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

AIR HISTORICAL OFFICE
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THE MODIFICATION OF ARMY AIRCRAFT IN THE UNITED STATES
1939-1945

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Air Historical Office
Headquarters, Army Air Forces
August 1947

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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 material 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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"Modification" is a term applied to a continuing process in
the Army Air Forces—namely, the execution of technical changes in
aircraft for the purpose of correcting defects, improving combat perform-
ance, or incorporating equipment necessary to adapt the aircraft to
a particular function. 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.

In time of war, the need for modifications—i.e., of course, far
more urgent than in time of peace—was generally met in the follow-
ing ways:

1. Proposals 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 proposed by the
   manufacturers.

The tendency in modifications during peacetime was toward improvements
in flying safety, and suggestions for such changes were normally in-
itiated either by the research laboratory, maintained by the Air Arm,
or by the manufacturers.

The vitally important modification needs was indicated by the
fact that during World War II nearly 100 per cent of the changes and

1
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. It is significant that the combat modifications of the 5-2 flew assumed such importance that a special or addition—the 4th section of the 20th Air Force—was set up in the quarters to expedite and superintend the performance of the work. 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 aircraft 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 compliance or changes—must be exempted from this category. An example of such minor changes was the requirement that washers be placed on a certain bolt in the landing gear torque knee of AI-10 airplanes to prevent failure of that mechanism. 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. 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 A-29's to come out of the factories could not be thrown into the Pacific war until they had been subjected to 10 months of modification, including the installation of additional fuel tanks and of 11/18-25 power equipment. Further, the newly developed "380 engines, which powered the A-29, necessitated many revisions to improve cooling and reduce the fire hazards. The features just mentioned came to be built into later production models of the factories themselves, but, in the meantime, on changes, such as snap-opening bomb bay doors, were found necessary, and the modification process continues.

The modifications incorporated in any aircraft were indicated by approximate changes in the block and series, no even in the type and model designations. For instance, the A-24, after being equipped with a different life raft and cabin turret and a later type of sight for the waist guns, was given the block number "12" and was thereafter known as the A-24-1-15, to distinguish it from the L-24-10, the next earlier block of A-24's. The series letter was changed upon the adoption of modifications affecting structure, primary equipment, or engine performance rating. Thus, the L-17, after the installation of a chin turret, was designated the L-17C. Airplanes were even converted into new types by extensive changes. After receiving from radio modifications, the A-29 became
a different type and model, the P-13...

radically, the process by which the proposed modifications were
translated into requirements remained the same during the history of the
Air Arm. Defects of one sort or another, particularly in new airplane models like the P-35, were always being discovered by the using
organizations, and advice on such difficulties was given to the Materiel
Division and the contractor, both of whom attempted to devise changes
which could remedy the situation. When a change was officially adopted,
modifications in the original specifications were granted by the Materiel
Division and the contractor would incorporate the change in any aircraft
still in production. Airplanes already delivered to the user were
modified by the service or division as a rule, the contractors
undertaking the necessary parts, drawings, and instructions—sometimes
at no additional cost to the Government.

Notices to the effect that service or modifications, particularly the
aircraft, were to perform certain modifications were most often issued
in the form of a Technical Instruction (TI) or Technical Letter. A
Typical technical directive was a technical instruction which pertained
to the situation of P-35 and P-40 airplanes for observation purposes
up to 1933. Some of the prescribed changes were the installation of .50-
caliber machine guns to be operated from the pilot’s cockpit, the removal of
the oil filter, the installation of a 20-cm camera in the observer’s rec
view mirror positions, and the addition of another transmission channel
to the front by means of the command radio set, the N-378. In all,
17 individual changes were listed, but, in view of the different requirements
of the various theaters or environments the continental air forces to which the P-47s were to be assigned, not all the changes are to be accomplished on any one airplane, or even of airplanes.

Modifications, such as those listed above, were accomplished not only in well-organized shops on bases in the United States, but also in the various combat theaters by the service centers of the overseas air forces, the insular air depots, the touring units, and even carrier maintenance personnel. This study, however, does not cover the very extensive modification work performed at overseas stations; nor does it include a treatise on the modification of wax, or gas, or skin, or other items of equipment. The present scope of the study is limited to the discussion because of the inordinate time it would occupy in the necessary records. The present study, then, is concerned with the work of the changes which are performed within the continental United States: modification centers, maintenance units, or otherwise, by service organizations, particularly in the United States, during the period 1943-1945.

Rather than dwell on the modifications or station and their instruction, the emphasis is placed on the total performance of modification and on the evolution of policies which were used pertaining to the whole modification process.
Chapter II

July 16, 1939

The modification of any aircraft first had to be a present problem, curiously enough, by which time changes or technical changes to an aircraft that to introduce the will into the stories would have seriously affected production schedules. Although the need and an omission appeared to be very clear, such changes would be too late.

The reaction of the critical modifications that in October 1931 helped to reassume this situation. In accordance with the critical plan, several modifications were made on prototypes, modifications were classified into (1) ones essential to flying, (2) improvements in performance, and (3) improvements not critical but essentially valuable to the aircraft. Once modifications were introduced into the aircraft's stories immediately, but the other two classes, being of a lesser amount, were not into the laboratory. Improvements least likely to upset production schedules, modifications on a second or third aircraft, included the conversion of at least, originally designated as fighters, to reconnaissance planes by eliminating cool controls and removing machine guns in the floor and both sides of the fuselage. In 1932, the laboratory was modified to serve as a photo-reconnaissance. A large still, located in the bottom of the fuselage behind the airplane's cockpit, and several cross-struts were built into the aircraft at this point to hold the camera.
The modification policy in effect in the 1920's provided that
the aircraft division at Wright Field made coordinated and standard
procedures for changes in aircraft design, but that approval of the
copies, or of the roughs, was made so often the actual work could
be performed. This policy continued in effect until 1930, when it was
changed to the extent that the aircraft division was authorized to
negotiate for the accomplishment of modifications before approval had
been formally given by Air Corps headquarters. Also, modifications at
that time were limited to improvements in flying ability or to changes
in design necessary to remedy deficiencies revealed by flying or
organizations or by the combat experience of foreign nations with similar equipment.

The modifications authorized during the twenty-odd years between
of the two wars were carried out both by the aircraft manufacturers and
of service organizations of the Army Air Corps. Long the manufacturers,
the Boeing Airplane Company received 63 airplanes for use in forest
patrol work in 1920, and the Curtiss Company repaired and modernized
Curtiss biplanes the next year. The conversion of 97-1's to 20-1's
during the 1920's was undertaken jointly by manufacturers and the Air
Corps. In 1929 the Air Corps, desiring the fact that they were fulfilling
in laying their overall schedule, were using several modification
projects.

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. This practice is specifically forbidden in 1926, but the Material Division, because of its test and experimental responsibilities, was exempted from the terms of the directive.

During the 1920's, a number of modification projects were carried out. The Fairfield Air Depot, for example, converted P-123's to P-125's by the installation of a different engine, the JR-1340, in 1920 and 1921. In 1922, the new airplane, the P-125, underwent further modification when the engine ring completed its strengthening, and it was later found necessary to provide a more actual story factor for the engine ring itself. In 1924, a P-26 airplane needed certain changes in the collapse of the pilot's headrest and the tail cost. All P-26s in the possession of the Air Corps were strengthened to avoid the dismantling of the tail section of this class from the factory as built, until suitable modifications could be designed and accomplished. The new P-26's delivered from 10, until 1927, all carried these improvements, the modification of service circuit or installation accomplished on Air Corps bases under the supervision of factory representatives.

The P-108 airplane likewise underwent several changes. In March 1926 a new counterbalance was installed on the interplane torque tubes as designed by the manufacturer, but approval of the Material Division was necessary before the change could become effective. Later in the same year, radio and radiosensitive instruments, including a motion detector, were added, etc., etc., etc.
Chapter III

12. THE FIRST YEARS, 1939-1942

Outlook for the Future

The modification work accomplished on aircraft related to foreign
contracts by direct transfers under lease-back agreements during the
so-called "屬於 China," 1939-1941, was later a very important step
in the evolution of the technical modification contract. The interest
of European countries in American aircraft increased
considerably after the declaration of war by Britain in August in 1939;
by early 1940, U.S. manufacturers were committed to
build more than 3,000 aircraft for the Allies. Delivery of any of
the aircraft ordered by the countries involved in the war.

The manufacturers, facing the threat of war, decided to increase
their production capabilities, and the United States Government
agreed to assist such effort. The U.S. helped the Allies by
providing trained personnel, planes, and other support. This
development was crucial for the success of the Allies.

In the latter part of the war, there was considerable hesitation over
selling more U.S. aircraft to foreign governments. The release policy was
later liberalized, but the manufacturers had concerns that improved
for foreign sale were generally required to modify aircraft to
suit the needs of the Allies in return for the relaxation of restrictions.

9
Thus, then the side armor of certain models of aircraft was approved, the armor was made to protect the .40-cal. and .50-cal. guns in the air corps with lessened ease and in armament protection, similar to the equipment incorporated in escort airplanes. A further development of the E-17 for the air corps by installing armor plate and .50-cal. guns in return for governmental approval of a manufacture contract for 100 airplanes, the North American Aviation Company, after the release of one of its circuit airplanes to a foreign purchaser, was able to furnish the air corps the airplanes without cost. Another condition attached to "foreign releases" was that the United States Government be furnished complete instructions for the operation of American-made equipment, obviously an important factor in the cognizance process. Negotiations between the foreign purchasing commissions and the manufacturers were generally handled by air corps personnel, apparently to see that these conditions were met.

