



Line up of Bell P-59A-1's at the Niagara Falls Municipal Airport with the Bell Plant in the background. (Bell)

THE BELL XP-59A AIRACOMET THE UNITED STATES' FIRST JET AIRCRAFT

By RONALD D. NEAL

On September 4, 1941 the first officially recorded conference to discuss jet propulsion was held in the office of Major General Hunry H. Arnold, who was then Chief of the Army Air Force. The ground work for this meeting actually had its beginnings in the early part of 1941, when on February 25, General Arnold, prompted by Army intelligence reports on German rocket developments, wrote Mr. Vannevar Bush, Chairman of the NACA, advising him of the German efforts in the rocket field. General Arnold went on to suggest that the NACA might look further into this question of jet propulsion. Acting on General Arnold's suggestion, Mr. Bush, in March 1941, established the Special Committee on Jet Propulsion under the direction of Dr. W. R. Durand. Dr. Durand had been the chairman of the NACA during World War I, and he came out of retirement to accept this new and important position. It should perhaps be pointed out that at this time (circa 1940-1941) the term "jet propulsion" was mainly thought of as applying to the principle of what today would be called "rocket propulsion" or non-air breathing engines, and thus the early usage of "jet" did not necessarily refer to the present day conception of the jet engine.

The British had already been active in the field of jet propulsion for several years, particularly in the area of gas turbine development, and one of the foremost exponents for using the gas turbine as a propulsion device was a young RAF officer by the name of Frank J. Whittle. Whittle's interest in gas turbines dated back to 1928 when in his fourth term as a cadet in the RAF College at Cranwell, he discussed, in a paper he had written on the future developments of aircraft, the possible use of jet propulsion and gas turbines. Some 18 months later, he conceived the idea of using the gas turbine for jet propulsion. Naturally, other people

and other groups throughout the world were working on somewhat similar efforts. However, in this article the remarks will be confined primarily to the events that eventually contributed directly to the United States' entrance and participation in the jet propulsion field.

In January 1930, Whittle first applied for a British patent (No. 347,206) on his engine idea. After applying for the patent he attempted to interest the Air Ministry in backing the development of his proposed gas turbine engine. His idea was turned down on the grounds that the practical difficulties involved in developing it were too great. He next attempted to interest private British industry in his design, but again his efforts met with failure. After these setbacks, Whittle's active work in the field almost ceased and, due to the lack of encouragement, he even let the basic patent expire rather than pay the renewal fee. However, unexpected help came in May 1935 when he was approached by two ex-RAF officers who were interested in the possibilities offered by a gas turbine engine. From this beginning an organization was eventually formed for the purpose of producing a gas turbine engine based on Whittle's designs. The firm was legally incorporated in March 1936 as Power Jets, Ltd. Some two months later, Power Jets placed an order with the British Thompson Houston Company for the construction of a complete engine.

The test on the first engine, known as the type WU, began on April 12, 1937. For the next couple of years the new group struggled forward against constant development problems on the engine and the continued lack of any enthusiastic official interest or backing. However, the continued progress and improvement of the engine finally won the support of the government, and in July 1939 Power Jets was given the go-ahead to build a flight

engine. The design of the flight engine, which was designated as the W.1, was undertaken by Whittle and the engineers at the British Thompson Houston Company. The Gloster Aircraft Company, Ltd. was given the contract to build the airframe for the first British jet propelled airplane, and it was thereafter to be known by its specification number of E.28/39.

As the W.1 engine was being built, a sufficient number of unairworthy parts and spares became available so that from these pieces a test engine, to be known as the W.1X, could be assembled. With this engine installed in the airplane, the first taxiing tests took place on April 7, 1941. At the completion of the trials, the 850 pound thrust W.1 flight engine was installed in the airplane, and Gloster's chief test pilot, Philip E. G. (Jerry) Sayer, made the first flight on the evening of May 15, 1941. This flight was not the first of a jet-powered airplane, since this honor must be reserved for the German-designed Heinkel He 178 which flew on August 27, 1939. The first twin-engined jet to fly was also a Heinkel design, the He 280V-1, making its initial flight on April 2, 1941. Today, the Gloster E.28/39, Serial No. W 4041/G, is preserved in the aeronautical collection of the Science Museum, South Kensington, London, England. The "G" at the end of the serial number indicated that an armed guard was required for the airplane.

In April 1941, while in England, General Arnold finally had the opportunity to review first-hand the English developments in the jet propulsion field when he had the occasion to examine the Whittle gas turbine engine and the Gloster E.38/39 airplane. During this visit, he also had the opportunity to witness both taxiing and short flight tests of the airplane. Realizing the full importance of these developments, he discussed the gas turbine question further with Lord Beaverbrook, Sir Henry Tizard, Colonel Moore-Brabazon and Sir Charles Portal. As a result of these discussions, preliminary arrangements were made for providing information on the Whittle engine to General Arnold's London technical staff for their evaluation.

General Arnold returned to the United States in May. He at once informed Brig. General Frank Carroll, Chief of the Engineering Division at Wright Field, and Brig. General Oliver P. Echols, A-4 on the Air Staff at the Army Air Force headquarters in Washington, of the forthcoming development and production efforts that would probably be required in the field of gas turbine engines. He also advised the State Department of his findings and requested their assistance in making the necessary arrangements for establishing the desired liaison between the two countries to facilitate the exchange of information in the gas turbine area. In order to insure the necessary cooperation between the United States and England, a series of negotiations were then undertaken between Cordell Hull, United States Secretary of State, and the Earl of Halifax, British Ambassador to the United States.

As a result of these combined efforts, a very important meeting took place on July 22, 1941, at the Ministry of Aircraft Production in London. At this meeting Air Marshall Linnell of the MAP and Dr. Roxbee Cox of Power Jets Ltd. briefed Colonel A. J. Lyon and Mr. D. R. Shoults, on gas turbine developments in the United Kingdom. On July 25, Colonel Lyon, Mr. Shoults and Major Carl Brandt visited the Power Jets Ltd. facilities and discussed gas turbine progress with Wing Commander Whittle. Three days later, this same group visited the Gloster Aircraft Company's factory and viewed the two E.28/39 experimental aircraft then under development. During this visit, details of the F.9/40, twin engine fighter design (later versions of which would be known as the Meteor) were also discussed.

Colonel Lyon was General Arnold's representative in England for all technical matters. Mr. Shoults was a technical service representative for the General Electric Company, and he had originally been sent to England by General Electric to advise and assist Colonel Lyon

in the servicing and use of turbosupercharger equipment being used in the Lend-Lease B-17C airplanes. However, with the new and growing emphasis on gas turbine engines, General Arnold had appointed Mr. Shoults to act jointly with Colonel Lyon as an investigating committee on the new engine. In order to evaluate the technical aspects of the English jet-powered airplanes, Colonel Lyon had requested Major Brandt to serve on the committee and to report on this phase of the program.

In late July, Major Donald J. Keirn arrived in England on a secret mission, and reporting directly to Colonel Lyon, he found that he had been appointed, by General Arnold, to be Colonel Lyon's deputy on the jet propulsion project. After being brought up to date on the British developments in the gas turbine field, Major Keirn was sent to Lutterworth where the Power Jets factory was located. There he could gain first hand information on this effort and evaluate it with respect to possible American utilization. Arriving at Lutterworth, he met Frank Whittle for the first time and then for the next four days he went over the details of the Whittle engine. Returning to London, he again reported to Colonel Lyon and made the recommendation that the United States build a copy of the Whittle design.

In order to present the results of their findings regarding possible United States participation in the gas turbine field, Mr. Shoults and Major Brandt returned to the United States, and at the September 4 meeting they presented the recommendations of the London committee. The government and the Army Air Force were represented at this meeting by Mr. Robert A. Lovett, Assistant Secretary of War for Air, Major General H. H. Arnold, Chief AAF, Brig. General Carl A. Spaatz, Chief of the Air Staff, Brig. General Oliver P. Echols, Chief of the Materiel Division, Lt. Colonel Benjamin W. Chidlaw, Materiel Division and Major Brandt. The General Electric Company was represented by Dr. A. R. Stevenson, Jr., Mr. R. C. Muir, Mr. S. R. Puffer and Mr. Shoults. At this meeting, after hearing and discussing the recommendations, it was tentatively decided that 15 engines and three airplanes should be produced as soon as possible. Due to the low thrust output of the Whittle engine, it was decided that the airplane should be of a twin engine design with Bell Aircraft Corporation being selected as the first choice to build the airplane.

The official reason given for selecting Bell as the airframe manufacturer was listed as being because of its close proximity to the General Electric facilities. However, as with most major decisions, the final conclusion or recommendation is usually not the result of any one factor. Rather, it represents the best judgment based upon several considerations, and such was the case in the selection of Bell. In a letter to the author, General B. W. Chidlaw, USAF (Ret.), elaborated on this point and made the following remarks.

"Quite naturally all aircraft companies experienced in Fighter Aircraft Design and Production entered into our early considerations. My recommendation as to the choice of BELL (on the airframe side) hinged mostly around the following considerations:

"(1) Most all of the other companies previously experienced in Fighter design and production found their design and engineering staffs so overloaded with work improving and/or 'debugging' the aircraft already under development or production that I did not wish to see them further overloaded with undertaking still another project of this magnitude - particularly within the completion time span of one year which General Arnold had decreed for the first phase completion of this highly experimental project.

