

CASE HISTORY OF THE B-42 AIRPLANE PROJECT

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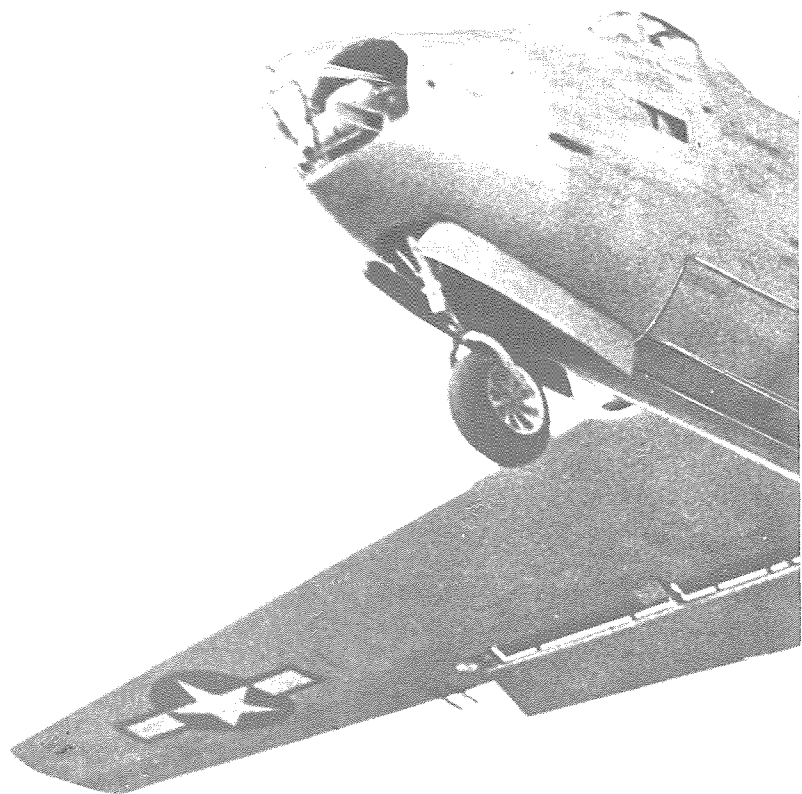
IN A GLOBAL CONFLICT SUCH AS WORLD WAR II, THE ability to overcome great distances was a predominant factor in the success of a military operation. In an attempt to overcome the handicap of distance, the Army Air Forces initiated several projects for the development of bombardment airplanes with greater speed and longer range than could be achieved by existing aircraft. Some of the new developments were to be used during World War II, while others were intended for use in future emergencies.

This history covers the development of the Douglas XB-42 *Mixmaster* pusher type, medium bombardment airplane from the initiation of the project by the Army Air Forces in 1943 to January 1948. It also includes the development of the XB-42A airplane which was a modified XB-42 with auxiliary jet engines installed under the wings. The project was initiated for the purpose of developing a high-speed, long-range bombardment airplane with improved performance. No production for the aircraft was planned.

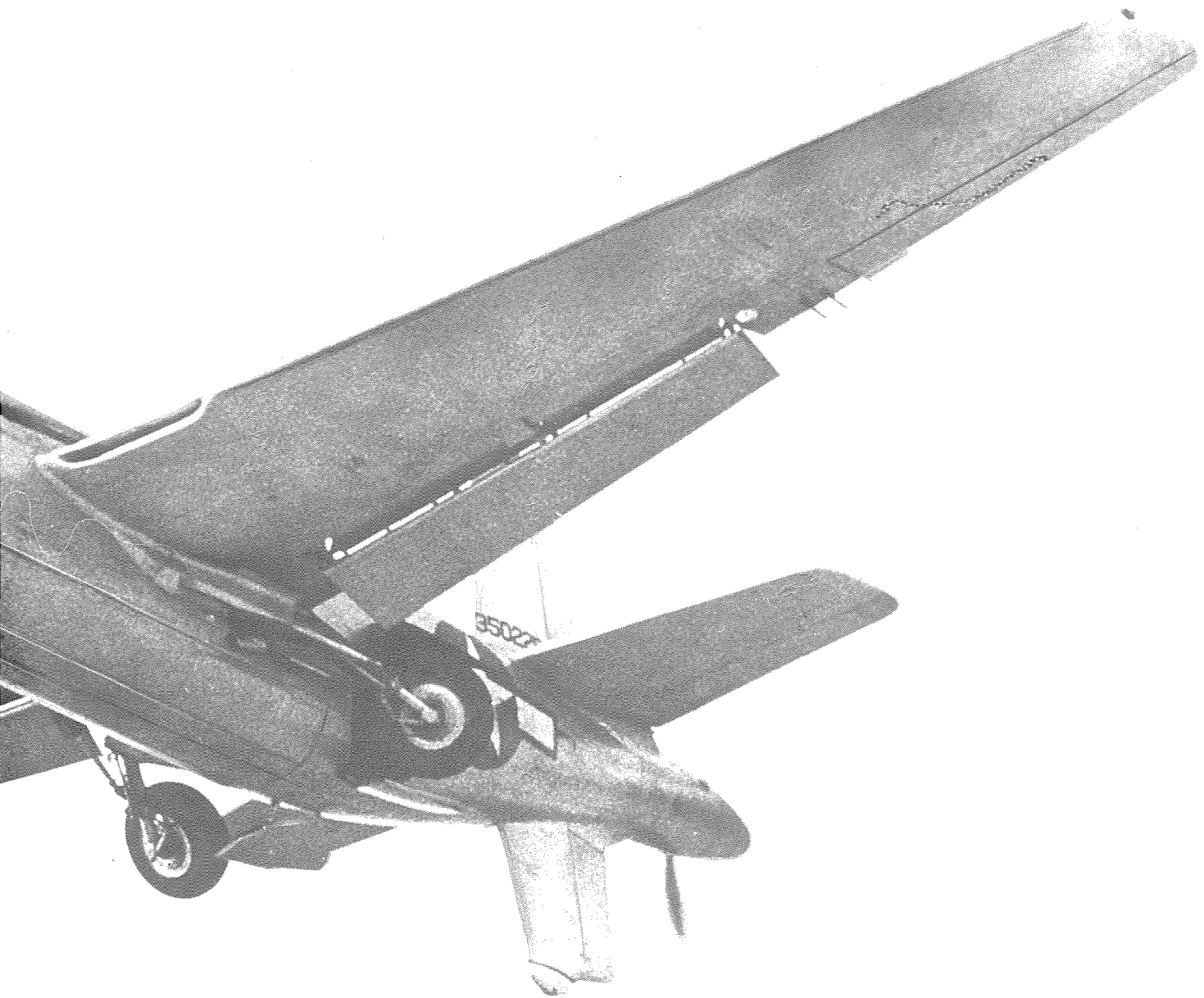
Most of the material for this study was found in the files of the Air Materiel Command at Wright Field, and the War Department files in Washington. Much valuable information was also furnished by personnel in the engineering and procurement agencies of the Air Force.

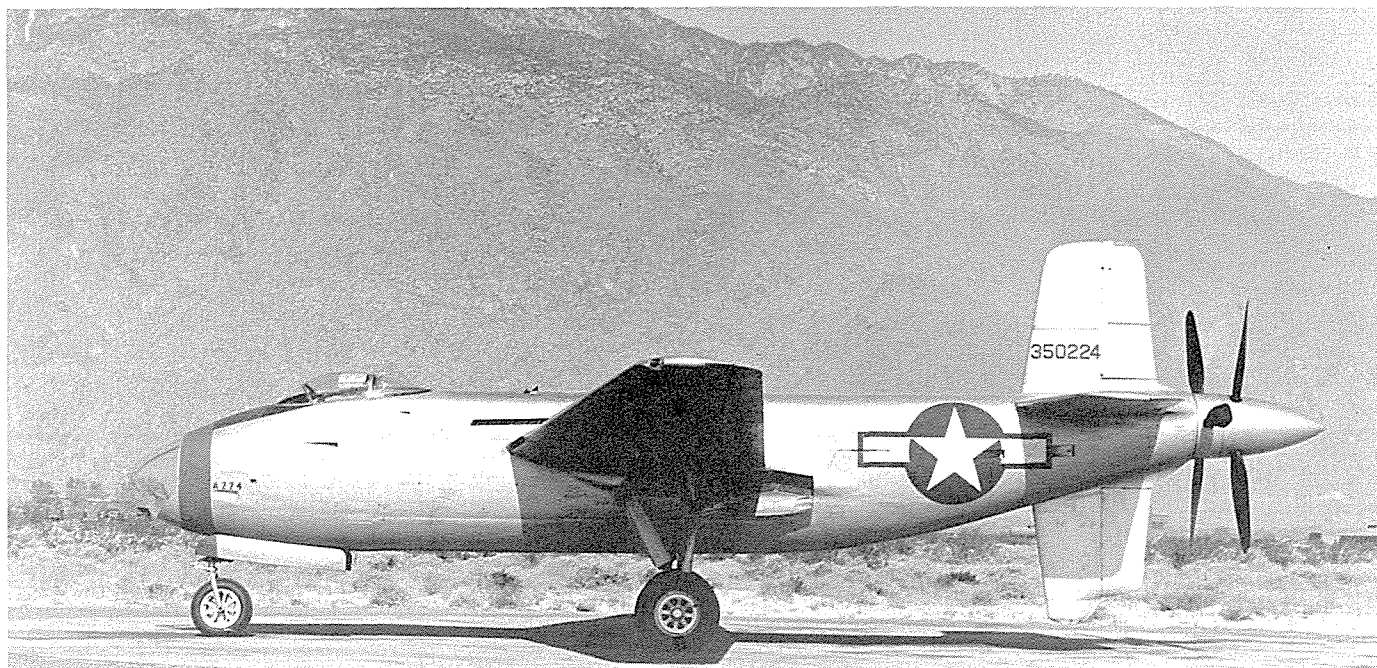
At the time of the writing of this history in January 1948, the development and flight testing program was practically completed. The Engineering Division of the Air Materiel Command believed that the project could be closed out in the early part of 1948.

This article is presented as a verbatim reprint of a source document to offer unabridged research material to the AAHS membership.



This rare shot of XB-42 No. 2 on takeoff is a most interesting view. Note the main gear rotating aft into the wheel wells, the extended flaps, the blast tubes of the four .50-caliber machine guns protruding from the wing trailing edge marking the location of the wing turrets, cooling air inlets for the radiators in the wing, and the one-piece canopy. The large bomb bay in relation to the fuselage size can be seen. (R.E. Williams Collection)





Douglas XB-42 No. 1, 43-50224, at Palm Springs, California, during flight test program on May 10, 1944.

