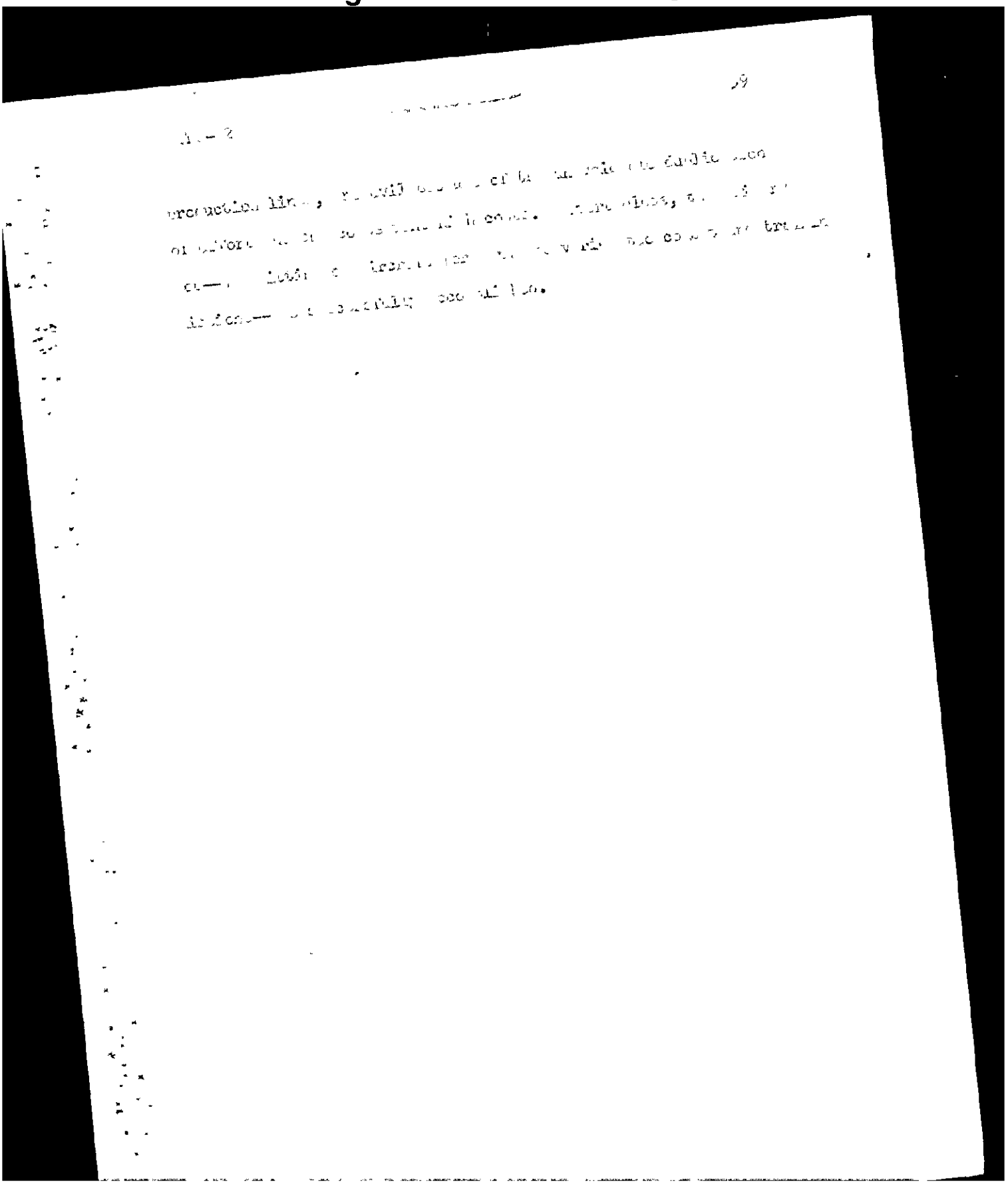

Glossary

AF	Army Air Forces
AG	Air Adjutant General
AC/S	Assistant Chief, Air Staff
Asst.	Assistant
AFHRA	Archives, Air Historical Office
AG	Adjutant General
Amph	Amphibian
ASC	Air Service Command
AS/W	Assistant Secretary of War
ATSC	Air Technical Service Command
CAA	Civil Aeronautics Administration
CAC	Chief, Air Corps
CAS	Chief, Air Staff
CFE	Contractor Furnished Equipment
CG	Commanding General
C/S	Chief of Staff
CTI	Confidential Technical Instruction
DC/AS	Deputy Chief of Air Staff
DC/S	Deputy Chief of Staff
DMR	Director of Military Requirements
Exec.	Executive
FAD	Fairfield Air Depot
GFE	Government Furnished Equipment
GHQ Air Force	General Headquarters Air Forces

Mat.	Material
MC	Materiel Command
Mil. Req. Pol.	Military Requirements Policy
MM&D	Materiel, Maintenance, and Distribution
MS	Materiel and Services
OC/AC	Office, Chief of Air Corps
OC&R	Operations, Commitments, and Requirements
OPM	Office of Production Management
Prod.	Production
Req.	Requisitions
S/W	Secretary of War
TAG	The Adjutant General
TAI	The Air Inspector
Tech.	Technical
TI	Technical Instruction
TO	Technical Order
TSCF	Central Files, Air Technical Serv. Comd., Wright Field
TSM	Maintenance Division, Air Technical Service Command, Wright Field
[illegible]	[illegible]
[illegible]	War Production Board

NOTES

Chapter I

1. In the earlier directives, the term "remodeling" was often used synonomously with "modification." (See Air Service Circular 65-11, 9 Jan. 1926). In Air Corps Circular 65-11A, 29 Sep. 1930, "remodeling" is defined as "the operation of changing the structure of equipment so as to produce a different type or model."

2. See the brief account of modification in "AAF Biennial Report 1941-1943," pp. 51-52, in AFSHO.

3. "The Procurement Division Modification Program," lecture by Maj. B. Kinsey, Jr., and J.V.C. Gregory, in AFSHO.

4. Ibid.

5. The very extensive modifications required by the B-29 and its R-3350 engines are not treated here inasmuch as a full discussion of the subject is available in AFSC Historical Monograph, The History of Supply, Maintenance, and Training for the B-29, in AFSHO.

6. See AAF Reg. 15-50, 21 Oct. 1943.

7. TO 01-90KB-13, 9 July 1943.

8. See the AFSC Historical Monographs, History of the Operation of the Unsatisfactory Report System in the AAF, 1939-1945, and A History of Technical Publishing by the Air Service Command--Air Technical Service Command, 1923-1944, in AFSHO.

9. Most of the other widely used aircraft engines, however, required relatively few changes during World War II, inasmuch as they had been developed and refined much earlier than the R-3350.

10. See AFSC Historical Monograph, The History of Supply, Maintenance, and Training for the B-29.

11. AAF Reg. 65-30, 11 April 1944. See also the publication, Model Designations Army Aircraft, 11th ed., January 1945, for the modifications that distinguished the blocks and series of aircraft of each model. For example, there were eight different series of B-17 airplanes, as indicated by the letter designations "A" through "G." For the B-17F series alone, 53 separate blocks or groups of modifications were performed, and for the B-17G series, 48 different blocks. (Contd.)

11. (Contd.) In addition it was proposed that B-17's modified to carry lifeboats for air rescue missions be given a special designation, (Col. ... Chief, Maint. Sec., AC/AS, ..., to Dir., ...-17. (Col. ... 15 Feb. 1945, in AAG 452.1, Boeing B-17 Airplane.) The B-17 received more modifications than any other AAF airplane. Naval aircraft were likewise given designations according to modifications. Major modifications were indicated by dash numbers, specific minor modifications by suffix letters. Thus, the designation F6F-5N referred to the fifth major modification of the Grumman Hellcat (F6F) fitted with night-fighter radar (N).

12. Interoffice memo for Fld. Serv. Sec., OC/AC by Maj. ... Chief, Fld. Serv. Sec., Mat. Div., 6 Dec. 1939, in AAG 452.1, Conversion and Alteration of Planes.

13. The theaters, commands, and special missions for which these airplanes were prepared were as follows: (1) Caribbean, (2) Northwest African, (3) United Kingdom, (4) North Africa, (5) Northeast Army, (6) Middle East, (7) Australia, (8) New Caledonia, (9) Hawaii, (10) Antisubmarine Command, (11) Western Defense Command, (12) Operational Training Units and Replacement Training Units, and (13) Alaska.

14. TI 1500, ... No. 1, 26 April 1943, in AAG 452.1, North American B-25 Airplane.

15. "The Procurement Division Modification Program," lecture by Maj. ... ..., Jr., and J.W.C. Gregory, in ...

[illegible] FHO-62

NOTES

Chapter II

1. Maj. Gen. Charles T. Menoher, Dir., Air Serv. to Hon. Benedict Crowell, A/S, 24 Dec. 1919, in AG 452.1-17, Manufacture of Airplanes.

2. "Report of American Aviation Mission," reprint from Aircraft Journal, 23 Aug. 1919, in AFSHO.

3. [illegible], Prod. Div., Ordnance and Instrument Br., Photographic Sec., Bureau of Aircraft Production, 7 Dec. 1918, in [illegible] 452.33, Camera.

4. [illegible]

5. [illegible] aerial [illegible]

6. [illegible]

7. [illegible] G [illegible] 19[illegible], in ibid.

8. [illegible] 1921, in ibid.

9. Dir., [illegible] in ibid.

10. [illegible]

NOTES

Chapter III

1\. [illegible] Anglo-French [illegible] Commission, [illegible] 1940, in [illegible] 452.1-[illegible], [illegible] of [illegible].

2\. Memo for [illegible] Gen. H. H. Arnold, [illegible] by Brig. Gen. George V. Strong, Chief, [illegible] Div., 20 [illegible] 1940, in ibid. [illegible] policy [illegible] manufacturer, but no [illegible] criticized [illegible] consolidated [illegible] from [illegible] to the President of the United States, [illegible] 1940, in ibid.

3\. [illegible] Gen. Oliver P. Echols to [illegible] Gen. Geo. V. Strong, Chief, [illegible] Div., [illegible] 1940, in ibid.

4\. [illegible] by Brig. Gen. George V. Strong, Chief, [illegible] Div., for Maj. Gen. H. H. Arnold, C/S, 9 May 1940, in ibid.

5\. [illegible] to Chiefs of all [illegible] of [illegible] Gen. Staff, etc., 29 March 1940, [illegible] 452 (3-27-40) [illegible], in ibid.

6\. [illegible] Brig. Gen. George V. Strong attended a conference between the Anglo-French [illegible] Commission and the Curtiss Co. on 10 April 1940. ([illegible] for Col. [illegible], Office of [illegible] by Brig. Gen. Geo. V. Strong, Chief, [illegible] Div., 11 April 1940, in ibid.)

7\. Memo for C/S, by [illegible] Gen. H. H. Arnold, C/S, 17 [illegible] 1940, in ibid.

8\. Sir Henry Self, British Purchasing Commission to all aircraft [illegible], 9 July 1940, in ibid.

9\. Memo for [illegible] Gen. H. H. Arnold, [illegible] by Brig. Gen. Oliver P. Echols, Chief, [illegible] Div., [illegible] 1940, in [illegible] 452.1-32951, Sale of Planes Abroad. British [illegible] installed because of the reluctance of the United States Government to [illegible] at that time.

10\. [illegible] British Air Commission to Col. [illegible] Army and Navy Munitions Board, 31 March 1941, in [illegible] 452.10, Sales of Planes Abroad.

11\. [illegible] to Fld. Serv. Sec., [illegible], 16 Nov. 1940, in [illegible] 452.1-32951, Sale of Planes Abroad.

12. Memo for Chief, AAF by Maj. Gen. [illegible], Acting C/AS, 23 Jan. 1942, in AAG 452.1-51, Conversion and Alteration of Planes. See also Memo for C/AC by Lt. Col. [illegible] Whitney, Asst. [illegible] C, 13 Feb. 1942, in ibid.

13. Rpt. 41,673, U.S. Military Attaché, London, [illegible] April 1940, in Air Intel. Lib., "England 9,510."

14. Memo for C/S by President Roosevelt, 19 Jun. 1941, in AAG 323.7, Modification Centers. Just previously, however, Edward Warner of the Civil Aeronautics Board recommended that all modifications be accomplished in the United States. (Edward Warner, Civil Aeronautics Board to Maj. Gen. H. H. Arnold, Chief, AAF, 2 June 1941, in AAG 452.1-4, Using, Leasing, Maintaining, Operating Airplanes.)

15. Several overseas depots were set up by the Lockheed Overseas Corporation and the Douglas Aircraft Corporation late in 1942 and early in 1943. In addition, much modification work was performed by the maintenance activities of the various overseas air forces.

16. Merrill C. Meigs, Chief, Aircraft Br., OPM to Lt. Gen. H. H. Arnold, C/AC, 15 Jan. 1942, in AAG 452.1-[illegible], Sale of Planes Abroad; Brig. Gen. Oliver P. Echols, Asst. for Procurement Serv. to Mr. Merrill C. Meigs, Chief, Aircraft Br., OPM, 16 Jan. 1942, in ibid.; Air Marshal Roderic Hill, British Air Commission to Col. Bennett E. Meyers, CO/AC, 19 Jan. 1942, in AAG 452.1G, Sale of Planes Abroad.

17. The Materiel Division was able to reply to Brig. Gen. O. P. Echols' request that the need for such a plan had been anticipated and that it was already in progress. [illegible], Exec. to Maint. Div., 10 Jan. 1942, in [illegible] 635, Modification Centers.

18. Interview by Capt. [illegible] Ackerman with G. [illegible] Harley, Tech. Asst., Maint. Div., ASC, 20 Dec. 1945.

19. Memo for C/AS by Brig. Gen. O. P. Echols, Asst. for Procurement Serv., 15 Jan. 1942, in AAG 323.7A, Modification Centers.

20. R&R, Col. H. L. Boatner, Chief, Aircraft Modification Sec. to Chief, Prod. Resources Sec., 26 Feb. 1943, in AAFCD 635, Modification Centers.

21. Memo for Chief, Maint. Div. by Col. B. E. Meyers, Exec., 18 Jan. 1942, in ibid.

22. See the complete list of modification centers, together with dates of establishment and of closing, in App. 5, this study.

23. Col. . . . Crawford, C/S, Mat. Center to Chief, Factory Sec., Aircraft Prod. Div., ..., 23 Nov. 1942, in ... 635, Modification Centers.

24. Col. O. ... Cook, Chief, Prod. Eng. Sec. to Boeing Aircraft Corp., 27 July 1942, in ibid.

25. ..., Col. O. ... Cook, Chief, Prod. Eng. Sec. to Chief, Industrial Planning Sec., 12 Au . 1942, in ibid.

26. See complete list of modification centers in App. ., this study.

27. C.I 477, 13 Feb. 1942, in ... 635, Modification Centers.

28. Memo for C/S by ... Sec., AC/AS, 7 Feb. 1942, in ibid.; Brig. Gen. ... ..., Chief, Prod. ... Div., to Chief, Industrial Planning Sec., 11 March 1942, in ibid.

29. ... Historical Study No. 10, Organization of the Army Air Arm, 1935-1945, p. 63, in ....

30. Col. H.C. ...urber, Russian Modification Committee to CG, ..., ... 1942, in ... 452.08, Modification.

31. See pp. 28-30, this study.

32. ... of the project officers ... Air Carrier Maintenance Inspectors who had been assigned to the Special Projects Branch by the Civil Aeronautics Administration. Asst. ... Sec., Mat. Div. to Acting Administrator, C..., Dept. of Commerce, 15 Jan. 1942, in ... 5..., Modification Centers; Acting Deputy Administrator, C..., Dept. of Commerce, to C/S, 31 Jan. 1942, in ibid.

33. ... Office Memo ..., Technical Executive, 4 June 1942, in ... 635, Modification Centers.

34. See p. 1, this study.

35. Ibid.

36. Interview with Lt. Col. L.. Cook, Serv. ... Sec., ..., ... 1945.

37. Interoffice memo for CG, Mat. Center by Chief, Contract Sec., 7 ... 1942, in Wright Field, Modification Control Unit files, Modification Centers, Vol. II; ..., Chief, Procurement Div. to Chief, Prod. Div., 7 Jan. 1943, in Wright Fld. Contractors' files 635, Modification Centers.

38. AAF Reg. 95-15, 1 Aug. 1942. The Air Service Command role in the modification program is discussed later in this chapter.

39. Col. A. M. Crawford, C/S, Mat. Center to Chief, Factory Sec., WPB, 25 Nov. 1942, in TSAGD 635, Modification Centers.

40. See complete list of airplanes and permanent modification centers, App. 5, this study.

41. Maj. Gen. M. S. Fairchild, Dir. of Military Requirements to CG, MC, 6 Sep. 1942, in Modification Control Unit files, Modification Centers, Vol. III.

42. Interview with J.V.C. Gregory, Modification Control Unit, May 1945.

43. Telephone transcript, Lt. Col. O. R. Cook, Serv. Eng. Sec., MC/and Maj. E.H.S. Russel, Central Procurement Dist., 16 Jan. 1942, in TSAGD 635, Modification Centers.

44. Brig. Gen. H. H. Wolfe, Chief, Prod. Div. to AAF Resident Representative, United Nations Modification Center, Cheyenne, 28 Sep. 1942, in TSAGD 452.1, Modification Centers.

45. Interoffice memo for all Branch Chiefs, Prod. Eng. Sec. by Chief, Prod. Eng. Sec., 10 Dec. 1941, in ibid.

46. Interoffice memo for CG, MC by Brig. Gen. A. W. Vanaman, CG, Mat. Center, 20 June 1942, in AAG 452.1, Modification Centers.