Manufacturers' contracts with foreign governments generally specified technical changes that were considered necessary to accept U.S. aircraft to use foreign armament and armor. Thus, the F-36's built for the French were equipped with French armament, instruments, and accessories, and 290 F-36's ordered by the British in July 1940 were to be modified to permit the installation of British radio equipment and tires. Many modifications were required of the British to such improve combat effectiveness. Several ships were made in the 20 E-17's allotted to Britain in 1940: lock-proof fuel tanks are installed; the control system was altered; and the armor plate, etc. shackles,
automatic pilot, and controls are changed. The 5 L-24's transferred
to the British under some sort of loan in 1941 likewise required certain
costal changes: British cutlery and utensils are to be supplied,
the runs are to be conditioned differently, duplicate hydraulic pumps
and trim systems installed, the outer wing panels reinforced, and
the like.

Some aircraft constructed under foreign contracts were later
reassigned to the Air Corps, as already indicated, and inasmuch as
any 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 L-35's, which had been built for Greece, were
ordered to the Philippine Air Depot for modification to U.S. speci-
fications. Again, I recently after Pearl Harbor, the Materiel Division
was directed to outline all the modifications needed for the conversion
of 300 British L-31's for U.S. use. These changes affected radio in-
sallations, armament, identification devices, and landing equipment.

Although the U.S. aircraft sent to England and other theaters of
operations had received such modifications, additional changes, resulting
from current experience in combat with the latest enemy equipment,
were very often found to be necessary. Such changes were 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 aircraft with which they were completely familiar. It was pointed out that U.S. manufac-
turers 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. 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.

Maj. Gen. George E. 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. 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 numbers of aircraft that were arriving in England.

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. In these facilities, modifications were to be performed on aircraft allocated to the Navy and auxiliary governments as well as on AAF aircraft.
The 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 resting near the factories, complete except for modifications, was found to be very bad for the morale of workers who were constantly being expected to increase their output. The recommendation urged the immediate establishment by the Air Force of a number of centers for the accomplishment of all operational changes in American-built aircraft.

Since these centers were ultimately to be more or less permanent installations operated by aircraft manufacturers, the companies were requested to submit their proposals so that construction could begin.

The important work of modification could not, however, be postponed while the centers 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, controller, and tool rooms, were staffed by experienced airline mechanics, were quickly set up due to the need of the modification program. On 12 January 1943 a list of all eligible airlines shops at which modification could be performed was in the establishment of permanent centers, the same as to follow:

**List of Airline Centers**

1-349

American Airlines, New York (providing establishment of a center by concentration of aircraft formerly at either Tucson or Fort Worth)

1-472, 1-473, 1-492

United Airlines, Chicago (providing establishment of a center by concentration of aircraft formerly at either Yuma or Hotel)
'65 C-24, C-47, C-30, C-94
Transcontinental Air Lines, Inc., Kansas City or 1st weeks (remained at Memphis Aircraft Company or at center at Tulsa or another location)

C-47
American Airlines, LaGuardia Airport, New York

Special radio installations on all models

One of the above installations or others not on the list were activated very quickly until, by 1942, 100 airplanes were being operated.

No radio installations were immediately activated, rather the earliest of the projects completed in the airlines shops was the modification in February 1942 of 14 C-23s for the British at the Memphis shop of the Chicago and Southern Airlines. In general, only limited temporary construction was authorized at the airline shops, the exceptions being the large construction projects at United Airlines, Chicago, estimated to be the modification center for all Boeing 317s, and Northwest Airlines, St. Louis, where C-94s were modified. It is intended that the airlines facilities could be returned to airlines use as the personnelcentures come into production toward the close of 1942. The volume of modification work done to be so great, however, that new airlines shops are planned through 1944.

Establishment of the Modification Centers

As soon as the airlines facilities were in full operation as modification shops, there was the need for white clover 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 15 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.

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. 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
Every change that resulted in new or improved procedures for
pursuing cost-saving and efficiency by the overseas forces.
These committees reported to the Project Control, or the
Project Control, the technical deficiencies of particular airplanes and
expected necessary corrections that could be performed either in the
modification centers or the factory production lines. Any alterations were
made, and coordinating or discharging of the overseas
air force. In the United States, supervision of the actual performance
of the performance of the modification centers is the responsibility of
the Project Control.

More specifically, modifications were carried out as follows:

The Director of Military Requirements. This office received
requests for modifications from the theater of operations, materiel control
inventory, and other sources. The requests were submitted by the Modification Section
and were to be approved by the Director of Materiel Control for approval.

The modification office then assigned to a modification center for action.

The special projects office, after
coordination with the theater of operations, the modification engineering section
and other units, provided the necessary technical instructions
essential to 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 the modification center
capacity was found to be insufficient, the Air Service to area was re-
31 requested to schedule some of the work at one or more of the air centers.
32 the district supervisors assigned to the centers to assist
33 with any inservice problems and to visit sources of supply. The procure-
34 ment districts of the material command assumed some of the admin-
35 istrative responsibilities for the operation of the modification centers
36 in the sense that the district supervisors were in charge of the ins-
37 pection of the finished product and of the preparation of the monthly
38 status report.

The modification centers. The centers accepted the airplanes
as they were delivered from a "pre-modification pool," usually by the
39 flying squadron, performed the required work, and then released the
40 completed airplane to the flying squadron for transfer to a staging
41 area or to storage. Stationed at each of the centers was an "A" resident
42 representative whose duties included assisting the contractor with his
43 relations with the air forces, placing the completed airplane to in-
44 dicate that modifications had been performed, and executing a certificate
45 after the final acceptance of the airplane. He was further expected to
46 observe the efficiency of the contractor's operations and to check the
47 adequacy of his purchase orders. Upon request of the resident represen-
48 tatives, the district supervisors assigned properly qualified inspectors
to the centers, and if such personnel were not available, the requests
49 were forwarded to the material command for action. Another functionary
50 assigned to the centers was the "A" inspector-in-charge, who served as
51 the assistant to the resident representative or in his stead. The
52 primary duty of the inspector-in-charge, however, was supervision of the
53 inspectors and the inspection procedures within the modification centers.

54
The foregoing description applies particularly to aircraft destined for use by the U.S. It must be remembered, however, that the modification centers also performed work on aircraft allocated to the Navy and to 13 foreign customers as well. Inasmuch as only a few airplane types were used in common by the Navy and the U.S., the Bureau of Aeronautics absorbed a very small proportion of the total output of the material to various modification centers. During 1942, for example, the only work performed for the Navy was the modification of 20 B-24's by the Fort Worth Consolidated-Vultee Modification Center in November and December. For the eight foreign countries 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. 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 A.F. Thereafter, manufacturers produced aircraft for the Allies under A.F. contracts, and the modifications written into the contracts were performed just as on aircraft allocated to the U.S.

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 model 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 units. Later, the operation of the permanent centers was covered by cost-classified contracts in which adjustments were made for the Government furnished equipment (GF) and contractor furnished equipment (CF) supplied by the modification centers.

On the basis of some months of experience with the modification centers, modification was reduced in August 1942 and the administrative responsibilities of the material centers were stated more positively. Modification was defined as "any change in structure, armament, method of operation, equipment, armament, or realization of such necessary equipment as will alter the military characteristics and/or tactical utility and operation of the aircraft." It was further stipulated that most changes would be delivered into the factories in as nearly operational condition as practicable, but that modification centers would accomplish such changes assigned by the combat organizations as had not yet been introduced into the production lines. The emphasis on factory production of aircraft 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 material centers. As will be shown, recourse to air service command assistance in keeping up with the steady
increasing losses of the obsolescence category had necessitated the first.

The construction of the permanent centers in the early 1942
because of the slowness of the site survey in concluding reports, the
difficulty of obtaining building materials, the occasional labor
37' problems. Nevertheless, 16 centers, exclusive of the airfields facilities
(already discussed), were in production by the end of 1942. The lock-
heed heater at Bellows field was activated in December 1942,
but the other six did not start until over a year of that year.

Of these, 12 were government-built installations, whereas the other six
occupied a story space which was usually the property of the manufacturer.

Obsolescence centers, 1942

With the ever-increasing number of varieties of obsolescence
by experience it became evident, with the limited time which occurs
in actual allowances for such work, that the Director of Military
swaps feel it essential to withdraw from an "emergency" restricted list of
obsolescence. Thus, out of priority, certain installations were
considered to be "in serious priority.," if the situation was not vital
or some other reason. From this group, the Director of Military
installations could designate to which installations were.

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practicable. As special relief, the director of military requirements if it were necessary to order drums to overseas units before such changes could be collected.

In practice, where all the changes completed in the notification centers and the directors were necessary changes, are relatively less to re-source for the military lookout, drums that were needed in actual practice where the innovations could be finished. That is, there proved to be very little time or space out these or other

orces. In one "mud" or "dirty" (the drum, or else this or that) which relieves the inconvenience because the frequently

had to be conforme on the site of a line in case of interruption or

were less likely, the need of improvisation became necessary—and as

are made, so to speak, with the advice in above table

are in the result we do not as much as results, because, indeed, history

on the other hand, lines are the sooner to finish that the work.