(McDonnell Douglas Photo from Harry Gann)

Douglas XB-42 at Palm Springs, California, for flight test. C-54 was used as source of ground hydraulic power.

(McDonnell Douglas Photo from Harry Gann)

Douglas XB-42, ship No. 2, 43-50225.

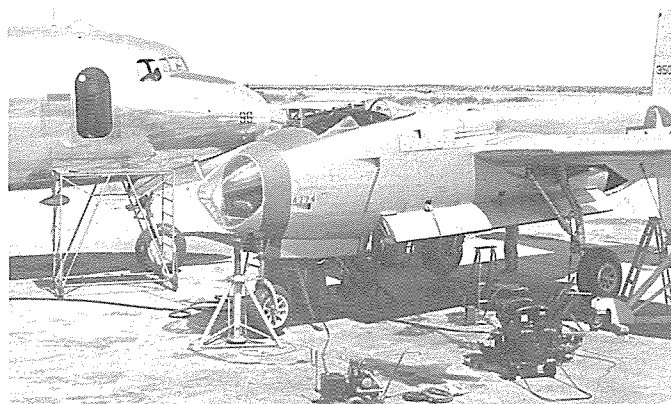
(Douglas Photo from G.H. Balzer Collection)

Main landing gear of Douglas XB-42, March 22, 1946.

(McDonnell Douglas Photo from Harry Gann)

Main landing gear configuration for flight No. 3 with no doors, May 14, 1945.

(McDonnell Douglas Photo from Harry Gann)



THE XA-42

During the early part of World War II the Army Air Forces became interested in the development of bombardment airplanes with greater speed and better performance than could be obtained with existing aircraft. On 25 June 1943 a letter contract was approved with Douglas Aircraft Company of Santa Monica, California, for two pusher-type attack airplanes known as the Douglas Model 459. During the early development stages this aircraft was referred to as the Army Air Forces Model XA-42. However, in November 1943 the designation was changed to the XB-42 bombardment-type airplane. After that date all reports and correspondence pertaining to the airplane carried the revised model designation. Later, Douglas developed the XB-42A which was a modified XB-42 with auxiliary jet engines.

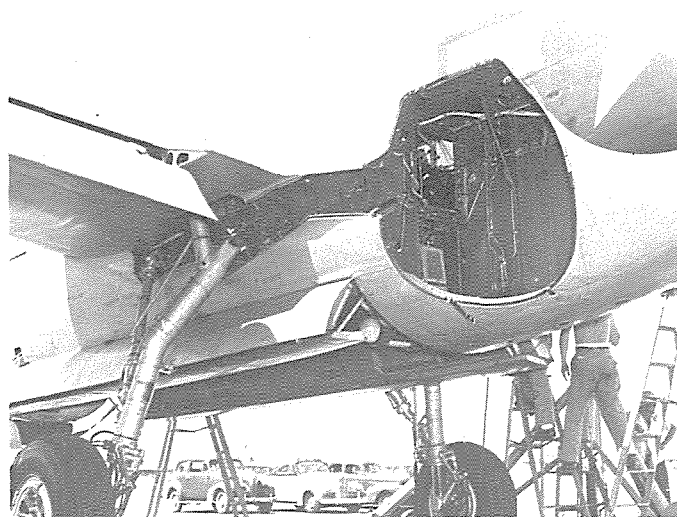
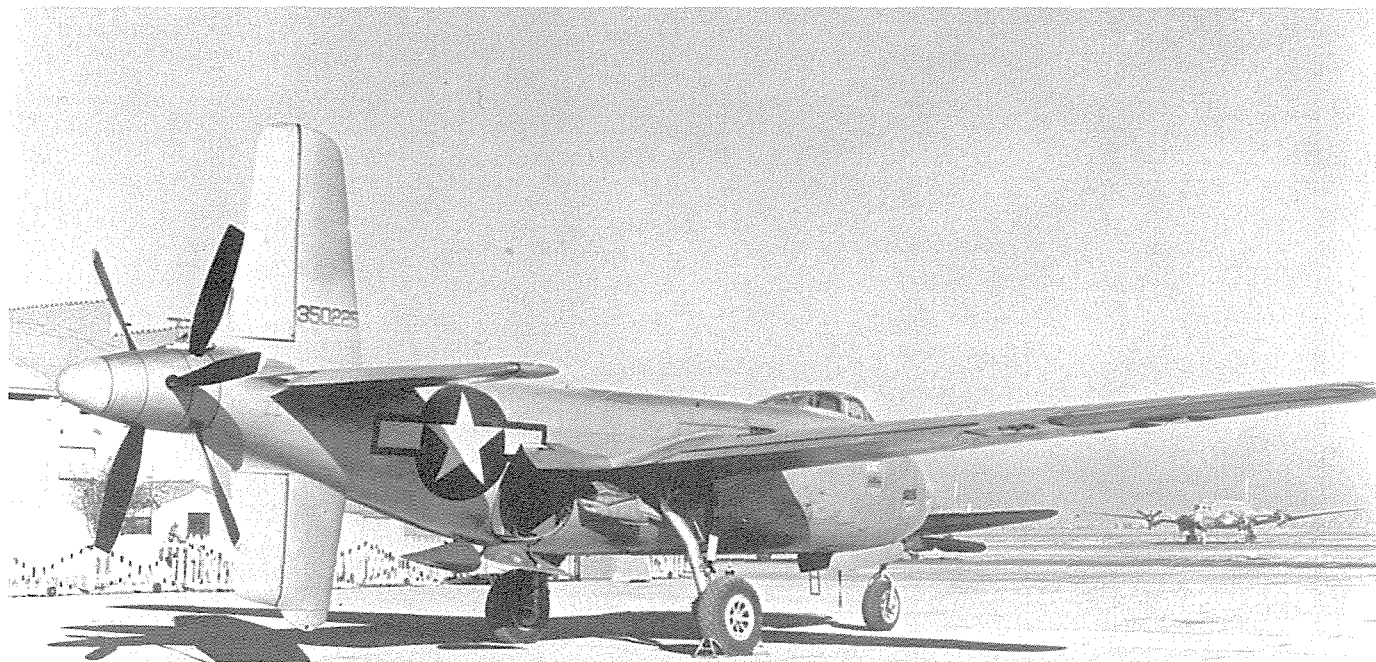
THE XB-42

General Description and Purpose

This airplane, known as the *Mixmaster*, was a long-range, medium bomber of all-metal construction. With a clean aerodynamic design, engines housed in the fuselage to eliminate the drag of large nacelles, and pusher propellers installed in

the extreme tail to do away with thrust disturbance, the XB-42 was the first pusher-type bomber to reach the flight test stage. It was a mid-wing monoplane type, slightly larger than an A-20, with unpressurized cabin and twin bug-eye canopies. That it was capable of greater speed than any existing bomber of its size was demonstrated in December 1945 in a coast-to-Washington flight in which it covered 2,295 miles in five hours 17 minutes and 54 seconds, averaging approximately 433 miles per hour.

Power was provided by two Allison V-1710 engines mounted side by side just behind the crew's compartment in the nose, and long drive shafts were geared to the propellers in the rear. Hinged hoods similar to those of an automobile provided ready accessibility for maintenance, and each engine was mounted with only four bolts. Two extension drive shafts transmitted power to the 13-foot Curtiss Electric propellers through a reduction gear box in the tail of the airplane. The propellers were independent of each other; the left engine operated the forward propeller, and the right engine operated the aft propeller. Another unique feature was the lower vertical stabilizer and rudder, in addition to the usual upper



and horizontal tail surfaces.

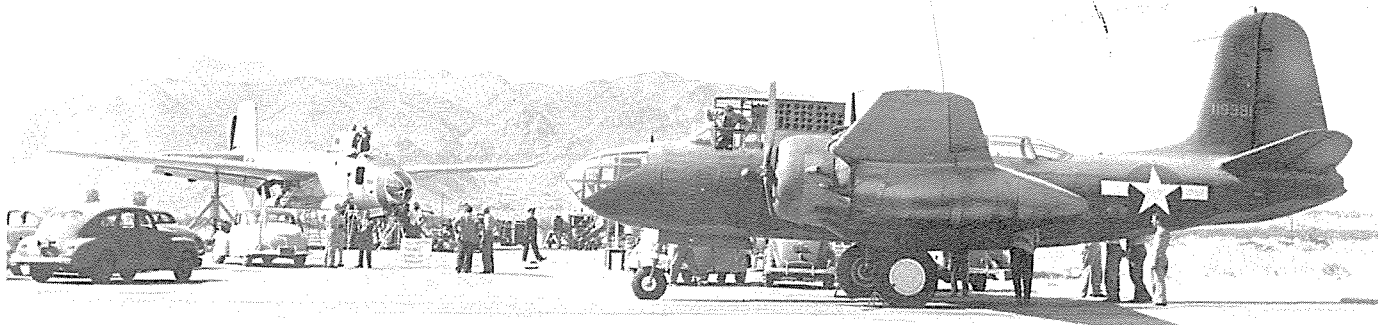
The XB-42 carried a crew of three, with pilot and gunner seated side by side in a nose compartment, and the bombardier situated in a forward well. Provision for wing guns mounted to fire rearward was another unconventional feature. An interchangeable nose could also be installed to accommodate several forward-firing guns or a 37mm cannon. While provisions were made for these armament items, including bomb racks and bomb sights, this equipment was never installed in the flight articles.

The airplane had an overall length of 53 feet seven inches, a wingspan of 70 feet six inches, and a height of 20 feet nine inches. With a normal gas capacity of 650 gallons, and at a gross weight of 33,208 pounds, its maximum speed at sea level was 344 miles per hour. The maximum speed of the first flight article at an elevation of 23,800 feet was 410 miles per hour, and its range at 10,000 feet was 1,840 miles. By a reduction in the normal bomb load, and a corresponding increase in fuel capacity, the maximum range could be extended considerably.

With high aerodynamic, structural and powerplant effi-

ciency planned for the XB-42, Douglas and the Army Air Forces believed that the result would be a high-speed, long-range, comparatively small, versatile bomber capable of being maintained and operated by a small crew. The engineers believed that the airplane would use a relatively small amount of fuel, and would require only minimum armament because of its speed. Douglas emphasized the fact that comparatively small plant facilities would be necessary for a high production rate. The manufacturer estimated that, by using the same plant facilities, the XB-42 could be produced in one-fourth the time required for a larger bomber such as the B-29. Furthermore, the designers maintained that the "pusher" feature decreased the overall drag of this aircraft to approximately 70 percent of that of a comparable twin-engine, tractor-type airplane.