"(2) Bell had a smaller, but highly-experienced and imaginative engineering staff, well-experienced in Fighter design. This particular group was--at just that time--less overloaded with current development and production improve-

ment...work and hence able to undertake a project of this sort with less interference to other important projects and production programs than on the books.

"(3) BELL had certain isolated facilities which could be made readily available to start this project under the strict conditions of the 'SECRET' classification as imposed by General Arnold.

"(4) The proximity of Buffalo to the Schenectady and Lynn (Mass.) engine plants of G.E. promised easier, faster and more complete and constant coordination, so necessary to both the airframe and engine manufacturers in this project, so highly experimental in nature. You must remember that in building the Americanized version of the British engine all measurements had to be translated to American standards and such measurements had to be passed on immediately to the design staff of the airframe manufacturer so that both parts of the project could go on concurrently.

"(5) Last, but by no means least, we were all aware of Larry Bell's tremendous personal drive and boundless enthusiasm in all matters relating to Research and Development...and we likewise knew that once in this program, Mr. Bell would personally be riding herd...and keeping on top of the project...every minute."

Bell's willingness and capacity to undertake the somewhat unorthodox approach had already been demonstrated by the Bell-designed XFM-1 Airacuda and the XP-39 Airacobra. In the years to come, the ability of the Bell Aircraft Corporation to push forward into new frontiers would be exemplified by the Bell X-1, X-2 and X-5 research airplanes.

General Electric, of course, had been selected by the Army Air Force as the engine contractor because of their extensive research and development capabilities in the closely-related field of turbosuperchargers. It is interesting to note that when the NACA Special Committee on Jet Propulsion was first formed, the only industrial companies invited to participate were Westinghouse, Allis-Chalmers and the Schenectady steam turbine division of General Electric. Representatives from the established aircraft engine companies, i.e., Allison, Pratt & Whitney, etc., were specifically left out of this group at the request of General Arnold. At this time he feared that the old line firms might possibly be opposed to the development of an unorthodox powerplant.

At the conclusion of the September 4 meeting, Arnold had the British government notified, through the American Embassy in London, that a decision had been reached to produce jet-propelled airplanes and gas turbine engines in the United States. It was also requested that Great Britain send authorization rights covering the reproduction of the Whittle engine, one complete engine and one single engine airplane (E.28/39) to the United States.

That evening, General Arnold's office contacted Larry Bell at his home and requested that he and his chief engineer, Mr. Harland M. Poyer, be present for a meeting in Washington the next day. Mr. Bell then quickly contacted Poyer at his home to advise him of the meeting, and late that evening they both left Buffalo for Washington.

Thus, on September 5, in a preliminary meeting with General Echols, Mr. Bell and Mr. Poyer were given a briefing on the reasons for their visit and a resume of progress in the gas turbine field. The records indicate that at this meeting General Echols asked Mr. Bell to participate in the development of America's first jet-powered airplane and that Mr. Bell in turn expressed the willingness of his company to undertake this effort. Since the decision to have Bell build the airplane had already been made the day before, it then seems likely to assume that the act of asking Mr. Bell

to participate, was more a matter of form, than an actual request. In any event, the fact that Bell would build the airplane was probably a foregone conclusion! Later that same day a second meeting took place, this time in General Arnold's office, with Mr. Bell, Mr. Poyer and Mr. Shoultz present, and at this meeting a final decision was reached to build 15 gas turbine engines and three airplanes.

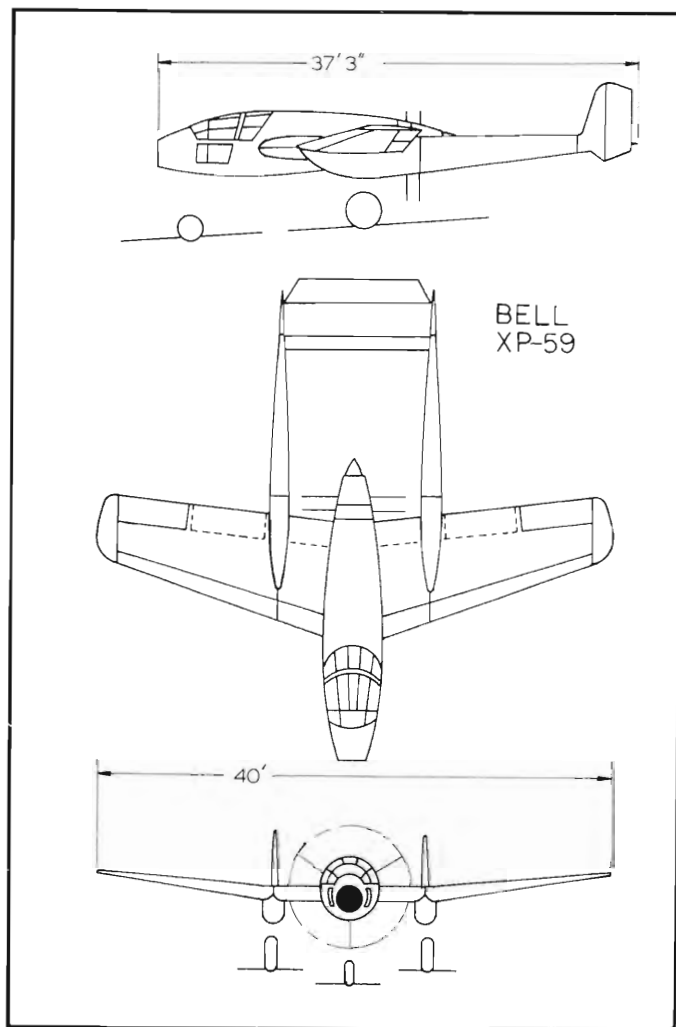
After returning to Buffalo, Mr. Poyer selected a small group of his key engineers and these men were then called into Mr. Bell's office. They were first sworn to strict secrecy and then given a briefing on the recent Washington trip. Mr. Bell then assigned them the task of designing the XP-59A. This original group consisted of an aerodynamics engineer, a thermodynamics engineer, a structural designer, a development engineer, a stress analysis engineer and a weights engineer.

Two other men who, of course, knew of the project were Robert J. Woods and Ray P. Whitman, co-founders, who along with Larry Bell had organized Bell Aircraft Corporation on July 10, 1935. At that time Larry Bell had been vice-president and general manager of the Consolidated Aircraft Corporation, but when Consolidated moved to California he resigned his position and remained in Buffalo to form his own company. Initially, 40,000 square feet of space in Consolidated's old building was rented, and by the end of 1935 Bell Aircraft Corporation employed all of 60 people. The first airplane design to be produced by Bell was the XFM-1 Airacuda which first flew on September 1, 1937.

With only an 8½ x 11 free-hand sketch of the engine and working under extreme security measures, this group of six men, within the short span of two weeks, prepared a proposal and a 1/20 scale model of the airplane. The proposal was presented to and approved by General Arnold. On September 30, 1941 fixed fee Contract W535 ac-21931 was entered into with the Bell Aircraft Corporation for three XP-59A airplanes, one wind tunnel model and data for a total price of \$1,644,431. The XP-59A airplanes, were described in the contract only as "twin engine, single place interceptor pursuit models." General Echols had recommended the approval of this contract with the comment that this airplane was needed in connection with the development of high performance interceptor pursuit airplanes. The contract was approved by the Under Secretary of War on October 3, 1941 and it called for the first airplane to be delivered eight months from the date of the contract approval--a rather tight schedule considering the magnitude of the project. The guidelines given for the design of the airplane were very loose, with Bell being given a free hand in determining the configuration of the airplane. The only basic requirement was that they wrap an airframe around the two forthcoming General Electric engines.

Throughout the entire XP-59A effort tight security measures were constantly imposed on the project, and from the beginning it was given a special secret classification. In fact, the designation for the airplane, XP-59A, was not original, but rather was borrowed from a Bell experimental model that had been assigned the designation XP-59. The XP-59 was to be a 450 mile per hour single engine interceptor with twin tail booms, dual rotating pusher propellers and a tricycle landing gear. The armament for the final version was to be four .50 caliber machine guns and two 20 mm cannons and the airplane was to be powered by a two-stage Pratt & Whitney R-2800-23 engine. The original Army Air Force contract called for the procurement of two airplanes of this type, but the program never progressed further than a partial mock-up and several wind tunnel models, and on December 1, 1941 the Army Air Force informed Bell that the propeller-driven XP-59 project would be terminated.

When Bell first agreed to participate in the secret jet propulsion program, the question of the airplane designation had arisen. It was then decided to assign the new jet airplane the designation XP-59A so that at



General arrangement drawing of the original, propeller-driven XP-59 that did not progress beyond drawing board.

least on paper it would appear to be a modification of the Bell propeller-driven design. Bell Aircraft was to assign Model Number 27 to the XP-59A project.

Colonel Chidlaw was selected by General Arnold and General Echols to head up, monitor and direct the development and testing phases of the XP-59A project. This responsibility also involved the coordination of the activities at Bell and General Electric with the British and Washington. Colonel Chidlaw brought to the project almost 20 years of aviation experience, having joined the Air Service in 1922 as a 2nd Lieutenant immediately after his graduation from the United States Military Academy. Ray Whitman, acting as the Bell representative, handled the liaison work between Bell, Wright Field and Washington. Major Ralph R. Swofford, Jr. and Major Keirn were assigned as aircraft project officer and jet engine project officer, respectively. Both of these men reported directly to Colonel Frank O. Carroll, who was Chief of the Experimental Engineering Section at Wright Field.