This is quite beneficial.

The principal type of service these and to the several modifications

entail was that of (1) installation of

radio, etc., and (2) installation and management (3) installation, etc.,

on the site of a line on a notification folio as


\textit{notification. In the case of a notification were

instantly upon the order, can it be made necessary to convert

a drum, which is Holub and to the line, to use it... This

sent in a written order. Some free written order only, and

converted to the line, are, in making the line etc., etc., in such

orders to the line...
"QUICK AND DIRTY" by Boyd

"Remember? I Warned You About Stopping Off at the Mud Contest"

Figure 1
on each airplane, the internal changes are few. The masts are 10 to 50 ft high, however, and were not an overnight accomplishment for an overnight arrival.

During the first year of activity, the majority of airplanes were 17's, 18's, and 1-25's. The reequipment on these changes was determined by the requirements of the various combat theaters, and the changes in general consisted of more in the matter of the carrier of the weapons on each airplane, increased in mission supply, and the normal or protection against fire. In order to install and equip the airplane for combat duty, the minimum equipment lists and new items that could be used in the cloistered aircraft with the least matter of change to the structure was other ways and without seriously disturbing the balance or the airplane.

In first priority in the reequipment project was added to the conversion of the — to a convoy flight, torpedo tower, and protected airframe. Present improvements for all versions of the 1-25 were used in June 1942, and Brig. Gen. Twobold's                                                                    (James II) comments on the carrier carrier's protocol to install the fixed 50-cal., 3-in., and flexible 50-cal., gun in the tower case. Also, for combat and purpose, 1-25's were provided with 37-mm., cannon and 40-mm. installations. Later it was pointed out that some of the changes, particularly in weight, were still in the experimental stage, and it was stated as interim measures in modification center, and not to a large extent for production line aircraft. For reasons of ease in revision later, however, one incorporated
foreign U-Boats as well as in strategic airlifts. The theory was that, if properly equipped, the aircraft would be interchangeable among the services.

In July 1943, at General Arnold's request, the British ceased using the T-17 aircraft in their coastal patrol and changed to the T-24 model. The principal modifications of the coastal patrol's T-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 inter-changeable versions of this equipment suitable for the T-24's, both of British design, and the British Air Commission arranged for the requisitioning and supply of these to the modification centers. An increase in assistance was offered also inasmuch as British technicians working with the RAF had considerable experience in developing no-installation. The urgency of this project is indicated by a statement made by the British Air Commission: "It will be realized that even an extra patrol aircraft can make a very great impression on the shipping position as it is today."

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 RAF 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 airframes to enable them to locate an enemy target on land or sea, to identify the target's friend or foe, and to track through overcast or at night. By March 1945 certain classes of radar and radar equipment were being installed in the factories, but it remained the responsibility of the centers to complete the installation of specific types or equipment that were required in the various theaters of operations. At the Consolidated-Vultee modification Center at Louisville, nearly 35 per cent of the airframes scheduled for modification carried a complete complement of radar search gear as well as the usual communications and navigational equipment.

Interization of aircraft. During the early months of 1942, attention at North Field was directed toward still another project, the interization program. The pioneer work on such modifications was done in the engineering shops of the Material Command, and the results were tested by the 54th Interceptor Group at North Field, Alaska. The project was set up for the purpose of interizing only those Russian aircraft which were to be ferried across Alaska and Siberia. In July 1942, however, it was found desirable to interize all airplanes to be ferried to service across the North Atlantic as well as those destined to service on the Long-Sea-Liberia route.
The problem of operating aircraft under conditions of extreme cold was divided into three parts: (1) provisions to permit the satisfactory operation of the aircraft in flight, (2) modifications of equipment to resist in service in the areas of operation, and (3) provisions for maintaining the aircraft after it has remained on the ground for long periods in extreme cold. Typical problems that had to be solved by the airframe division were shrinking of parts of the aircraft at different rates caused upon them or that of aluminum, steel, or rubber; the hardening of the oil to stone; and the thickening of fuel coolant to jelly. Metal became brittle and trapped in the cold, and tires cracked like chinks. To protect the airplane against the effects of frost, plans to airframe modification requirements are considered, such as the use of lower cost, more flexible, more difficult on-site research. Rather than in the airplanes themselves, the modification changes were made in the materials and in various items of equipment to protect them and to permit their functioning at low temperatures.

In 1942, engineering personnel thought that considerable modification or care had to be taken at the last minute before airplanes actually departed for their ultimate destination, and that some modification centers could therefore be necessary for this project. Analysis of the 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 restrictions on modification are to be obtained between the material centers and the air service centers. The former
would be charged with the responsibility of installing all winterization items at centers until they could be standardized by the factories. Exception were those which would be harmful to the operation of the airplane, such as flying iron, non-climate to a cold one, or those which were especially susceptible to poor weather, such as the snow-era-ice-tread tires. The Air Service Command was to designate installation points in appropriate locations for the installation of snow-era-ice-tread tires, and such other items as experience might prove were more practically installed at the last minute. It was later directed that all production aircraft and cargo types of aircraft accepted by the government on or after 1 October 1942 should be winterized. In order to achieve uniformity of purpose in 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 material center. In that time winterization was regarded as the most important project confronting the material center. 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 material center representatives. Those items that could not be installed in the production line immediately were purchased from the contractors and installed by the modification centers until arrangements could be made to incorporate them in the production lines.

The proposal to convert P-40's to transport was seriously considered at one time. In May 1942, General Army of the Chinese Army
discussed with right field officials the possibility of converting
the Chinese allotment of B-24D's to transports because of the extreme
necessity for long-range cargo aircraft along the Burma road route. The
technical problem of changing the bomber fuselages to a cargo carrier
and then to reassemble disassembled fighter airplanes had previously
been studied, and it was believed that a B-24 so modified could fly
from the United States to Russia 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 Air Materiel Command, the Chinese request was not acted upon.

The project that discussed the other less important projects sent
through the Air Modification Center during 1942 involved an impressive
number of airplanes, as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of aircraft accepted</td>
<td>4,507</td>
</tr>
<tr>
<td>Total number of aircraft delivered</td>
<td>4,597</td>
</tr>
<tr>
<td>Number of aircraft in stock:</td>
<td></td>
</tr>
<tr>
<td>Combat</td>
<td>1,506</td>
</tr>
<tr>
<td>Training</td>
<td>196</td>
</tr>
<tr>
<td>Average daily production:</td>
<td>19</td>
</tr>
<tr>
<td>Approximate monthly production:</td>
<td>376</td>
</tr>
</tbody>
</table>

Modification functions of the Air Service Command at the Air Depots

Throughout the year, it is during the latter period, the
modification of service aircraft—aircraft already in the possession
of flying organizations—was largely accomplished at Air Service
Command facilities, particularly by the line repair depaitements of the several
air depots. In addition, however, any production aircraft were sent
directly from the factories to the depots to receive the necessary
parts. As the others were routed to the depots after undergoing certain
alterations at the centers, modifications of service aircraft at oversea
stations, when found to be necessary, were usually accomplished
by service groups or depot group personnel. To facilitate this work,
these contain the required parts and ordnance were assembled and
shipped overseas by the material command.

Directives already discussed provided that all modification orders
were to be submitted through the material command, and that this Command
should call upon the Air Service Command to handle work loads beyond the
capacity of its modification centers. As a result, when a deadline was required, the Special Projects Section of the material
Command, normally arranged within the Air Service Command (more specifically, within the Plans and Special Projects Branch of that Command) for
routinely processing aircraft to certain depots where the work could be
performed. If projects were allocated directly
to the Air Service Command by the Directorate of Material Requirements
in Washington, a parent to avoid any delays that might have resulted
from following the prescribed channels of communication. The practice
of bypassing the material command was occasionally the source of some
confusion, since the Special Projects Section of that Command,
which theoretically controlled all modifications, was often unaware of
projects that had been allocated directly to the Air Service Command
and depots.

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 painted new shop at the depot, particularly the Fairfield shop, were each better supplied with experienced radio mechanics than the modification centers. A large variety of other projects was later allocated to the depots, however accurate statistics are not available for 1942, but it could appear that approximately 30 per cent of all the aircraft that were sent to the depots underwent some sort of modification. Hence, since over 10,000 aircraft passed through the maintenance shops of the IIL depot during 1942, it may be assumed that 3,000 to 3,500 received complete overhauls.

Robert T. Schilling, 10th Mar., 1944

From the outset it was recognized, by W. J. Barnett, Myers

pointed out, that modification centers with a capacity equivalent to the
capacity of the Aircraft Factory No. 14, to be reviewed. "It is a

practical job to accomplish, in our opinion, "... we can't win this war
with this air line at a time in the industry. The existence of cer-

tain vital centers was required to maintain the output rate. This

idea was taken that the modifications at the factories be

accomplished to a real extent in the country in order to relieve
overloads or shortages of such work. Another: 10.11:22, 17-88,

-81-8, 91-7, 18-10's, 12-10's, were raised to aviation in order. They are

required by the war effort until such time as the modifications could

be incorporated in the aircraft in the field. In addition, shortages of

materiel or inadequate began to appear, and the depots

are

requirement.
The next problem in the present situation is to determine whether a given instance of an incident is 'within the jurisdiction' of the Arbiter, or to the establishment of jurisdiction.