In a global conflict such as World War II, the ability to overcome great distances was a predominant factor in the success of a military operation. The Douglas company believed that it had helped to overcome the handicap of distance by creating this long-range medium bomber. Some pressure was even exerted by the manufacturer to put the airplane in pro-



Douglas XB-42 No. 1 at Palm Springs, California, for flight test, May 14, 1944. Douglas A-20 was used to fly courier between Santa Monica and Palm Springs.
(McDonnell Douglas Photo from Harry Gann)

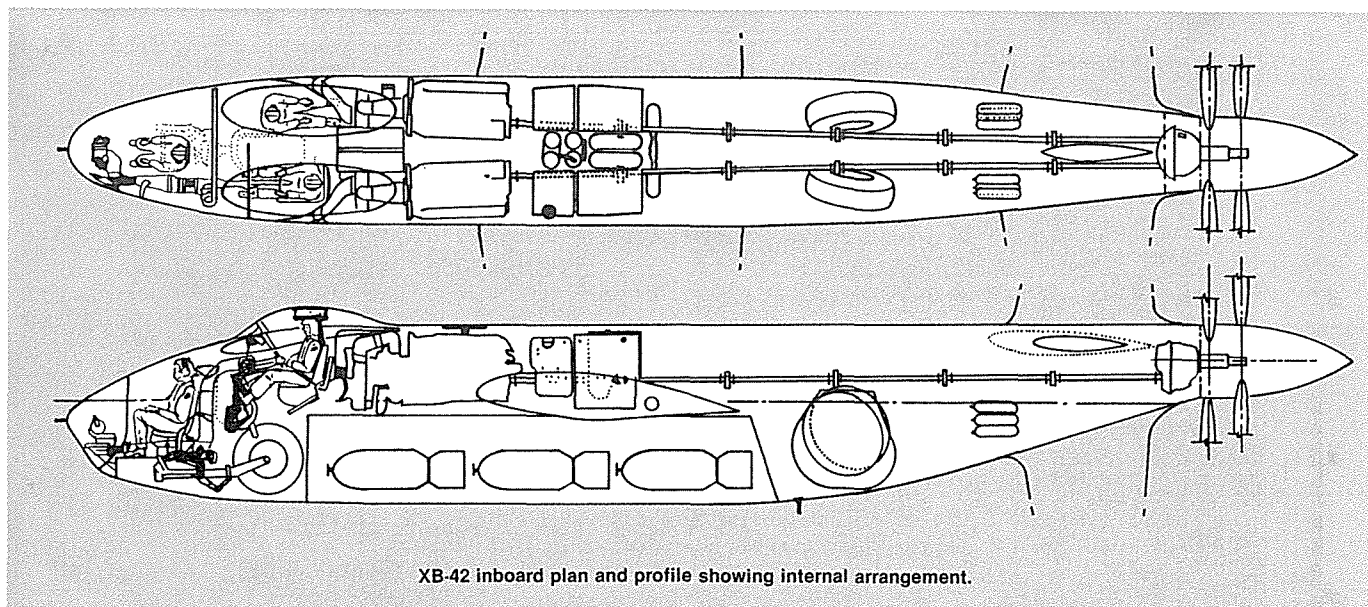
duction. As early as September 1945, Colonel J.P. Phillips, Materiel Maintenance and Distribution, Washington, noted that Douglas was "apparently" putting on a campaign for XB-42 production. Colonel Phillips understood that tooling for quantity production had already been done, or at least was contemplated, by the Douglas company. While the possibility of military application of the XB-42 was not ignored by the Army Air Forces, the airplane was procured purely as a development type rather than as a military weapon. The purpose of the project was to determine the effects of fuselage shapes on drag and propulsive efficiency and to develop a bombardment airplane with improved performance.²

After the idea of quantity production had been abandoned, the construction of a limited number of service test articles was discussed by representatives of Douglas and the Army Air Forces. At a series of conferences at the manufacturer's plant in March 1944, production of a small quantity of the bomber version of the XB-42 was considered. However, plans for this production did not extend beyond a request by the Army Air Forces that Douglas submit an engineering proposal for this construction. The Air Technical Service Command explained that the reason for not recommending the procurement of the bomber version was "because re-engineering would be necessary to reduce weight and because of the possible difficulties due to vibration caused by opening the bomb bay doors at high speed."

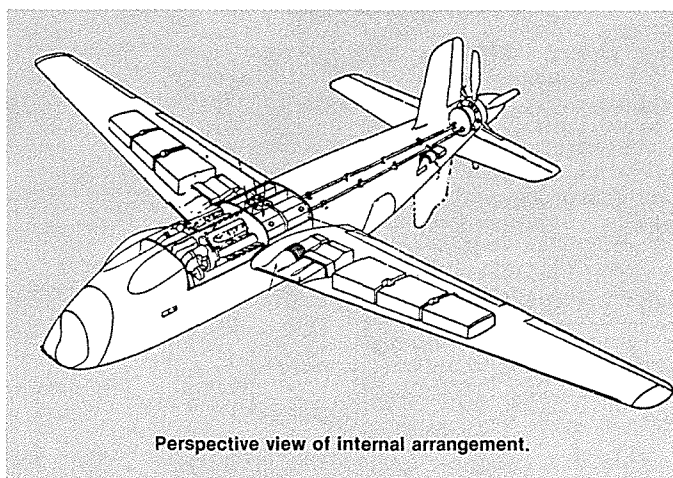
Although plans for the production of the bomber versions were abandoned, the Army Air Forces gave some attention to the idea of producing a photographic reconnaissance version of the XB-42. In January 1944, a study of the feasibility of this conversion was made by the Aircraft Laboratory. In a series of conferences at the contractor's plant during March, Colonel D.L. Putt of the Engineering Division at Wright Field discussed this matter with Douglas personnel. Late in 1944, some Army Air Forces personnel expressed the opinion that the airplane might be adaptable to photographic reconnaissance aviation since only three airplanes under consideration at that time met the requirements for very long-range reconnaissance aircraft.

On 7 December 1944, Brigadier General F.O. Carroll of the Engineering Division at Wright Field conferred with Douglas officials concerning this matter. At that time, some personnel of the Air Technical Service Command understood that General Carroll would recommend to Major General K.B. Wolfe of the Procurement Division that the photographic model be procured in a quantity not to exceed 100 "for delivery as soon as possible. . . . However, there were some differences of opinion among personnel in the Army Air Forces in regard to this proposed production. Furthermore, another bomber of almost identical configuration [the XB-43] was under development at that time, and some personnel of the Army Air Forces were of the opinion that it would be procured in production quantities during 1945. Consequently, neither the photographic nor the bomber version of the XB-42 was ever placed in production.

Contractual Data—In April 1943, the Army Air Forces started negotiations with Douglas Aircraft Company, Santa Monica, California, for two flight articles and one static-test article of the Douglas Model 459 (AAF Model XB-42). In May, Major General Charles E. Branshaw, Commanding General of the Materiel Command, gave verbal instructions to proceed with the project. Douglas presented quotations on the cost of the development program on 18 May 1943,³ and a letter contract of 25 June authorized the expenditure of \$3,000,000. The source was not questioned in view of the part played by Douglas in the development of this model. The cost-plus-a-fixed-fee contract (W-535ac-40188), which was approved on 11 February 1944, called for two flight test airplanes, one static test article, and engineering data, at an estimated initial cost of \$3,103,686.56. According to the agreement, the first airplane was to be ready for flight 12 months after 25 June 1943. The second flight article was to be ready for flight within 16 months after the June date, and the static test model was to be delivered within 18 months. Both flight articles were to be delivered to the government not later than six months after their first flights.



XB-42 inboard plan and profile showing internal arrangement.



Perspective view of internal arrangement.

On 13 March 1944, the static test article was deleted by a change order to the basic contract. At the request of the Materiel Command, Douglas presented a quotation representing the credit due the government as a result of the elimination of this item. A total credit of only \$285,502.88 was finally allowed, although the estimated contract cost of the static test model was \$860,234. Apparently, the engineering and tooling costs were prorated over the two remaining XB-42s when the static test article was canceled.

By December 1943, reports from the Army Air Forces representative at Douglas indicated that the costs on this project might run higher than was originally expected. At that time the Engineering Division at Wright Field expressed the opinion that the project would require close watching. The contractor explained that the requirement for speed in fabrication, which resulted in an increase in direct labor hours and utilization of considerably more overtime than had been originally contemplated, contributed to the increased costs. Following the company's request for additional funds, the Engineering Division initiated an authority for purchase to cover the estimated cost of completion of the airplanes, less an item of \$400,000 for flight test expense which was the subject of a separate negotiation. On 10 June 1944, the amount allotted to this project was increased by the sum of

\$2,056,888 by a change order to the formal contract.

During 1945, additional funds were allotted to the XB-42 project to offset additional estimated costs. Under Supplemental Agreement 10 to Contract ac-40188, approved 4 January 1945, the sum of \$2,990,418.64 was allotted for spare parts, ground handling equipment and changes in contract provisions. Because of further contract changes, an additional allotment of \$269,869.60 was made on 23 November 1945. The total amount of money involved as of 4 December 1945, including initial costs, overruns, spare parts, contract change notifications, flight tests, and handling tools, was \$7,727,212.69. As late as January 1947 there had been no appreciable change in the estimated cost of completion of the XB-42 project.

It should be pointed out that two XB-43 experimental jet bombers were built under the same contract as the XB-42s. As of 6 August 1947, the total amount obligated on Contract ac-40188 was \$14,281,672.85. At that time, \$13,611,012.44 had been paid to Douglas, leaving an unpaid obligation of \$670,660.41.

Engineering Development—On 5 May 1943, following an evaluation of design data on the Douglas Model 459 airplane, the Aircraft Laboratory at Wright Field concluded that "the design is now practicable for immediate construction." Personnel of the laboratory believed that the design would result in a well-balanced airplane with excellent performance and maximum utility and flexibility from a military standpoint. The laboratory recommended that at least two prototypes be constructed, and that "a definite 'hands-off' policy should be established and enforced" during the construction period. In order to maintain this policy, Army Air Forces engineers recommended that all proposals for modification of the airplane be reviewed by a single agency which fully appreciated the problems of the military aircraft manufacturer. Data from the Douglas Aircraft Company, including Model Specification 459, was utilized in writing the Air Forces specification for the XB-42.

In June 1943, Douglas reported that the design and layout work for this airplane was in the preliminary stages. At that time the company indicated that shop work had been started

on the wind tunnel models and the mock-up. On 13 September 1943, the mock-up was inspected and "approved as satisfactory for the intended purpose." The mock-up committee approved the general design features, configuration, and details of construction, but recommended that several engineering changes be made.