Just as Bell was beginning to prepare its proposal for the XP-59A airplane, negotiations between the United States and England, concerning details of the Whittle engine, were rapidly reaching completion. In reply to General Arnold's request of September 4, the Military Air Attache in London advised that drawings and data on the jet engine and one complete engine would be sent to the United States as soon as possible. A single engine airplane was not available and at that time a definite date could not be established for shipping one.

On September 22, 1941 the British Air Commission advised the United States Secretary of War that authority for release of all available information on jet propulsion to the United States had been given by the British Government. However, certain restrictions on the use of the material would first have to be agreed upon by the United States. These restrictions were, (1) the information would be used only for the purpose intended, (2) secrecy would be maintained and commercial rights would be protected, (3) no information would be released to a third party without the concurrence of the British Government, and (4) none but citizens of the United States and subjects of Great Britain (of known background in either case) would be permitted to have knowledge of this information without British consent. On October 9, 1941 these restrictions were officially confirmed by Henry L. Stimson, United States Secretary of War, with only one minor addition, dealing with United States rights of development on independent gas turbine projects.

All of the jet propulsion projects were originally placed in a "Special Secret" category, and this classification remained in effect until May 1943 when the project was reduced to "Secret." In November 1943 the security classification was reduced to "Confidential" with the actual airplane performance remaining "Secret", and finally, in August 1944 this classification was further reduced to "Restricted." Initially the XP-59A project was so secret that the Army Air Force Plant Resident at Bell was not even informed of the project's existence until May 1943.

With the initial authorization of September 22, arrangements had been started for the shipment of the requested items to the U.S. Thus, on October 1, 1941 a B-24 Liberator lifted from the runway at Prestwick, Scotland and winged westward across the Atlantic. It is interesting to note that exactly one year later, to the day, the jet-powered XP-59A would make its maiden flight. The destination of the B-24's cargo was the Turbo-Supercharger Department of General Electric's Lynn, Massachusetts plant. The shipment consisted of the W.1X engine, which was concealed under floor boards in the bomb bay, and a set of manufacturing drawings of the Power Jets W.2B engine design. The W.1X engine that was being sent to the United States was the same engine that was used for the initial taxi tests of the E.28/39, and during the nine months while it was being tested by Power Jets, it had accumulated approximately 132 hours of test running. All of this material was accompanied by a three-man Power Jets team and Major Keirn. The airplane arrived at Bolling Field, Washington, D.C. on October 2, and after a running battle with a rather uncooperative United States Customs Department, the still secret and uninspected cargo was finally delivered to the General Electric plant by Major Keirn.

To test the Whittle engine, General Electric built a special engine test cell, and for security reasons this cell was built within an existing building with the engine exhaust being ducted into an unused 64-foot chimney. This small engine test cell was constructed of reinforced concrete with the entrance to the test area being through a heavy steel door. The only means for viewing the engine was through a small observation slit. The heavy construction of the cell and the extreme precautions taken while running the engine were considered necessary in order to prevent any accidents from occurring that might jeopardize the security of the project. The first test experience in the test cell with the Whittle engine took place in November 1941. The initial engine run-ups were restricted to 10,000 rpm and only after gaining considerable test time and experience on the engine was the speed stepped up to the 14,000 rpm level. The maximum speed of this engine was approximately 17,550 rpm.

Using the W.2B drawings, the General Electric personnel, under the direction of Mr. Donald F. Warner, began to produce a reproduction of this engine. However,

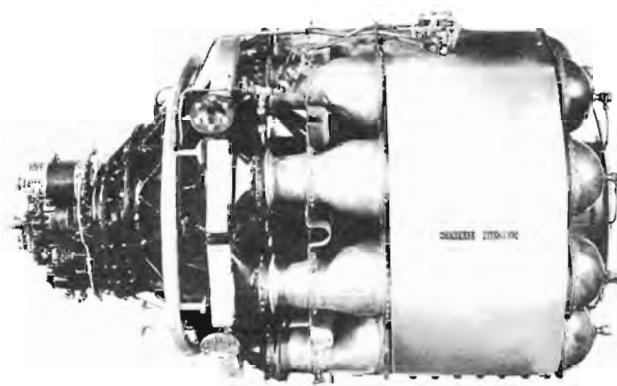
detailed inspection of the drawings revealed several omissions and some shortcomings in the overall design of the engine, and General Electric requested that they be permitted to make the missing parts and to incorporate other design details that they felt were necessary. The Army Air Force approved the request with the provision that General Electric should not make any modifications that would adversely affect engine performance. In spite of the many problems that had to be overcome, the General Electric engine, now known as the Type I-A, made its first run in the test cell on March 18, 1942, less than six months after the arrival of the drawings! Eventually, a total of 30 I-A engines would be produced for the XP-59A program.

The Type I-A was a centrifugal, reverse flow, turbojet engine that delivered approximately 1,250 pounds of thrust. Just as in the case of the airframe designation, the "I-series" designation for the jet engine was selected for security reasons. General Electric was then producing aircraft superchargers with the designation "A" through "F" and therefore, the use of "I", plus the fact that the jet engine was referred to as a turbosupercharger, served to hide the true nature of the project.

Wing Commander Frank Whittle arrived in the United States in early June 1942, the purpose of his visit being to deliver the latest drawings of the new Power Jets W2/500 engine and to confer with the General Electric people on the development of their I-A engine. From its earliest runs the I-A engine had suffered from excessive exhaust gas temperatures, and Whittle was instrumental in helping to solve this problem. Commander Whittle returned to England in the first week of August 1942 after having remained here until the problems with the engine were ironed out and units were ready for installation in the number one XP-59A.

After preparing their proposal and receiving approval of the design, the Bell team had set up the initial XP-59A project in the old Pierce-Arrow Plant which was located on Elmwood Avenue in Buffalo. The original preliminary drawings were made at this location. Before the detail layout stage was reached, however, the project was moved into the second floor of a four story building located at Main and Rodney Streets in Buffalo. At the outset of the program Bell had realized that a separate area for the engineering and shop work would be necessary for the XP-59A effort and so, after some scouting, the "Main Street" plant was located and leased from the Ford Motor Company. When the project first began moving into the building the lower floor was still occupied by a Ford Agency. This activity was immediately eased out with Bell then setting up their machine shop facilities and storage area on the newly-vacated first floor. All entrances to the building were guarded around the clock and special identification passes were required for entrance to the building. To further insure security the metal window frames were welded shut and the lower window panes (even on the second floor) were painted over.

Though initially lacking accurate engine details, Bell had proceeded on the design of the airplane and a 1/16 scale wind tunnel force model was built and tested in the Wright Field five foot tunnel by December 1941. A second wind tunnel model was built, this one being used for pressure distribution studies, and tests on this model were completed by late March 1942. Because of the extreme secrecy of the project it had been decreed that all of the wind tunnel tests, prior to the first flight of the airplane, would be conducted in the Wright Field tunnel. Realizing the importance of proper intake duct design for the engines and recognizing the limitations of the Wright Field facility, Major Echols, in November 1941, had requested that testing in NACA tunnels be permitted. Because of the secrecy requirement imposed by the original agreement with Britain, General Arnold had to refuse this request. In June 1942, Colonel Chidlaw reported that the XP-59A project was being handicapped by the requirement of secrecy



General Electric Type I-A turbojet engine, the type used for the first flight of the XP-59A. (General Electric)

which permitted tunnel testing in the Wright Field facility only. He went on to comment that the engine performance for the General Electric engine was in poor agreement with the original calculations, partly because the original engine calculations were based on small scale model data that had to be extrapolated from the Wright Field tunnel tests. Another factor that did not help was that the British W2B engine, which was the basis for the I series, was designed for a static sea level thrust of 1,760 pounds. Actually, it never reached this performance, with 1,560 pounds of thrust being the maximum obtained. In line with this fact, Colonel Keirn and Mr. Shoults, in an Institute of the Aeronautical Sciences paper, presented in August 1945 stated:

"Performance predictions for this aircraft (XP-59A) were based on estimated design performance characteristics furnished from England in lieu of United States engine test data. Unfortunately, neither the original nor the later production engines produced the output predicted."

One of the many problems that confronted the Bell design team was that the secrecy of the project prevented any contact with outside technical experts (NACA) or any of the aircraft equipment vendors. They were then forced to either design and build all of the parts and equipment for the airplane or purchase readily available "off the shelf" components. Many of the major pieces of the airplanes were fabricated in the first floor machine shop, but large or specialized parts had to be farmed out to the main Bell plant facilities. To disguise their true nature, the drawings that had to be sent to the main plant for fabrication were deliberately mis-titled. An example of this practice was the engine exhaust pipe that was labeled as a "heater duct." No doubt the sheet metal man who received a drawing calling for a 14-inch heater duct was convinced that he was working on a part for one of the world's largest airplanes. The actual assembly of the three XP-59A airplanes was carried out on the second floor of the building. Manufacture of the number one airplane began on January 9, 1942 with the assembly work on the wing and fuselage occurring during March and April.