47. R&R, Brig. Gen. M. S. Fairchild, DMR to CG, MC, 28 June 1942, in ibid.

48. Field Office Memo 22-1, 1 Nov. 1943, in TSAGD 635, Modification Centers.

49. R&R, Maj. Gen. M. S. Fairchild, DMR to Brig. Gen. B. E. Meyers, Exec., Mat. Div., 5 Sep. 1942, in AAG 300.6, Codes and Memoranda.

50. Interview with J.V.C. Gregory, Modification Control Unit, May 1945; R&R, Brig. Gen. M. S. Fairchild, DMR to CG, MC, 13 May 1942, in AAG 452.1, Modification Centers.

51. Air Marshal, British Air Commission to CG, MC, 23 July 1942, in AAG 452.1, Modification Centers.

52. Interview with Lt. Col. L. V. Cook, May 1945.

53. Col. G. V. Gaffney, Ladd Fld. to Maj. Gen. G. E. Stratemeyer, Office, Chief, AAF, 15 Dec. 1942, in AAG 452.1, Modification Centers.

54. T.X, Prod. Eng. Staff to C/S, AC, 1 Sep. 1942, in TSAGD 400.112, Winterization, 1940-1944.

55. CTI 893, 9 Sep. 1942, in TSAGD 400.112, Winterization, 1940-1944.

56. Ltr, Actg. C/AS to all branches, 19 Sep. 1942, in TSAGD 400.112, Winterization, 1940-1944.

57. T.X, Chief, Prod. Eng. Sec., to Dist. Supvrs., 21 Sep. 1942, in TSAGD 400.112, Winterization, 1940-1944.

58. Interoffice memo for Maj. Gen. O. P. Echols, CG, AC by Brig. Gen. K. B. Wolfe, Chief, Prod. Div., 11 May 1942, in AAG 452.1, Modification Centers.

59. Memo for Asst. Tech. Exec., Washington, D. C., by Asst. Tech. Exec., Wright Fld., 30 Dec. 1942, in TSAGD 635, Modification Centers.

60. The charge was once made, however, that there was a wastage amounting to as much as 90 per cent in modification kits produced and forwarded to the theaters of operation to modernize older aircraft. Daily Diary, AC/AS, P&S, Air Serv. Div., 1 Jan. 1945, in AFHRO.

61. Interviews by Capt. A. J. Ackerman with Lt. Col. L. V. Cook, formerly of Special Projects Sec., AC, 20 Dec. 1945, and Maj. R. T. Puffer, Chief, Aircraft Scheduling and Special Projects Unit, ATSC, 19 Dec. 1945.

62. See Chap. IV, this study, for a discussion of depot modifications dating from 1943 and 1944.

63. See AAF Historical Study: No. 51, The Maintenance of Army Aircraft in the United States, 1939-1945, in AFHRO.

64. Memo for CG, AAF by Brig. Gen. Bennett E. Meyers, CG, Mat. Center, 28 Aug. 1942, in AAG 452.1, Modification Centers.

65. T.X, Brig. Gen. J. H. Doolittle, ATC, Morrison Fld. to Brig. Gen. K. B. Wolfe, Mat. Center, 9 July 1942, in TSAGD 635, Modification Centers.

66. T.X, Brig. Gen. K. B. Wolfe, Chief, Prod. Div. to AC/AS, 4 July 1942, in ibid.

67. Interoffice memo for Chief, Special Projects Br. by Prod. Eng. Sec., 19 Jun. 1942, in Wright Fld. Modification Unit files, Modification Centers, Vol. II.

68. Thus, the Directorate of Technical Services was reminded that requests for modifications were to be coordinated with the Directorate of Military Requirements. R&R, Brig. Gen. M. S. Fairchild, DMR to Col. E. G. Greene, Dir. of Tech. Serv., 27 April 1942, in AAG 452.1-5, Conversion and Alteration of Planes.

69. As late as October 1942, General Fairchild believed that modification work would decrease shortly as modifications were introduced into the production lines. Maj. Gen. M. S. Fairchild, DMR to CG, MC, 28 Oct. 1942, in ibid.

70. R&R, Col. B. L. Boatner, Chief, Special Projects Sec. to CG, MC, 7 Jan. 1943, in TSAGD 452.1, Modification Centers.

71. R&R, Col. A. M. Crawford, C/S, Mat. Center to Chief, Factory Sec., Prod. Div., 28 Nov. 1942, in TSAGD 635, Modification Centers, Hangars.

72. R&R, Col. B. L. Boatner, Chief, Aircraft Modification Sec. to Chief, Prod. Resources Sec., 26 Feb. 1943, in ibid.

73. These difficulties are discussed more fully in Chap. IV, this study.

74. T.X, Brig. Gen. J. H. Doolittle, ..TC, Morrison Fld. to Brig. Gen. K. B. Wolfe, Mat. Center, in TSAGD 635, Modification Centers, Hangars.

75. Col. B. L. Boatner, Chief, Special Projects Br. to CG, Mat. Center, 17 Oct. 1942, in ibid.

76. Brig. Gen. M. S. Fairchild, DMR to Col. B. L. Boatner, Chief, Special Projects Br., 14 July 1942, in ibid.

77. Memo for C/AS by Brig. Gen. B. E. Meyers, 4 Sep. 1942, in AAG 323.3, Modification Centers.

78. R&R, Col. D. L. Hutchinson, Chief, Prod. Control Sec. to Chief, Special Projects Sec., 6 Nov. 1942, in TSAGD 452.1, Modification Centers.

79. Interoffice memo by Brig. Gen. K. B. Wolfe, Chief, Prod. Div., 18 Oct. 1942, in TSAGD 635, Modification Centers.

80. The Director of Bombardment stated that the modification centers were not performing their mission satisfactorily. Interoffice memo for Brig. Gen. M. S. Fairchild, DMR by Dir. of Bomb., 12 July 1942, in ibid.

81. Brig. Gen. M. S. Fairchild, DMR to Col. B. L. Boatner, Chief, Special Projects Br., 14 July 1942, in ibid.

82. Memo for C/AS by Brig. Gen. B. M. Meyers, 4 Sep. 1942, in AAG 323.3, Modification Centers.

83. Memo for CG, AAF by Brig. Gen. B. E. Meyers, CC, Mat. Center, 28 Aug. 1942, in AAG 452.1, Modification Centers.

84. H&R, Brig. Gen. Muir S. Fairchild, DCS to Brig. Gen. B. M. Meyers, 5 Sep. 1942, in AAG 300.6, Codes and Memoranda.

85. H&R, TAI to C/S, Hq., AAF, 22 Dec. 1942, in AAG 323.3, Modification Centers.

NOTES

Chapter IV

1. The supervisory units at the Materiel Command were given different names from time to time:

Special Projects Branch, Production Engineering Section	1 Jan. 1942
Special Projects Section	19 Oct. 1942
Aircraft Modification Section	1 Feb. 1943
Aircraft Modification Branch, Production Engineering Section	19 June 1943
Modification Control Section	10 May 1944
Modification Control Unit	11 June 1944

2. Memo for Chief, Special Projects Sec. by Asst. Chief, Special Projects Sec., 22 Jan. 1943, in TSAGD 452.1, Modification Centers.

3. R&R, Col. B. L. Boatner, Chief, Aircraft Modification Center to Chief, Prod. Resources Sec., 26 Feb. 1943, in TSAGD 635, Modification Centers.

4. Members of the committee: Carl A. Cover of Douglas Aircraft Co., Inc., Chairman; John L. Atwood of North American Aviation, Inc.; Ralph S. Damon of Republic Aviation Corp; Charles A. Perelle of Vultee Aircraft, Inc.; Harry T. Rowlands of Northwest Airlines; Maj. Gen. Oliver P. Echols; Brig. Gens. Bennett E. Meyers, Arthur W. Vanaman, and Kenneth B. Wolfe; and Cols. Bryant L. Boatner, A. D. Eckert, and J. H. Sessums.

5. Report of Special Committee on Airplane Modification to Chief, Materiel Command, 4 Feb. 1943, in TSAGD 635, Modification Centers.

6. TI 1443, 12 Feb. 1943, in AAG 004.03, Output, Capacity, and Facilities, Misc.

7. Col. B. L. Boatner, Chief, Aircraft Modification Sec. to District Supervisors, 22 Feb. 1943, in TSAGD 635, Modification Centers.

8. R&R, Comment No. 1, Lt. Gen. H. H. Arnold, CG AAF to Maj. Gen. O. P. Echols, AC/AS, M&D, 22 Feb. 1943, in files of AC/AS, L&S, Prod. and Eng. Br., Modification Sec.

9. Ibid., Comment No. 2, Maj. Gen. O. P. Echols to Lt. Gen. H. H. Arnold, 26 Feb. 1943.

10. Full statistics are given in Apps. 1 and 2, this study.

11. See App. 2, this study.

12. In 1945, it was considered that to incorporate all but two modifications of a given airplane in the production line--installation of chemical tanks and of AN/APS-13 radar tail warning equipment--would result in a saving of approximately three weeks in the delivery of the complete airplane. Daily Activity Report, AC/AS, P&S, 1 Feb. 1945, in AFSHO.

13. A complete airplane was defined as one meeting all requirements of the applicable specifications, change orders, and Technical Order Compliances, and including all equipment, both loose and installed. Brig. Gen. O. P. Cook, Chief, Prod. Div. to all Procurement District Supervisors, 24 April 1944, in TSACD 452.1, Modification Centers.

14. Ibid.

15. Ltr, Lt. Col. J. . Delaney, Comptroller to Brig. Gen. L. R. Crawford, C/S, WC, 17 June 1944, in TSACD 635, Modification Centers.

16. "The Procurement Division Modification Program," lecture by Maj. B. Kinsey, Jr., and J.V.C. Gregory, in AFSHO.

17. Fld. Office Memo 152-2, 6 June 1944, in TSACD 452.1, Modification Centers.

18. Ltr, Gen. H. H. Arnold to CG, AC, 10 March 1944, in ibid. This directive was preceded by correspondence between Generals Arnold, Giles, and Echols, in which General Arnold stated that the modification situation was badly obscured by the fact that such work was being accomplished at modification centers, air depots, subdepots, and even in the squadrons. Rad., Gen. H. H. Arnold to AC/AS, [illegible], 13 March 1944, and succeeding comments, in AAG 452.02, Modification.

19. Maj. Gen. Charles E. Branshaw, DC, AC to AC/AS, [illegible], 19 March 1944, in ibid.; Col. T. [illegible] Sims, DC/S, AC to District Supervisors, 19 March 1944, in ibid. Special radio and radar installations involving only a few planes, according to Maj. J.C. Good of Hq. AAF.

20. Ltr, Col. T. [illegible] Sims, DC/S, AC to Col. [illegible] Bradley, Prod. Engr. Div., 25 March 1944, in ibid.

21. Office Memo 42, 26 April 1944, in TSACD 321.9, [illegible], Washington.

22. In a conference held on or about 16 May 1944, it was stated that the aim of the Air Service Division had been to keep depot modification work to a minimum and that, in fact, there had been some reduction of depot modifications. Daily Diary, AC/AS, M&D, Air Serv. Div., 16 May 1944, in AFSHO.

23. AAF Historical Monograph, The History of Supply, Maintenance, and Training for the B-29, in AFSHO.

24. Aircraft Sub-Section Office Instructions 20-2, 15 Jan. 1945, in AFSHO.

25. Fld. Office Memo 152-2, 6 June 1944, in TSACD 452.1, Modification Centers.

26. ATSC Reg. 152-3, 24 Feb. 1945.

27. Daily Diary, AC/AS, M&S, Air Serv. Div., 15 Sep. 1944, and 19 Sep. 1944, in AFSHO. See also "V-E Day Planning, ATSC Procurement District," in Modification Control Unit files.

28. Daily Diary, AC/AS, M&S, Air Serv. Div., 3 Oct. 1944, in AFSHO.

29. One change, administrative in nature, was that the Chief of Management Control, ATSC was charged with over-all supervision of redeployment, demobilization, and postwar planning. Maj. Gen. Elmer E. Adler, Chief, Management Control, ATSC to CG AAF, 15 May 1945, in AAG 452.02, Modification.

30. Ibid.

31. See Depot Maintenance Activity Report, June 1945, in AFSHO.

32. Special Mail Pouch Message, Procurement Div., Hq., ATSC to CG AAF, 7 Mar. 1945, in AAG 452.02, Modification.

33. R&R, Col. J. A. Gibbs, Chief, Aircraft Projects Br., AC/AS, M&S to AC/AS, C&R, 6 July 1945, in ibid.

34. See ATSC Historical Monograph, The History of Supply, Maintenance, and Training for the B-29.

35. Ltr., Brig. Gen. D. C. Swatland, Chief, Procurement Div., ATSC to TSLTM, 28 Aug. 1945, in TSACD 635, Modification, General. See also Apps. 3 and 4, this study.

36. Apps. 3 and 4, this study.

37. Col. C. G. Jensen, Office, AC/AS, M&S to E. T. Cummins, Asst. Chief, War Projects Unit, Bureau of the Budget, 2 Feb. 1945, in AFSHO.

38. There were some exceptions. The Third Air Force, for example, performed radar modifications on 25 B-17's in 1945. (Col. D. C. Doubleday, Chief, Eng. Br., Mat. Div., AC/AS, M&S to Dir., ATSC, 10 March 1945, in AAG 452.02, Modification.) On one occasion, the Air Transport Command sought to have one of its commercial overhaul agencies make certain modifications. (Maj. Gen. Muir S. Fairchild, Dep. to CG ATC, 28 Sep. 1942, in AAG 452.1-51, Conversion and Alteration of Planes.) Further, some of the air depots arranged for the subdepots under their jurisdiction to accomplish modification work. Thus, the 5th Sub-Depot at Baer Field, Ind. undertook a gun mount and door modification of 165 B-26C airplanes beginning in February 1943. "History of the Fairfield Air Service Command, February 1942-October 1944," p. 13.

39. Memo Rpt. for CG ASC by Col. W. F. Hefley, Asst. Chief, Maint. Div., ASC, 15 Dec. 1943, in TSAGD 337, Conferences.

40. R&R, Brig. Gen. Muir S. Fairchild, DMR to Dir. of Tech. Serv., 13 Aug. 1942, in AAG 452.1-51, Conversion and Alteration of Planes.

41. Interview by Capt. L. M. Ackerman with Lt. Col. L. V. Cook, 20 Dec. 1945.

42. History of the Fairfield Air Service Command, February 1943-October 1944, pp. 309-13.

43. History of the Middletown Air Service Command to 31 December 1943, p. 32.

44. History of the Mobile Air Service Command, January 1945-March 1945, p. 119; History of the Warner Robins Air Service Command, January 1944-July 1944, p. 1.

45. History of the Ogden Air Service Command, January 1939-February 1943, p. 10; History of the Rome Air Service Command, February 1943-July 1944, p. 208.

46. Daily Diary, AC/AS, M'&D, Supply and Maint. Dr., 9 July 1943, in AFSHC.

47. See ATSC Historical Monograph, History of Supply, Maintenance, and Training for the B-29.

48. Ibid.

49. R&R, Col. O. A. Cook, Chief, Prod. Eng. Sec. to AC/AS, 18 Sep. 1942, in TSAGD 452.81, Dust Excluders.

50. T.X, AC/AS to Tech. Exec., Mat. Center, 23 Feb. 1943, in ibid.

51. Mil. Req. Pol. 26, 26 May 1943, in TSAGD 452.81, Air Filters.

52. Memo Rpt. EXP-M-50-654, 21 March 1942, in "Fighter Airplane Extension Program, Vol. I," Historical Office files, Hq., ATSC.

53. Mil. Req. Pol. 8, 1 Aug. 1943, in "Fighter Airplane Extension Program, Vol. I."

54. CTI 1459, 27 Sep. 1943, in "Fighter Airplane Extension Program, Vol. II."

55. Ibid.

56. Gen. Arnold to President, American Stove Co., St. Louis, 23 Oct. 1943, in "Fighter Airplane Extension Program, Vol. II."

57. Interview with Lt. Col. L. V. Cook, May 1945.

58. TI 1603, Add. No. 1, DC/S, Wright Fld. to Prod. Div., 21 April 1944, in TSACD 413.53, Modification Center, Camera.

59. R&R, Maj. Gen. Davenport Johnson, DLR to MC, 21 Jan. 1943, in TSACD 333.1, Modification Centers, Inspection.

60. 1st Ind., Brig. Gen. A. . Vanaman, CG Mat. Center to Maj. Gen. O. P. Echols, CG MC, 4 March 1943, in ibid.

61. 1st Trapper Ind., Lt. Col. F. D. Creulich, Chief, Inspection Sec. to Tech. Exec., in ibid.

62. R&R, Maj. Gen. O. P. Echols, CG MC to CG Mat. Center, 17 Feb. 1943, in TSACD 452.1, Modification Centers.

63. 1st Ind., Tech. Exec. to CG MC, 19 Feb. 1943, in ibid.

64. R&R, Comment No. 1, DC/AS to C/AS, 22 Sep. 1943, in AAG 252.02D, Modifications.

65. R&R, Comment No. 5, Brig. Gen. E. . Meyers, Acting C/AS to DC/AS, 15 Oct. 1943, in ibid.

66. Daily Activity Report, AC/AS, OCMM, 18 Jan. 1945, in AFHRO.

67. Procurement District Supervisor, Midwestern District to CG Mat. Center, 26 Nov. 1942, in AAG 452.1, Modification Centers.

68. R&R, AAF Resident Representative, Martin-Omaha Modification Center to CG Mat. Center, 23 Dec. 1942, in ibid.

69. R&R, Exec. for Control, Mat. Center to CG MC, 5 March 1943, in TSACD 452.1, Modification Centers.

70. Memo for CG MC by Office of Military Requirements, 16 March 1943, in AAG 323.3, Modification Centers.

71. R&R, Col. E. L. Boatner, Chief, Aircraft Modification Sec. to Fld. Security Officer, Wright Fld., 29 April 1943, in TSACD 452.1, Modification Centers.