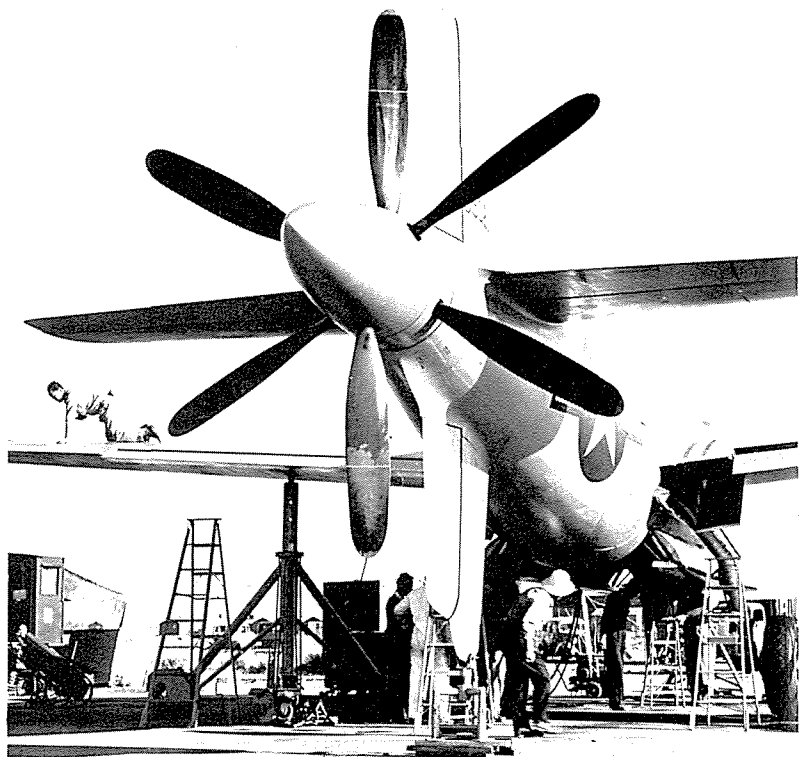
By February 1944, wind tunnel tests had been made on most of the models pertaining to this project, and almost all of the engineering drawings had been completed. At that time, Engineering Division liaison personnel at the Douglas plant reported that an additional 15,000 manhours would be required to complete contractual requirements and commitments made at the time of the mock-up inspection. As further tests were made, additional rework of minor items became necessary. Wind tunnel tests conducted by the National Advisory Committee for Aeronautics at its Ames Aeronautic Laboratory, Moffett Field, California, revealed that controls were inadequate. No particular trouble was experienced with stability, although the problems of stability and control were closely related.

The design and construction of the XB-42 was accomplished in approximately a year's time. One year from the date of the initial proposal by Douglas to the Army Air Forces, the number one airplane made its first flight. The project engineer⁴ and Douglas personnel believed this to be a design and construction period as short as that for any comparable modern bomber.

Engineering and Production Problems—One of the problems which confronted the Air Forces on the XB-42 project was the development of a propeller suitable for this airplane of unconventional design. In the latter part of 1943, and during the year 1944, Douglas and the Engineering Division at Wright Field discussed the development of a "stop-gap" propeller suitable for flight and routine testing, and an "ultimate" propeller necessary for maximum high-speed performance and adequate reverse thrust.

In July 1943, the Propeller Laboratory of the Engineering Division initiated action to provide suitable propellers for this project. In general, personnel of the laboratory desired that the two propellers be independently driven and automatically controlled; that they have a reversible pitch feature to prevent a speed of more than 400 miles per hour in a dive and to shorten the landing distance; that the propeller along with the gearbox be jettisonable; and that the weight of the complete propeller installation not exceed 845 pounds.

Since no existing propeller possessed the desired characteristics, several companies were contacted in an effort to develop a satisfactory one. Curtiss Propeller Division of the Curtiss Wright Corporation, Caldwell, New Jersey, aided by the Acrotorque Company of Stamford, Connecticut, initiated a study to determine the most suitable type for this installation. Hamilton Standard Division of the United Aircraft Company, East Hartford, Connecticut, and Aeroproducts Division of General Motors, Vandalia, Ohio, were also approached concerning this development. Aeroproducts informed the Propeller Laboratory that it could not undertake

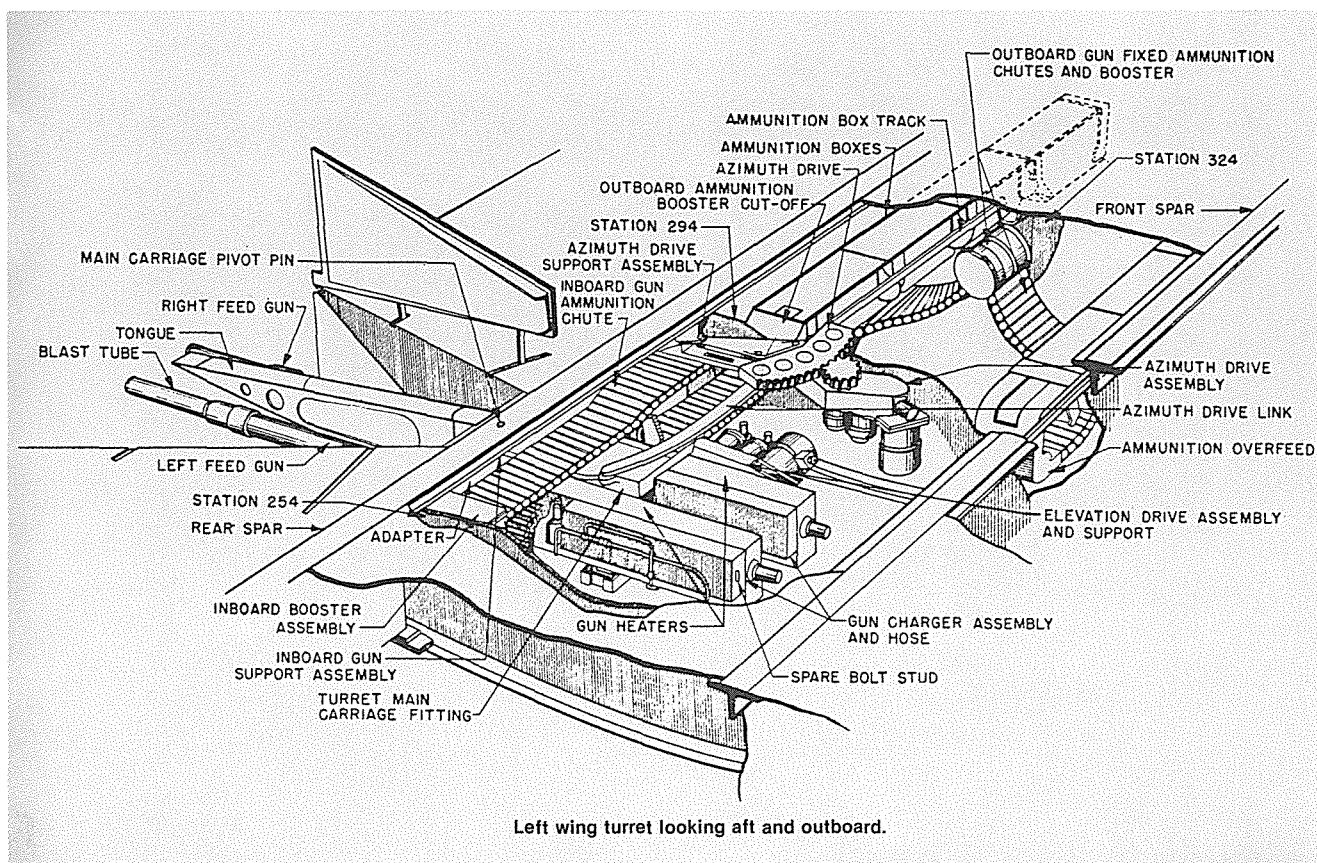


the project at that time because of the amount of engineering involved. Hamilton Standard was unable to promise delivery within the desired time.

Curtiss proceeded with the development of both an "ultimate" and a "stop-gap" propeller for the XB-42. As late as November 1944, the Engineering Division at Wright Field outlined a plan for the installation of the "ultimate" propeller in both XB-42 airplanes. However, after several months of experimentation by the Acrotorque Company in conjunction with Curtiss engineers, this development was discontinued. In the meantime, the Curtiss Division furnished the "stop-gap" propellers. In March 1945, the Engineering Division explained, "In view of the present status of the XB-42 airplane in regard to production, it is believed that it is inadvisable for Curtiss to develop an ultimate propeller at this time."

Douglas encountered no particularly difficult problems in the powerplant installation, although this was one of the most radical items in the XB-42. The drive shafts extending from the engines to the propellers were identical in length to those used in the Bell P-39 airplane. The manufacturer experienced difficulty in the operation of the ground cooling system, because no airflow from the propellers was available for ground cooling. However, Douglas engineers had solved this problem by the fall of 1944.

The major aerodynamic problem was that of engine, extension drive shaft, and propeller vibration. Douglas took steps to minimize this problem early in the development period. Experience of the Engineering Division revealed that it was necessary to isolate the engines in an installation of this type. However, in September 1943, the division pointed out that the contractor's specification did not specify definite pro-



visions for isolating engine-propeller vibration from the airplane. As engine-propeller vibration tests progressed, the manufacturer discovered that propeller stresses were excessive. Douglas believed that this condition would necessitate a revision in the program of the first XB-42 airplane. However, at a conference on 3 April 1944, personnel from Allison, Curtiss, Douglas, and the Army Air Forces decided that although the drive shaft, gearbox, and engine vibration characteristics were not entirely satisfactory, the first flight of the airplane would not be postponed because of these characteristics.

As a result of ground vibration tests conducted at the Douglas plant in March and April 1944, the Materiel Command recommended that the contractor adopt a flexible mounting for the gearbox in order to reduce the vibration at the rear part of the fuselage. Further information obtained by Douglas convinced the company that this type of mounting would minimize the effects of the vibration both on the propellers and the airplane. Beginning in the latter part of 1944, several investigations concerning objectionable vibration during flight were made by the contractor. Early in 1945, after conferring with Douglas personnel, the Aircraft Laboratory at Wright Field recommended that steps be taken to install an anti-vibration gearbox to combat the adverse vibration condition.