In this connection, the fact that the Arbiter's decisions are to be given is not considered to be as important as the establishment of jurisdiction. The Arbiter's decisions are to be given whenever there is a request for arbitration, under certain conditions. In the event that the Arbiter's decisions are to be given, the request must be made in a certain manner.

In the case of a dispute on the basis of military orders, the Arbiter's decisions are to be given. However, to be considered within the jurisdiction of the Arbiter, the request must be made in a certain manner.

In the case of an incident occurring in an area where the situation is rapidly deteriorating, the Arbiter's decisions are to be given in a certain manner.
in foreign countries into our story. And since

four or six of the fatalities were caused by the critical
conditions have been interpreted as due to: (1) insufficient
training, (2) officials in technical or clerical duties who short-
ages or delays in action or releases are provided for this unit or for delays, etc.; (3) the fact that the same model
of aircrafts are used, produce quite different fatalities in different
nlocations or centers; and (4) apparent idleness or overwork at
the location centers. In order to meet criticisms, the officials
in charge of the operations point out that the fatalities are due
to errors in their control. In the letter of complaint, cut the

untrained or not properly trained to organizations which pre-
are, for security reasons, however, it was not the case, although the materi-
als are not reported for the protection of the location or collection of aircraft
since these functions. In some instances, the other centers are involved in
subsequent storage. It is true, but the fatalities are considered the

aircrew are trained to the air service centers for the installation
of certain equipment. Hereafter, the unit or subsection receives the
aircraft equipment, but it is only equipped with ready for shipment or
repair except for necessary repairs. Frequently, however, it

means that routine maintenance inspections and pressures on other
tasks, has been neglected and that lack of equipment were lacking.
Further, "check sheets" prepared by pilots who fly the airplanes to the overseas bases often reveal mechanical irregularities. All these deficiencies were due to the codification activities of the central office, when sent with blank forms to other organizations. The codification centers are frequently unable to secure C-1's and even C-5's in sufficient quantity to remedy shortages.

In improving the service given airplanes as they progressed from the overseas through codification to the combat organizations, better coordination was made by the special projects branch of the materiel section. Complaints about the quality of codification work were also about the fact that airplanes of the same type were sometimes receiving different codifications at different centers under investigation. Both the director of R and M and the director of military requirements dispatched inspectors to such activities at the largest City codification center and the San Antonio Air Depot. Thereafter it was noted that the inspection function at the codification centers could be more carefully supervised and that the directives describing the codifications to be performed could be made more specific and detailed for the use of the centers and the other facilities. Further recommendations bearing on the efficiency of codification activities had to do with such minor matters as inordinate delays on the trip of the resident representatives and improper use of government auto mileage.

Another possible suggestion for improving the codification program was by Mr. Cen. Bennett's reports as to the extent that the number of
authorized changes should be more rigidly restricted. In this, the director of Military Aeronautics realized the inadequate machinery for controlling modifications was already in existence. He illustrated this statement by describing how modifications on the -25 and -26 were adopted. One nirhole of each type with all the changes required by the British was sent to string field together with one of each type incorporating the changes and other changes approved by the Material Command.

General Fairchild, Colonel cothner, General Coolidge, and General Arnold, had in charge of medium bomber, twin-engined, and other technical personnel than studies every suggested change, including the test results and the number of man-hours involved in the work. Final decisions were made by General Fairchild.

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 fronts and that hand-tailored modifications resulted 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 decreeing special modifications.
Chapter IV
The "CONFIDENTIAL" Report, 1943-1945

Absorption of modifications by the factories

At no time during the war were technical changes picked up by the circuit factories as readily as has been expected. At the General Electric plant it was believed that there had been too much unity in forcing certain modifications back into the factories. For example, the Glenn L. Martin Company at Inglewood has been induced to pick up several items which the Martin factory at Lufkin are steadily refusing to incorporate in their assembly lines for the ray forced air-line. Even 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 on the "Interal" or a much processed modification at that time, 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 a mediator but see the prime contractor and the special projects section and his decision would be final.

The clauses with which modifications were taken up by the factories as well as the terms of work rendered the release of the airlines facilities impossible, despite Colonel Savary's determination to make all
Reflections: the direct responsibility of the prime contractors in their own offices, in the above, the conduct of solicitation projects to the-fore, the newer instructions as to be continued.

Resolution of the solicitation concerns, 1943

In view of the chances with which civil engineering and the

...
and with the conviction wherefore:

one of the important factors in the misprints of concrete opinion are the measures of

1. preliminary measures are to be compared to the total of the

important factors, namely the kind of the

institution and the place where it

exists.

2. Preliminary measures are to be considered.

3. The order of elements is important. It is essential for

adequate and efficient action to be taken so that

the measures are not taken and are not

executed.

4. In the event of the measures to be carried out with efficiency

order and a distinct to their execution.

5. With the exception, all forms of control or to coordi-

rate their activities with the following to new opportunity

for the ultimate of their execution, execution either by direct

and very explicit that culminated or through intermediary,

such as the physical execution as under, carried out in the

times and place of the decision, the measures are to be

until the definite time.

6. In the event, it occurs, the district

7. Where there are no means for the means of concret-

and for practical results that could be recovered, the

existence of decisions and individuality of the

organization, and the direct result in terms to concrete final

results.
In July 1942, after World War II was already in progress and many significant events had occurred, I was instructed to return to the United States and take up residence in Los Angeles, California. This instruction was given to me by major John Oliver, who informed me that I was to return to the United States immediately.

I was initially made to feel somewhat uncomfortable in the presence of other individuals, as the atmosphere was noticeably different from what I was accustomed to. However, I soon adjusted to the new environment and began to interact with the people around me.

In LA, I lived in a small apartment, which was furnished with basic necessities. I spent most of my time working on projects related to the war effort, and I was often called upon to attend meetings and briefings.

One day, I was called to a meeting with a group of high-ranking officials. During the meeting, I was informed that my work was highly coveted and that I was being considered for a position in the government. The meeting was quite intense, and I felt a sense of pride knowing that my efforts were being recognized.

In conclusion, my experience in the United States was a significant one. It allowed me to contribute to the war effort and to be part of a community that valued my expertise. I am grateful for the opportunity to have lived in Los Angeles and to have been a part of such a crucial time in history.
Figure 2
The administration of modification activities at the centers and the air forces, 1942-1944

Perhaps the most important trend to be observed in the modification process in 1942 and 1943 was the assumption of responsibility by the manufacturers for the modification of their own aircraft. The policy of shifting the responsibility 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 economical modifications in their production lines and thus expedite the delivery to operational units of 100-per-cent-complete airplanes. In the past, the manufacturers had been responsible for carrying 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 order as was the case before. To assist the manufacturers, the Material Command, through the Production Engineering Section of the Production Division, thereafter issued the directives prescribing all the modifications to be made.

The support at change would not include the support of contractors, since at that time the air force was not equipped to embody such a plan. Prior to 1 June 1944, aircraft entered the
parent factory area is now and forever to be the "true common property." The IC then flies there, repeats the validation centers for alterations, and thereafter the houses tested for the second time in accordance with the policy, and must passes directly from the factory to a new one for inspection, testing, and acceptance by the manufacturer. It only then all modifications are obtained. This policy, or similar variations thereof, are implemented, wherever the aircraft is situated at or very near to the factory, or at locations where there are no such facilities, and the modifications are made only to a safe flying check to the factory.

By the end of 1944, most of the centers were operating under the supervision of the prime center stores. Considerable elements, however, brought with it a decided lack of flexibility, so far as available modification centers are concerned. Consequently, the United Airlines, of Chicago, the North Western Airlines, and the United States-Congress-Center, all within a zone, represented open-contract facilities under the Department of the Naval Stores, to provide for the modification of the other centers, or for the establishment of such centers.

According to the instruction, to which the stores performed, several varieties of technical changes are necessary: (1) the modification desk is introduced into the factory by the manufacturer; (2) modifications performed in manufacturer-operated centers, (3) modifications performed in contractors-operated centers, the latter centers,
one (4) technical order changes applicable in either the motor or the airship division. This list will also reference to the fact that a certain number of all modifications are accomplished by the air service to the installations.

In connection with the modifications claimed to the air service, it should be noted that in 10 years, 800 were added direct to the 20-inch of 1920, but in all modifications of present division it should be coordinated in the reconstruction center. It is not that such new items do not occur in the design and subsequent execution of the new type for the data that this order control could be exercised over the present job, but it never actually involved in this manner to perform modifications. The directive was not to allow work to be performed on service lines, however. In view of the fact that new design cannot still in process of the design, the work is to be carried out in such a way that the order involves any consultations between an authorized group in the air service and in the course of these, the work must be kept on schedule to certain public work projects, but then is presented by the request of one of the directed items, the requirements of the new order will be had. This is further true that all air service bureau modifications, as in now, involve consultation with the director on the central office of the director of the central office, so that the final modifications will be worked out in such a manner that all individual modifications are worked out and the instructions are referred to the design department.
senior officer, in the solicitation contacts and the air reveals.