As finally formalized the design of the jet-powered XP-59A bore a strong family resemblance to the piston engine Bell designs, the P-39 and P-63. This was a natural occurrence, since the extremely short time allowed for development of the airplane almost precluded any major advances in the state of the art. Also, the secrecy of the project dictated that Bell draw on its own design team, without additional hiring, and these people in turn used their design experience with the piston-powered airplanes. Furthermore, the purpose of the project was to design, build and fly a jet-propelled airplane

as quickly as possible in order to provide the United States with experience with this new type of powerplant. The XP-59A was also unique in that from the beginning of the project it was proposed to build an airplane that would result in a production fighter. Commenting on the purpose of the XP-59A project, General Chidlaw has remarked:

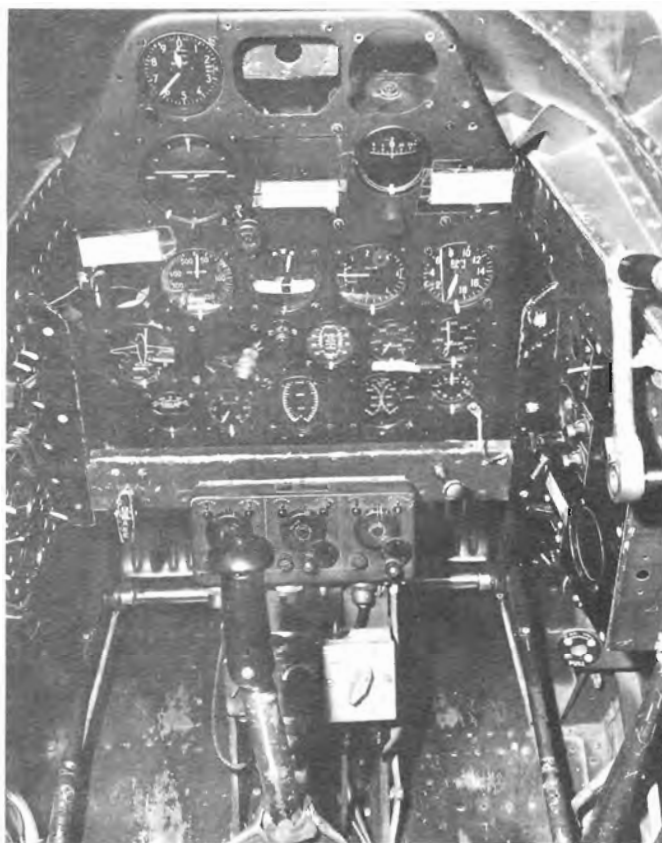
"...we wished to start this project primarily in a Fighter Configuration as a 'Fighter prototype' test bed hoping that we could later expedite (with the development of greater thrust from the Americanized version of the Whittle engine and the addition of adequate armament) the translation from the initial experimental test airplane(s) into a useable 'superior performance' fighter, capable of being produced in quantity for our then Army Air Force fighter units."

This is in contrast to the British and German efforts in that the first jet airplanes produced by these countries were purely experimental in nature with no real hope or plan for production of these models.

As the project effort began to pick up momentum, it soon became necessary to increase the manpower level of the project and so in the main Bell plant a strange thing began to occur--people suddenly began to disappear. Where these people had gone, what they were doing, or even if they still worked for Bell was a mystery to those who remained behind, and the now empty and vacant desks and drawingboards only served to add to the mystery. Of course, the people who were now working on the "X" airplane could not entirely end their social life, and when parties or a professional meeting took place and these "lost ones" made an appearance, they were subjected to the friendly cross-examination from their friends and ex-coworkers. The extent of the security finally reached the point where those working on the XP-59A were actually discouraged from participating in social affairs. The people working in the project not only had to refrain from telling their families what they were working on, but the location where they worked had to remain a secret. In the event of an emergency, the family could call a phone number that would ring a phone at the secret plant. The name of the party calling and their phone number was taken and this information was relayed on to the employee, who could then return the call from another phone!

The all metal, semi-monocoque fuselage of the XP-59A consisted of a spliced forward and aft section. The forward section was the principal component, with this section containing such items as the wing center section, the engines (which were housed in nacelles that were integral with the main fuselage), all engine accessories and controls, pilot compartment, radio equipment, the non-steerable nose landing gear and all flight control systems. The engines, which attached to the wing center section structure, were supported by three engine mounts located on the forward portion of the engine. Ready access to the engines and accessories was gained by the removal of the three sections of nacelle cowlings. The pilot compartment was heated and pressurized by using bleed air from the compressor of each engine. The cabin glass was heated by using hot exhaust air from the left engine tail pipe. The gun compartment was heated by utilizing the air used to cool the rear engine bearings. Access to the cockpit was made through a side-hinged canopy.

The instrument panel was equipped with all the normal fighter type flight and engine instruments, and the general panel layout followed conventional design. However, the noticeable additions in the panel came in the form of an 18,000 rpm indicating tachometer and tail pipe temperature gauges. Later on, after the airplane had been flying for a while, a problem involving overheating of the engine bearings was encountered and so bearing temperature gauges were incorporated as standard equipment. In flight the airplane was found to be so vibration free, due to the smoothness of the jet engines,



The main instrument panel of the original Bell XP-59A.
(Photo - National Air Museum)

that it was necessary to install a vibrator on the instrument panel so that the instruments would function properly and not stick due to the natural friction in the instrument mechanical linkage.

Even though the number one airplane was never fitted with any armament, it was designed from the outset to carry two type M4 37mm cannons, with 44 rounds of ammunition each, in the nose compartment. The second and third airplanes were so armed.

Each wing was made up of an inner and outer panel, with the inner panel attaching to the wing center section. The inner panel was built up on three spars consisting of the front beam, auxiliary beam and rear beam. The electrically-driven main landing gear retraction mechanism was located in the inner wing panel and it was attached to the auxiliary beam with the gear retracting inwards. The outer wing panel, carrying the aileron assembly, had only a front and rear beam with the inner wing auxiliary beam ending at the junction of the inner and outer panels. All of the fuel was carried in wing fuel tanks that consisted of four self-sealing cells in each wing for a total capacity of 290 U. S. gallons. The airfoil sections employed for the wing design were of the low drag laminar flow 66 series.

The ailerons were of monospar construction with fabric covering and they were actuated through a control system using bell cranks and push-pull tube assemblies. The aileron trim tabs, located on both ailerons, were cable operated.

The fabric covered flaps were located on the inner wing panels and each flap was raised and lowered through its individual gear box and actuating screw, both systems being driven by a 24 volt electric motor located in the fuselage. Limit speed for fully deflected flaps (45°) was 150 mph IAS.

The horizontal and vertical stabilizers were of conventional all metal construction. The rudder and eleva-

tors were of similar construction to the ailerons and they, too, were fabric covered. The use of fabric control surfaces might today seem to be a poor choice of materials for a jet airplane, but it must be remembered that other airplanes of this period were capable of high speed performance and yet they, too, were initially fitted with fabric surfaces. Actually, at this point (1941-1942) the speeds had not progressed to the point where control surface distortion and/or failure of control surface fabric had become a problem. The fabric surfaces did eventually create a problem in the P-59 program, and later models were modified to have metal-covered surfaces.

One unexpected problem experienced with the fabric-covered elevators was the danger of burning or scorching them as a result of a "hot start" with the engines. The "hot start" could occur when accumulated raw kerosene in the tail pipe area was ignited during an engine start. To prevent damage to these surfaces, pilots were eventually instructed to keep the stick pulled back (up elevator) during engine starts!

Just a few short months after the initiation of the XP-59A program, Bell submitted a quotation, on February 17, 1942, to the Army Air Force for 13 YP-59A airplanes to be used as service test articles. The contract for procuring these airplanes was enacted as a supplement agreement to the original XP-59A contract. The contract called for 13 YP-59A airplanes, a static test airplane, wind tunnel models, spare parts and data for a total cost, including fixed fee, of \$2,670,377.16 with this contract being approved by the Secretary of War on March 26, 1942.

Both from an external and internal appearance these airplanes, as originally built, closely resembled the X models because design changes between the two models were being held to a minimum in order that the transition from experimental to service test, and eventually to the production airplane, would be as uninterrupted as possible. Initially, the only noticeable exterior difference between the two models was that the canopy on the Y models was of an aft sliding design, whereas the X airplanes had a hinged, side-opening canopy.

As the design of the service test models progressed, some questions arose regarding the suitability of the proposed armament for the airplanes, but after considering several armament installations the Army Air Force advised Bell that the first nine YP-59A airplanes should be armed with two 37mm cannons. After further considerations on the armament question, Bell was advised that the last four airplanes should be equipped with one 37mm cannon and three .50 calibre machine guns. These last four airplanes also differed in that they were to be provided with droppable auxiliary fuel tanks.

Along with all the other problems occasioned by the extreme security measures of the project, it had been realized by the AAF that the flight testing of the jet airplane could not be carried out in the populated Buffalo area. Therefore, Colonel Chidlaw and Major Swoford made a tour of various sections of the country to determine a suitable location. After surveying the available sites, they selected the Army Air Force Muroc Bombing and Gunnery Range located on Rogers Dry Lake in eastern Kern County, California. This site was later renamed Edwards Air Force Base on January 27, 1950, in honor of Captain Glen W. Edwards, who was killed June 5, 1948 while flight-testing the Northrop YB-49 flying wing airplane. The jet flight test area, having now been established as the Materiel Command Flight Test Base, was located at the north end of the lake about five miles from the regular Army Air Force base of Muroc. Later on in its career this new area would sometimes be referred to as the Wright Field of the West, or as Muroc II.