72. R&R, Maj. Gen. C. E. Branshaw, CG Wright Fld. to AC/AS, MM&D, 14 Sep. 1943, in ibid.

73. Interview with Lt. Col. L. V. Cook, May 1945.

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N O T E S

Chapter V

1. Col. C. G. Jensen, Office, AC/AS, L&S to E. I. Cummins, Asst. Chief, War Projects Unit, Bureau of the Budget, Exec. Office of the President, 2 Feb. 1945, in AFSHO.

APPENDIX I

Official Publications

AAF Regulations

Air Corps Circulars

Air Corps Policies

Aircraft Sub-section Office Instructions

Air Service Circulars

ATC Regulations

Confidential Technical Instructions

Field Office Notes

Model Designation of Army Aircraft, 11th edition, January 1945

Office Notes

Technical Instructions

Technical Letters

Technical Orders

AAF Central Files

(Cited as AG with decimal)

Air Adjutant General, Records Branch (Headquarters, AAF)

	Output, Capacity, and Facilities, Misc.
AG 004.0[illegible],	Modification
AG 452.0[illegible],	[illegible] and [illegible]
AG 3[illegible]0.6,	Modification Centers
AG [illegible]5.[illegible],	Modification Centers
AG 32[illegible].7[illegible],	Modification
AG 452.01,	Conversion and Alteration of Planes
AG 452.1,	

.FAL-32

Air Adjutant General, Records Branch (Headquarters, AAF) Contd.

AAG 452.1,	Modification Centers
AAG 452.1-,	Boeing Aircraft Planes
AAG 452.10,	Sale of Planes Abroad
AAG 452.13,	Government Planes
AAG 452.1-4-,	Using, Loaning, Maintaining, Operating Airplanes
AAG 452.1-17,	Manufacture of Airplanes
AAG 452.1-21,	Conversion and Alteration of Planes
AAG 452.1-57,	Airplanes, Repair of
AAG 452.1-[illegible],	Sale of Planes Abroad
AAG 452.1-[illegible],	Sale of Planes Abroad
AAG 452.1-[illegible],	Sale of Planes Abroad

Bureau Field Files

AAF CG 333.1,	Modification Centers, Inspection
[illegible] 400.112,	Information, 1940-1944
AAF CG 319.5,	Centers
AAF CG 319.5,	Modification Centers, General
AAF CG 452.1,	Modification Centers
AAF CG 452.1,	Boeing [illegible] Airplanes
AAF CG 452.1,	North American B-25 Airplane
AAF CG 452.01,	Air Materiel
AAF CG 452.01,	Dust Deflectors
AAF CG 635,	Modification Centers
AAF CG 635,	Modification Center, Centers
AAF CG 635,	Modification, General

[illegible]-52

[illegible]

Contractor [illegible] [illegible] at [illegible] [illegible] [illegible] Branch, [illegible]

[illegible]

[illegible] Report, [illegible]

[illegible]

[illegible] April 1940, [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]–4[illegible]

[illegible] historical [illegible], [illegible] of the [illegible] of the [illegible]tory [illegible] in [illegible], [illegible]

[illegible] historical [illegible], [illegible] history of [illegible] [illegible] for the [illegible]

History of the Fairfield Air Service Command, 194[illegible]–1944

History of the Middletown Air Service Command [illegible] December 1943

History of the [illegible] Air Service Command, [illegible] 194[illegible]–[illegible] 1945

History of the [illegible] Air Service Command, [illegible] 19[illegible]–[illegible] 1942

History of the [illegible] Air Service Command, [illegible] 1943–[illegible] 1944

History of the [illegible] Air Service Command, [illegible] 1944–July 1944

History of the [illegible] Air Service Command, [illegible]

[illegible] Article

"[illegible] of [illegible] Aviation [illegible]," reprinted from [illegible] Journal, [illegible] 19[illegible], in [illegible]

Interviews[2]

Cook, [illegible], [illegible] in [illegible] Section, [illegible] (formerly of [illegible] Special Projects Section, [illegible]), with [illegible] Air [illegible] [illegible] 1945 [illegible], [illegible] 194[illegible], [illegible]

Gregory, J. [illegible], [illegible] Unit, [illegible] 1945

[illegible], [illegible], [illegible] Division, [illegible], with [illegible] [illegible] 1945

[illegible], [illegible], [illegible], Aircraft [illegible] Special Projects Unit, [illegible], with [illegible], 19 [illegible] 1945

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2. All interviews [illegible] unless otherwise indicated.

[illegible]

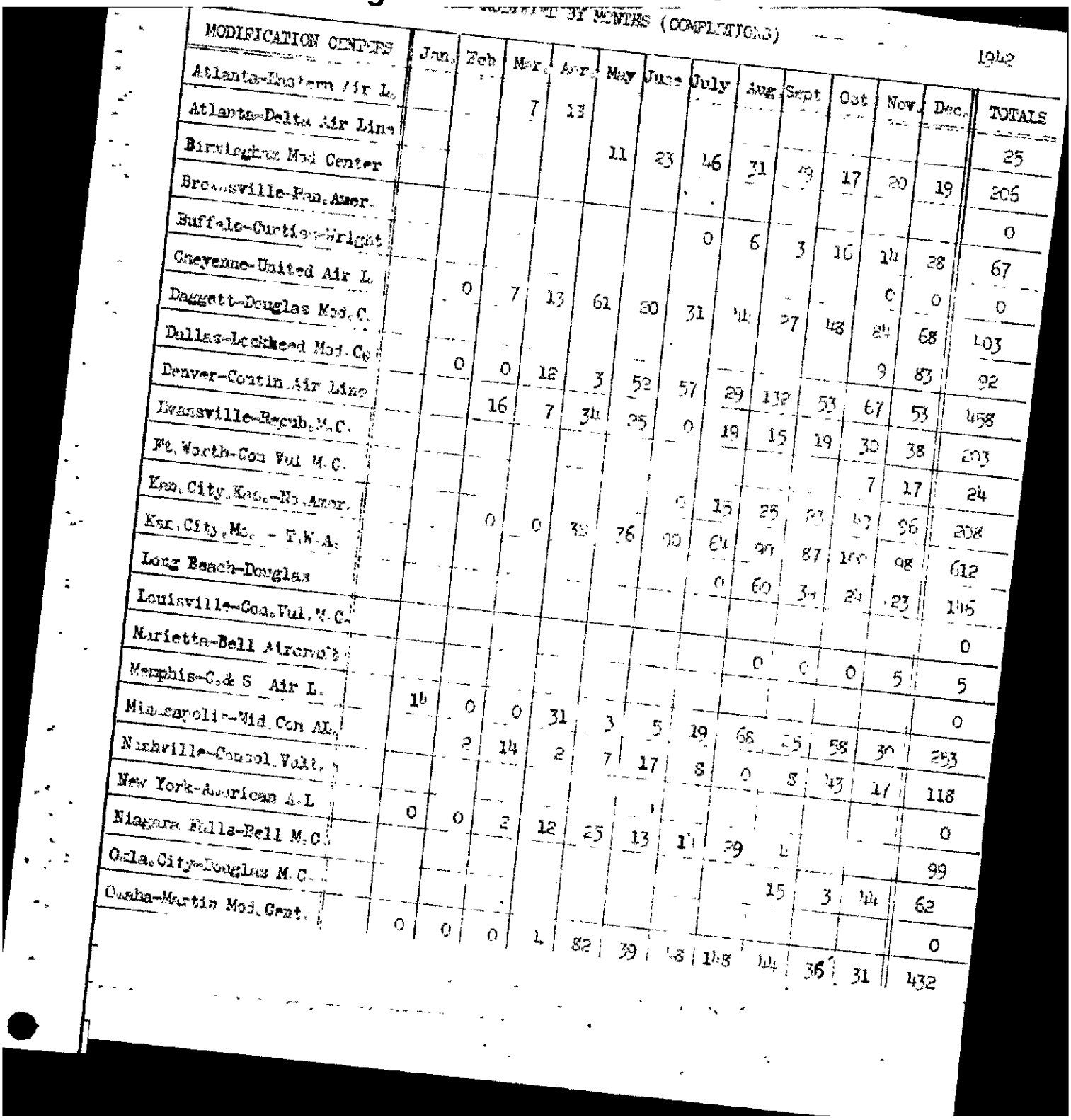
APPENDIXES

Appendix 1

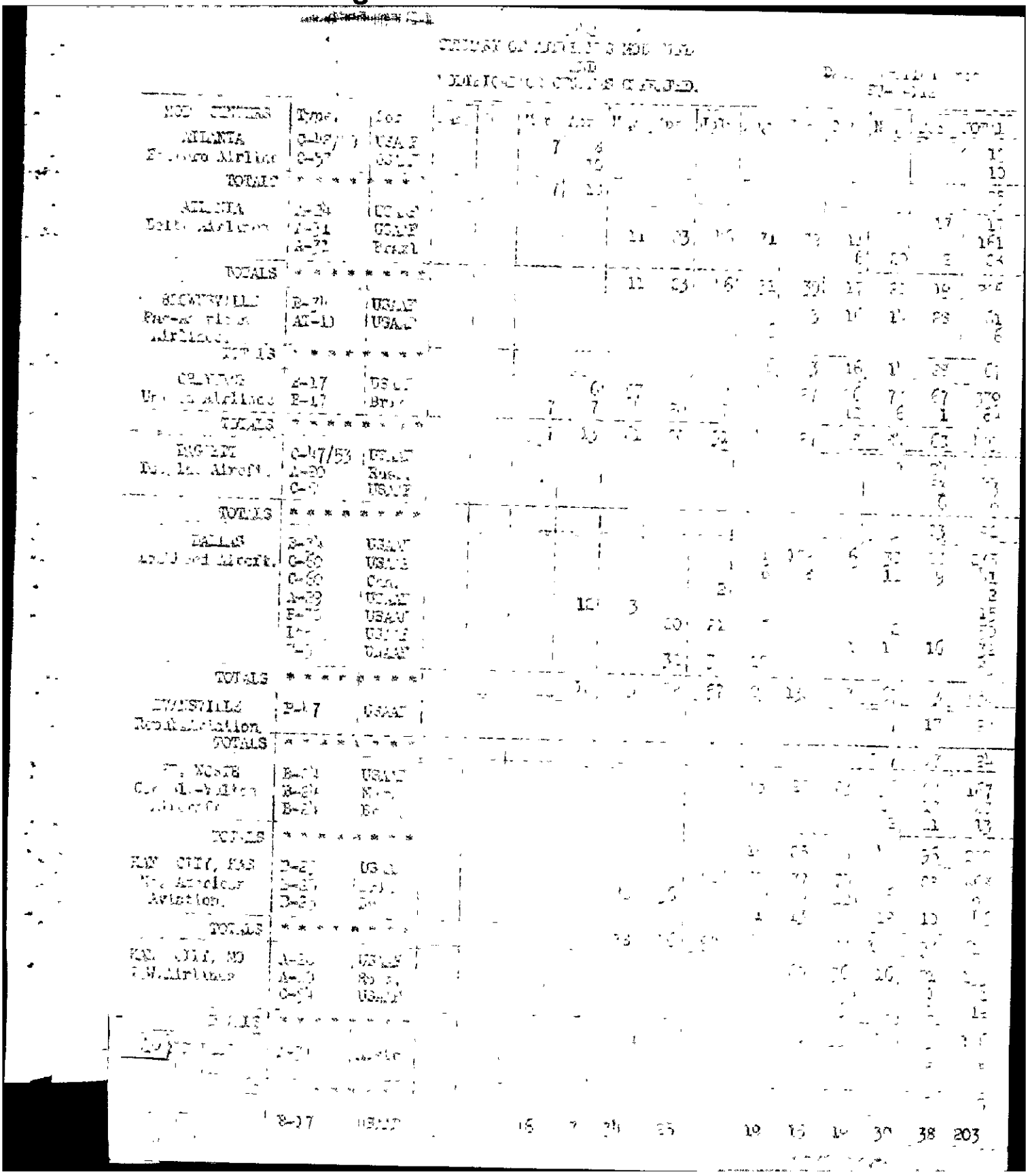
1942 MODIFICATION SUMMARY

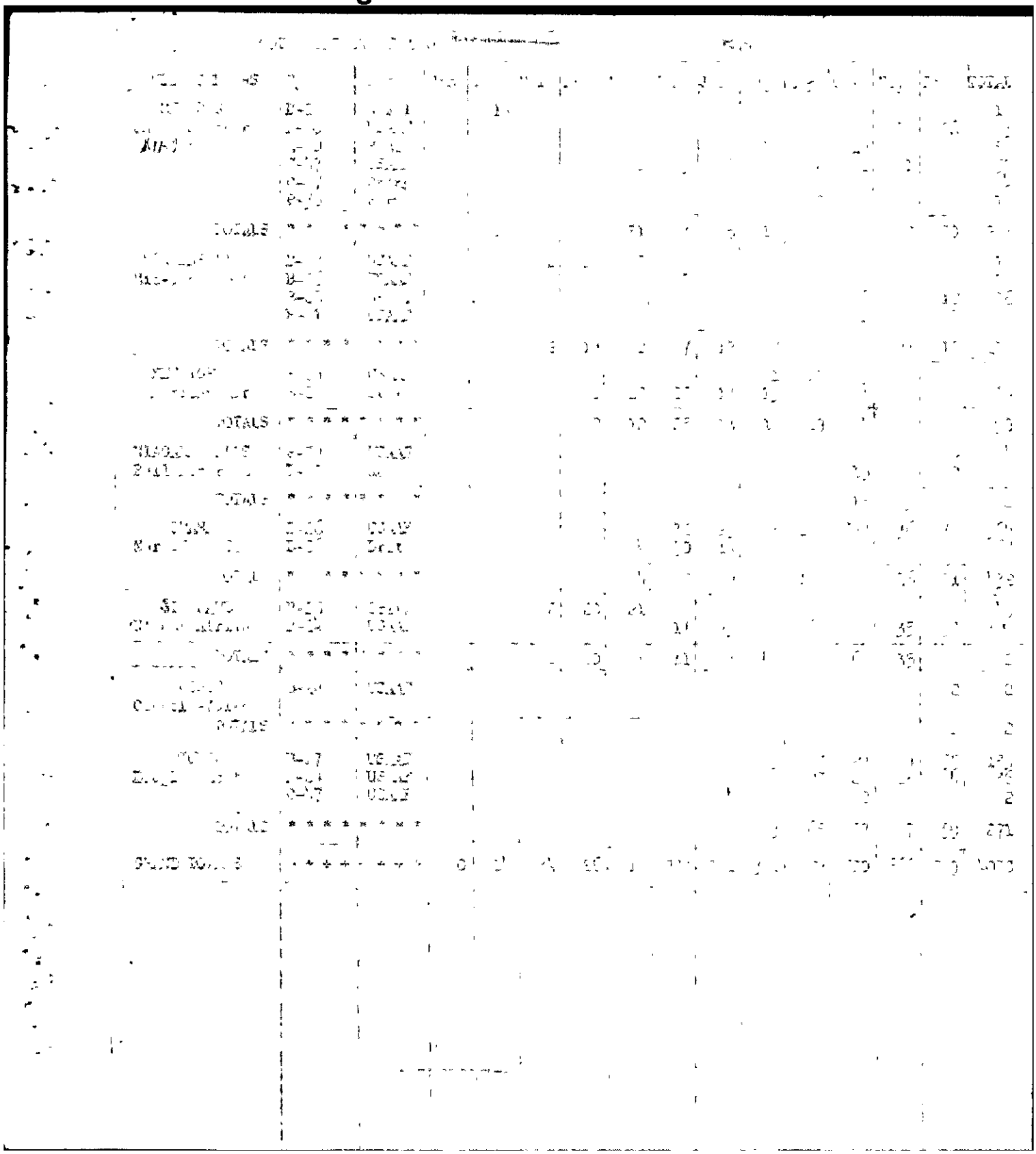
Appendix I

(Contd.)