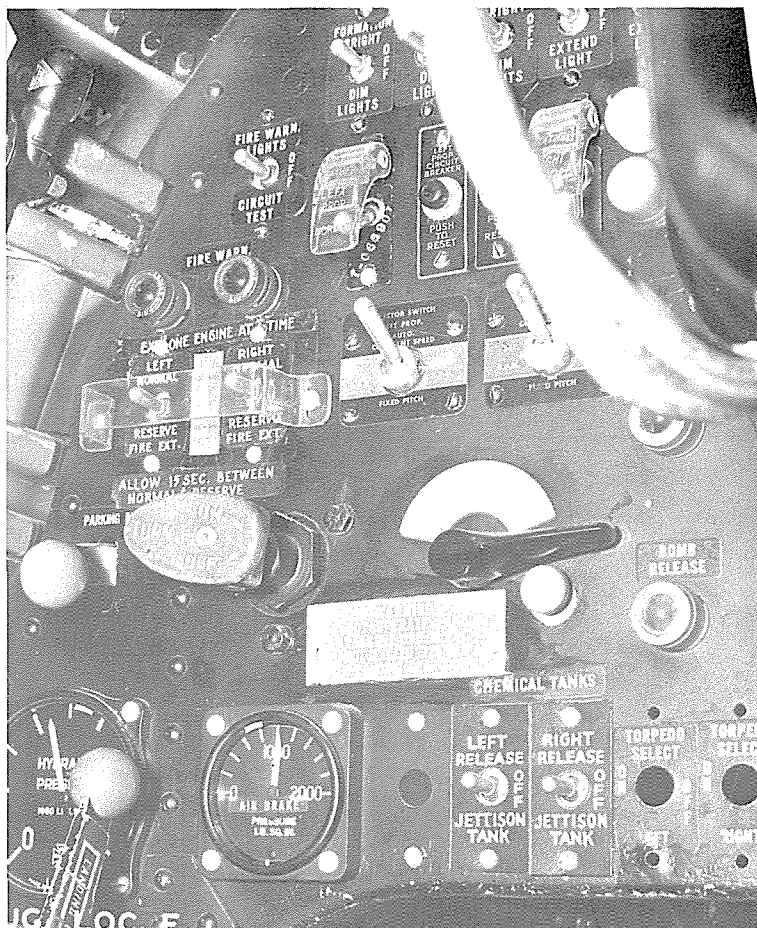
Douglas then proceeded with the design, development and procurement of a dynafocal gearbox mount. The contractor encountered some difficulty with this procurement. After several companies had been contacted, and a considerable amount of time had elapsed, new type mounts were furnished by the Lord Manufacturing Company, Erie, Pennsylvania. These mounts were installed on the first flight article

in February 1947. The vibration program had not yet been completed by the summer of that year. In the meantime, Douglas proposed to convert the XB-42 airplane to the XB-42A by the installation of auxiliary jet engines in addition to the Allison engines.

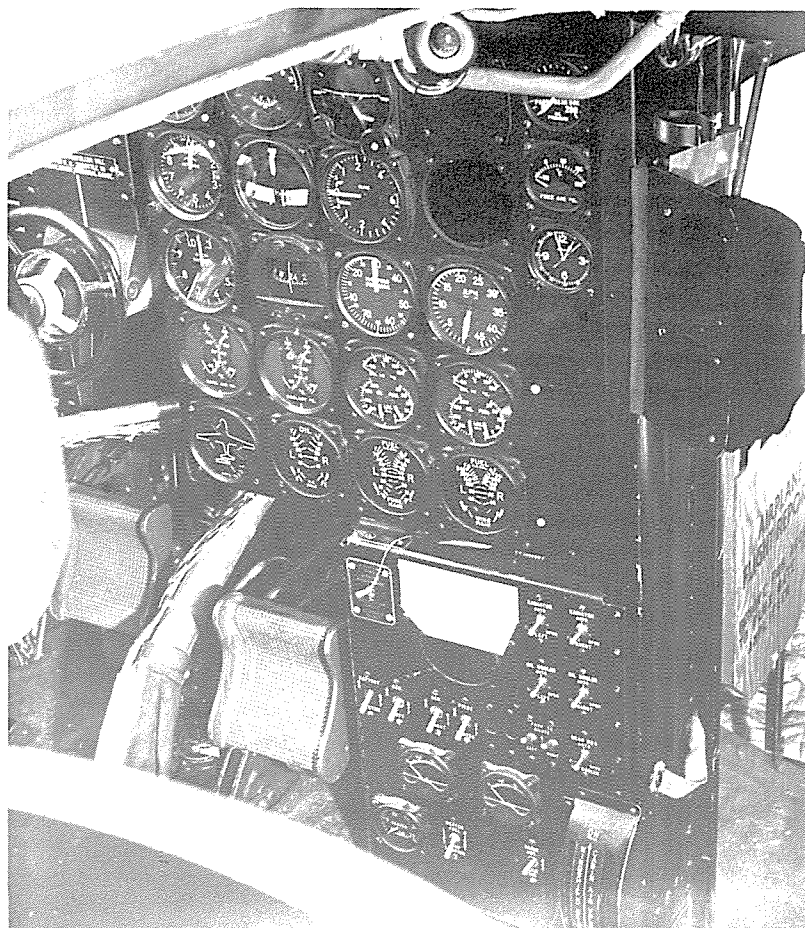
The Flight Test Program—Flight testing of the first XB-42 was conducted between May 1944 and March 1946 with rather disappointing results. The initial flight was made on 6 May 1944 at the Army Air Base in Palm Springs, California. By 16 August of that year 32 test flights had been completed. Although no difficulties of major importance were encountered in these flights, minor failures of hydraulic items, cooling motors, and electrical equipment delayed the flight test program. Colonel V.R. Haugen of the Air Technical Service Command, who flew the airplane in October 1944, was favorably impressed with its performance.

After the contractor had flown the XB-42 for approximately 150 hours, it was turned over to the Army Air Forces for additional test flights. During March 1946, Captain Glen W. Edwards of the Air Technical Service Command completed four test flights at Clover Field, Santa Monica, California, before an internal failure of the left engine terminated the tests. This failure resulted in an Air Technical Service Command decision to cancel the remaining part of the program and to convert the airplane to the XB-42A model.

Even though the flight test program on the first XB-42 was not completed, sufficient information had been obtained to check most of the contractor's guarantees. It was evident from test results that the airplane "did not meet the company's guarantees for maximum speed at altitude, range, and single-engine service ceiling." The tests revealed that the aircraft exceeded guaranteed performance at sea level, and at two-



Douglas XB-42, ship No. 1, pilot's left-hand panel prior to first flight.
(McDonnell Douglas Photo from Harry Gann)



Pilot's panel, right-hand side prior to flight No. 1, July 31, 1944.
(McDonnell Douglas Photo from Harry Gann)

engine service ceiling at the design gross weight of 33,208 pounds. This design gross weight could be met, however, only by eliminating one-half of the bomb load, because the basic weight of the airplane had been considerably increased over the design weight.

The second XB-42 airplane made its initial flight at Los Angeles, California, on 1 August 1944. It was flown approximately 70 hours by the contractor. During October 1945, test pilots Lieutenant Colonel F.J. Ascani and Captain Glen W. Edwards flew this airplane approximately 48 hours. All of these tests were made at the Air Technical Service Command Flight Test Base, Muroc, California, with the exception of lightweight flights and landing tests which were conducted at Mines Field, El Segundo, California. This second airplane did not meet Douglas Aircraft Company's guarantees in regard to maximum speed at altitude, maximum speed at sea level, or range with guaranteed bomb loads. However, it did meet the guarantees for rate of climb at sea level, single-engine and two-engine service ceiling, and takeoff and landing distances.

During the flight test program, some confusion existed between Douglas Aircraft and Flight Test Division personnel of the Air Technical Service Command. At the beginning, there was some discussion in regard to the cost of the program. Noting an item of \$400,000 for flight testing, the Army Air Forces indicated that "this exorbitantly high figure" was not understood. Douglas explained that the estimated cost was greater than originally contemplated because

of a belated decision to utilize a remote air field for reasons of safety and security. The Air Forces believed that the company's intention, from the beginning, was to conduct these tests at a remote location, in order to increase the safety of such operations. In view of the high estimated cost, Douglas was instructed finally to "perform only that part of the program necessary to prove airworthiness." Other tests necessary to determine the airplane's acceptability were to be conducted at Wright Field, Dayton, Ohio. Only the first airplane, however, was to be removed to Wright Field. The second article was to be prepared for delivery to Eglin Field, Florida, for tactical tests.

As a result of this confused program, only the first airplane was sufficiently instrumented for performance flights. Separate flight plans were drawn up for the two airplanes, inasmuch as the models differed slightly in configuration. Since the installation of two auxiliary jet units on the first model was contemplated, Army Air Forces personnel desired that this model be tested in its current configuration. Douglas and Wright Field personnel finally agreed to curtail the program on the first article and to check all guarantees on the second model, since the latter had the configuration desired by the Army Air Forces. The Army Air Forces believed that a production flight check would be adequate for the acceptance of the first airplane, since most of its instrumentation was to be removed and installed in the second model.

Pending final approval of the flight program, Douglas

proceeded with its tests on the second airplane. These tests revealed that the critical altitude for this model was approximately 3,000 feet under the guarantee. Furthermore, the Allison torquemeters were found to be unsatisfactory. A conference with Allison representatives brought no satisfactory answer to either problem. At that point Douglas and the Air Technical Service Command decided to turn the second XB-42 over to the Army Air Forces just as it was.

After it had been tested by Air Force pilots at Muroc, California, the number two airplane was officially accepted by the Army on 8 December 1945 and was flown from Long Beach, California, to Washington, D.C., on that date.⁵ The transcontinental distance of 2,295 miles was covered in five hours 17 minutes and 34 seconds, averaging 433.6 miles per hour. Official timekeepers of the National Aeronautical Association supervised the timing.