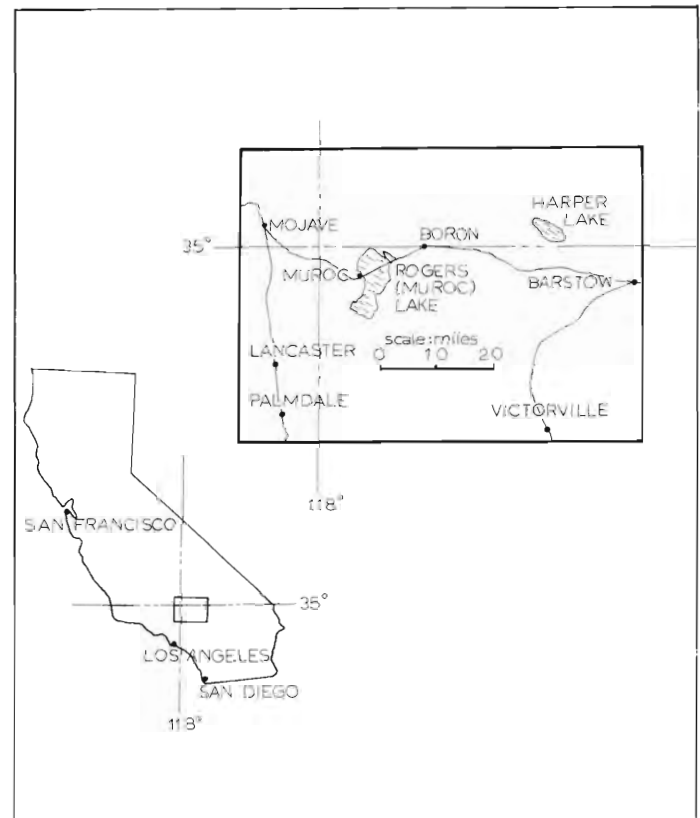
It would have been hard to select a more ideal flying site, for the hard surface of Rogers Dry Lake afforded an almost unobstructed landing field encompassing approximately 65 square miles. Situated among the San

Bernardino and Shadow mountains, this area in the heart of the Mojave Desert, looked out across a vast barren wasteland of sand, tumbleweeds and an occasional grove of Joshua trees.

Bell was advised in mid-May 1942 that a test site had been selected and that the XP-59A airplanes would be tested at Muroc. It was at this point that Larry Bell called in his chief test pilot, Robert M. Stanley, and told him that Bell was actively engaged in the development of a jet-propelled airplane and that he should begin to establish a flight test program for the airplane. Stanley's aircraft experience dated back to 1931 when he first went to work for the Douglas Aircraft Company. Four years later he received his Bachelor of Science Degree in Aeronautical Engineering from Cal Tech, with the next four years being spent as a Navy pilot. In 1939 he joined United Aircraft Corporation as a test pilot and then joined Bell in 1940. Bob Stanley's task now became one of familiarizing himself with the airplane and its gas turbine engines and preparing the reorganization of his flight-research staff so that he could take several of these people some 2,000 miles to the California desert, while still leaving sufficient personnel to handle the normal testing operations at Buffalo. So secret was the project that many of the flight test people later sent to the Muroc site did not even know what airplane they were being sent to work on until they arrived and got their first look at the new airplane.

By the middle of July the XP-59A airplanes were on schedule, but Bell was being delayed due to slippage in the engine delivery schedule. Finally, on August 4, the first of the two Type I-A engines arrived at Bell. The second engine followed shortly thereafter, and the final assembly of the number one airplane was then completed and the task of disassembling and crating it for shipment to Muroc began on September 10, 1942.

Since the old Ford building had not originally been



Map of the area in and around the Rogers Dry Lake site where the XP-59A was first flown. The jet test base was located at the north end of the lake. (Neal)

designed to have airplanes built on its second floor, it was necessary to make certain structural changes in the exterior of the building. A rather large hole was knocked in one of the brick walls so that the larger crated components of the airplane could be lowered to the ground and the waiting railroad cars. And so, at about two o'clock on the morning of September 12, the fuselage and wing crates were loaded and the journey began. At approximately eight o'clock on the morning of September 19, the XP-59A, Bell Model 27-1, along with the three General Electric personnel and five military guards that had accompanied the airplane, arrived at Muroc, California.

Bob Stanley had first arrived at the test site on August 20 to survey the progress being made on the construction of the hangar and barracks. Progress on the buildings was not as far along as had been hoped, and the contractor held out little hope for having work completed by the middle of September. However, by the time the airplane arrived, the barracks were finished and the hangar was complete except for a floor and the electrical wiring. The approaching arrival of the airplane necessitated the removal of the civilian construction personnel from the area, and Stanley and his crew had to make the finishing touches on the hangar. The first crew of Bell personnel had left Buffalo at eight A.M. on September 14, and consisted of 11 people, with this group arriving at Barstow, California September 17, 1942.

Conditions at the site were somewhat primitive with drinking water being obtained from a 200 foot deep well and water storage being maintained in a wooden water tank. The mess for feeding all personnel at the new area was set up and managed entirely by Bell personnel with the Army Air Force providing all of the cooking and kitchen utensils for the mess. Transportation at the base was provided by two company-owned station wagons that Bob Stanley had purchased in mid-August.

One of the problems the trip to Muroc had presented the General Electric people, was the possibility that the engine bearings might sustain damage due to the constant pounding caused by the rail expansion joints. Since the bearings were of very close tolerance, and because the engine operated at such high speeds, a damaged bearing could result in the destruction of the engine. In order to prevent the bearings from being flattened or ridged, it was decided that the engines should be kept rotating throughout the trip. To accomplish this a small door was made in the side of the crate containing the fuselage, and flexible pipe from an auxiliary air compressor was then ducted to the engine intakes so as to provide a flow of air through the engines and thus keep them rotating.

The crated pieces of the airplane after being unloaded from the train, were trucked on September 20 to the newly-built hangar at the test site where the Bell assembly team then began the task of re-assembling the airplane and checking out the various systems. This work continued throughout the next week with the first installed engine run-up occurring on September 26. Both engines were successfully run through three five-minute run-ups. The official target date for the first flight had been scheduled for October 2 and so a great deal of effort was being exerted by all members of the flight test team in order to meet this date. Larry Bell arrived at Muroc on September 30, in time to witness Bob Stanley make the initial taxi runs. After these initial trials, several "high speed taxi" runs were made for the purpose of general aircraft checkout and to obtain a feel for control surface effectiveness. During these runs "lift-off" actually occurred and based on the encouraging performance of the airplane, Bob Stanley wanted to go ahead and try for the first flight. However, since it was getting late in the day, and not wishing to push their luck, Mr. Bell persuaded him to wait until the next day.

Then in the early afternoon of October 1, 1942, American aviation history was made when Stanley lifted

the XP-59A from the Muroc lake bed for the first jet flight. On this date, four flights were made, all with landing gear down and with the altitude being limited to about 100 feet.

Stanley's comments on the first flight have been recorded as follows:

"Duration of flight: 30 minutes. Throttle was applied promptly and acceleration during take-off appeared quite satisfactory

The first flight reached an altitude of approximately twenty-five feet."

The next day before military and civilian observers who had come to witness the official takeoff, Stanley made two more flights, one to 6,000 feet and the other to an altitude of 10,000 feet. The third flight of the day, and the first by a U. S. Army Air Force pilot, was made by Colonel Lawrence G. Craigie who was the Chief of the Aircraft Project Section at Wright Field. Colonels Keirn, Swofford and Chidlaw had actually already drawn straws to see who would be the first military pilot to fly the XP-59A, however, at the time of the flight all three of these men were absent from the Muroc area and so the honor fell to Colonel Craigie. Colonel Craigie was an old hand at the flying game having joined the Army Air Service immediately after graduation from the United States Military Academy in 1923. The fourth and final flight of the day was then made by Mr. Stanley. Stanley was to stay on at the site until late in October when Larry Bell called him back to Buffalo. Bell test pilot, Frank H. Kelley, Jr. then took over as the Representative-In-Charge for Bell on November 11.

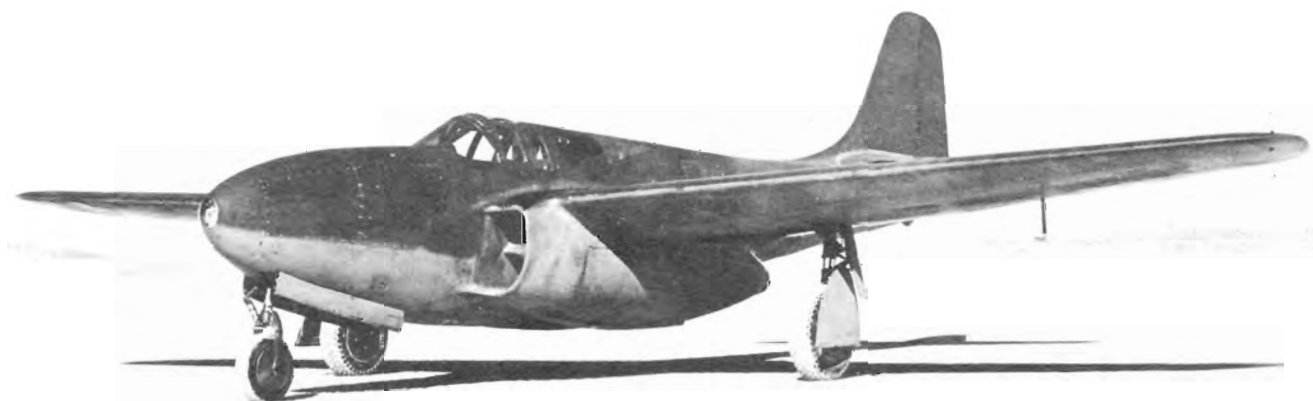
Some of the people in attendance for the October 1 and/or October 2 flights were Harlan Poyer, E. P. Rhodes, Arthur L. Fornoff, R. A. Wolf and Herb Bowers of Bell; Ray Shoults and Don Warner from General Electric; Dr. W. F. Durand, NACA; and Major N. D. Heenan of the British Air Commission.