The solicitation procedure is that, a first and final solicitation is made, in the first, the procurement districts are to correspond to the requirements in essential

In the second solicitation, the concepts are

Firstly, the concept is closely to recent change in price

Secondly, the concept is closely to the Air, Medical Service, so that

The concept is closely to the concept, with the concept, in the line.

Notification

While in the concept of ability, concurrent or concurrent, in the concept of ability, concurrent or concurrent, in each concept, it is noted that the concept of ability, the concept of ability, the concept of ability, the concept of ability, the concept of ability, the concept of ability, the concept of ability.

In general, it is noted that the concept of ability, to the concept of ability, to the concept of ability, to the concept of ability.

Four types of solicitations are defined: (1) Solicitation for type change and the term, such as "linings and stock toll" alterations, as in a change in the lines of the lines, reduction of production expenditures; (2) In the solicitation

The type is not directly on a new or production of a given tool, such as

The concept of ability, or the concept of ability, is an alteration to be effected on all aircraft assigned to
particular theater of operations, such a 'modification' can be on
aircraft for rear area use; and (4) a 'special modification' was
applied to a limited number of aircraft to prepare for a
highly specialized mission. The installation of further reconno-
issance aircraft involved "special modifications."

Modification plans leading to the execution of the war in Europe
were born as early as the fall of 1944. These plans covered the con-
cancellation of many projects then current, revision of the modification
process applicable to production aircraft, and special modifications to
be performed on aircraft redeployed from the European and Mediterranean
theaters to the Pacific. At this time it was considered that changes
on aircraft to be trans ferred from Europe to the Pacific could best
be accomplished by service personnel in the European and Mediterranean
theaters. Because the European war engaged on somewhat longer than
expected, however, readjustments were necessary. For
eexample, it was directed that all modification required as a result
of the redeployment of aircraft to the Pacific could be performed in
the United States, with the exception that those B-29s still in
Europe could be reequipped at their overseas stations. The air
bases, airports, and runways, were to act as "modification
centers" in preparing aircraft for the Pacific theater. The earlier
plans to carry out other projects in the European and Mediterranean
theaters were cancelled temporarily because the redeployment schedule
provided for a more rapid flow of both men and aircraft out of these
thotors than had been anticipated. In addition to the P-47's receiving modifications in excess, other P-47's stationed in the United States were ordered to the Miamiville Modification Center at the rate of nine per day for automatic pilot installations and other changes. Another important project continued to step up the tempo of the air war over Japan was the planned conversion of 1,111 P-3's to the close range P-47N. This work was allocated to the Miami Modification Center in July 1945. Of perhaps greater importance than any of these projects was the modification of P-39's which were being pushed through on the highest priorities at the Oakland City Air Depot and elsewhere. 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 increased 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 A/F 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 delivery rates of new aircraft from the factories during the months declined only about 3 or 4 per cent. The reduction in operations continued until the first eight months of 1945, when between July and November 1945 all the centers were officially closed down. No more total of aircraft modified for the P-47 during...
1943 was over 6,500, but this was scarcely one-fourth the 1944 total.

It is of the utmost importance, therefore, that the aircraft modified for the Navy be handled carefully and with the utmost efficiency, from the design stage through production and delivery. The number of aircraft modified at the depot likewise totalled off beginning in April 1944, although many of the projects carried on in these installations during 1945, especially those involving modifications for the B-29, were complicated and difficult. As the modification centers put out on ceremonies, one by one, at the end of the war, the depots continued to perform the modification of service aircraft just as they did in the years before the war.

**Important Modification Process, 1943-1945**

The modification centers, as already indicated, together accomplished virtually all the modification work within the continental United States. During the later part of 1943, in fact, it is estimated that 65 per cent of the total work accomplished in the various repair departments of the centers consisted of modifications.

Some projects, such as the equipping of B-24's with turbo-superchargers and the installations necessary to increase the fuel capacity on combat aircraft, were allocated both to modification centers and to the depots. A great variety of other projects were carried out exclusively at the centers, however.

At first, during 1943, torque rods were installed on B-24's and supplementary armament on B-25's. Several 2-17's were later converted into what became airliners, 0-47's, and other airliners modified to serve as flying classrooms. In addition, a number of airliners
are concerned the other is fitted out for the use of various
in radio transmissions, many other projects, e.g., 24's were
modified for anti-aircraft work. Extensive changes were
in the overhead power of 121 B-24's at North American 1942.
By January 1945 all essential fires control was installed in 125 B-24's
by both male and female crews, at least in January 1944.

The main area here, many airplanes were delivered, 1-24's, 1-39's,
1-40's, 1-47's, etc., the latter about 27 B-24's were on
inventory in the summer of 1943. 1-39's were modified for research-
work training, etc., in 1944. In Canada, many projects performed
the same work for their institutions, and in particular, the B-41 project for 10-42's to replace B-41's they.

A very important project, known as the 412 series, was
not which it used.

Of the projects one to be of real importance to the pro-

er of the B-24 during the period 1942-1945 and thus deserve con-
tinued attention. In particular, the development of escort-raid-

able tactics was essential to the successful air war in Europe.

In the first weeks of B-24's, the R.A.F. version was used of
the role of the B-24 in the strategic bomber command, e.g., escort
able tactics, were the B-24's in the air were included in both B-24's and at the time the R.A.F. operation.

escort-raidable tactics. In the latter part of the

erial work, and for discussions on the

The situation was extremely important, and as early as 1942.
initiative on April 14th. The same organization, men and women, but this time on a mass scale, were working on the new fuel tanks and filling them at the collocation centers rather than building them. In effect, the collocation centers built into the aircraft at the factory became collocation centers that could be removed should the need arise.

By 1943, it was evident that the new fuel tanks would require a new system of refueling. This system was designed to ensure the safety of aircraft and maintain the integrity of the fuel system.

Airbases were called upon to make deeper daylight penetrations into industrial areas, and tanks and other attacking assets were being replaced by large numbers of both naval and air forces. The effectiveness of this technique, in fact, was so pronounced that it provided our fighter pilots with sufficient fuel to enable them to attack the bombers, thus securing a protective role on their flight. Thus our tactics resulted in severe destruction upon the enemy.

The new fuel tanks were designed to meet the needs of the P-38, P-40, and P-47. New tanks included a series in the interior, which increased fuel capacity by 50% and made it possible to fuel the aircraft in the collocation centers rather than on the airfields. In addition, the P-47's were equipped with externally-mounted fuel tanks, allowing for additional fuel capacity of 1,000 gallons. This feature made the P-38 a very valuable asset in long flights, as it could carry extended fuel to meet the demands of long-range operations. For short flights, the P-40 proved to be a most effective weapon, and for short flights the P-38 was used.

Thus, the tactical advantages of this
Flexibility was obvious. 47 The Immortals didn't include with 75-gallon auxiliary gasoline tanks, some, like the J-7, J-29, and J-39, in the run extension program continued.

All necessary modifications were incorporated into production lines as soon as practical, most of a special nature for small skids of aircraft were considered " installer " items and performed at modification centers. To keep up with the heavy schedules, installer aircraft were modified increasingly in nine centers.

Photographic modifications andable tion of aircraft to be used for photo inflatable were another important product. In

July 1942, it was directed that the , , , 46, and 36 aircraft be modified to accommodate special camera installations. These installations are to be introduced into the production lines as soon as possible. Other aircraft to receive camera modifications, i.e., the 46, , 40, and 51, are requiring a specific type of installation depending on the use for which it is intended. Once they have been converted into photo inflatable reconnaissance models, these aircraft were given a designation. That is, the modified 40 became the 43, the 51 the 52, the 44, the R-7, the 47 the 49, and the 45 the 411.

The modification of reconnaissance aircraft continues to be accomplished both in the factories and in the modification centers, and some installations were done in the field. That is, the necessary mounts and wiring were incorporated in the aircraft. Very often the engines themselves were not immediately available and had to be shipped to
Built to on April 1942, our first aircraft were war-casualties, but there is reason to believe the city increases an estimated 10 miles. The latter dual tanks are hidden for later use in the event of an emergency. The double tanks are installed in the small capacity rather than built into the floor at the time of the accident. The capacity of the large tanks is soon to be renewed should the need arise.

In 1943, it is expected that the emergency situation narrows.

The most important accomplishment in the summer of 1942.

Our aircraft is called upon to make deeper daylight penetrations into industrial and military areas, and these demands are being resolved by every means at our disposal. The making of the B-32 and B-33, the most effective of which is the B-32, has been a great step forward. It provides our fighters with sufficient fuel to enable them to carry the bombers, to provide a protective umbrella of fighters. Thus our bomber aircraft can be more effective against new threats.

Bombing missions were evacuated to extend the range particularly of the B-32, B-34, and B-37. Measures included the increase in the internal, self-stabilizing fuel capacity of all three aircraft, and the development and production of improved, self-stabilizing, controllable rocket-fueled tanks. In addition, the B-32's were equipped with a self-stabilizing rocket-shield of a type which permits interception of 120-gallon tanks with 500-lb. In this connection, it was observed that the most remarkable feature of the B-32 was its high-speed vulnerability. In long flights the 32-36 tanks were carried, and for medium-to-short flights one tank was carried in the 1,000-pound load, and for short flights the 1,000-round load. The tactical advantages of this
Flexibility was obvious. B-47s, Immaculate fighters, equipped with 75-gallon auxiliary gasoline tanks, were likewise only needed /6
in scores in October 1942. As the war's extension program continued, all interim modifications were incorporated into production lines as
soon as practicable. Most of a special nature for a small clock of aircraft were considered 'theater' changes and performed at modification
centers. To keep up with the heavy schedules, lighter airplanes were
modified simultaneously in nine centers.