MODIFICATION CENTERS	Jan.	Feb	Mar.	Apr.	May	June	July	Aug	Sept	Oct	Nov.	Dec.	TOTALS
Atlanta-Eastern Air L.													
Atlanta-Delta Air Lines			7	13									20
Birmingham Mod Center					11	23	46	31	29	17	20	19	206
Brownsville-Pan.Amer.													0
Buffalo-Curtiss-Wright							0	6	3	10	14	28	67
Cheyenne-United Air L.		0	7	13	61	80	31	94	27	48	0	0	0
Daggett-Douglas Mod. C.											24	68	403
Dallas-Lockheed Mod. Ce		0	0	12	3	52	57	29	139	53	9	83	92
Denver-Contin. Air Line			16	7	31	95	0	19	15	19	67	53	458
Evansville-Repub. M.C.											30	38	203
Ft. Worth-Con Vul M.C.											7	17	24
Kan. City, Kans.-No.Amer.			0	0	32	76	90	15	25	23	62	56	208
Kan. City, Mo. - T.W.A.								64	90	87	100	98	612
Long Beach-Douglas							0	60	34	29	23		146
Louisville-Con.Vul. M.C.													0
Marietta-Bell Aircraft								0	0	0	5		5
Memphis-C.& S. Air L.		16	0	0	31	3	5	19					0
Minneapolis-Mid Con AL			2	14	2	7	17	8	68	35	58	30	253
Nashville-Consol. Vult.									0	8	43	17	118
New York-American A.L		0	0	2	12	25	13	11	39	4			0
Niagara Falls-Bell M.C.													99
Okla. City-Douglas M.C.										15	3	44	62
Omaha-Martin Mod. Cent.		0	0	0	4	82	39	48	148	44	36	31	432





Appendix 2

1943 MODIFICATION SUMMARY

[illegible] 19[illegible] [illegible] SUMMARY – Types [illegible] by Months

Types of Aircraft		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	USAAF	Navy & Foreign	TOTALS
Heavy Bombardm't	B-17	211	269	307	339	265	369	314	[illegible]	371	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]
	B-24	163	[illegible]	173	[illegible]	323	[illegible]	627	[illegible]	[illegible]	577	[illegible]	636	[illegible]	522	[illegible]
	YB-40			13				2				9	1	25	0	25
TOTALS * * * * * * *		[illegible]	[illegible]	[illegible]	[illegible]	593	609	[illegible]	[illegible]	[illegible]	[illegible]	977	[illegible]	[illegible]	522	[illegible]
Medium Bombardm't	B-25	143	102	[illegible]	[illegible]	170	[illegible]	61	101	[illegible]	[illegible]	[illegible]	[illegible]	1614	745	2359
	B-26	[illegible]	[illegible]	72	112	173	[illegible]	[illegible]	172	56	80		17	[illegible]	[illegible]	[illegible]
	B-34	67	5	32	36	[illegible]	11	1	1	[illegible]	[illegible]	12		191	[illegible]	[illegible]
TOTALS * * * * * * *		[illegible]	[illegible]	304	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2772	877	[illegible]
Light Bombardm't	A-20	83	115	22	10	91	32	[illegible]	[illegible]	172	265	235	[illegible]	[illegible]	857	[illegible]
	A-24	18	43	10	49	8	1						1	[illegible]	1	160
	A-25		[illegible]	1										22	0	22
	A-31	41	19	4	6	72	[illegible]	[illegible]	43	[illegible]	[illegible]	7	1	[illegible]	221	221
	A-33			1				6	3	[illegible]				0	13	13
	A-35						1					[illegible]	[illegible]	1	[illegible]	[illegible]
	A-36		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]	0	[illegible]
TOTALS * * * * * * *		[illegible]	[illegible]	[illegible]	[illegible]	175	93	[illegible]	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1191	[illegible]
Transport	C-45								2	[illegible]	1			5	0	5
	C-46	2	7	2	10	[illegible]	22	[illegible]	[illegible]		11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	C-47/53	[illegible]	103	[illegible]	120	[illegible]	211	[illegible]	[illegible]	201	187	[illegible]	[illegible]	[illegible]	751	[illegible]
	C-54	[illegible]												[illegible]	0	6
	C-60			[illegible]	[illegible]	6	4	24	[illegible]	14				[illegible]	0	105
	C-64									[illegible]	[illegible]	[illegible]		[illegible]	0	42
	C-72					1	16	[illegible]						[illegible]	0	[illegible]
	C-87		2	2	2								9	15	0	15
TOTALS * * * * * * *		61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	311	[illegible]	[illegible]	[illegible]	[illegible]
Photo	F-[illegible](P-38)		[illegible]		2	[illegible]	33	[illegible]		5	[illegible]	77	[illegible]	[illegible]	0	[illegible]
	F-7(B-24)								1		[illegible]		[illegible]	16	0	16
TOTALS * * * * * *			[illegible]		2	[illegible]	33	[illegible]	1	[illegible]	101	77	[illegible]	[illegible]	[illegible]	[illegible]
Fighters	P-36		[illegible]						[illegible]	[illegible]				0	12	12
	P-[illegible]					2	[illegible]	[illegible]	6	[illegible]	2	[illegible]	[illegible]	617	0	617
	P-[illegible]	[illegible]	[illegible]	[illegible]	55	173	222	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	P-[illegible]							[illegible]	[illegible]	[illegible]	71		[illegible]	[illegible]	0	[illegible]
	P-[illegible]	12	[illegible]	20	30	24	13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]
	P-[illegible]	1	1		1			[illegible]	12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	P-[illegible]					10	[illegible]		[illegible]	18	1		1	66	0	66
TOTALS * * * * * * *		[illegible]	210	[illegible]	76	[illegible]	277	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Misc.	F[illegible]-17							3						[illegible]	0	3
	[illegible]	[illegible]	[illegible]	3	[illegible]	[illegible]								[illegible]	0	[illegible]
	A[illegible]									11	[illegible]			[illegible]	[illegible]	[illegible]
	[illegible]								[illegible]	[illegible]	[illegible]			[illegible]	0	[illegible]
	[illegible]									[illegible]				[illegible]	0	3
TOTALS * * * * * * *		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	0	[illegible]
GRAND TOTALS * * *		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16816	5191	[illegible]

1943 AIRPLANES MODIFIED BY MONTHS (COMPLETIONS) 1945

MODIFICATION CENTERS	Jan	Feb	Mar	Apr	May	June	July	Aug.	Sept	Oct	Nov	Dec	TOTAL
Atlanta-Eastern Air L.													0
Atlanta-Delta Air Line	7	41	31	49	61	30	4	8	24	28	24	29	336
Birmingham Mod.Center		0	0	0	3	20	74	81	126	189	262	306	1061
Brownsville-Pan.Amer.	32	5	27										64
Cheyenne-United Air L.	102	166	214	221	185	197	208	181	227	207	221	243	2372
Daggett-Douglas Mod.C.	98	153	199	120	165	67	238	12	143	194	309	250	1854
Dallas-Lockheed Mod.C.	89	88	82	124	82	90	89	72	84	131	285	366	1582
Denver-Contin.Air Line	78	103	93	118	80	72	106	100	137	150	192	226	1455
Evansville-Repub.M.C.	12	24	20	20	24	15	48	20	67	110	61	38	459
Ft.Worth-Con.Vult.M.C.	97	71	67	58	99	70	97	81	6				646
Kan.City,Kan.-No.Amer.	64	102	135	171	141	176	39	61	68	130	132	105	1324
Kan.City,Mo.- T.W.A.	14	5	29	29	26	44	22	40	45	29	9		292
Long Beach- Douglas					78	128	166	152	181	156	181	177	1249
Louisville-Conr-Vul.M.C.	41	49	57	23	32	51	39	21	22	28	47	47	457
Marietta-Bell Aircraft											0	0	0
Memphis-C.& S.Airline	30	26	25	10	47	16	6	45	26	1	44	56	330
Minneapolis-Mid.Con.AL.	3	26	49	23	1								102
Nashville-Consol.Vultee													0
New York-American A.L.													0
Niagara Falls-Bell M.C.	143	179	205	51	147	222	364	220	308	327	168	206	2540
Okla.City-Douglas M.C.					0	16	26	16	20	31	78	112	299
Omaha-Martin Mod.Center	49	51	32	142	178	201	198	132	68	121	66	136	1374
St.Paul-Northwest A.L.	33	52	38	74	93	115	105	98	105	95	36	63	907
Santa Monica-Douglas													0
Tucson-Con.-Vul.Mod.C.	32	48	111	102	143	131	196	235	226	241	220	723	2008
Tulsa-Douglas Mod.Cent.	119	100	120	1	1	1	6	49	31	84	96	57	665
Vandalia-Northwest A.L							0	20	15	8	0	0	43
Buffalo-Curtiss-Wright	14	12	2	15	67	32							

SUMMARY OF AIRPLANES MODIFIED
AND
MODIFICATION CENTERS CHARGED.

[illegible]

MOD. CENTERS	Type	For	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
ATLANTA Delta Airlines	B-24	USAAF								1		[illegible]	12		29
	A-20	Fr.					54	25							[illegible]
	A-24	USAAF	7	41	31	49	7								135
	A-35	USAAF						1							1
	P-35	USAAF						3	1	6	[illegible]				16
	P-[illegible]	USAAF												[illegible]	[illegible]
	C-[illegible]	USAAF								1					1
	UC-[illegible]	USAAF									10	20	10		[illegible]
	PT-17	USAAF							3						[illegible]
TOTALS * * * * * * * * * * * * * *			7	41	31	49	61	[illegible]	4	8	[illegible]	[illegible]	[illegible]	29	376
BIRMINGHAM Bech.-Mid.-Fir.	B-24	USAAF					3	20	74	21	126	139	262	[illegible]	1061
TOTALS * * * * * * * * * * * * * *							3	20	74	21	126	139	262	[illegible]	1061
BROWNSVILLE Pan-Amer Airln.	B-24	USAAF	32	5	20										57
	A-24	USAAF			7										7
TOTALS * * * * * * * * * * * * * *			32	5	27										64
BUFFALO Curtiss-Wright Aircraft.	B-24	USAAF				1									1
	P-39	USAAF	12	5		4	26								47
	P-40	USAAF							68	40	[illegible]	11			217
	P-51	USAAF											1	24	[illegible]
	C-46	USAAF	2	7	2	10	40	22	15			11	31	16	156
	C-46	Navy								14			9	7	30
	C-76	USAAF					1	16	35						52
TOTALS * * * * * * * * * * * * * *			14	12	2	15	67	38	118	[illegible]	66	[illegible]	41	107	563
CHEYENNE United Airlines	B-17	USAAF	102	166	214	221	[illegible]	197	203	181	227	207	221	243	2372
TOTALS * * * * * * * * * * * * * *			102	166	214	221	185	197	203	181	227	207	221	243	2372
DAGGETT Douglas Aircft.	C-47/53	USAAF	30	73	149	69	53	20							429
	C-47	Brit.		16	40	22	46	33	23						185
	C-47	Russ.	9	11	10	24	22	1	13						[illegible]
	C-47	S.Afr.				5	9	3	7	6					32
	C-54	USAAF	6												6
	A-20	USAAF	53	53								32	100	115	356
	A-20	Russ.							190	[illegible]	149	156	[illegible]	105	709
	P-51	USAAF											10	29	[illegible]
TOTALS * * * * * * * * * * * * * *			98	[illegible]	199	[illegible]	165	67	236	[illegible]	[illegible]	[illegible]	207	250	[illegible]
DALLAS Lockheed Acft	B-17	USAAF					7	7	55	59	65	[illegible]			218
	B-34	USAAF	59		18	5	27	[illegible]	4						135
	B-34	N.Zld.				17	7	2							36
	B-34	Austr.				14		3							17
	C-60	USAAF			14	31	6	4	24	18	14				[illegible]
	A-28	USAAF		21	1										22
	A-36	USAAF			52	51	3	1							107
	P-38	USAAF					2	24	3			[illegible]	[illegible]	352	601
	P-51	USAAF												1	1
	Lodestar	USAAF	34	11	3	4	4								[illegible]
	B-[illegible]	USN		[illegible]		2	34	33	3		4	97	77	13	[illegible]
	[illegible]-7	USAAF								1					[illegible]
TOTALS * * * * * * * * * * * * * *			[illegible]	[illegible]	82	[illegible]	82	90	[illegible]	72	[illegible]	171	255	[illegible]	[illegible]

1943 MODIFICATION SUMMARY [illegible]

MOD. CENTERS	Type	For.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
DENVER Contin. Acft.	P-47	USAAF	73	103	93	116	[illegible]	72	106	[illegible]	[illegible]	[illegible]	[illegible]	202	1471
	P-51	USAAF												24	24
TOTALS * * * * * * * * * * * * * *			73	103	93	116	80	72	106	100	[illegible]	[illegible]	[illegible]	226	1455
EVANSVILLE Republic Aviation	B-25	USAAF											23	15	68
	P-47	USAAF	12	24	30	20	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]	3	[illegible]	270
	P-47	Russ.										3			3
	P-51	USAAF							[illegible]	12	[illegible]	27	[illegible]	7	[illegible]
TOTALS * * * * * * * * * * * * *			12	24	[illegible]	20	24	15	[illegible]	[illegible]	[illegible]	[illegible]	61	[illegible]	[illegible]
FT. WORTH Consol.-Vultee Aircraft	B-24	USAAF	60	46	51	[illegible]	[illegible]	35	62	41	[illegible]				17
	B-24	Navy	[illegible]	10											70
	B-24	Brit.	17	15	16	[illegible]	[illegible]	35	33		1				199
TOTALS * * * * * * * * * * * * * *			97	71	67	[illegible]	97	[illegible]	97	[illegible]	[illegible]				[illegible]
KAN. CITY, KAS. No. American Aviation	B-25	USAAF	[illegible]	74	112	171	108	116	33	73	49	67	35	[illegible]	915
	B-25	Navy					20	19	6		[illegible]	1			59
	B-25	Brit.					13	11		[illegible]		[illegible]	[illegible]	73	178
	B-25	Rus.	13	12	13								25	[illegible]	[illegible]
	B-25	N.E.I.	10	15	10					2	[illegible]	3	27	[illegible]	[illegible]
TOTALS * * * * * * * * * * * * * *			[illegible]	102	[illegible]	171	141	[illegible]	[illegible]	61	[illegible]	[illegible]	132	[illegible]	[illegible]
KAN. CITY, MO. T.W.Airlines	B-25	USAAF		5	[illegible]	17									[illegible]
	B-25	Brit.					[illegible]	[illegible]							[illegible]
	B-25	Russ.				12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			176
	B-25	N.E.I.					[illegible]			[illegible]	[illegible]	[illegible]	9		[illegible]
	B-25	Chin.								8	[illegible]				10
	A-20	USAAF	13												13
	A-20	Russ.	1												1
TOTALS * * * * * * * * * * * * * *			[illegible]	5	[illegible]	29	[illegible]	[illegible]	22	[illegible]	15	29	9		282
LONG BEACH Douglas Acft	C-47	USAAF					31	[illegible]	111	[illegible]	[illegible]	[illegible]	[illegible]	175	1061
	C-47	China							2	2	2	2	2	2	12
	C-47	Brit.					70	[illegible]	[illegible]	[illegible]	10				110
	C-47	Russ.					17	1	[illegible]	15					51
	C-47	Canada							5		[illegible]				10
	C-47	Austr.								5					5
TOTALS * * * * * * * * * * * * * *							[illegible]	128	[illegible]	[illegible]	[illegible]	156	[illegible]	177	[illegible]
LOUISVILLE Consol.-Vultee Aircraft	B-24	USAAF								7	[illegible]				[illegible]
	B-24	Brit.								1	[illegible]	[illegible]	[illegible]	[illegible]	117
	B-24	Canada												3	[illegible]
	A-31	[illegible]	[illegible]	19	[illegible]	2	1	9	17	[illegible]	9	[illegible]	3	1	119
	A-31	Brit.				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					102
	A-35	USAAF		[illegible]	[illegible]	17		1							101
TOTALS * * * * * * * * * * * * * *			[illegible]	[illegible]	57	[illegible]	[illegible]	[illegible]	39	21	[illegible]	[illegible]	7	47	457
MEMPHIS Chi. & Southern Airlines	A-20	USAAF	[illegible]	22		10									[illegible]
	A-20	Russ.			17		[illegible]	13							67
	A-24	Brit.												1	1
	A-35	Russ.							[illegible]	3	[illegible]				13
	A-35	Brit.											[illegible]	[illegible]	[illegible]
	P-76	Russ.		1						[illegible]	6				12
	P-40	USAAF					10	3		[illegible]	[illegible]	1			[illegible]
	C-47	China	[illegible]	3											[illegible]
TOTALS * * * * * * * * * * * * * *			[illegible]	26	[illegible]	[illegible]	[illegible]	16	6	[illegible]	[illegible]	1	[illegible]	56	330

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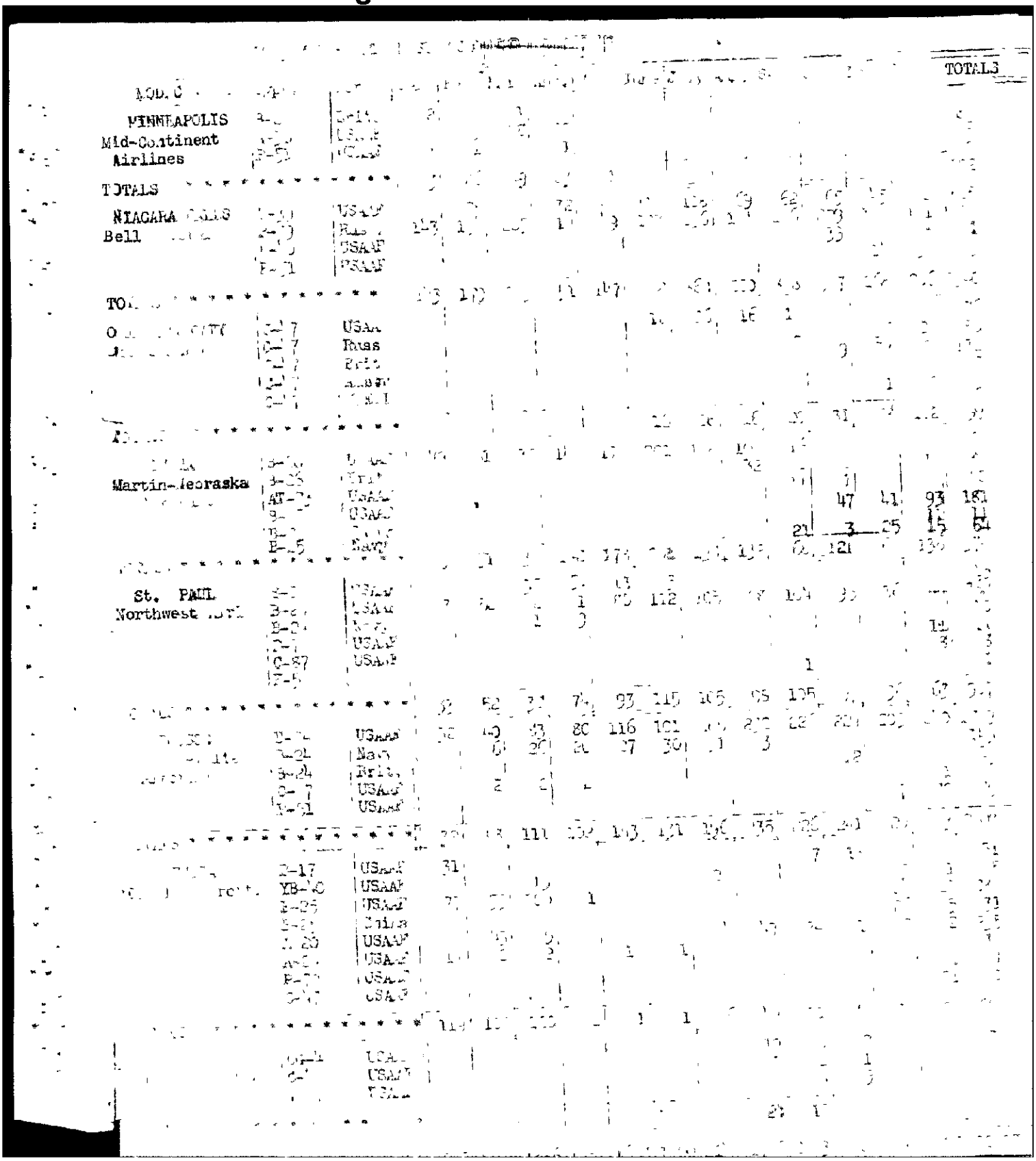