The XP-59A airplane, as first flown at Muroc, was finished in the standard U. S. Army Air Force camouflage scheme (circa 1941-1942) of dark olive drab upper surfaces and gray lower surfaces. The national markings consisted of the blue circle with a white star and this marking was carried on the fuselage sides, upper left wing surface, and lower right wing surface. At the time of the first flight no serial numbers or any other identifying marks were carried on the airplane.

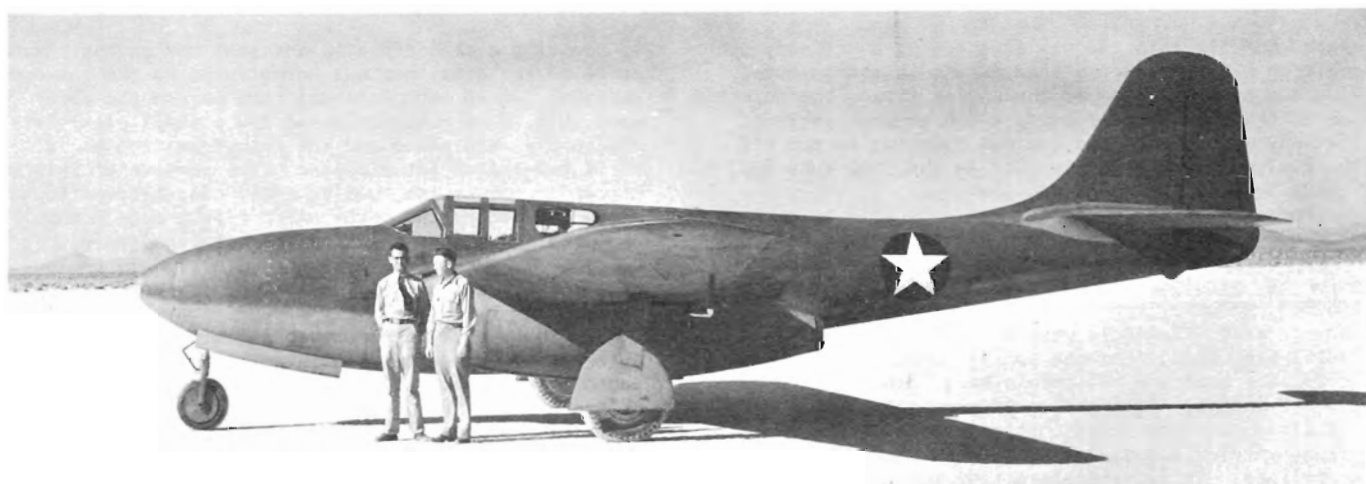
Following the October 2 flights, no more flights were made until October 30 due to repairs and modifications being carried out on the airplane.

On the last flight of October 2, the landing gear had failed to achieve full retraction (fortunately, however, it would fully extend and lock) and correcting this problem required the fabrication of new parts for the landing gear system. Two new I-A engines were received and installed in the airplane because at this time and for sometime to come the engine life was anything but optimum. The serial numbers for the original Type I-A Supercharger engines used in the first XP-59A were No. 170121 left hand engine and No. 170131 right hand engine. A cut-away of an I-A engine, No. 240215, is presently on display at the Air Force Museum. It was during this period that the number one XP-59A received its unofficial nickname, "MISS FIRE." The name was given to the airplane at a time of some exasperation when one of the newly-installed engines repeatedly failed to start. The official name for the P-59 models, "Airaconet" did not come into usage until September 1943, when this name was selected from a list of names proposed by Bell employees who worked on the project.

The starting procedure for the I-A engines was actually quite simple. The first steps involved making certain that the fuel selector valves were switched to the proper tanks and that the stop cock fuel levers were set to the minimum position. The battery switch, general switch and engine switch were set on the "on" position, and when the electric starter had brought the engine up to about 1,200 rpm, the fuel stop cock was



The first U. S. jet airplane, Bell Model 27-1, as it appeared for its first flight, October 1, 1942. (USAF 32720)



The XP-59A, 27-1, with Robert M. Stanley on the left and Colonel Lawrence C. Craig on the right. (Bell Aerosystems)



During early 1943, the first Bell XP-59A in flight over the Southern California desert. (U. S. Air Force 19943)



The luminous glow of a nighttime engine start for the number one Bell XP-59A. (Bell Aerosystems)



Model 27-1, modified to carry an observer, with Lawrence D. Bell in front and Frank Kelley in cockpit. (Bell)

opened and the throttle was advanced to a half-way open position with the engine then firing in approximately five seconds. As soon as the engine fired, the throttle was returned to approximately a fourth-open setting. The only way to shut the engines down was to cut off the fuel supply to them by putting the stop cock fuel levers back to the "off" position.

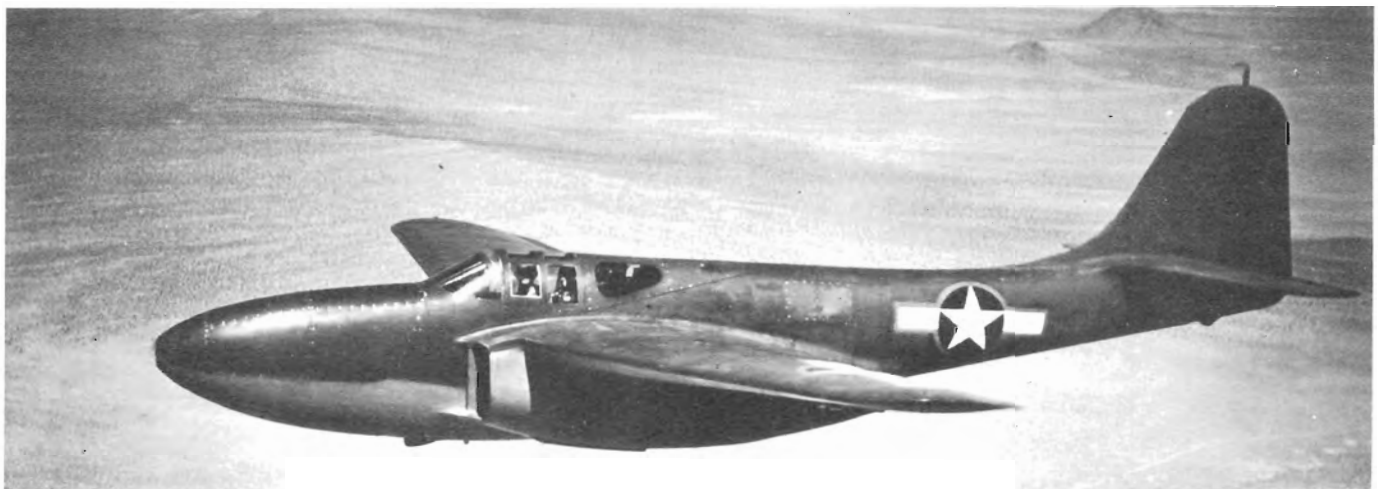
Perhaps, at this point it would be well to comment on a question dealing with the serial numbers for the XP-59A airplanes. The serial numbers assigned to the three "X" airplanes were 42-108784, 42-108785, and 42-108786. However, the serial numbers given to the 13 service test "Y" models were 42-108771 through 42-108783 and, thus, from the serial numbering sequence it is seen that the "Y" models have lower numbers than the "X" models. Examination of photographs of the XP-59A airplanes shows that initially none of the "X" airplanes carried any serial numbers on their vertical stabilizer. It is, therefore, the author's conjecture that because of the special secret classification given to the jet propulsion project, that the three "X" airplanes were not even originally assigned serial numbers and that only after the project classification was reduced to "Secret" in May 1943 were serial numbers assigned, and in the security shuffle the "Y" models were assigned serial numbers first.

During the month of October the first airplane underwent modification so that an observer could be carried in the nose section. This modification consisted

of mounting a standard airplane seat and an instrument panel in the area that was normally to be the gun compartment. A 20 inch hole was then cut in the upper fuselage skin, some rubber combing and a small plexiglass windshield were added and the result was the world's first two-seated jet airplane. The purpose of this modification, of course, was to enable an observer to go along and record the much-needed flight data. When flying with the number one airplane was finally resumed on October 30, 1942, Mr. E. P. Rhodes, the Bell project engineer for the XP-59A, went along as the first observer.