Dedicated Modifications. The modification of aircraft to
be used for photo, map, 'surveys was another important project. In
July 1942, it was decided that the B-24, B-29, B-34, B-3A, and B-36 cir-
rplanes be modified to accommodate special camera installations. These
circuits were to be introduced into the production lines as soon as
possible. Other aircraft to receive camera modifications were the
B-40, B-41, and B-51, each requiring a specific type of installation
depending on the use for which it was intended. Once they had been
converted into photographic reconnaissance aircrafts, these aircraft were
given a new designation. Thus, the modified B-24 became the A-3, the
P-51 the A-6, the L-24 the L-7, the L-17 the L-9, and the L-25 the L-10.

The modification of reconnaissance aircraft continued to be accom-
plished 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 aircraft alone were used.

Later modification problems

The expansion of the modification program in 1943 and subsequent developments were attended by numerous difficulties which only a few could be treated in the formal discussion. One important problem was that of improving the quality of both the modification and the inspection at the modification centers. Deficiencies in these matters were attributed to a lack of sufficiently trained, consistent personnel. For the rapidly expanding program, courses for aircraft inspectors and coordination of inspection methods were initiated by the Terial Board in an effort to remedy the difficulty. At the same time, the Terial Board prepared that to describe all technical failures arising during the delivery to the modification centers was unjustified inasmuch as many of these deficiencies could be traced to poor maintenance, inexperienced pilots and operators, personnel, and similar factors. Further, it was unrealistic to expect the aircraft inspectors, the majority of whom had less than one year's experience, to detect all flaws in maintenance.

Another problem, a perennial difficulty in the modification program, was the slower pace with which aircraft are delivered to the various modification centers. It was recognized that, to expedite the modification of aircraft, the matter 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
Several moves were made in the effort to reduce the number of officers. In the first place, the size of the air staff was reduced by the removal of several air corps commands. In the second place, the size of the air corps was reduced by the removal of several air force commands. In the third place, the size of the air corps was reduced by the removal of several air force commands. In the fourth place, the size of the air corps was reduced by the removal of several air force commands. In the fifth place, the size of the air corps was reduced by the removal of several air force commands. In the sixth place, the size of the air corps was reduced by the removal of several air force commands. In the seventh place, the size of the air corps was reduced by the removal of several air force commands. In the eighth place, the size of the air corps was reduced by the removal of several air force commands. In the ninth place, the size of the air corps was reduced by the removal of several air force commands. In the tenth place, the size of the air corps was reduced by the removal of several air force commands.
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

Appendix B

It is not too much to say that on the success of ordnance depended the rate of the entire aircraft production program of World War II. But it, alas production at home, the prime requisite of which is stability of tool and man, position only because, beginning there the assembly line had off, there were industrial facilities enough to alter the necessary improvements in cases in the minds of the men, it is the trend which must be the constant in the production program. The industrial trends in the production program which must be noted first to the adoption of machinery, to the men is concerned with the climate, the climate to be man, in the case of the climate to be the men, in the case of the climate the men...
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any air forces
Air doctrine general
resident, air staff
Action, civil historical office
Air staff
Air liaison
Air service command
assistant secretary of air
Air technical service command
Civil aeronautics administration
Chief, Air Force
Chief, Air Staff
Contractor furnished equipment
Command, Naval
Chief of Staff
Confidential technical instruction
Admn, chief of air staff
Deputy chief of staff
Director of military requirements
Defense
Fairfield air base
Government furnished equipment
General Staff, forces air force
NOTES
Chapter I

1. In the earlier directives, the term "remodeling," was often used synonymously with "modification." (See Air Service Circular 65-11, 9 Jan. 1925.) 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 "AEC Biennial Report 1941-1943," 14. 51-52, in AFSO.


4. Ibid.

5. The very extensive modifications required by the B-29 and its derivatives are not included here inasmuch as a full discussion of the subject is available in AEC Historical Monograph, The History of Supply, Maintenance, and Training for the B-29, in AFSO.


7. TO 01-22-13, 9 July 1943.

8. See the AEC Historical Monograph, History of the Operation of the Unsatisfactory Repair System in the AAF, 1939-1945, and A History of Technical Publishing by the Air Service Command—Air Technical Service Command, 1923-1944, in AFSO.

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.


11. AAF Reg. 65-30, 11 April 1944. See also the publication, Model Designation Army Aircraft, 11th ed., January 1945, for the modifications that distinguished the blocks and series of aircraft of each model. For example, there were 16 different series of B-17 aircraft, as indicated by the letter designations "A" through "P." For the B-17F series alone, 58 separate blocks or groups of modifications were performed, and for the B-17G series, 48 different blocks. (Contd.)
11. (Cost.) In addition to the 13-17's used to carry
libraries for NC recon missions, a special designation
for the 17-17 received for recon missions. The
17-17 (Col. C. L. S. 7th Div., 20th Air Force, 38th
Wing, 149th, 49th) received 17 recon missions. The
17-17 received 17 recon missions, all in 17-17
missions. The 17-17 received 17 recon missions according
to specification. The missions were indicated on a chart
by the mission number, each mission being indicated by a
specific number of mission numbers. Thus, the missions
were indicated on the chart. The missions of the 17-17
helicopter (17-17) fitted with night-fighter rear (17).

Head of Serv. Sec., 6th Div., 6/17, 1950, in O. 152.1, Conversion
and alteration of planes.

13. The theaters, commands, and special missions for which these
aircraft were prepared were as follows: (1) Far East, (2) North
Africa, (3) Europe, (4) United States, (5) South Pacific, (6) India,
(7) China, (8) Australia, (9) Italy, (10) Antisubmarine warfare,
(11) Western Europe, (12) Special missions. Units and replacement training
units, etc. (13) H.Q.

14. 40th Div., 1st, 1943, in 115.1, North American
1-17, 4-35 airline.

15. "The purpose of this publication is to educate the public" letter by Maj. D. B.
Hanes, 1-17, 4-35, 1943, in 115.
Chapter II


...


15. Several overseas personnel were put up by the Lockheed overseas Corporation at the Colonial Air Transport Co. in 1942 and early in 1943. In addition, several modification work was performed by the rain forest activities of the various overseas air forces.

16. April 6, 1942, Chief, Aircraft Production, to I.G. ... C.O. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records, for Technical I.G. ... Chief, Aircraft Production, to I.G. ... C.O. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records...

17. The technical division has been able to supply to C.B. ... C.B. ... C.B. ... C.B., request that the Service for such a plan had been anticipated in that it was already in progress. Also, see, to C.B. ... C.B., 10 Jan. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records...

18. Interim by C.B. ... C.B. ... C.B., with C.B. ... C.B., Feb. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records...

19. See for C.B. ... C.B. ... C.B. ... C.B., 15 Jan. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records...

20. I.G., Col. ... L., Chief, Aircraft Production, to Chief, I.G. ... I.G., 26 Feb. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records...

21. I.G., Col. ... L., Chief, Aircraft Production, to Chief, I.G. ... I.G., 18 Jan. 1942, in C.O. 1354.1-31, Civil Aeronautics Board records...

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


26. See complete list of calibration centers, in p. 9, this study.


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


38. AAF Leg. 05-15, 1 Aug. 1942. The Air Service Command role in the modification program is discussed later in this chapter.


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


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


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


48. Field Office memo 22-1, 1 Nov. 1943, in TSAAD 635, 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. Y. Cook, May 1945.


55. CTI 893, 9 Sep. 1942, in TSGD 400.112, Interization, 1940-1944.


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, AG/AD, 125, Air Serv. Div., 1 Jan. 1945, in AFR 70.


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


68. Thus, the Directorate of Technical Services was reminded that requests for modifications were to be coordinated with the Directorate of Military Requirements, Brig. Gen. J. M. Fairchild, DMR to Col. K. C. Greene, Dir. of Tech. Serv., 27 April 1942, in ANG 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. I. S. Fairchild, DR to CG, EC, 28 Oct. 1942, in ibid.

70. DR, Col. B. L. Boatner, Chief, Special Projects Sec. to CG, NC, 7 Jan. 1943, in TSCD 452.1, Modification Centers.


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


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


NOTES
Chapter IV

1. The supervisory units at the Material 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


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

6. TM 1443, 12 Feb. 1943, in A.A.A. 64.03, Output, Capacity, and Facilities, Misc.

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


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 M/F-13 radar tail warning equipment—would result in a saving of approximately three weeks in the delivery of the complete airplane. Daily Activity Report, AD/AC, 1SS, 1 Feb. 1945, in L557.

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

14. Ibid.


17. Ibid. Office Memo 152-2, 6 June 1944, in TTCD 452.1, Modification Centers.

18. Maj. Gen. H. H. Arnold to GO, 10 March 1944, in ibid. This directive was preceded by a correspondence between Generals Arnold, Gillis, and Nichols, in which General Arnold stated that the modification situation was badly obscured by the fact that much work was being accomplished at modification centers, air depots, subdepots, and even in the squadrons. Maj. Gen. H. H. Arnold to GO, 13 March 1944, and succeeding comments, in AS 452.02, Modification.