TOTALS

MINNEAPOLIS
Mid-Continent
Airlines

TOTALS

NIAGARA
Bell

TOTALS

Martin-Nebraska

St. PAUL
Northwest

TOTALS

TOTALS

TOTALS

Appendix 3

1944 MODIFICATION SUMMARY

1944 MODIFICATION SUMMARY - Types Modified by Months.

Types of Aircraft.		Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	USAAF	Navy & BenGv	TOTALS
Very Heavy Bombardm't	B-29	8	54	100	25	74	99	99	75	76	56	99	102	867	—	867
Heavy Bombardm't	B-17	430	425	424	533	419	486	397	377	149	81	46	75	3827	15	3842
	B-24	766	734	773	874	703	705	744	385	257	213	304	250	5749	1009	6758
	TOTALS	1196	1209	1197	1407	1122	1191	1141	762	406	294	350	325	9576	1024	10600
Medium Bombardm't	B-25	372	203	326	384	410	362	317	95	64	2			1715	800	2515
	B-26	45												19	26	45
	B-34			5										5	0	5
	TOTALS	417	203	331	384	410	362	317	95	64	2			1739	826	2565
Light Bombardm't	A-20	267	257	314	275	287	319							964	785	1749
	A-24	28	43		47	73								175	16	191
	A-25				10	26								0	36	36
	A-26					19	15							34	0	34
	A-31	4	2	1										0	7	7
	A-34	1												0	1	1
	A-35	12	4	21	62	43	39	66	67	21				0	335	335
	TOTALS	312	306	336	394	448	403	66	67	21				1173	1180	2353
Transport	C-45	4	1		7	5	7	13	9	7				53	0	53
	C-46	10	42	60	46	3			21	4		19	1	179	21	200
	C-47	406	542	480	474	574	551	293	20					2519	821	3340
	C-54												2	2	0	2
	C-64	2		4	4									10	0	10
	C-87	16	11	2	5	10	11	13	25	31	13		1	114	24	138
	C-109							6	28	32	101	18		185	0	185
	TOTALS	438	596	546	530	592	569	325	103	74	114	37	4	3062	866	3928
Fighter	P-36			1										0	1	1
	P-38	216	221	65	121	1						28	226	878	0	878
	P-39	368	264	294	201	181	256	63	4	7	1			12	1633	1645
	P-40	25	6	25	4		12	13						85	0	85
	P-47	124	122		76	50			2					374	0	374
	P-51	229	105	211	215	91	32	18	5	55	11			828	144	972
	P-63				88	15						16		119	0	119
	P-70				9	29	23	6						67	0	67
	TOTALS	962	718	596	714	367	323	106	11	62	12	44	226	2263	1778	4141
Photo	F-3(A-20)				1		3							4	0	4
	F-5(P-38)	74	40	22	81	90	50	50	100	125	99	5	25	746	15	761
	F-6(P-51)	Records carried in with P-51 figures above.												—	—	—
	F-7(B-24)	27	33	4	8	23	15	12	4					126	0	126
	F-8(Mosqto)			7	12	3	2		2					32	0	32
	F-9(B-17)								3	1	3	2		9	0	9
	F-13(B-29)	Records carried in with B-29 figures above.												—	—	—
	TOTALS	101	73	33	108	116	70	62	109	126	102	7	25	917	15	932
Misc.	AT-6	4												4	0	4
	AT-11			8										8	0	8
	OA-10						15	2	9	2	14	21	17	80	0	80
	TOTALS	4		8			15	2	9	2	14	21	17	92	0	92
GRAND TOTALS *****		3438	3159	3147	3542	3129	3032	2118	1231	831	594	558	699	19789	5689	25478

1944 AIRPLANES MODIFIED BY MONTHS 1944

Modification Centers	Jan.	Feb	Mar	Apr.	May	June	July	Aug	Sep	Oct	Nov	Dec	TOTALS
Atlanta- Delta Airlines	39	1	9	13	27								94
Birmingham Mod.Center	338	399	331	375	329	350	408	200	132	123	118	123	3236
Buffalo-Curtiss-Wright	64	54	87	44	3	15	14	38	4				313
Cheyenne-United A.L.	234	402	250	287	256	260	284	307	68	32	57	81	2418
Daggett-Douglas Mod.Cen	250	277	314	276	213	136							1506
Dallas-Lockheed Mod.Cen	304	327	238	312	179	131	160	165	135	141	54	227	2473
Denver-Continental A.L.	197	57	90	140	19	62	11	7	14	13	11	32	653
Evansville-Repub.Mod.C.	140	125	7	141	94	31	56	11	17				622
Kan City,Kan -No.Amer	182	175	240	254	275	379	335	100	119	13			2049
Long Beach-Douglas	176	192	223	212	286	306							1395
Louisville-Consol Vult.	75	63	53	178	83	87	102	101	90	103	91	53	1094
Marietta-Bell Aircraft	3	14	28		5	11	25	11					97
Memphis-C & S.Airline	17	5	16	1	12	17							68
Nashville-Consol Vultee			3	105	1		11	65	11				196
Niagara Falls-Bell A.C.	400	267	311	307	204	263	82	10	9	14	24	11	1902
Okla.City-Douglas M.C	180	275	223	254	231	303	231	20				2	1854
Omaha-Martin Mod.Center	174	51	103	127	139	49	27	22	22	22	20	10	799
St.Paul-Northwest A.L.	81	90	100	124	81	122	103	105	82	83	96	86	1153
Santa Monica-Douglas					74	216							290
Tucson-Consol-Vultee	371	315	302	285	282	210	175	18	8				1946
Tulsa- Douglas Mod.Cen	126	179	134	175	231	99	24	61	70	60	87	79	1325
Vandalia-Northwest A.L.	4												4
Burbank-Lockheed C.S	4												4

1944

SUMMARY OF AIRPLANES MODIFIED AND MODIFICATION CENTERS OPERATED.

Data compiled from SU-A-112

MOD. CENTERS	Type:	For:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct	Nov.	Dec.	Total
ATLANTA	B-34	USAAF			5										5
Delta Airlines.	C-45	USAAF				4	1								5
	C-64	USAAF	2		4	4									10
(Closed 1 June)	P-38	USAAF	5												5
	P-51	USAAF	32	1											33
	A-25	Navy				10	26								36
TOTALS	* * * * * * * * *		39	1	9	18	27								94
BIRMINGHAM,	B-24	USAAF	333	370	[illegible]	363	264	293	382	165	60	1	30		2551
Bechtel-	B-24 H2X	USAAF												27	27
McCone-Parsons.	B-24	Brit.					24	6							30
	C-87	USAAF												1	1
	C-109	USAAF									32	101	18		151
	B-29	USAAF	5	29	41	12	41	51	36	35	40	21	68	70	449
	F-5	USAAF											2	25	27
TOTALS	* * * * * * * *		338	399	331	375	329	350	418	200	132	123	118	123	3236
BUFFALO	C-46	USAAF	9	42	60	45	3			21	4				179
Curtiss-Wright.	C-46	Navy	1												1
	P-40	USAAF	13	6	25	4			13						61
	P-51	USAAF	41	6	2										49
	OA-10	USAAF						15	1	7					23
TOTALS	* * * - * * * *		64	54	87	49	3	15	14	28	4				313
CHEYENNE	B-17	USAAF	234	312	250	227	256	260	284	304	67			1	2255
United Airlines.	B-17 H2X	USAAF										18	42	74	134
	F-9 (B-17)	USAAF								3	1	3	2		9
	OA-10	USAAF										1	13	6	20
TOTALS	* * * * * * * *		234	312	250	227	256	260	284	307	68	22	57	81	2418
DAGGETT	A-20	USAAF	164	157	134	143	97	32							727
Douglas Aircraft	A-20	Russ.	103	100	135	117	93	14							553
	A-20	Brit.			45	14	25	27							[illegible]
(Closed 1 July)	F-3 (A-20)	USAAF				1		3							[illegible]
	P-51	[illegible]	23	[illegible]											[illegible]
TOTALS	* * * * * * * *		290	277	314	276	213	176							1506
DALLAS	F-5 (P-38)	USAAF	70	40	22	21	90	50	50	25	125	99	3		715
Lockheed Airc'ft	F-5	China								15					15
	P-38	USAAF	211	221	62	16							21	226	754
	P-51	USAAF	23	36	204	129	62	3							456
	P-51	Brit.		30		87	27								144
	B-17	USAAF						43	16						59
	B-17 H2X	USAAF						35	94	65	60	42	4		300
	C-46	Navy											19	1	20
TOTALS	* * * * * * * *		304	327	288	312	179	131	160	165	185	141	54	227	2473
DENVER	B-17	USAAF	156	16	45	73	20	14							324
Continental	B-17 H2X	USAAF	40	37	29	61	17								184
Airlines	B-17 H2X	Brit.					1	14							15
	P-51	USAAF	1												1
	B-29	USAAF		4	16	6	11	14	11	7	14	13	11	22	129
TOTALS	* * * * * * * *		197	57	90	140	49	42	11	7	14	13	11	22	653

1944 MODIFICATION SUMMARY

MOD CENTERS	Type	For	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep	Oct.	Nov	Dec.	Total
EVANSVILLE	P-47	USAAF	124	122		76	50			2					374
Republic	P-51	USAAF	7		1										8
Aviation	B-25	USAAF	9	3											12
(Closed 1 Oct.)	A-35	Brit.	.		6	62	43	29	55	2	10				207
	C-45	USAAF				3	1	2	1	7	7				21
TOTALS	* * * *	* * * *	140	125	7	141	94	31	56	11	17				622
KANSAS CITY	B-25	USAAF	68	82	182	211	196	312	200	91	64	2			1408
No. American	B-25	Brit.	72	33	15		34	4	37	3					198
Aviation	B-25	N.E.I.	7	9	9	5	5	5							40
	B-25	Russ.	35	31	9	25	29	20	1						150
	B-25	Navy			17	10	7	9	30						73
	B-25	China			8		4		49	1					62
	P-51	USAAF						29	18	5	55	11			118
TOTALS	* * * *	* * * *	182	155	240	251	275	379	335	100	119	13			2049
LONG BEACH	C-47	USAAF	176	188	221	208	265	225							1283
Douglas Aircraft	C-47	China		4	2	4	2								12
	A-26	USAAF					19	15							34
	B-17	USAAF						66							66
TOTALS	* * * *	* * * *	176	192	223	212	286	306							1395
LOUISVILLE	B-24	USAAF		1				28	61						90
Consolidated-	B-24	Brit.	71	60	85	106	89	57	35	97	85	98	91	48	922
Vultee Aircraft	B-24	Canada			1	2		2	6	4	5	5		10	35
	A-31	Aust.	4	2	1										7
TOTALS	* * * *	* * * *	75	63	87	108	89	87	102	101	90	103	91	58	1054
MARIETTA	B-29	USAAF	3	14	28		5	11	25	11					97
Bell Aircraft															
MEMPHIS	A-34	Brit.	1												1
C. & S. Airlines	A-35	Brit.	12	4	15			10							41
(Closed 1 July)	C-45	USAAF	4	1											5
	P-36	Peru			1										1
	P-70	USAAF				1	12	7							20
TOTALS	* * * *	* * * *	17	5	16	1	12	17							68
NASHVILLE	P-38	USAAF			3	105	1								109
Consol.-Vultee	A-35	Brit.							11	65	11				87
Aircraft TOTALS	* * *	* * *			3	105	1		11	65	11				196
NIAGARA FALLS	P-39	USAAF								4	7	1			12
Bell Aircraft	P-39	Russ.	368	264	294	201	181	256	69						1633
	P-40	USAAF	12												12
	P-51	USAAF	20	3	2		2								27
	P-63	USAAF				88	15						16		119
	F-8	USAAF			7	18	3	2		2					32
	C-45	USAAF					3	5	12	2					22
	AT-11	USAAF			8										8
	OA-10	USAAF							1	2	2	13	8	11	37
TOTALS	* * * *	* * * *	400	267	311	307	204	263	82	10	9	14	24	11	1902
OKLAHOMA CITY	C-47	USAAF	18	7	178	150	2[illegible]	222	184	17					1043
Douglas Aircraft	C-47	Russ	20	30	20	30	20	6	14						140
	C-47	Brit.	132	15[illegible]	20	63	73	80	30	1					607
	C-47	Aust.	9	6	4	4	4		4						31
	C-47	Canada	1	4	1	3	2		4						15
	C-47	N.E.I.		1		2	2								5

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1944 MODIFICATION SUMMARY.

MOD. CENTERS	Type:	For:	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
OKLAHOMA CITY (Continued)	C-47	N.Z.		2		2			5						9
	C-47	Col.								1					1
	C-47	French								1					1
	C-54	USAAF												2	2
TOTALS	* * * * * * * *		120	275	223	254	301	308	291	20				2	1854
OMAHA Martin-Nebraska Company	B-26	USAAF	19												19
	B-26	Brit.	26												26
	B-25	USAAF	96	37	78	35									246
	B-25	Navy	37	3	3	69	135	12							264
	B-25	China		4		9									13
	F-7 (B-24)	USAAF			2	7	7	2							18
	P-40	USAAF						12							12
	B-29	USAAF		7	15	7	17	23	27	22	22	22	20	10	192
TOTALS	* * * * * * * *		178	51	103	127	159	49	27	22	22	22	20	10	790
ST. PAUL Northwest Airlines	B-24	USAAF	25	33	84	110	2	50	24	7	1		3	12	351
	B-24 H2X	USAAF	29	25	14	13	63	59	61	65	81	83	93	74	661
	F-7 (B-24)	USAAF	27	32	2	1	16	13	12	4					107
	C-109	USAAF							6	28					34
TOTALS	* * * * * * * *		81	90	100	124	81	122	103	105	82	83	96	86	1153
SANTA MONICA Douglas Aircraft	A-20	USAAF					74	163							237
	A-20	Russ.						40							40
	A-20	Brazil						13							13
TOTALS	* * * * * * * *						74	216							290
TUCSON Consol.-Vultee Aircraft	B-24	USAAF	308	295	298	277	251	206	173	16	8				1832
	B-24	Aust.				3	11	4	2	2					22
	C-87	USAAF	16	11	2	5									34
	F-7 (B-24)	USAAF		1											1
	P-51	USAAF	47	8	2										57
TOTALS	* * * * * * *		371	315	302	285	262	210	175	18	8				1946
TULSA Douglas Aircraft	B-17	USAAF		60	100	112	125	54	2		9	21			433
	B-17 H2X	USAAF							1	8	13				22
	B-24	USAAF								28	11	11	69	52	171
	B-24 H2X	USAAF									6	15	18	27	66
	C-87	USAAF					9	8	7	11	31	13			79
	C-87	Brit.					1	3	6	14					24
	B-25	USAAF	48	1											49
	A-24	USAAF	12	45		47	73								175
	A-24	N.A.	16												16
	P-70	USAAF				8	17	16	6						47
	C-47	USAAF	59	75	34	8	6	18	2						193
TOTALS	* * * * * * * *		126	179	134	175	231	99	24	61	70	60	87	79	1325
VANDALIA N/W Airlines	AT-6	USAAF	4												4
BURBANK Lockheed Aircraft	F-5	USAAF	4												4
ROME AIR DEPOT	P-51	USAAF	35	1											36
[illegible] TOTALS			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1231	831	504	558	690	25478

Appendix 4

1945 MODIFICATION SUMMARY

[illegible] [illegible] MODIFICATION SUMMARY – Type [illegible] [illegible]