In these early days almost all of the flight test data was taken by the pilot reading his instruments and radioing the information back to the ground, or he could attempt to jot the information down on a pad of paper while he continued to fly the airplane. Because of the many readings required for the new jet engines, the added cockpit for the observer on the XP-59A was a real asset. Later on in the program Brown Recorders were installed in the airplane to record data and an instrument panel was installed in the aft fuselage section with this panel then being photographed during flight so as to obtain a continuous data record throughout the test.

Meanwhile, back at the factory, work had continued on the other two XP-59A airplanes, so that by the end of October the second airplane, 27-2, was complete except for engine installation and landing gear retraction system, and assembly on the third airplane, 27-3, was approx-



XP-59A, 27-2, in July 1943 shortly after Jack Woolams set an unofficial altitude record of 45,765 feet. (Bell)

imately 80 percent complete. General Electric was unable to meet the engine delivery schedule for the second airplane, and so when fabrication was completed, it was shipped on to Muroc without engines. The wing panels arrived on December 27, followed by the fuselage on January 4, 1943, but the end of January found it still at Muroc without engines. The engines finally arrived in the early part of February and the first flight of the number two airplane took place on February 15, 1943, with Frank Kelley at the controls. The first flight of this plane proved to be far from routine. No sooner had Kelley taken off than the cabin defroster malfunctioned, with the result that the cockpit filled with smoke. Reacting quickly to the situation he made a tight turn, began a landing approach, cut the engines and then proceeded to make a dead stick landing. No permanent damage was done to the plane and further flights were resumed on a regular schedule the next day. As the flight program continued, the practice of making dead stick landings actually became rather routine. This situation came about as a result of the combination of three factors; limited endurance of the airplane, a low wing loading and the great expanse of space available at Muroc. To make full use of these factors the pilots sometimes would fly the airplanes until they ran out of fuel and then peacefully glide back to the base.

The same problem of delayed engine delivery confronted the third airplane and it was shipped, without engines, from the Main Street plant on February 5, 1943. This airplane arrived at the site on February 21, 1943, but due to the lack of engines and the work and modifications being carried out on the first two, it was not immediately assembled.

The problem of engine delivery slippage was certainly not a new one, for as early as October 30, 1942, Colonel Swofford had stressed the fact to Colonel Chidlaw that little progress could be made on the XP-59A flight test program until sufficient engines were available at the test site. The need for additional engines was necessary because engine inspections would be constantly interrupting the test program. In all fairness to General Electric, it must be remembered that they were involved in producing a truly revolutionary, and to a large degree, untried, type of powerplant, and the problems being experienced with the I-A engines were merely the growing pains of a new piece of equipment.

The work on the Y model design had also progressed rapidly so that by the middle of August 1942 the engineering on the first nine airplanes was almost complete. A review of the progress on the airplanes was made by newly-promoted Colonel Swofford, in late October, and at this time he estimated that the first YP-59A could not be delivered before February 28, 1943. Because of various problems, this anticipated date came and went without the delivery of the Y model.



Rear view of the number three XP-59A showing the national insignia with red border, summer of 1943. (Bell)

The first YP-59A, 27-4, was finally delivered to Muroc on June 12, 1943, quickly followed by the arrival of the second YP-59A, 27-5, on June 22, 1943. The delivery of the Y airplanes was behind schedule because of interference from the P-63 program, delay in the receipt of parts, changes that were necessary because of failures in the static test airplane and changes that had to be made to the canopy emergency release mechanism. Even after the first two airplanes were delivered to Muroc their initial flights were delayed because of further modifications being made to the canopy release and to the ailerons. The first flight of the YP-59A's 27-4 and 27-5 took place on September 15 and August 18, 1943, respectively. Still a further problem associated with the first Y models delivered to Muroc was that they lacked the more powerful I-16 engine that had been promised for them. The lack of the I-16 engines at the desired time had been anticipated by Bell and they had therefore installed smaller tail pipes on the first six airplanes so that either the I-A or I-14B engines could be installed without problems. Performance flight tests were carried out on the second YP-59A, 27-5, in December 1943. This airplane was powered with the I-A engines and since its configuration was the same as the X airplanes, its performance is then representative of both the X and Y models. The maximum true air speed attained was 389 miles per hour at an altitude of 35,160 feet and a gross weight of approximately 8,900 pounds. At maximum rpm (16,500) this speed fell to about 350 miles per



Second YP-59A, 27-5, was one of three "Y" airplanes used in the accelerated service tests conducted during February of 1944. (Photo - National Air Museum)

FALL - 1966



The YP-59A, 27-8, at Wright Field, Ohio. This airplane was totally destroyed as a result of a takeoff accident at Reidsville, N. C. on February 17, 1945. (USAF)



The "Mystic Mistress", two-seated YP-59A, 42-108783, in black paint finish. This airplane was the "Mother" used to control the drone aircraft. (Esposito Collection)



The "Reluctant Robot", a P-59B-1, 44-22633, with its orange paint finish. Aircraft is seen during the period of radio-controlled testing. (Esposito Collection)

hour at sea level. Minimum time to climb to 30,000 feet was 18.82 minutes. Four other YP-59A airplanes were eventually flown at the Muroc site with Nos. 27-7, 27-8, 27-9 and 27-10 being delivered on October 7, 26, November 1 and 16, 1943, respectively.

The last one of these YP-59A airplanes delivered, 27-10, was eventually modified to have a second open seat cockpit, in a manner similar to the original XP-59A. Still another YP-59A was modified to have the second cockpit, this airplane, 27-16, named The "Mystic Mistress", was used as the "Mother" plane during the development of radio control equipment for drone airplanes in late 1944 and early 1945. The original drone or "robot" airplane used in this program was also a YP-59A, 27-13. However, on March 23, 1945 this airplane was completely destroyed during a radio-controlled takeoff. After this accident, a production P-59B-1, 44-22633, named the "Reluctant Robot", was used as the "robot" airplane for the remainder of the program. The "Mystic Mistress" was to gain a further distinction when it was used to carry the first air mail to be flown by a jet airplane.

Prior to its conversion to a two seater, the YP-59A airplane, 27-16, was used in gunnery tests to determine its suitability as a gun platform. These tests were carried out in April 1944 with firing tests of the three .50 caliber machine guns being made at speeds varying from 220 mph to 340 mph. During this series of tests the 37mm cannon was not fired because of the problem of attempting to simultaneously hit a deflecting target with the machine guns and cannon. As a result of these tests, it was concluded that, as tested, the YP-59A airplane was unsatisfactory as a gun platform because of its poor directional stability at speeds above 290 mph.

Along with all the other problems normally expected with a new airplane and powerplant, it was unfortunate for the XP-59A program that heavy rains came to the usually dry California desert in late January 1943, with the resulting flooding of the lake bed preventing further flight testing of the airplane. However, while waiting for the lake surface to dry out, the time was utilized to conduct ground tests on the engines in an attempt to solve the critical problem of engine bearing over-heating that had developed during the flight tests. The results of these ground tests indicated that the over heating of the bearings was apparently the result of excessive bearing tolerances and thus, the cure for this problem rested with General Electric.

The bad weather continued through February with the weather reports indicating that more rain could be expected. Since the urgency of the project required that flight testing should resume as soon as possible, it was then necessary to locate an alternate flying area. It was quickly discovered that an area was available at an auxiliary air field, Hawes Field, of the Victorville

glider program. The Victorville Air Base (now George Air Force Base) was located about 35 miles from the Muroc site. Because of this need, General Carroll issued a directive that permitted flights from another location, and so on March 10, 1943, the number two XP-59A was towed down a public highway for approximately 35 miles to Hawes Field. To maintain the security of the airplane for this trip, the entire center section of the fuselage and most of the nose section was wrapped in canvas and in addition, a dummy four-bladed propeller was fitted on the nose. During this move the highway was briefly closed to public travel.

The number one XP-59A was left at the Muroc site where work continued on the various modifications and revisions required on this airplane.

After making one flight from Hawes Field, on March 11, it was decided that this base was unsatisfactory from the standpoint of security. Therefore, another move was made, about March 15, to Harpers Lake, located almost due north of the Victorville base. This area proved to be adequate for flight testing even though it made the overall operations somewhat difficult. This temporary site was located about 42 miles from the main base at Muroc and therefore it was very inconvenient to transport all the personnel to and from this base daily. In addition, it was now necessary to maintain a considerable amount of supplies at this auxiliary base, and it was also necessary to provide a noon-day meal for the personnel.

The Harpers Lake site was used until April 7, when the improved surface conditions of Rogers Lake permitted the return of the flight test program. The number two airplane was then flown back, and the temporary Harpers site was disbanded much to the relief of all involved.



Second XP-59A, 27-2, with canvas covers and dummy propeller used while the airplane was being moved from one site to another. (Bell Aerosystems)



Head-on view of the XP-59A showing the overall clean lines of the aircraft. (Photo - Air Technical Service Command)

By April 11, 1943 the first XP-59A had made 30 flights for a total flying time of only 15½ hours, while the second airplane had made 24 flights and acquired 13 ¾ hours of flight time. The third airplane had not yet been flown. During the remaining part of April the flight testing began to gather some momentum, so that by the 25th of the month the number one airplane had a total of 20 hours, 10 minutes, the number two plane a total of 17 hours, 2 minutes, and the third XP-59A had finally flown for a total flight time of one hour, three minutes. During the April-May period, approximately 67 flights were made covering such areas as glide tests, speed-power calibrations, landing gear tests and performance investigations. From the first flight of the number one airplane, on October 1, 1942, through January 1943, about 15 hours of flying time had been accumulated and all of this time was on the first XP-59A. For the first month of its flying existence, October 1942, the airplane flew a total of 5 hours, 45 minutes. In November it flew only 3 hours, 40 minutes. In December no flights were made at all and in January 1943, the airplane was flown 5 hours, 15 minutes. This rather low number of flight hours was not due to any serious problems associated with the airplane, but rather, it was the result of the constant maintenance and trouble-shooting that was required on the engines. In addition to the major problem of the overheated engine bearings, some of the other problems that were experienced with the engines were loss of turbine blades, malfunction of fuel pumps, flame-out in high speed dives and the inability to then make an in-flight engine restart, high fuel consumption and engine surging at high altitudes.