19. Maj. Charles W. Runchow, GO to AC/AC, 19 March 1944, in ibid.; Col. R. F. Lass, GO/5, 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.


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, AD/AC, 16 May 1944, in AS 452.

23. AAF Historical Document, The History of Supply, Maintenance, and Training for the C-29, in AFSQ.
24. Aircraft Sub-Section Office Instructions 20-2, 15 Jan. 1945, in ARSC.

25. Flb. Office Ltr. 152-2, 6 June 1944, in TASC OD 452.1, Modification Centers.


27. Daily Diary, AG/AS, Air Serv. Div., 15 Sep. 1944, and 19 Sep. 1944, in ARSC. See also "2-Day Planning, ARSC Procurement District," in Modification Control Unit files.


29. One change, administrative in nature, was that the Chief of Management Control, ARSC was charged with over-all supervision of redeployment, demobilization, and postwar planning. Maj. Gen. Elmer L. Adler, Chief, Management Control, ARSC to CG AAF, 17 May 1945, in AG 452.02, Modification.

30. Ibid.

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

32. Special Mail Message, Procurement Div., AG, ARSC to CG AAF, 7 Mar. 1945, in AG 452.02, Modification.


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


36. Ltrs. 3 and 4, this study.


38. There were some exceptions. The Third Air Force, for example, performed radar modifications on 25 B-17's in 1945. (Col. D. C. COMPANY, Chief, Eng. Br., AG/AS, ARSC to Div., ARSC, 10 March 1945, in AG 452.02, Modification.) On one occasion, the Air Transport Command sought to have one of its commercial overhaul agencies make certain modifications. (Maj. Gen. L. S. Fairchild, Air Force, to CG AAF, 22 Sep. 1942, in AG 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 Barksdale 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, November 1942-October 1944," p. 13.


41. Interview by Capt. ... L. Ackerman with Lt. Col. L. V. Cook, 20 Dec. 1943.


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


47. See ATSC Historical Monograph, History of Supply, Maintenance, and Training for the 13-29.

48. Ibid.


51. Air. Req. Pol. 25, 26 May 1943, in TSGD 452.81, Air Filters.


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

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

55. Ibid.


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

58. To 1603, add.: No. 1, DC/5, 11 Nov, to Prod. Div., 21 April 1944, in TSCD 452.1, Modification Centers, Inspections.


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


67. Procurement District Supervisor, Northeastern District to CG Nat. Center, 26 Nov. 1942, in AG 452.1, Modification Centers.

68. RfK, Nat. Resident Representative, Martin-Craba Modification Center to CG Nat. Center, 23 Dec. 1942, in ibid.

69. Nat. Exec. For Control Nat. Center to CG DC, 5 March 1943, in TSCD 452.1, Modification Centers.

70. Memo for DC by Office of Military Requirements, 16 March 1943, in AG 323.3, Modification Centers.

71. RfK, Col. L. L. Rostow, Chief, Aircraft Modification Sec. to Prod. Security Officer, Wright Div., 29 April 1943, in TSCD 452.1, Modification Centers.


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

Chapter V

Official Publications

Air Corps Circulars
Air Corps Bulletins

Discussed in-coming office instructions

Air Service Circulars

Confidential Technical Instructions

Technical Office lace

Model specification: "Interle", 11th edition, January 1945

Office lace

Technical Instructions

Technical lectures

Technical lectures

Air Division General, Score punch (used factors, etc.)

- 6 103.03
- 6 132.02
- 5 391.88
- 5 45.01
- 6 543.76
- 6 102.02
- 6 151.0

79

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Air Defense Sector, Senior Officers (Capt. Officers and up) Job:

1. 4-5241,
2. 4-5231,
3. 4-5213,
4. 4-5216,
5. 4-5214,
6. 4-5212,
7. 4-5211,
8. 4-5213,
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10. 4-5209,
11. 4-5207,
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16. 4-5200,
17. 4-5209,
18. 4-5208,
19. 4-5206,
20. 4-5204,
21. 4-5203,
22. 4-5202,
23. 4-5201,
24. 4-5200.

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...in the air service and in the air service. In the air service, 1940-1945

History of the 1st Group in the air service, January 1940-1945

Later, in the 8th Air Force Service, January 1943-1945

Later, in the 8th Air Force Service, January 1944-1945

...and so forth...

'part of annual inspection,' remitted to, 'local journal,' etc...
Appendix 1

1942 MODIFICATION SUMMARY
Appendix I

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- OA-4: 250
- OA-5: 300
- OA-6: 350
- OA-7: 400
- OA-8: 450
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<td>Toluca, Yr.</td>
<td>Ford Endurance Corp.</td>
<td>Nov. 1952</td>
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<td>Fort Worth, Tex.</td>
<td>Tobar Aeronautical Corp.</td>
<td>July 1953</td>
<td>Sept. 1954</td>
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**NOTE:** In addition to the list above, all other facilities are subject to modification at the discretion of the Modification Division. For additional information, refer to the following pages.
DELTA-ATLANTA MODIFICATION CENTER, Mailional Airport, Atlanta, Georgia

CONTRACTOR - Delta Air Corp.

First Aircraft received Modification Center - 13 May, 1942
Final Aircraft delivered from Modification Center - 21 April, 1942

NUMBER AND TYPES OF AIRCRAFT MODIFIED -

1942 - 29 aircraft - C-18, C-19, C-49

MODIFICATION Ownership - Delta Air Corp

FACILITIES -

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

Final disposition - Pooled by contractor.

MODIFICATION CONTRACT -

AC-32 - AC-7057

MISCELLANEOUS DATA -

Closed out as no longer required by contractor.
BISMARK MODIFICATION CENTER, Bismarck, S.D., 1955

CONTRACTOR - Bischel, Morison, Inc.

First Air L-2A delivery - 26 July, 1956
First air L-2A delivery from Modification Center - 9 October, 1956

1955 L-2A airplanes 5-2, C-2, C-3, R-15, X-15
1956 1957 1959 airplanes B-29, B-29, F-5, C-109, A-26, P-3

TOTAL 590 airplanes

MODIFICATION - U.S. Defense Plant Corp

MAINTENANCE -

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

MODIFICATION CONTRACTS -

M-15, M-21, M-29

MISCELLANEOUS DATA - Closed as modification program terminated after 7-3 Day.

PAN-AMERICAN MODIFICATION CENTER, Brownsville, Tex.

CONTRACTOR - Pan-American Airways Corp.

First L-2A airplane at Modification Center - 12 July, 1958
Final Air L-2A delivered from Modification Center - 23 March, 1959

TOTAL 174 airplanes

MODIFICATION - Pan-American Airways Corp.

MAINTENANCE - Site of contract 23 April, 1959

Final disposition - Returned to owner.

MODIFICATION CONTRACT - Numbers: M-7, M-21, M-31

MISCELLANEOUS DATA -
United-States Air Force, Medium Bases, Fort Worth, Texas.

CONTRACTOR: United Airlines, Inc., Fort Worth, Texas.

First Aircraft delivered at Fort Worth, Texas - 4 February, 1942

First Aircraft delivered at Fort Worth, Texas - 4 February, 1942

TOTAL 753 AIRPLANES

MODIFICATION Contractor: U.S. Army Air Forces
MISCELLANEOUS DATA: This capacity was not over required or A-20 modifications were made to the existing planes. In addition, the labor situation was always critical at this facility because of the extreme heat and the isolated location.

LOCTORED-LIMITED MODIFICATION CENTER, Love Field, Dallas, Texas.

LOCATION - Lockheed Aircraft Corp.

Final Airplane received at Modification Center - 17 February, 1942
Final Airplane delivered from Modification Center - 7 November, 1942

NORTH AMERICAN AIRCRAFT MODIFIED:

- 1944: 12 aircraft - B-17, B-24, B-26, B-25, B-26, B-26, A-36, B-7, P-41, P-5, P-7, L-5

- 1945: 1338 airplanes - B-17, P-39, P-5, P-52

FINAL AIRCRAFT:

- 561 airplanes

MODIFICATION Centered: U.S. Army Air Forces

FACILITIES:

- 1,000,000 sq. ft. 2,000,000 sq. ft.
MODIFICATION CENTER DATA

SUGGESTION - Colorado Springs, Colorado

CONTRACTOR - Bolling Air Force Base, Washington, D.C.

MODIFICATION CENTER - MacDill Air Force Base, Tampa, Florida

First Aircraft completed 12th August 1915

Local Aircraft completed 12th August 1915

29 August, 1915

NUMBER AND CODE OF AIRCRAFT MODIFIED

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<td>B-17, P-1, B-29, P-51</td>
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TOTAL: 377

SPECIFICATIONS - 5 1/2 B-17's

FACTORIES - 2 Packard, 1 H. N. A.

NOTE: Ventilator - To U.S. Army Air Forces for disposal

MODIFICATION COMPLETED

- B-777 - AC-6295
- B-777 - AC-6296
- B-777 - AC-6297
- B-777 - AC-6298
- B-777 - AC-6299
- B-777 - AC-6300

MOTOR CARS - The facility started under Continental Aircraft Co.

EдвANSVILLE, INDIA - Contract awarded to Continental Aircraft Co.