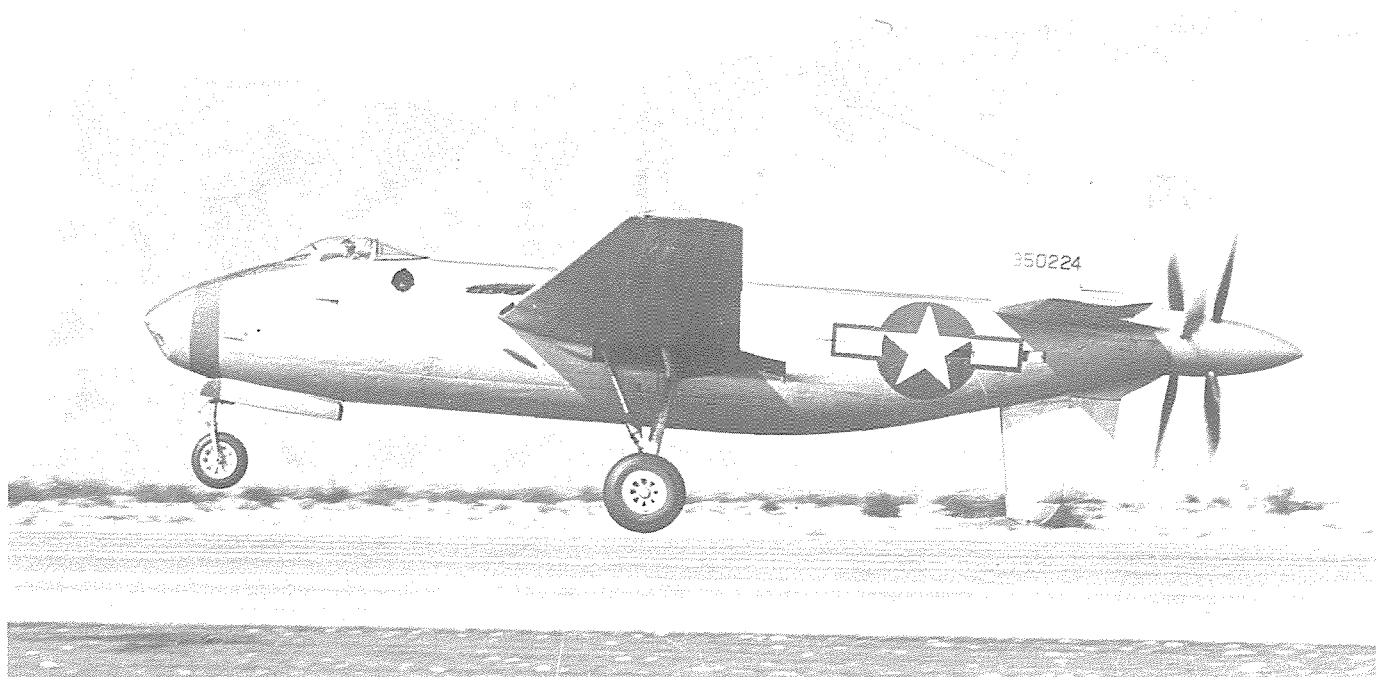
The number two plane was to be flown to the General Electric plant at Schenectady, New York, in December 1945 for installation of radar equipment, and then flown to Eglin Field in January 1946 for tactical tests. However, it crashed near Bolling Field, Washington, D.C., on 16 December 1945 and was completely demolished. An investigation by authorities of the First Army Air Forces Base Unit at Bolling Field revealed that the failure of the gear diaphragm in the hydraulic accumulator was, in all probability, the cause of the malfunctioning of the landing gear. The report also stated that the failure of the landing gear system was "considered to be a definite contributing factor to the accident. . . ." However, the chief of the Flying Safety Branch, Flight Operations Division, AC/AS-3, reported that "as a generality, it is the opinion of this office that the basic cause of this accident is the permitted multiplicity and complexity of controls."

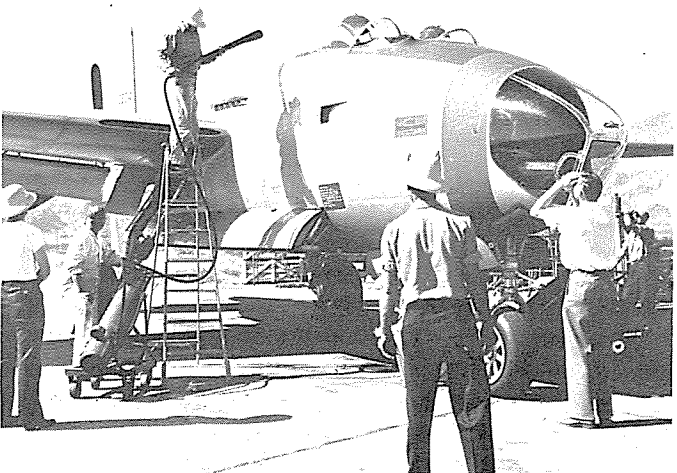
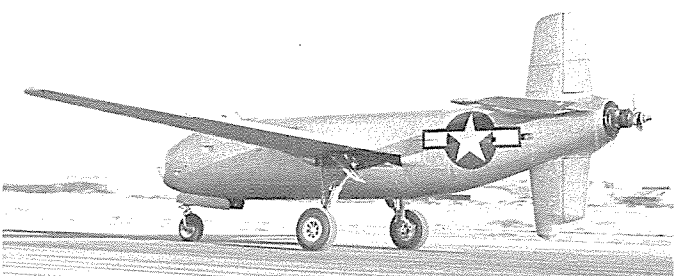
Douglas XB-42, ship No. 1, taking off from Palm Springs, California.
(Douglas Photo from G.H. Balzer Collection)

Inspection and Acceptance—The usual engineering acceptance was conducted on the two XB-42 airplanes at the contractor's Santa Monica plant during the week of 4 September 1945. No major alterations were required as a result of this inspection, although it was necessary to rework a large number of small items on both airplanes. The final acceptance inspection report for the number one airplane was made on 24 September 1946. It was stipulated, however, that satisfactory dynafocal shock mounts for the engine reduction gearbox should be installed prior to the next flight, in accordance with previous instructions. On 28 August 1946, the Engineering Division at Wright Field had wired the following message to the Army Air Forces Officer in Charge at the Douglas plant: "Request your office accept the airplane with the understanding that new and satisfactory mounts for the gearbox will be installed against the basic contract during the XB-42A conversion." Throughout 1947, Douglas proceeded with the requested modification and the required tests under the basic contract, in preparation for the conversion of the XB-42 to the XB-42A, which was to be accomplished by the installation of two auxiliary jet units under the wings. The final acceptance report for the number two airplane was made on 21 November 1945. This was about three weeks before its record transcontinental flight, and approximately one month before its crash near Bolling Field.

THE XB-42A

As early as September 1945, the Army Air Forces requested the Douglas Aircraft Company to make a proposal covering the installation of auxiliary jet engines in the XB-42 airplane. In October of that year, the Engineering Division at Wright Field explained that "it was anticipated that the static test article of the XB-42 airplane would be used for installation of jet engines in the event that the studies indicated a satisfactory airplane would result. At that time, Douglas expressed





the opinion that a modification of the XB-42 airplane for jet engine installation could be completed "much earlier" than an entirely new airplane for that purpose could be designed and completed. In December 1943, Army Air Forces authorities in Washington approved a proposal to convert the static test article of the XB-42 to a flying model incorporating jet units. However, this approval did not pertain specifically to the XB-42A project, but applied to the development of the XB-43 bombardment airplane which had a configuration almost identical to the XB-42.⁶

Approximately six months after the approval of the XB-43 project, the Assistant Chief of Air Staff, Operations, Commitments, and Requirements, went on record "as favoring emphasis of the highest possible degree being placed on jet propulsion for our future bombardment aircraft." Shortly before that time, the Army Air Forces Board recommended "the early development and production of jet-propelled bombers as one of our best possible future defenses against hostile jet fighters." A step in that direction was taken in August 1944, when the Production Division at Wright Field, acting on authority from Washington, issued a technical instruction to initiate a program for jet-propelled bomber development. According to the instruction, aircraft manufacturers were to be encouraged to submit bids for jet bombers on phase contracts "in such a manner that the Air Forces may readily terminate development of a project upon completion of any one phase." New proposals from the various manufacturers were to be encouraged as well as the modification of existing airplanes.

Preliminary negotiations concerning the conversion of the XB-42 airplane to the XB-42A, by the installation of auxiliary jet propulsion engines, began in February 1945. On 23 February, Douglas Aircraft Company submitted a proposal calling for the installation of two Westinghouse Model 19XB-2A jet units on the XB-42 airplane. Two possible configurations were suggested. One was a "quick and dirty" arrangement with the auxiliary engines under the wing. The optional arrangement called for a complete rework of the wings for a more permanent installation. On 29 March 1945, at the request of the Army Air Forces, Douglas submitted a cost quotation of \$400,000 for the installation of the jet units under the wings and for the necessary flight testing. However, on 5 November 1945, at the request of the Air Technical Service Command, the company submitted a new cost quotation of \$388,090, including 10 percent profit, for the conversion of the XB-42 to the XB-42A.

The work on this project was first authorized on 23 April 1945 by Contract Change Notification 34 to the cost-plus-a-fixed-fee contract (W535 ac-40188) under which the govern-

Douglas test pilot Gene May in the cockpit of XB-42 ship No. 2.
(Douglas Photo from G.H. Balzer Collection)

Douglas XB-42, ship No. 2, being prepared for towing from the Douglas El Segundo plant at Mines Field to the Santa Monica plant, November 14, 1944.
(McDonnell Douglas Photo from Harry Gann)

Douglas XB-42, ship No. 1, during taxi test at Mines Field, April 20, 1944.
(McDonnell Douglas Photo from Harry Gann)

Close-up of Douglas XB-42 No. 1 at Palm Springs, California.
(McDonnell Douglas via Bob Williams)

Douglas XB-42, ship No. 1, after addition of jet engines under wings and redesignation as XB-42A. (Douglas Photo from the G.H. Balzer Collection)

ment procured the XB-42 airplane. Later, personnel of the Air Materiel Command decided that the best interests of the government would be served if the new work was placed on a fixed-price basis. Since the contractor had issued a separate work order for this modification, and thus segregated all costs, the placing of this project on a fixed-price basis was easily consummated. On 20 March 1946, Change Order 21 to Contract ac-40188 was issued to cancel Contract Change Notification 34, at no additional cost to the government.