Type of Aircraft	Model	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	USAAF	[illegible]	TOTAL
V[illegible] – B[illegible] Bombard[illegible]	B-2[illegible]	[illegible]	1[illegible]	157	1[illegible]	11[illegible]	1[illegible]	136	[illegible]	26				1[illegible]87	[illegible]	1[illegible]87
[illegible] Bombardment	B-1[illegible]	7[illegible]	57	1[illegible]	11[illegible]	1[illegible]	[illegible]	102	2[illegible]	6				757	[illegible]	76[illegible]
	B-2[illegible]	2[illegible]	320	3[illegible]	[illegible]	[illegible]10	2[illegible]	198	73	53				1578	60[illegible]	2[illegible]78
	TOTALS	[illegible]6	377	[illegible]	50[illegible]	[illegible]	[illegible]	300	[illegible]	59				[illegible]	[illegible]	30[illegible]
V[illegible] Bombardment															[illegible]	0
[illegible]	[illegible]-2[illegible]				2	[illegible]	[illegible]	1						[illegible]	[illegible]	[illegible]
	[illegible]-26					1[illegible]	3[illegible]	6[illegible]	[illegible]	5	[illegible]			1[illegible]5	11	1[illegible]6
	TOTALS				[illegible]	[illegible]	90	[illegible]	[illegible]	[illegible]	2			135	110	[illegible]5
[illegible]	C-45	[illegible]		3			3							7	0	7
	C-4[illegible]		1		1	37	6[illegible]	1						1	1[illegible]1	102
	C-[illegible]	9	1[illegible]	11	[illegible]3	[illegible]	[illegible]	1						172	6	178
	C-1[illegible]	[illegible]	27	2										[illegible]	0	[illegible]
	TOTALS	3[illegible]	[illegible]1	[illegible]	[illegible]	81	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]		229	107	336
[illegible]	F-38	[illegible]	1[illegible]	[illegible]	[illegible]	[illegible]	27	[illegible]	[illegible]	13				780	0	780
	F-[illegible]					[illegible]	5	[illegible]	1[illegible]	3		1		15	0	15
	F-47	[illegible]	[illegible]	13[illegible]	1[illegible]3	1[illegible]	1[illegible]	[illegible]	71	139				11[illegible]	0	11[illegible]
	F-63				1									1	0	1
	F-[illegible]							[illegible]			1[illegible]	11		27	[illegible]	27
	TOTALS	[illegible]	[illegible]	[illegible]	17[illegible]	1[illegible]	[illegible]17	2[illegible]	1[illegible]	155	1[illegible]	12		1953	0	1953
[illegible]	F-[illegible](F-[illegible])	73	79	[illegible]	[illegible]	[illegible]	[illegible]	1[illegible]	7	22				470	0	470
	F-7(B-[illegible])					[illegible]	[illegible]	11	2[illegible]					40	0	40
	F-13(B-29)	[illegible]	[illegible]	6	4	5	[illegible]	17	1[illegible]		7			63	0	63
	F-1[illegible](F-8[illegible])															
	TOTALS	77	[illegible]	50	93	67	[illegible]	[illegible]1	7[illegible]	22	7			573	0	573
[illegible]	OA-10	2[illegible]	27	23	15	1[illegible]	[illegible]	[illegible]	[illegible]		1			121	0	121
	TOTALS	[illegible]	27	23	15	1[illegible]	[illegible]	[illegible]	1		1			121	[illegible]	121
GRAND TOTALS*******		[illegible]5	[illegible]	1[illegible]	[illegible]0	[illegible]7	[illegible]	[illegible]	[illegible]	267	24	12		[illegible]3	[illegible]2	[illegible]

1945 AIRPLANES MODIFIED BY MONTHS 1945

Modification Centers	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	TOTALS
Baltimore-Martin Co.			1		37	62	1						101
Birmingham Mod. Center	213	176	171	183	120	112	117	71	33	8			1209
Cheyenne-United A.L.	93	64	113	96	64	26	54						510
Dallas-Lockheed M.C.	213	197	151	155	135	113	171	107	41	14	11		1328
Denver-Continental A.L.	23	27	33	34	37	37	42	39					272
Evansville-Repub Mod C.	8	157	156	123	140	135	81	71	139				1100
Louisville-Consol. Vult.	96	81	66	123	69	53	53	-3					541
Louisville-Curtiss-Wrt			45	40	51	40	22						198
Niagara Falls-Bell A.C.	14	12	16	13	24	13	20	13	3	1	1		130
Okla. City-Douglas M.C.	9	22	55	62	46	17	1						212
Omaha-Martin Mod Centr	4	4	1	13	2	2	2						28
St. Paul-Northwest A.L.	90	107	94	151	149	144	96	52	40				903
Tucson-Consol. Vultee		1				36	69	31	10				147
Tulsa-Douglas Mod. Cen	97	111	93	27	101	94	57	38	1	1			623

[illegible]

[illegible] of Aircraft Modified [illegible]

[illegible] Modification Centers [illegible]

Data compiled from [illegible]

Modification Center	Type	[illegible]	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
[illegible]	C-47	[illegible]					?7	62	1						100
[illegible]	C-[illegible]	[illegible]			1										1
	TOTALS * * * *				1		?7	62	1						101
BIRMINGHAM -	B-[illegible]	USAAF	6	[illegible]	1	1		1			3				188
[illegible]	[illegible]	[illegible]	[illegible]	10	1?0	[illegible]	81	[illegible]	10?	65	26				8?0
[illegible]	[illegible]-F	USAAF	?0	2											92
	[illegible]-10?	USAAF	[illegible]	27	1										8
	[illegible]	USAAF					7	12	9	6	4	1			34
	F-13											7			7
	TOTALS * * * *		1?	17?	1?1	1?7	120	112	117	71	33	8			1209
[illegible] -	B-17	USAAF	77	?9	7?	38	??	24	?1						355
[illegible] Air [illegible]	B-17	Brit			3										3
	B-2?	USAAF			55	?5	1?	2	13						138
	OA-10	USAAF	16	??	10	3?									?4
	TOTALS * * * *		??	?9	14?	??	??	2?	5?						540
DALLAS -	B-17	USAAF			1?	18	28	??	10	26	6				169
[illegible] Aircraft	B-17	Brit.			2										2
	P-38	USAAF	200	1?7	??	??	?7	27	116	64	13				752
	P-?G	USAAF	13	?0	1?	??	60	53	13	37	22				378
	P-??	USAAF							2			14	11		27
	F-1?	USAAF													
	TOTALS * * * *		???	1?7	?51	155	135	?13	171	127	41	14	11		1328
DENVER -	B-29	USAAF	1?	??	27	??	32	34	2?	2?					216
Continental	?-13	USAAF	4		?	4	5	3	17	11					56
[illegible]	TOTALS * * * *		?3	27	33	3?	37	?7	??	39					272
[illegible]VILLE -	P-?7	USAAF	?	1??	?96	12?	1??	1??	?1	71	139				1100
[illegible]	TOTALS * * * *		?	1?7	196	123	1?0	135	81	71	139				1100
LOUISVILLE -	B-??	USAAF		1		6?	2			11					78
Consolidated	B-??	Brit.	96	80	60	??	67	53	?8	12					?70
-Vultee	B-??	Canada			6	5			5						16
Aircraft.															
	TOTALS * * * *		96	81	?6	12?	6?	53	53	23					564
LOUISVILLE -	B-??	USAAF			3										3
Curtiss-	B-17	USAAF			1?	?0	?1	?0	21						194
Wright	B-2?	USAAF							1						1
	TOTALS * * * *				??	?0	51	?0	22						198
NIAGARA FALLS	C-?5	USAAF	1		3			?							7
Bell Aircraft	OA-10	USAAF	1?	1?	13	12	1?	?	?	1		1			77
	P-??	[illegible]					9	5	1?	12	3		1		?5
	P-??	[illegible]				1									1
	TOTALS * * * *		1?	1?	1?	13	??	1?	??	13	3	1	1		130

[illegible]	Type	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	B-17	[illegible]		2			2							32
[illegible]	C-47	USAAF				1								1
	B-17	[illegible]		1										1
	C-[illegible]	USAAF	9	12	50	[illegible]	[illegible]	17	1					172
	C-[illegible]	Brit.		1	1		1							6
	TOTAL * * * *		9	[illegible]	53	[illegible]	[illegible]	17	1					212
OMAHA [illegible]-Omaha Co.	B-29	USAAF	[illegible]	[illegible]	1	12	[illegible]	2	2					28
	TOTALS * * * *		[illegible]	[illegible]	1	12	[illegible]	[illegible]	2					28
ST. PAUL	B-24	USAAF	[illegible]	107	[illegible]	15[illegible]	[illegible]	[illegible]	96	31	[illegible]			892
	B-24	Austr.								[illegible]				1
	F-7 [illegible]	USAAF					2	2						4
	TOTALS * * *		[illegible]	107	[illegible]	[illegible]	[illegible]	[illegible]	96	32				903
TULSA [illegible] [illegible]	B-24	USAAF		1				36	31	5	10			83
	B-7?	USAAF							11	25				36
	P-[illegible]	USAAF							27	1				28
	F-[illegible]	USAAF	(Split cowl modifications not included)											
	TOTALS * * * *			1				36	[illegible]	[illegible]				147?
TULSA Douglas Aircraft	B-17	USAAF					7							7
	B-24	USAAF	57	[illegible]	68	7				[illegible]				292
	B-24	Austr.		1	[illegible]	[illegible]	[illegible]	16	[illegible]	[illegible]				113
	A-26	USAAF						[illegible]	[illegible]	[illegible]	1	1		101
	A-26	Brit.					11							11
	A-20	[illegible]				[illegible]	[illegible]	56	1					[illegible]
	[illegible]	USAAF												
	F-61	USAAF												
	TOTALS * * * *		[illegible]	111	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				623
GRAND TOTALS * * * * * * * *			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	445	267	24	12	7355

[illegible]

[illegible] CENTERS

[illegible]

LOCATION	CONTRACTOR	OPENED	CLOSED
Atlanta, Ga	[illegible] Air Lines, Inc	Mar, 1942	[illegible], 1942
Birmingham, Ala	[illegible] Air Corp.	May, 1942	[illegible]
[illegible], Ala	[illegible] Corp.	Feb, 194[illegible]	Oct, 1945
[illegible], [illegible]	[illegible] Aircraft [illegible]	[illegible], 1942	[illegible]
Buffalo, N.Y.	Curtiss-Wright Corp., Airplane Division	Nov, 1942	Sept, 1945
Cheyenne, Wyo	United Air Lines Transport Corp	Feb, 1942	July, 1945
[illegible], Calif.	[illegible] Aircraft Co., Inc	Nov, 1942	June, 1944
Dallas, Texas	[illegible] Aircraft Corp	Dec, 1942	Nov, 1945
Denver, Colo	Continental Air Lines, Inc.	Mar, 1943	Aug, 1945
Evansville, Ind.	Republic Aviation Corp.	Nov, 1942	Sept, 1944
Fort Worth, Texas	Consolidated Vultee Aircraft Corp	July, 1943	Sept, 1943
Kansas City, Mo	North American Aviation, Inc. of Kansas	Mar, 1942	Oct, 1944
Kansas City, Mo	Transcontinental & Western Air, Inc.	[illegible], 194[illegible]	[illegible], 1943
Long Beach, Calif.	Douglas Aircraft Co., Inc	Apr, 194[illegible]	June, 194[illegible]
Louisville, Ky	Consolidated-Vultee Aircraft Corp	Sept, 194[illegible]	Aug, 1945
Louisville, Ky	Curtiss-Wright Corp., Airplane Division	Jan, 194[illegible]	July, 194[illegible]
Memphis, Tenn	Chicago & Southern Air Lines, Inc	Feb, 1942	[illegible]
Minneapolis, Minn	Mid-Continent Air Lines, Inc.	Mar, 1942	May, 1943
Nashville, Tenn	Consolidated-Vultee Aircraft Corp.	Mar, 1944	Sept, 1944
New York, N.Y.	[illegible] Airlines, Inc.	[illegible], 1942	Oct, 1942
Niagara Falls, N.Y.	Bell Aircraft Corp.	Oct, 1942	Nov, 1945
Oklahoma City, Okla.	[illegible] Aircraft Co., Inc	May, 1943	July, 1945
Omaha, Neb	The Glenn L. Martin Co.	[illegible], [illegible]	July, 1945
St. Paul, Minn	Northwest Airlines, Inc.	[illegible], 1942	Sept, 1945
Santa Monica, Calif.	Douglas Aircraft Co., Inc	May, 1942	June, 1[illegible]
Tucson, Ariz	Consolidated-Vultee Aircraft Corp	Nov, 1942	Sept, 1945
Tulsa, Okla.	Douglas Aircraft Co., Inc	July, 1942	Oct, 1945
[illegible], Ohio	[illegible] Airlines, Inc	July, 1943	Jan, 1944

* *

NOTE - In addition to [illegible] Modification Centers [illegible] [illegible] in the Modification Program [illegible] other facilities [illegible] [illegible].

* *

NOTE - For actual dates of "OPENED" and "CLOSED" refer to details on individual Modification Centers on following pages.

MODIFICATION CENTER [illegible]

EASTERN AIRLINES MODIFICATION CENTER, Municipal Airport, Atlanta, Georgia

CONTRACTOR - Eastern Airlines, Inc.

First airplane received at Modification Center - 10 March, 1942
Final airplane delivered from Modification Center - 21 April, 1942

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942 25 airplanes C-48, C-49, C-53

MODIFICATION FACILITIES - Ownership - Eastern Airlines, Inc.

Size - Space as required in contractor's hangars & shops.

Final disposition - Leased by contractor.

MODIFICATION CONTRACTS - W-533-AC-27037

MISCELLANEOUS DATA - Closed out as no longer required and as contractor had other war work to do.

DELTA-ATLANTA MODIFICATION CENTER, Municipal Airport, Atlanta, Georgia

CONTRACTOR - Delta Air Corp.

First Airplane received at Modification Center - 13 May, 1942
Final Airplane delivered from Modification Center - 26 May, 1942

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	205 airplanes	A-24, A-[illegible]
1943	336 airplanes	B-[illegible], A-[illegible], A-[illegible], A-[illegible], P-[illegible], P-[illegible], C-[illegible], C-[illegible], PT-17
1945	96 airplanes	B-[illegible], A-[illegible], P-[illegible], P-[illegible], C-[illegible], C-[illegible],
TOTAL	637 airplanes	

MODIFICATION FACILITIES - Ownership - Delta Air Corp

Size - Space as required in contractor's hangars & shops.

Final disposition - Returned by contractor.

MODIFICATION CONTRACTS - W-533-AC-[illegible]
W-533-AC-[illegible]
W-533-AC-[illegible]

MISCELLANEOUS DATA - Closed out as capacity no longer required.

BIRMINGHAM MODIFICATION CENTER, Municipal Airport, Birmingham, Alabama

CONTRACTOR - Bechtel, McCone, [illegible] Corp

First Airplane received at Modification Center - [illegible] 1943
Final airplane delivered from Modification Center - 9 October, 1945

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1943	[illegible] airplanes	B-24
1944	[illegible] airplanes	B-24, C-47, C-10[illegible], B-2[illegible], [illegible]
1945	1209 airplanes	B-24, B-29, F-5, C-109 A-26, F-13
TOTAL	550[illegible] airplanes	

MODIFICATION FACILITIES - Ownership - U.S. Defense Plant Corp

Size - 10 hangars [illegible] ft x 7[illegible] ft

Final disposition - Returned to U.S.Defense Plant Corp.

MODIFICATION CONTRACTS - W-[illegible]-AC-[illegible]
W-[illegible]-AC-[illegible]

MISCELLANEOUS DATA - Closed as modification program terminated after V-J Day.

PAN-AMERICAN-BROWNSVILLE MODIFICATION CENTER, Brownsville, Texas

CONTRACTOR - Pan-American Airways System

First Airplane received at Modification Center - 12 July, 1942
Final Airplane delivered from Modification Center - 23 March, 1943

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	[illegible] airplanes	B-24, AT-[illegible]
1943	[illegible] airplanes	B-3[illegible], A-2[illegible]
TOTAL	17[illegible] airplanes	

MODIFICATION FACILITIES - Ownership - Pan-American Airways System

Size - Space as required in contractor's hangars & shops.

Final disposition - Returned to contractor

MODIFICATION CONTRACTS - W-[illegible]-AC-[illegible]
W-[illegible]-AC-[illegible]

MISCELLANEOUS DATA - [illegible]

CURTISS-WRIGHT BUFFALO MODIFICATION CENTER, Municipal Airport, Buffalo, New York.

CONTRACTOR - Curtiss-Wright Corp., Airplane Division

First Airplane Received at Modification Center - 26 November, 1942
Final Airplane Delivered from Modification Center - 15 September, 1944

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1943 ... airplanes P-..., P-39, P-40, P-51, C-46, C-78
1944 313 airplanes P-..., P-51, C-46, OA-10

TOTAL ... airplanes

MODIFICATION FACILITIES - Ownership - U. S. Army Air Forces

Size - 1 Hangar 150 ft. x ... ft.

Final Disposition - To prime contractor for production use.

MODIFICATION CONTRACT - W-535-AC-...

MISCELLANEOUS DATA - This facility was given up upon completion of modification contract to the Curtiss-Wright Corp. for employment on the production and delivery of completely modified airplanes ... flight acceptance tests.

UNITED-CHEYENNE MODIFICATION CENTER, Municipal Airport, Cheyenne, Wyoming.

CONTRACTOR - United Airlines Transport Corp.

First Airplane Received at Modification Center - 4 February, 1942
Final Airplane Delivered from Modification Center - 25 May, 1...

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942 103 airplanes B-17
1943 2372 airplanes B-17
1944 ... airplanes B-17, B-..., OA-10
1945 ... airplanes B-17, B-..., OA-10

TOTAL ...33 airplanes

MODIFICATION FACILITIES - Ownership - U. S. Army Air Forces

Size - 3 hangars, each 1... x ...

[illegible]

[illegible] MODIFICATION CENTER [illegible], C[illegible]

CONTRACTOR - Douglas [illegible] Co., Inc.

F[illegible] Airplane [illegible] Modification Center - [illegible] [illegible]
Final Airplane Delivered from Modification Center - [illegible] June, 194[illegible]

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	[illegible] airplanes	C-4[illegible], [illegible], C-[illegible], A-[illegible], [illegible]
194[illegible]	[illegible] airplanes	[illegible], [illegible], C-[illegible], [illegible], F-[illegible]
1[illegible]	15[illegible] airplanes	A-[illegible], [illegible]-1, F-7 (A-[illegible])

TOTAL 3[illegible] airplanes

MODIFICATION FACILITIES - Ownership - U. S. Army Air Forces

Size - [illegible] hangars each 16[illegible] ft. x 1[illegible] ft.
[illegible] hangars [illegible] ft. x 13[illegible] ft.