CONTRACTOR - Bolling Air Force Base

First Aircraft completed Modification Center - 17 November 1915

Overall Airframe - 1105 Aircraft Work

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<tr>
<th>Year</th>
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<tr>
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TOTAL: 1105 Aircraft

MODIFICATIONS - 5 1/2 B-17's
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TOTAL: 780 articles

1. DISTRIBUTION: All issues are distributed through the mail. These issues are not intended for use at the facilities where they are produced, and are only intended for use by the personnel assigned to the respective facilities. All issues are subject to the same security requirements as are other classified materials.

2. STORAGE: All issues are stored in secure areas, and are only accessible to personnel who are authorized to receive and use them. All issues are marked with classified markings and are stored in locked cabinets.

3. REUSE: All issues are returned to the distribution center for reuse after they are no longer needed.

4. RECYCLING: All issues are recycled after they are no longer needed.

5. STORAGE: All issues are stored in secure areas, and are only accessible to personnel who are authorized to receive and use them. All issues are marked with classified markings and are stored in locked cabinets.

6. DISTRIBUTION: All issues are distributed through the mail. These issues are not intended for use at the facilities where they are produced, and are only intended for use by the personnel assigned to the respective facilities. All issues are subject to the same security requirements as are other classified materials.

7. DESTROY: All issues are destroyed after they are no longer needed.

8. STORAGE: All issues are stored in secure areas, and are only accessible to personnel who are authorized to receive and use them. All issues are marked with classified markings and are stored in locked cabinets.

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21. DESTROY: All issues are destroyed after they are no longer needed.
T-33 A:

CONTRACTOR - Transcontinental Air Transport, Inc.

First Aircraft Delivered to Modification Center - Oct 4, 1951
Final Aircraft Delivered to Modification Center - Nov 29, 1951

TOTAL AIRCRAFT MODIFIED:

1st Aircraft - Oct 6, 1951
2nd Aircraft - Oct 9, 1951

TOTAL 2 AIRCRAFT

MODIFICATION OVERHEAD - 31 45119 acres (U.S. Army Air Forces)

CONTRACTOR'S FACILITIES - 1 temporary building, 171,370 ft² (cubed) (171,370 ft³)

Field Airline - Temporary Line (U.S. Army) to Airline to Contractor's facilities located by contractor

MODIFICATION CENTER:

PA 49-40-7319
PA 49-79720
PA 49-35716

INSTRUCTIONS:

The purpose of this is to become acquainted in the following

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

CONTRACTOR - ILOCUS Aircraft Co., Inc.

First Aircraft Delivered to Modification Center - Nov 29, 1951
Final Aircraft Delivered to Modification Center - Nov 29, 1951

TOTAL AIRCRAFT MODIFIED:

1st Aircraft - Dec 17
2nd Aircraft - Dec 20, 1951

TOTAL 2 AIRCRAFT

MODIFICATION OVERHEAD - 31 45119 acres (U.S. Army Air Forces)

CONTRACTOR'S FACILITIES:

'Fleet, 1951

FIELD AIRLINE:

TOTAL 2 AIRCRAFT MODIFIED:

1st Aircraft - Dec 17
2nd Aircraft - Dec 20, 1951

TOTAL 2 AIRCRAFT MODIFIED:

INSTRUCTIONS:

Pre-certification pre-wraps only, pre-wraps of third

sheet to contractor, 359 sheet to contractor, 4591 sheet

This page declassified IAW EO12958
MODIFICATION CENTER DATA

Date: 20 August 1945

TOTAL 2000 airplanes

MODIFIED: 0-500 - U.S. Air Force
MODIFIED: 0-500 - 47th Bomb Group

Returned to U.S. Army Air Forces for disposition.

CIRCULATION: 0-500 - 46th Bomb Group

Final Air Test: 0-500 - 46th Bomb Group

Simplified: 0-500 - 46th Bomb Group

20 aircraft - 46th Bomb Group

Additional comments:

Closed as modification program terminated on V-J Day.
AMERICAN AIRLINES MODIFICATION CENTER, La Guardia Field, New York, New York

CONTRACTOR: American Airlines, Inc.

First aircraft modification contracted for: 6-30-42
Final aircraft modification completed: 7-17-42

INITIAL MODIFICATION COMPLETED:

1942 - American Airlines, Inc.

FINAL MODIFICATION:

1942 - American Airlines, Inc.

FINAL MODIFICATION CONTACT:

1942 - American Airlines, Inc.

MODIFICATION DATA:

The contractor herein to be relieved of further modification assignment at terminal or at any other location as per the contract for facility was closed.

NATIONAL RADAR MODIFICATION CENTER, Municipal Airport, Monroeville, New Jersey, New York

CONTRACTOR: Bell Aircraft Corp.

Final aircraft modification contracted for: 17 October 1944
Final aircraft modification completed: 7 November 1945

VING'S NO. OF AIRCRAFT MODIFIED

2541 - 40 aircraft - P-47
2500 - 100 aircraft - P-51, P-38, P-39, P-40, P-47, P-51, P-52, P-55, P-56
1500 - 150 aircraft - O-40, O-20, O-10, O-5, O-3

TOTAL 1634 aircraft

MODIFICATION CONTACT:

1944 - U.S. Army Air Forces

FACILITIES:

6 - 2 hangars, each 301 ft. X 100 ft.

FINAL MODIFICATION CONTACT:

Returned to U.S. Army Air Forces for disposition.

MODIFICATION CONTACT:

1945 - Closed as modification program terminated on V-J Day.
This Page Declassified IAW EO12958
<table>
<thead>
<tr>
<th>CONTRACTOR</th>
<th>Douglas Aircraft Co., Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF AIRCRAFT LOADED</td>
<td>1944: 750 airplanes</td>
</tr>
<tr>
<td></td>
<td>B-25</td>
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<td>B-29</td>
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<tr>
<td></td>
<td>C-47, C-77, Y-5</td>
</tr>
<tr>
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<td>1943: 195 airplanes</td>
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<td>B-25, C-77, C-47</td>
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<tr>
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<td>1944: 203 airplanes</td>
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<td>B-25, F-7 HE</td>
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<tr>
<td>TOTAL</td>
<td>3315 airplanes</td>
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<tr>
<td>MODIFICATION FACILITIES</td>
<td>Ownership: U.S. Army Air Forces</td>
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<tr>
<td>Size</td>
<td>2 hangars, each 163 ft. x 60 ft.</td>
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<td>Final disposition</td>
<td>To U.S.A.A.F. for disposition</td>
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<tr>
<td>MODIFICATION N.O.</td>
<td>N-175, AC-17728</td>
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<td>N-175, AC-17879</td>
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<td>N-175, AC-17911</td>
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<td></td>
<td>N-175, AC-18071</td>
</tr>
<tr>
<td>MISCELLANEOUS DATA</td>
<td>Closed as modification program terminated as of V-J Day</td>
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**DOUGLAS AIRCRAFT CO., INC. SANTA MONICA, CALIFORNIA**

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<td>B-25, F-7 HE</td>
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<tr>
<td>TOTAL</td>
<td>3315 airplanes</td>
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<tr>
<td>MODIFICATION FACILITIES</td>
<td>Ownership: Douglas Aircraft Co. Factory</td>
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<tr>
<td>Size</td>
<td>Same as required</td>
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<tr>
<td>Final disposition</td>
<td>Returned to production use by Douglas Aircraft Co.</td>
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<tr>
<td>MODIFICATION N.O.</td>
<td>W-175, AC-17728</td>
</tr>
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<td>W-175, AC-17879</td>
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<td>W-175, AC-17911</td>
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<td>W-175, AC-18071</td>
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<tr>
<td>MISCELLANEOUS DATA</td>
<td>Multiplcation work done at factory on double-assembly basis</td>
</tr>
<tr>
<td></td>
<td>Placed for modification on single-assembly basis as required on such date as required</td>
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</table>

THIS PAGE Declassified IAW EO12958
CONCLUSION: AIRWAYS FFLYING VESP, Marana Airport #3, Tucson, Arizona

CONTRIBUTED: HAWLEY HILO, T.O. - (unspecified) Aircraft Corp.
FIRST AIRFLIGHT: 30 November, 1945
REAL AIRFLIGHT: 6 September, 1945

1. A-10, B-17, B-24, B-29, C-47, F-1
2. B-24, P-70, P-75, B-29 (split cow)

T.O./I. 4153 airplanes

RETURNED TO U.S. ARMY AIR FORCES FOR DISPOSITION

MISCELLANEOUS: Closeout notification program terminated as of V-J Day.
Appendix 6

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<table>
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<tr>
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<th>Modification at Modification Centers by Months</th>
<th>Year</th>
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<tr>
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<td>Work performed at division:</td>
<td>1942</td>
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<td>Modification control section - 10th May to 11th June, 1944.</td>
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<td>Aircraft modification branch, F.R.S. - 19th June, 1944.</td>
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<td>Aircraft modification section - 1st February, 1943.</td>
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<td>Aircraft modification branch, R.L.S. - 19th January, 1943.</td>
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<tr>
<td></td>
<td>Special products section - 19th January, 1943.</td>
<td></td>
</tr>
</tbody>
</table>

Operating under the supervision of:

Modifications were completed at modification centres on which a summary of airplanes.
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