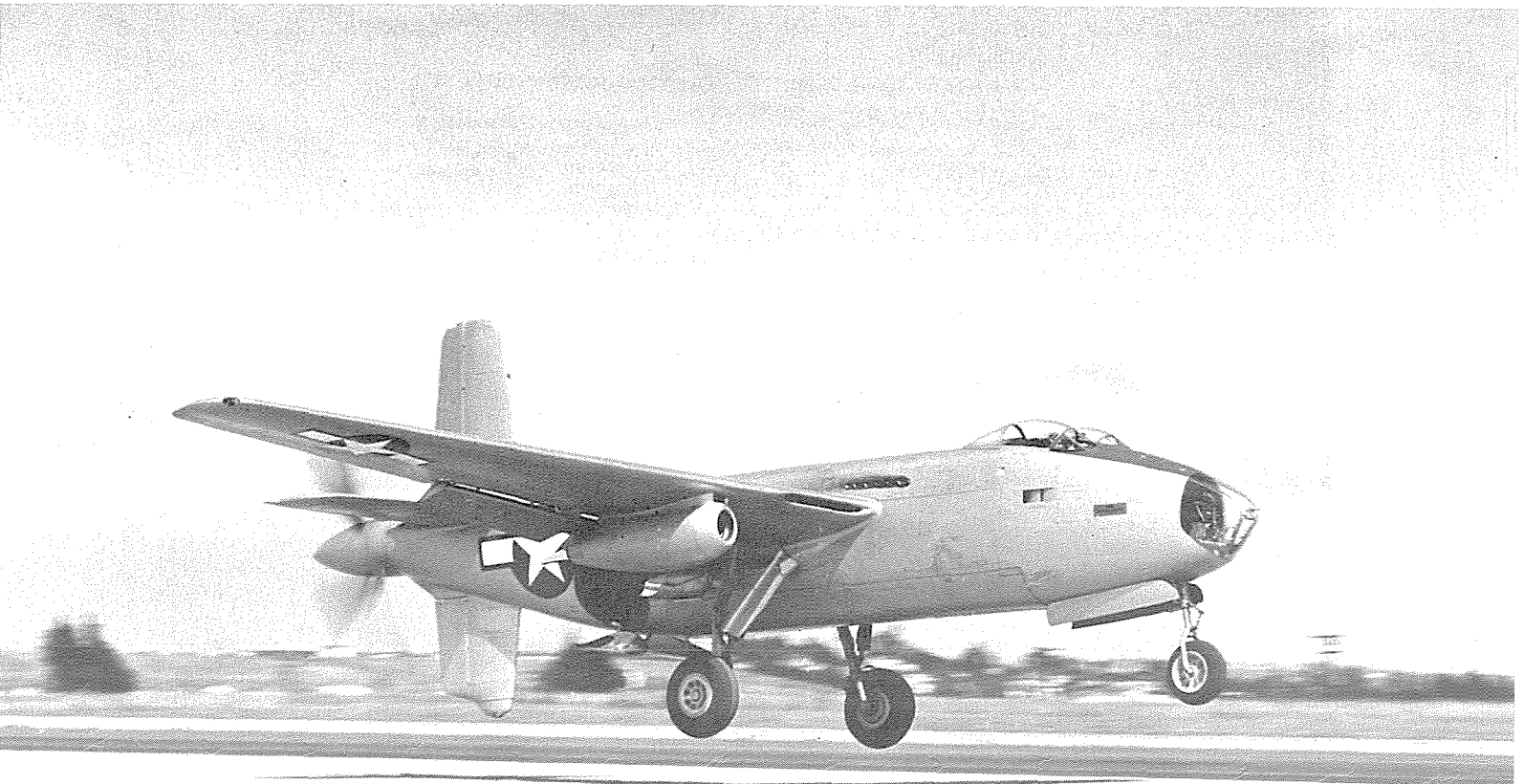
The negotiation of a fixed-price contract for the procurement of the XB-42A was then undertaken. An authority for purchase, which set forth the work to be accomplished, was issued on 8 March 1946. Funds obligated on the authority for purchase were allocated from the 1946 fiscal year appropriations. Letter Contract W33-038 ac-14527, covering this procurement, was drawn up on 29 April 1946 and approved on 15 July of that year. The formal contract for the XB-42A project for a fixed price of \$388,090 was approved on 31 March 1947.

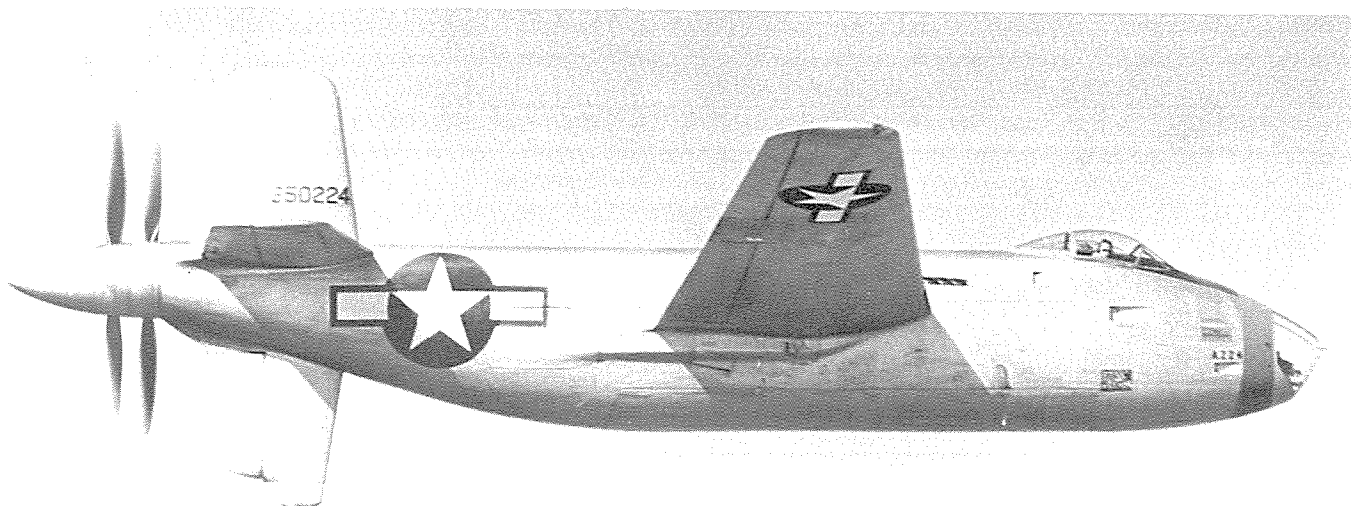
The negotiations for this procurement were started in April 1946 and extended over a period of approximately four months. During this time numerous conferences and discussions were held between Douglas and Air Materiel Command personnel. Command personnel made a detailed study of both the work to be performed and the price at which Douglas was willing to undertake such work. The contractor was required to modify the XB-42 airplane by installing, in addition to the two conventional Allison engines located in the fuselage, two auxiliary Westinghouse turbojet power units under the wings; to redesign and refabricate the flaps in the area of the jet units; to design and install a separate con-

trol system, separate fuel and oil systems, and a separate fire extinguisher system; and to install the necessary flight instrumentation equipment. The company was also required to flight test the modified airplane. All modifications were to conform to Appendix V of the XB-42 airplane specification, dated 1 March 1946.

The Army Air Forces believed that the quotations submitted by Douglas were reasonable with the exception of those covering the experimental flight testing program and the manhours required to service and maintain the airplane during the flight testing period. As a result of a review of the cost quotation by the Air Materiel Command, the contractor submitted a new cost breakdown of the flight test program. Following these negotiations, Douglas agreed to assume some additional work without any change in the fixed price previously quoted for the entire contract.

The contract for the XB-42A project included deviations from the standard contract language which had previously been used in Douglas Aircraft Company contracts. The standard article concerning patent rights could not be used, since Douglas had already obligated itself to foreign governments. Contract negotiations were stalemated from May through August 1946, while patent lawyers came to an agreement concerning this matter. Under the Kenyon Clause which was inserted in the "Authorization and Assistance" article of the contract, the government virtually agreed to bear the cost of any litigations in which the company might become involved in connection with patent infringements. This deviation from the usual contract, which increased the government's liability for any infringements, was approved by the Judge Advocate General Department for use in contracts negotiated prior to





Douglas XB-42, ship No. 1, in flight during flight test.
(Douglas Photo from the G.H. Balzer Collection)

31 December 1946. A modification of the "Limitation of Profits" article also exempted this contract from the provisions of the Vinson-Trammell Act concerning taxation. No royalty payments were included in the contractor's quotation for the items procured under this contract.

Among the factors which delayed the completion of the XB-42A project were the maintenance problems encountered, the time involved in the procurement of the Westinghouse jet engines through the Bureau of Aeronautics, and subsequent deferment of vibration tests of the dynafocal mounts on the reduction gearbox. In April 1945, Douglas personnel indicated that it was their understanding "that the engines for this installation will not be available as early as expected because of the fact that this project has a relatively low priority." However, on 4 June 1945, the Air Technical Service Command expressed the opinion that Douglas was attempting to get delivery on this equipment in advance of the time of its actual need. The Army Air Forces Plant Representative was informed that "The Air Technical Service Command can see no emergency in the supply of this equipment, and cannot see the reason behind the vigorous follow-up originating from your office." Furthermore, the plant representative was warned that his office would "be held strictly responsible for ascertaining the veracity of these requirement dates. . . ."

On 23 May 1945, the Air Technical Service Command Liaison Office with the Bureau of Aeronautics notified the command at Wright Field that the two jet engines currently allocated to the Army Air Forces for the XB-42A were scheduled for delivery in November 1945. Other Westinghouse jet engines scheduled for delivery prior to that time were to be installed in Naval experimental airplanes. It was mandatory that any action initiated to improve the delivery date be cleared through the Joint Engine Allocation Committee. However, on 30 May 1945, the Army Air Forces indicated that the situation was "well in hand," explaining that the jet engine mock-up had been shipped on that date, and that the late November date was acceptable for the delivery of the two installation engines. The tentative completion date for the engineering work on the XB-42A was 12 November 1945, but it was believed that this date probably would be revised in the near future because of the placing of higher priorities

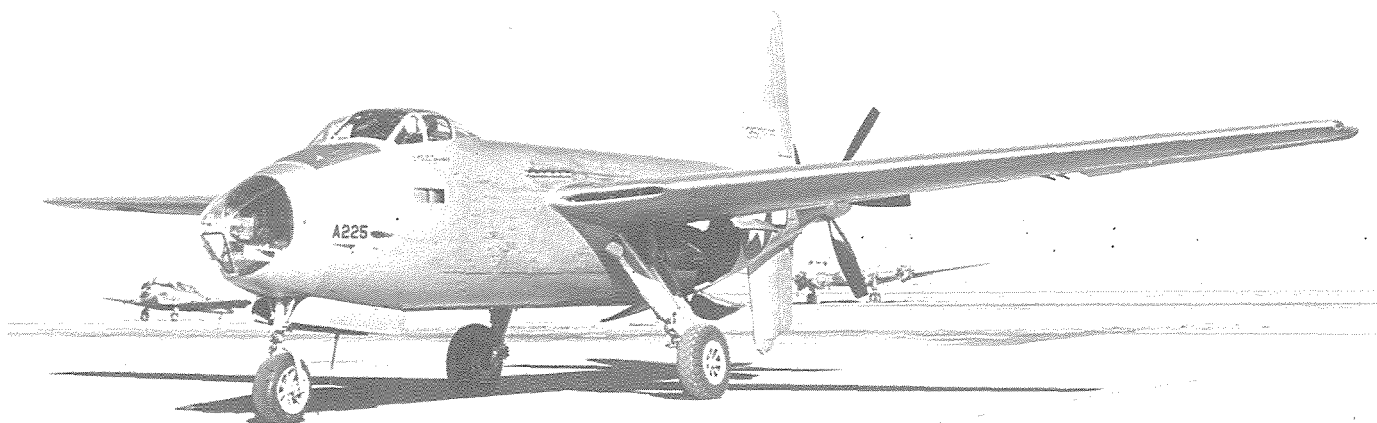
on the cargo transport prototypes of Douglas, and because of the revised program on the first airplane resulting from disapproval of the full-scale wind tunnel tests.