Final disposition.- To [illegible] Air Force for training purposes.

MODIFICATION CONTRACTS - W-[illegible] AC-[illegible]
W-[illegible] AC-[illegible]
W-[illegible] AC-[illegible]

MISCELLANEOUS DATA - This capacity [illegible] over [illegible] as A-2[illegible] modifications were picked up in production lines. In addition, the labor situation was always critical at this facility because of the extreme heat and the isolated location.

LOCKHEED-DALLAS MODIFICATION CENTER, Love Field, Dallas, Texas.

CONTRACTOR.- Lockheed Aircraft Corp.

First Airplane received at Modification Center - 27 February, 1942
Final Airplane delivered from Modification Center - 7 November, 1945

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

194[illegible]	[illegible] airplanes	B-3[illegible], C-[illegible], A-[illegible], P-[illegible], F-[illegible], [illegible]
1943	13[illegible] airplanes	B-17, B-3[illegible], C-60, A-[illegible], A-36, P-3[illegible], P-51, F-5, F-7, [illegible]
1944	[illegible] airplanes	B-17, B-[illegible], P-51, C-[illegible], F-[illegible]
1945	1328 airplanes	B-17, P-38, F-5, P-80

TOTAL 5[illegible] airplanes

MODIFICATION FACILITIES - Ownership - U. S. Army Air Forces

Size - [illegible] hangars each [illegible] x [illegible]

MODIFICATION CENTER DATA

[illegible]

BOEING-CONTINENTAL-DENVER MODIFICATION CENTER, [illegible] Airport, Denver, Colorado
CONTRACTOR - Boeing Aircraft Co. — SUB-CONTRACTOR - Continental Air Lines, Inc.

First Airplane received at Modification Center - 2 March, 19[illegible]
Final Airplane delivered from Modification Center - 29 August, 1945

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	[illegible] airplanes	B-17
1943	[illegible] airplanes	B-17, P-51
1944	[illegible] airplanes	B-17, B-29, P-51
1945	272 airplanes	B-29, F-13
TOTAL		

MODIFICATION FACILITIES - Ownership - U.S. Army Air Forces

Size - [illegible] 2 hangars each [illegible]

Final Disposition - To U.S. Army Air Forces for disposition.

MODIFICATION CONTRACTS -

W-535- AC-[illegible]	W-535- AC-[illegible]
W-535- AC-[illegible]	W-535- AC-[illegible]
W-535- AC-[illegible]	W-535- AC-[illegible]

MISCELLANEOUS DATA - This facility started work in Continental Air Lines hangars [illegible] Later the contract was given to Boeing Aircraft Co. with sub-contract for the operation of the center to Continental Air Lines. Closed as mod. program terminated after V-J Day.

EVANSVILLE-REPUBLIC MODIFICATION CENTER, Municipal Airport, Evansville, Indiana

CONTRACTOR - Republic Aviation Corp

First Airplane received at Modification Center - 17 November, 194[illegible]
Final Airplane delivered from Modification Center - 30 September, 194[illegible]

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	[illegible] airplanes	P-47
1943	[illegible] airplanes	P-47, P-51, B-25
1944	[illegible] airplanes	B-[illegible], A-[illegible], P-47, P-51, C-[illegible]
TOTAL	1105 airplanes	

MODIFICATION FACILITIES - Ownership - U.S. Army Air Forces

CONSOLIDATED [illegible] MODIFICATION CENTER, [illegible], [illegible]

CONTRACTOR - Consolidated Aircraft Corp. --- Consolidated-Vultee Aircraft Corp.

[illegible] Modification Center - [illegible]
[illegible] Modification Center - [illegible] 1943

NUMBER AND TYPE OF AIRCRAFT [illegible]

1942 [illegible] airplanes B-[illegible]
1943 [illegible] airplanes B-2[illegible]

TOTAL [illegible] airplanes

MODIFICATION FACILITIES - [illegible] - U S Government owned aircraft factory

[illegible] - [illegible]

[illegible] - Returned to production use.

MODIFICATION CONTRACTS - W-535- AC-[illegible]
W-535- AC-[illegible]
W-[illegible]- AC-[illegible]

MISCELLANEOUS DATA - [illegible] modification of B-2[illegible] [illegible] [illegible] [illegible] facilities to manufacturing products [illegible] [illegible] [illegible] [illegible] for the [illegible] [illegible] to Consolidated-Vultee-Louisville Modification Center.

NORTH AMERICAN-FAIRFAX MODIFICATION CENTER, Fairfax Airport, Kansas City, Kansas

CONTRACTOR - North American Aviation, Inc. of Kansas

First Airplane [illegible] at Modification Center - 14 [illegible] 1942
[illegible] Modification Center - 6 October, 1944

NUMBER AND TYPE OF AIRCRAFT MODIFIED -

1942 612 airplanes B-25
1943 1324 airplanes B-25
1944 [illegible] airplanes B-25, P-51

TOTAL [illegible] airplanes

MODIFICATION FACILITIES - [illegible] - U S [illegible] Air Force

[illegible] - 2 hangars, each 160 ft. x 60[illegible] ft.

[illegible] - [illegible]

MODIFICATION CONTRACTS - W-535- AC-[illegible]

MISCELLANEOUS DATA - [illegible] facility.

[illegible] CENTER DATA

T. [illegible] A. - KANSAS CITY MODIFICATION CENTER, Municipal Airport, [illegible]

CONTRACTOR - Transcontinental [illegible] Western Air, Inc.

First Aircraft [illegible] at Modification Center - [illegible] 1942
Final Aircraft [illegible] from Modification Center - 26 [illegible], 1943

NUMBER AND TYPE OF AIRCRAFT MODIFIED -

1942 1?6 airplanes [illegible], C-[illegible]
1943 292 airplanes A-20, B-[illegible]

TOTAL 4?? airplanes

MODIFICATION FACILITIES. -

Ownership - Transcontinental & Western Air, Inc. & U.S. Army Air Forces

Size - 1 temporary hangar, [illegible] (U.S. [illegible]) + part of contractor's facilities

Final disposition - Temporary Hangar (U.S. [illegible]) to Air [illegible] Contractor's facilities retained by contractor

MODIFICATION CONTRACTS - W-535- AC-23149
W-535- AC-27970
W-535- AC-35716

MISCELLANEOUS DATA - This [illegible] no longer being required [illegible] modification [illegible] with other war work, [illegible] the contractor being [illegible] with other war work, [illegible] this modification facility was closed. The temporary [illegible] steel hangar was [illegible] and transferred to the Air [illegible]

DOUGLAS AIRCRAFT CO., INC., Long Beach, California.

CONTRACTOR - Douglas Aircraft Co., Inc.

First Aircraft Received at Modification Facility - April, 1943
Final Aircraft Delivered from Modification Facility - [illegible]

NUMBER AND TYPE OF AIRCRAFT MODIFIED.-

1943 1?? airplanes C-47
1944 1?? airplanes C-47, A-26, B-17

TOTAL 2?? airplanes

MODIFICATION FACILITIES -

Ownership - Douglas Aircraft Co., Inc.

Size - Space as required

Final disposition - Returned to production [illegible]

MODIFICATION CONTRACT - W-535- AC-32123

MISCELLANEOUS DATA - This modification program [illegible] only on [illegible] [illegible] [illegible] customers, [illegible] [illegible] [illegible]

MODIFICATION CENTER DATA

[illegible], Ky.

[illegible] [illegible]ville, Ky

[illegible]

[illegible] [illegible]9 August, 19[illegible]5

[illegible]

[illegible] B-24

TOTAL 2030 airplanes

MODIFICATION FACILITIES - [illegible]

[illegible] - Returned to U.S. Army Air Forces for disposition.

MODIFICATION [illegible] - [illegible]

MISCELLANEOUS DATA - [illegible]
Closed as modification program terminated on V-J Day.

[illegible], Ky

[illegible]

First [illegible]
Final [illegible]

NUMBER [illegible]

[illegible]

MODIFICATION FACILITIES - [illegible]

[illegible] -

Final [illegible]

MODIFICATION CONTRACT - [illegible]

MISCELLANEOUS DATA - [illegible] airplanes [illegible] modification [illegible]

[illegible]

BELL AIRCRAFT CORP. [illegible]

CONTRACTOR - Bell Aircraft Corp.

First [illegible] received at Modification Center - [illegible]
Final [illegible] delivered from Modification Center - [illegible]

NUMBER AND TYPE OF AIRCRAFT MODIFIED -

[illegible] 27 airplanes [illegible]

MODIFICATION FACILITIES - [illegible] - U. S. Government owned factory

Size - [illegible]

[illegible] of facilities - Returned to production [illegible]

MODIFICATION CONTRACT - [illegible]-30- AC-27730 [illegible]

MISCELLANEOUS DATA - This factory, employed on the production of [illegible] or this [illegible] on the modification of other B-29 [illegible] by other factories. [illegible] modification [illegible] this was [illegible] Marietta, Ga. proceeded with the production of B-29 [illegible] delivering them completely modified on [illegible]

CHICAGO & SOUTHERN - [illegible] MODIFICATION CENTER, Municipal Airport, Memphis, Tenn.

CONTRACTOR - Chicago & Southern Air Lines, Inc.

First [illegible] received at Modification Center - 18 Feb., 1942
Final Airplane delivered from Modification Center - 23 June, 1944

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	2[illegible] airplanes	P-[illegible], A-[illegible], C-47, P-76
1943	7[illegible] airplanes	A-[illegible], A-[illegible], A-33, A-[illegible], [illegible], P-70, C-47
1944	[illegible] airplanes	A-[illegible], [illegible], P-7[illegible], P-70, C-[illegible]

TOTAL 651 airplanes

MODIFICATION FACILITIES - [illegible] - U. S. ARMY AIR FORCES

Size - 1 hangar 1[illegible] ft, x [illegible] ft. ([illegible]) [illegible] use of [illegible] hangar and [illegible] as required

[illegible] - To [illegible] Aircraft [illegible] - for [illegible]

MODIFICATION CONTRACTS - W-535- AC-[illegible] W-535- AC-[illegible]
W-535- AC-[illegible] W-535- AC-[illegible]
W-535- AC-[illegible]

MISCELLANEOUS DATA - This facility was closed as the capacity was small and other modification centers were sufficient [illegible]

MID-CONTINENT [illegible] INC., [illegible], Kansas

CONTRACTOR - Mid-Continent [illegible], Inc

First [illegible] received at Modification Center - 7 March, 1942
Final [illegible] delivered from Modification Center - [illegible]

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

194[illegible]	[illegible] airplanes	B-1[illegible], [illegible], B-[illegible], B-[illegible]
194[illegible]	[illegible] airplanes	B-[illegible], [illegible], P-[illegible]
TOTAL	[illegible] airplanes	

MODIFICATION FACILITIES - Owned by - Mid-Continent Airlines, Inc

Size - Space as required in contract [illegible]

Final disposition - Returned to contractor's use

MODIFICATION CONTRACTS - W-535-AC-[illegible] W-535-AC-[illegible]
W-535-AC-[illegible] W-535-AC-[illegible]
W-535-AC-[illegible] W-535-AC-[illegible]

MISCELLANEOUS DATA - [illegible] small [illegible] other [illegible] available [illegible] modification [illegible].

CONSOLIDATED-VULTEE AIRCRAFT CORP., Nashville, Tenn

CONTRACTOR - Consolidated-Vultee Aircraft Corp

First [illegible] received at Modification Center - [illegible] March, 1944
Final [illegible] delivered from Modification Center - 11 September, 194[illegible]

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

194[illegible] [illegible] airplanes [illegible], P-38

MODIFICATION FACILITIES - Owned by - U. S. Government [illegible]

Size - Space as required

Final disposition - Returned [illegible]

MODIFICATION CONTRACT - W-535-AC-[illegible]

MISCELLANEOUS DATA - [illegible]

MODIFICATION CENTER DATA.

AMERICAN AIRLINES MODIFICATION CENTER, La Guardia Field, New York, New York

CONTRACTOR - American Airlines, Inc.

First Airplane Delivered to Modification Center - 13 February, 1942
Final Airplane delivered from Modification Center - 10 October, 1942

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942 [illegible] airplanes Bell [illegible]

MODIFICATION FACILITIES - Ownership - American Airlines, Inc.

Size - Space as required in contractor's hangars & shops.

Final Disposition - [illegible] to contractor's use.

MODIFICATION CONTRACTS - W-535-AC-[illegible]
W-535-AC-[illegible]
W-535-AC-[illegible]

MISCELLANEOUS DATA - The contractor wished to be relieved of further modification assignments as they had other war work to do. As sufficient modification capacity was available the facility was closed.

BELL-NIAGARA MODIFICATION CENTER, Municipal Airport, Niagara Falls, New York

CONTRACTOR - Bell Aircraft Corp.

First Airplane Delivered to Modification Center - 17 October 1942
Final Airplane delivered from Modification Center - 7 November, 1945

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942	62 airplanes	P-39
1943	[illegible] airplanes	P-39, P-40, P-63
1944	[illegible] airplanes	P-39, P-40, P-51, P-63, P-47, C-45, AT-1[illegible], OA-10
1945	130 airplanes	C-45, OA-10, P-40, P-63

TOTAL [illegible]634 airplanes

MODIFICATION FACILITIES - Ownership - U. S. Army Air Forces

Size - 2 hangars, each 121 ft. X [illegible]

Final Disposition - Returned to U.S. Army Air Forces for disposition.

MODIFICATION CONTRACT - W-535-AC-[illegible] [illegible] - AC-12[illegible]

MISCELLANEOUS DATA - Closed as modification program terminated on V-J Day.

MODIFICATION CENTER DATA

DOUGLAS- OKLAHOMA CITY MODIFICATION CENTER, Municipal Airport, Oklahoma City, Okla.

CONTRACTOR - Douglas Aircraft Co., Inc.

First Airplane ... Modification Center ... 21 Nov. 1943
Final Airplane ... Modification Center ...

NUMBER AND TYPE OF AIRCRAFT MODIFIED -

1943 ... airplanes C-47
1944 1851 airplanes C-47 C-54
1945 ... airplanes C-... C-54, ...

TOTAL 2365 airplanes

MODIFICATION FACILITIES - ... - U.S. Army Air Forces

Final ... - Assignment to U.S. ... Maintenance Division.

MODIFICATION CENTER ... W535-ac-...

FINAL DISPOSITION - ... Aircraft Co. was able to ... C-47 airplanes in their ... regular ... was not otherwise ... Oklahoma City ... Maintenance Division for ... the request of the A.T.S.C. Maintenance Division ... Oklahoma City Air Depot was ... to them.

MARTIN - OMAHA MODIFICATION CENTER, Omaha, Nebraska

CONTRACTOR - The Glenn L. Martin Co.

First ... 10 Feb., 1942
Final ... 1945

NUMBER AND TYPE OF AIRCRAFT MODIFIED -

194. ... airplanes ...
194. 1174 airplanes ...
194. 760 airplanes ...
1945 ... airplanes ...

TOTAL 2.2.. airplanes

MODIFICATION FACILITIES - ...

MODIFICATION ...

MISCELLANEOUS DATA - ...

NORTHWEST- ST. PAUL MODIFICATION CENTER, Municipal Airport, St. Paul, Minnesota

CONTRACTOR:- Northwest Airlines, Inc.

First airplane received at Modification Center - 30 January, 1945
Final Airplane delivered from Modification Center - 24 September, 1945

NUMBER AND TYPE OF AIRCRAFT MODIFIED:-

1944	352 airplanes	B-25, B-26
1945	2467 airplanes	B-25, B-26, B-29, F-7, C-87, F-5
1944	1153 airplanes	B-25, B-26, B-29, C-87, C-109
1945	903 airplanes	B-29, F-7 HEX.

TOTAL 3315 airplanes

MODIFICATION FACILITIES:- Ownership:- U. S. Army Air Force.

Size:- 2 hangars, each 168 ft. X 600 ft.

Final disposition:- To U.S.A.A.F. for disposition.

MODIFICATION CONTRACTS:- W-535- AC-25870, W-535- AC-29742, W-535- AC-33811, W-535- AC-31758, W-535- AC-34911, W-535- AC-35710

MISCELLANEOUS DATA:- Closed as modification program terminated as of V-J Day.

DOUGLAS AIRCRAFT CO., INC. Santa Monica, California

CONTRACTOR - Douglas Aircraft Co., Inc.

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1944 290 Airplanes B-19

First Airplane received at Modification Center - 1 May, 1944
Final Airplane delivered from Modification Center - 30 June, 1944

MODIFICATION FACILITIES - Ownership - Douglas Aircraft Co. factory

Size - Space as required.

Final disposition - Returned to production use by Douglas Aircraft Co.

MODIFICATION CONTRACT:- W-535- AC-32103

MISCELLANEOUS DATA:- Modification work done at factory on double acceptance basis. Picked up by factory on single acceptance basis as modification work as such discontinued.

MODIFICATION CENTER DATA

CONSOLIDATED - TUCSON MODIFICATION CENTER, Municipal Airport #2, Tucson, Arizona
Revised - CONSOLIDATED - VULTEE - TUCSON MODIFICATION CENTER, Same address.

CONTRACTOR - Consolidated Aircraft Corp. & Consolidated-Vultee Aircraft Corp.