By August 1945, reports had reached the procurement agency at Wright Field that the first two engines would be delayed somewhat due to a number of rejected forgings. In November, after a conference at Westinghouse, the Bureau of Aeronautics advised the Air Forces that the delivery date had been set for February 1946. The Bureau explained that it was "barely possible" that the Air Forces might obtain these engines in January if the McDonnell Aircraft Company, St. Louis, Missouri, did not have its experimental aircraft ready at that time.

Attempts late in 1945 to expedite the delivery of the jet engines met with failure. The last jet unit was not shipped to Douglas until September 1946. In the meantime, the contractor completed the engineering for the engine installation, and requested permission to dispose of the Westinghouse jet engine mock-up. Accordingly, the Engineering Division at Wright Field instructed Douglas to ship the mock-up to Northrop Aircraft Company, Hawthorne, California, for use in the XS-4 airplane.

During the latter part of 1946 and the first half of 1947, the factory completion date of the XB-42A was advanced a number of times. Consequently, the starting date of the vibration tests on the gearbox mounting was also delayed. Early in February 1947, the factory completion date was advanced from 3 February to 5 March. Later the project was scheduled for completion by 21 April. However, the Western Field Office of the Engineering Division explained that the April date was "contingent upon completion of the nose fairings." Engineering difficulty with the Westinghouse auxiliary jet engines resulted in still further postponement.

On 27 May 1947, the XB-42A airplane was flown from the Douglas plant at Santa Monica to the Army Air Forces Test Base at Muroc, California. During this flight the drag of the Westinghouse jet units was "very noticeable." When tests were resumed at Muroc, neither the conventional nor the jet engines proved entirely satisfactory. During a vibration test



Douglas XB-42, ship No. 2, 43-50225. Note the conventional canopy on ship No. 2; ship No. 1 had individual 'bug-eye' canopies for the pilot and copilot. (Douglas Photo from G.H. Balzer Collection)

flight on 28 May 1947, a power surge was encountered in one of the Allison engines. One of the jet engines was later rejected because of failure and was returned to Westinghouse Electric Company for complete inspection and overhaul.

Three flights were made in July 1947 to obtain vibration data requested by the Air Materiel Command. The airplane was flown only a few times in August because of the excessive amount of maintenance work found necessary. Two flights were made on 15 August for the purpose of instructing a new pilot. The current company pilot was not to be available after a short time. On that date the contractor expressed a desire to complete the flight test program at the Muroc base. However, as a result of further flight testing in the fall of 1947, the Air Materiel Command decided to modify the nacelles. For this and other minor alterations the XB-42A was flown to the Douglas plant at Santa Monica late in 1947. The Air Force believed that the project would be completed and could be closed out in the early part of 1948.⁷ □

FOOTNOTES

1. The second flight article had a single canopy.
2. Chronological notes on the XB-42 airplane, 1944-1947, Adm. Br., Res. and Eng. Div., AC/AS-4, Washington.
3. "Research and Development Projects of the Engineering Division," 3rd ed., 1 July 1943, Hist. Office.
4. Interview with H.A. Sullivan, Bomb. Br., Eng. Div., AMC, 12 Aug. 1947.
5. Interview with Helen Blakeslee, Purchasing Agent, Airc. Sect., Proc. Div., AMC, 7 Nov. 1947.
6. Case History, "XB-43 Airplane," 1948, Hist. Office, AMC.
7. Interview with H.A. Sullivan, Bomb. Br., Eng. Div., AMC, 12 Jan. 1948.

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In Headquarters, United States Air Force, a search through a mass of material on bombardment airplanes in Central Files Classified Section yielded little information. However, much valuable evidence was obtained from the files in the Research and Engineering Division, AC/AS-4, and the Procurement and Industrial Planning Division, AC/AS-3.

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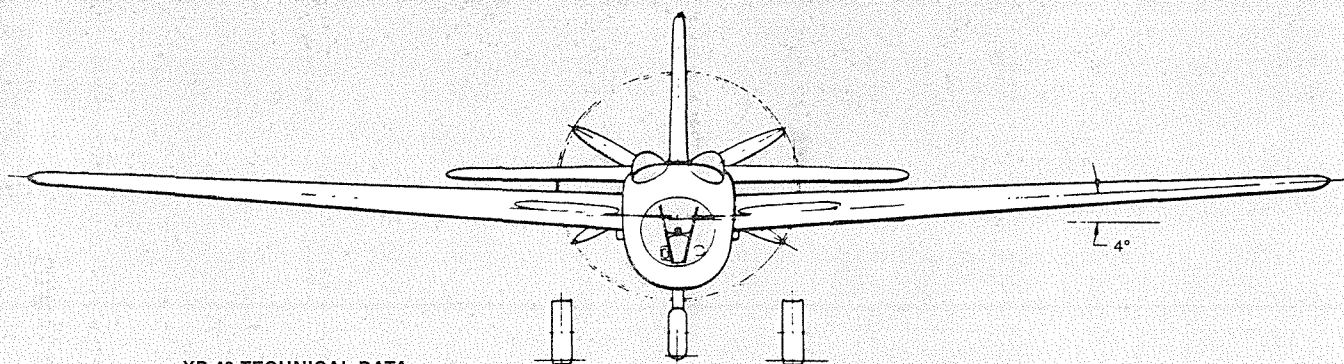
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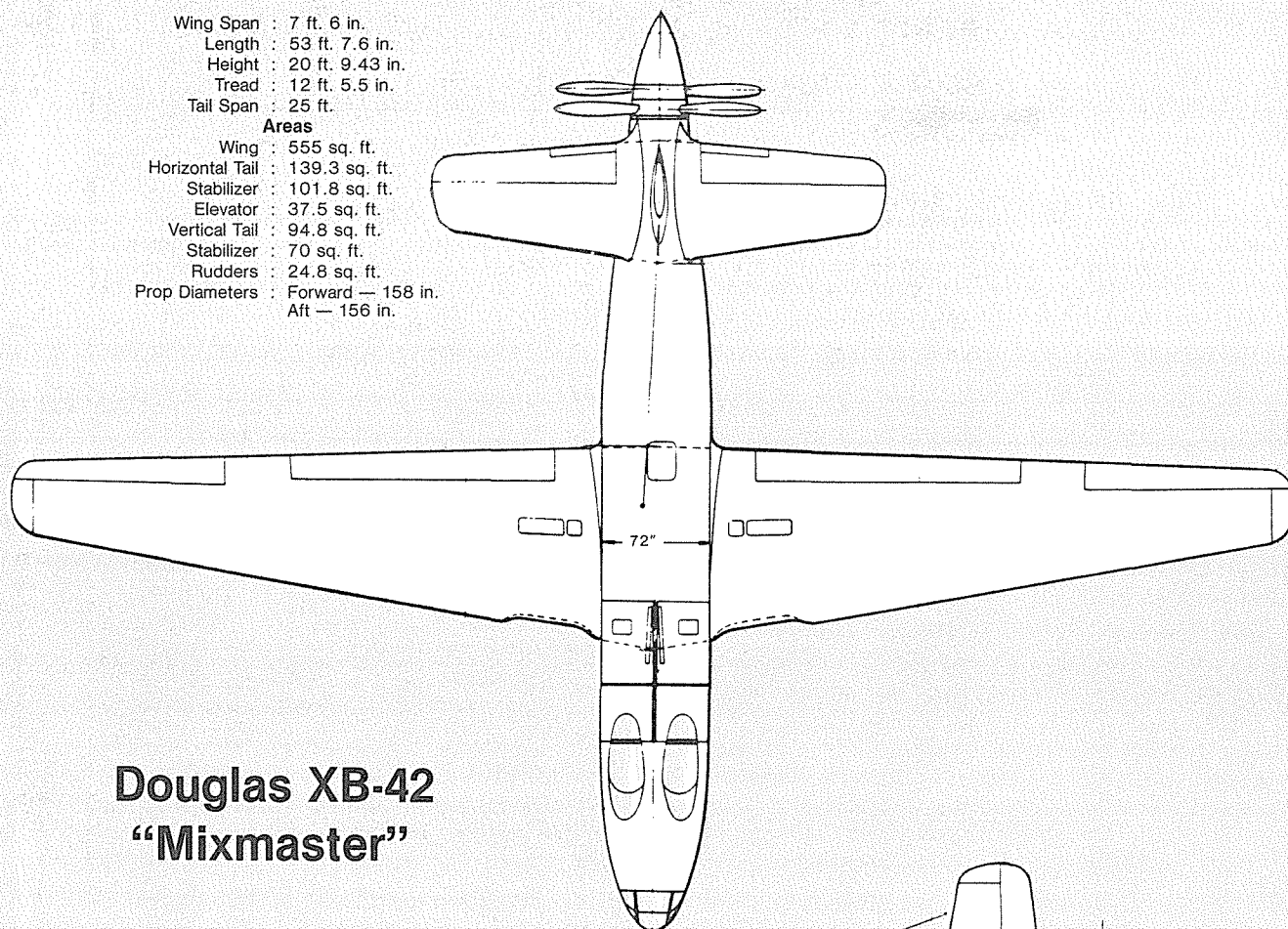


XB-42 TECHNICAL DATA

Wing Span : 7 ft. 6 in.
 Length : 53 ft. 7.6 in.
 Height : 20 ft. 9.43 in.
 Tread : 12 ft. 5.5 in.
 Tail Span : 25 ft.

Areas

Wing : 555 sq. ft.
 Horizontal Tail : 139.3 sq. ft.
 Stabilizer : 101.8 sq. ft.
 Elevator : 37.5 sq. ft.
 Vertical Tail : 94.8 sq. ft.
 Stabilizer : 70 sq. ft.
 Rudders : 24.8 sq. ft.
 Prop Diameters : Forward — 158 in.
 Aft — 156 in.



Douglas XB-42 "Mixmaster"