First aircraft [illegible] Modification Center - [illegible] November, 1942
Final aircraft [illegible] Modification Center - 6 September, 1945

NUMBER [illegible] MODIFIED -

1942 [illegible] B-24, [illegible]
1943 [illegible] B-24, [illegible] F-7
1944 [illegible] airplanes B-24, F-7, P-73, B-29 (split cowl)
1945 [illegible] airplanes

TOTAL 4103 airplanes

MODIFICATION FACILITIES - [illegible]
Size - [illegible]
[illegible] Returned to U.S.Army Air Forces for disposition.

MODIFICATION CONTRACTS - [illegible]

MISCELLANEOUS DATA - Closed as modification program terminated as of V-J Day.

DOUGLAS - TULSA MODIFICATION CENTER, Municipal Airport, Tulsa, Oklahoma

CONTRACTOR - Douglas Aircraft Co., Inc.

First Air[illegible] Modification Center - [illegible] 1942
Final air[illegible] Modification Center - 11 October, 1945

NUMBER [illegible] MODIFIED -

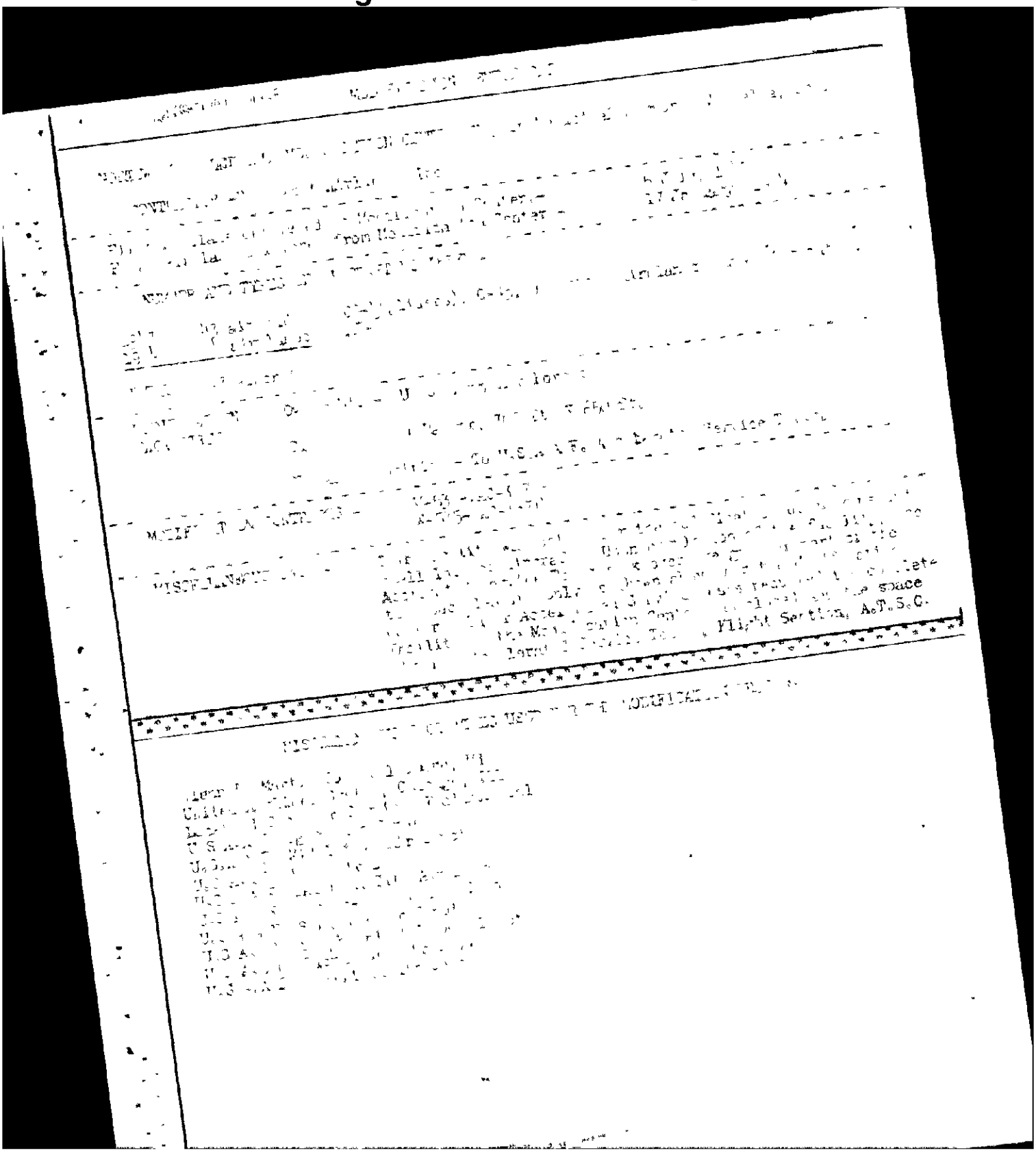
1942 [illegible] B-24, [illegible], P-70, [illegible]
1943 [illegible] [illegible] F-7, [illegible], C-47.
1944 [illegible] B-17, [illegible]
1945 603 airplanes B-17, B-24, A-26, A-20

TOTAL 23[illegible] airplanes

MODIFICATION FACILITIES - [illegible] Air Forces
[illegible] X [illegible]
Size - [illegible]
[illegible] Returned to U.S.Army Air Forces for disposition
[illegible]

MODIFICATION CONTRACTS - [illegible]

[illegible] modification program terminated as of V-J Day.



Appendix 6

SUMMARY, 1942 TO JUNE 1944

A SUMMARY OF AIRPLANES
ON WHICH
MODIFICATIONS WERE COMPLETED AT MODIFICATION CENTERS
OPERATING UNDER THE SUPERVISION OF:

SPECIAL PROJECTS BRANCH, P.E.S. – 1 JANUARY, 1942
SPECIAL PROJECTS SECTION – 19 OCTOBER, 1942
AIRCRAFT MODIFICATION SECTION – 1 FEBRUARY, 1943
AIRCRAFT MODIFICATION BRANCH, P.E.S. – 19 JUNE, 1943
MODIFICATION CONTROL SECTION – 10 MAY, TO 11 JUNE, 1944

WRIGHT FIELD, DAYTON, OHIO.

APPROVED [signature]

AIRCRAFT MODIFIED AT MODIFICATION CENTERS BY MONTHS

YEAR	1942												
MODIFICATION CENTERS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
ATLANTA-EASTERN A.L.			7	18									25
ATLANTA-DELTA AIRLINE					11	23	44	31	30	17	20	19	206
BIRMINGHAM MOD. CENTER													
BROWNSVILLE-PAN AMERICAN							0	4	3	16	16	28	67
BUFFALO-CURTISS WRIGHT											0	0	0
CHEYENNE-UNITED A.L.		0	7	13	61	20	31	44	27	48	64	68	403
DAGGETT-DOUGLAS AIRCRAFT											9	83	92
DALLAS-LOCKHEED AIRCRAFT		0	0	12	3	22	57	87	132	99	67	59	459
DENVER-CONTINENTAL A.L.			16	7	34	25	0	13	15	13	30	36	209
EVANSVILLE-REPUBLIC AIRCT											7	17	24
FT WORTH-CONSOLIDATED AIRCRAFT							0	15	35	23	49	58	206
KANSAS CITY-NORTH AMERICAN			0	0	30	34	90	64	39	67	100	38	812
KANSAS CITY-TWA AIRLINE								0	60	30	26	25	140
LONG BEACH-DOUGLAS A.C.													
LOUISVILLE-CONSOL. AIRCRAFT									0	0	0	5	5
MARIETTA-BELL AIRCRAFT													
MEMPHIS-C&S AIRLINE		14	0	0	31	9	5	19	60	25	58	30	252
MINNEAPOLIS-MID-CONT. A.L.			2	16	2	7	17	6	0	8	49	17	118
NASHVILLE-CONSOL. AIRCRAFT													
NEW YORK-AMERICAN A.L.		0	0	2	12	25	13	14	29	4			99
NIAGARA FALLS-BELL AIRCT										15	3	44	62
OKLAHOMA CITY-DOUGLAS A.C.													
OMAHA-MARTIN AIRCRAFT		0	0	0	4	62	37	48	140	44	36	31	432
ST. PAUL-NORTHWEST A.L.		0	2	20	21	11	43	48	69	65	35	38	352
SANTA MONICA-DOUGLAS A.C.													
TUCSON-CONSOL. AIRCRAFT											0	2	2
TULSA-DOUGLAS AIRCRAFT							0	9	65	57	67	59	271
VANDALIA-NORTHWEST A.L.													
TOTALS	0	14	35	86	27	384	341	348	779	520	660	749	4038

YEAR	1943												
MODIFICATION CENTERS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
ATLANTA-EASTERN A.L.													
ATLANTA-DELTA AIRLINE	7	41	38	43	61	30	9	8	24	28	24	22	336
BIRMINGHAM MOD. CENTER		0	0	0	2	10	70	61	126	109	262	300	1061
BROWNSVILLE-PAN AMERICAN	32	5	27										64
BUFFALO-CURTISS WRIGHT	14	12	12	16	97	30	110	54	60	52	41	107	580
CHEYENNE-UNITED A.L.	102	166	214	221	185	197	208	191	227	207	231	249	2372
DAGGETT-DOUGLAS AIRCRAFT	38	153	139	120	165	67	230	12	169	194	209	220	1656
DALLAS-LOCKHEED AIRCRAFT	69	60	62	129	62	30	69	72	86	171	285	366	1562
DENVER-CONTINENTAL A.L.	70	103	93	116	60	72	104	100	137	120	192	226	1633
EVANSVILLE-REPUBLIC AIRCT	12	26	20	20	24	15	60	20	67	110	61	30	457
FT WORTH-CONSOLIDATED AIRCRAFT	97	71	47	50	99	90	57	81	6				646
KANSAS CITY-NORTH AMERICAN	64	102	135	171	161	176	39	61	60	130	132	105	1524
KANSAS CITY-TWA AIRLINE	16	5	29	25	20	24	22	40	45	27	9		292
LONG BEACH-DOUGLAS A.C.					70	140	164	182	181	159	181	177	1249
LOUISVILLE-CONSOL. AIRCRAFT	41	49	57	23	32	51	29	21	22	20	47	67	457
MARIETTA-BELL AIRCRAFT											0	0	0
MEMPHIS-C&S AIRLINE	30	24	26	10	47	10	6	43	24	1	44	56	330
MINNEAPOLIS-MID-CONT. A.L.	3	48	49	23	1								102
NASHVILLE-CONSOL. AIRCRAFT													
NEW YORK-AMERICAN A.L.													
NIAGARA FALLS-BELL AIRCT	149	173	205	51	147	272	364	220	306	307	198	206	2540
OKLAHOMA CITY-DOUGLAS A.C.					0	6	26	16	20	31	78	112	299
OMAHA-MARTIN AIRCRAFT	49	57	32	142	170	201	190	132	60	121	66	136	1274
ST. PAUL-NORTHWEST A.L.	33	52	38	74	83	113	105	96	105	35	36	65	807
SANTA MONICA-DOUGLAS A.C.													
TUCSON-CONSOL. AIRCRAFT	32	40	111	92	149	121	136	235	226	241	220	323	2000
TULSA-DOUGLAS AIRCRAFT	179	100	120	1	1	1	0	49	31	64	30	57	665
VANDALIA-NORTHWEST A.L.							0	80	15	0	0	0	65
TOTALS	057	1301	1534	351	1659	760	2145	1720	2003	2312	2372	2647	22 007

YEAR	1944							
MODIFICATION CENTERS	JAN	FEB	MAR	APR	MAY	JUNE*	TOTAL	GRAND TOTAL
ATLANTA-EASTERN A.L.								25
ATLANTA-DELTA AIRLINE	37	0	10	25	19		91	633
BIRMINGHAM MOD. CENTER	328	377	366	369	272	67	1797	2858
BROWNSVILLE-PAN AMERICAN								131
BUFFALO-CURTISS WRIGHT	67	69	74	47	2	10	269	847
CHEYENNE-UNITED A.L.	245	307	296	275	261	106	1440	4225
DAGGETT-DOUGLAS AIRCRAFT	301	247	312	272	212	61	1396	3341
DALLAS-LOCKHEED AIRCRAFT	304	327	286	312	179	57	1462	3602
DENVER-CONTINENTAL A.L.	137	60	67	110	69	19	567	2205
EVANSVILLE-REPUBLIC AIRCT	158	200	10	133	93	8	602	1086
FT WORTH-CONSOLIDATED AIRCRAFT								854
KANSAS CITY-NORTH AMERICAN	100	155	243	256	258	94	1202	3138
KANSAS CITY-TWA AIRLINE								432
LONG BEACH-DOUGLAS A.C.	170	132	223	212	290	82	1175	2424
LOUISVILLE-CONSOL. AIRCRAFT	78	63	79	100	88	26	439	901
MARIETTA-BELL AIRCRAFT	3	17	25	0	8	3	56	56
MEMPHIS-C&S AIRLINE	5	9	15	3	11	11	51	634
MINNEAPOLIS-MID-CONT. A.L.								220
NASHVILLE-CONSOL. AIRCRAFT			3	105	1	0	109	109
NEW YORK-AMERICAN A.L.								99
NIAGARA FALLS-BELL AIRCT	301	272	318	300	204	91	1584	4180
OKLAHOMA CITY-DOUGLAS A.C.	176	275	223	264	301	78	1308	1604
OMAHA-MARTIN AIRCRAFT	147	58	98	138	148	27	614	2420
ST. PAUL-NORTHWEST A.L.	81	50	110	116	81	24	500	1729
SANTA MONICA-DOUGLAS A.C.					74	73	147	147
TUCSON-CONSOL. AIRCRAFT	371	315	302	285	262	55	1590	3600
TULSA-DOUGLAS AIRCRAFT	135	172	131	166	221	26	870	1806
VANDALIA-NORTHWEST A.L.	6						6	47
TOTALS	3264	3210	3194	3303	3056	898	17,227	43,272

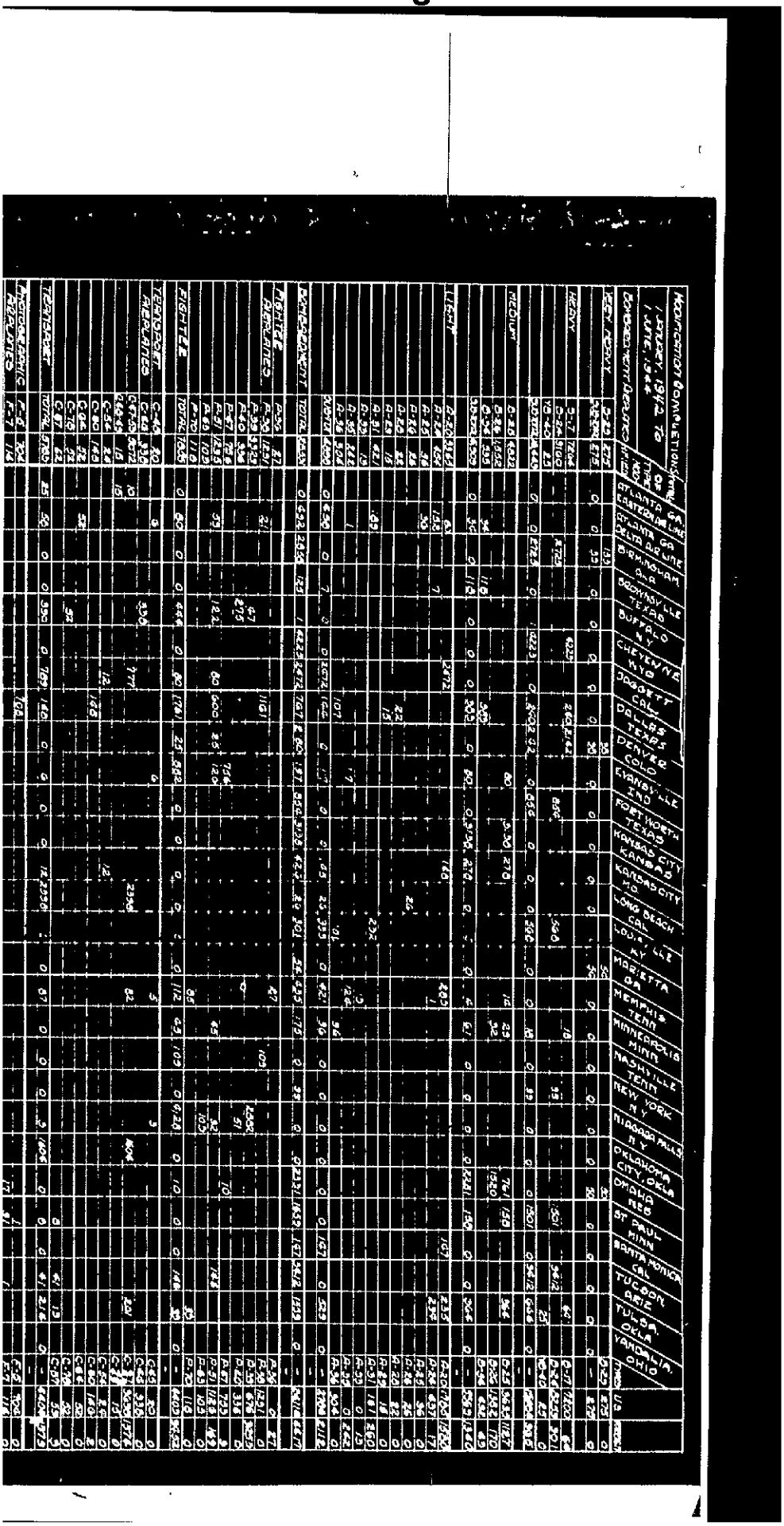
* – 1 JUNE TO 11, 1944

AIRCRAFT TYPES MODIFIED BY MONTHS

TYPE OF AIRCRAFT

1942 | 1943 | 1944

JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE TOTAL



I N D E X