The problem of engine surge at high altitudes was a characteristic of the W2B engine, and even though the W2B was a British design and already well into the development stage when General Electric first received the drawings, it fell to General Electric and Bell to first encounter and then solve this problem. This situation occurred because the XP-59A flew some 10 months before its contemporary, the F.9/40. The order for the F.9/40 had been placed by the Ministry of Aircraft Production on February 7, 1941. However, the first taxiing trials of the airplane were not made until July 3, 1942 with the first flight being delayed until March 5, 1943. When this first flight of the F.9/40 did occur, the airplane was powered by a Halford H.1 engine which employed a centrifugal compressor. Its combustion system was of a straight-through design rather than the reverse-flow of the Whittle engine. The first flight of an F.9/40 airplane powered by a Whittle-type engine (a W.2B/23) did not take place until July 24, 1943.

Out of the many difficulties and problems of the I-A engine came the necessary experience and knowledge required to design the newer and better jet engines that General Electric would produce in the years to come. As advances were made in engine design, I-A units in the three XP-59A models were eventually replaced by General Electric I-14B engines. The I-14 engine was very similar

to the I-A design but it featured improvements in the casing design, an improved turbine wheel (based on the design of the W2500) and new combustion liners. The I-14 engine made its first run-up at the General Electric plant in February 1943, delivering some 1,400 pounds of thrust.

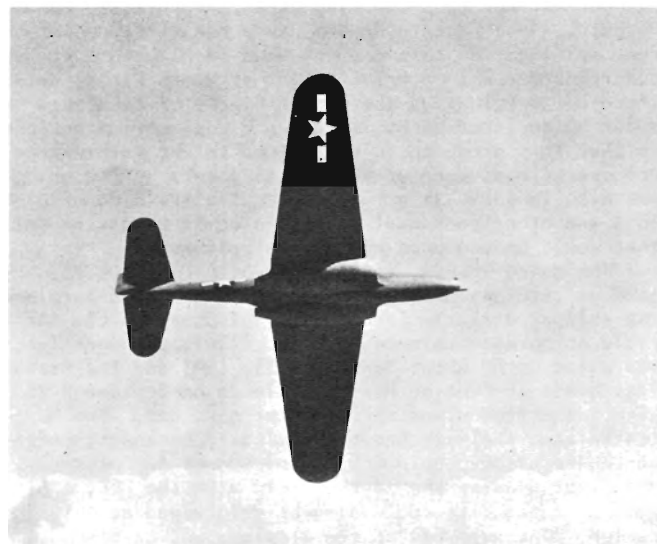
In preparation for the Navy's participation in the jet aircraft field, Captain Frederick M. Trapnell, Chief of Flight Test for the Bureau of Aeronautics, became the first Naval aviator to fly a jet when he made a flight in the number one XP-59A at Muroc on April 21, 1943. Captain Trapnell had been ordered to Muroc to undertake somewhat of a mysterious project and it was during the trip that he was first briefed on the nature of the XP-59A project and on the jet propulsion engines that powered it. Recalling this early flight, Admiral Trapnell, U.S.N. Ret. provided the following remarks,

"In ground run-ups the jet was very impressive for its unusual nose and the 'blow-torch' slipstream, but the aircraft was obviously a very gentle type of high-altitude fighter with low wing-loading.

"It was a great surprise to find that the thing was very quiet and smooth from the pilot's point of view. During takeoff the rattling of the landing gear was audible and the general impression was that of a glider. The XP-59 was comparatively low-powered and this was apparent from the shallow climb-out. Its performance was, at first, distinctly unimpressive--long takeoff and slow rate of climb."

Shortly after his flight in the secret jet airplane, Captain Trapnell found himself in a rather interesting situation,

"I found myself in a group discussing rumors then



View of undersurfaces of the Bell XP-59A. (Photo - USAF)

emanating from Europe, of a weird and wonderful means of propulsion - without a propeller. The discussion became quite intense and very inaccurate, to say the least. I was supposed to be the most knowledgeable of those present but I had to sit silent and act dumb. I couldn't say that I not only knew about it but had flown one. I was forbidden to say a word."

In November 1943, the Navy received its first jet airplanes when two YP-59A's, 27-11 and 27-12 were shipped to the Naval Air Station at Patuxent River, Maryland where they were to be flight tested. In late 1945 the Navy was to receive three production P-59B-1 airplanes, 44-22651, 44-22657 and 44-22658 with these three airplanes also being evaluated at Patuxent River.

Several "firsts" were naturally associated with this jet project and another of those was the precedent set by Colonel Keirn on June 16, 1943, when he removed the propeller blades from the insignia worn on his uniform. He also gave verbal permission for Army Air Force personnel who were associated with the airplane to remove the now "outdated" props from their insignias.

Still another "first" but this time of a more humorous vane, at least to all but the involved party, occurred when one of the Bell crew walked into the jet exhaust. The following quote is from the Bell flight test log of February 10, 1944:

"On this date, Bell inspector E. F. Fisher, weighing 200 pounds, walked into the jet approximately four feet behind the nozzle while the aircraft was operating at rated power. It lifted him approximately 3 feet in the air, tumbled him end over end approximately 3 times, and he made a face-down landing on the concrete approximately 25 feet behind the nozzle exit. No substantial injuries were sustained other than brush burns obtained upon contact with the concrete surface."

The three "X" models continued to be flown at Muroc at a continuous pace so that by October 8, 1943 the number two plane had accumulated 53 hours, 35 minutes with number three logging 42 hours, 5 minutes of flight time by November 17, 1943. It was during this period of testing that Bell test pilot, Jack Woolams, reached an altitude of 45,765 feet in number two on July 14, 1943. Several months later, on December 15, 1943, Woolams established a new unofficial American altitude record for single place aircraft when he reached an altitude of 47,600 feet while flying a YP-59A, 27-4.

The first Army Air Force jet-equipped unit was the 412th Fighter Group of the Fourth Air Force. The 412th was activated in late November 1943 at Muroc under the direction of Colonel Homer A. Boushey. Colonel Boushey was no newcomer to pioneering aviation projects, for on August 6, 1941 Captain Boushey made the first rocket-powered flight in this country when he piloted a rocket-powered Ercoupe in a brief flight at March Field, California. Originally, the Fourth Air Force furnished about 20 enlisted mechanics and one engineering officer so that this group could be trained in the maintenance and operational care of the jet airplanes. The group was also to serve as a nucleus for the training of pilots and other personnel who would be serving with units that would be equipped with jet airplanes.

The third YP-59A, Bell S/N 27-6, AAF 42-108773, became an international traveler when the crated airplane was shipped directly from the Bell factory to the RAF field at Moreton Valance, England. This shipment left the plant on or about September 13, 1943 and the fuselage crate arrived at Moreton Valance on September 26 with the crated wings arriving the next day. The Moreton Valance facility had been selected because it offered the necessary equipment and personnel for assembly, and since Gloster shared the field with the RAF, a high degree of security could also be maintained at this location. The assembly of the airplane was carried out by a joint RAF crew and Gloster Aircraft experimental group personnel under the direction of Mr. Charles

Cosser and Frank Burnham of General Electric and "Doc" Meshako of Bell. Kelley, now Bell's deputy chief test pilot, had accompanied the other three Americans to England and when the airplane had been assembled and checked out, he made the first flight in it on September 28, 1943. This flight was witnessed by Mr. M. Daunt, Chief Test Pilot for Gloster, Mr. John Grierson, Assistant Chief Test Pilot for Gloster and Wing Commander H. J. Wilson, RAF. After this demonstration flight, the airplane was turned over to the RAF for their use and evaluation.

On November 5, Wing Commander Wilson flew the airplane from Moreton Valance to Farnborough, where the flight test program on the airplane was to be conducted by "T" Flight to which the aircraft was attached. From December 1943 through January 1944 the airplane made nine flights totaling 5 hours, 10 minutes, with the pilots for these flights being W/Cdr Wilson, S/Ldr DBS Davie and S/Ldr Moloney. At the end of January the engines were pulled and sent away for overhaul, and it was April 1944 before the plane again flew. When flying did resume the pilots were Wilson and Moloney and six flights for a total flight time of 4 hours, 24 minutes were made from April 17 through April 26. After these flights, the engines were again apparently removed for overhaul and after this point no further efforts on the airplane were undertaken. The British Air Commission, on November 30, 1944, officially advised the AAF that the anticipated test program for the airplane could not be completed because of more urgent operational and development work. Since the storage of the plane was taking up needed space, they advised that it would either have to be stored in England at a maintenance unit or returned to the United States, and they requested that the AAF make a decision on this matter. The Air Technical Service Command (ATSC) that had control over this phase requested that the British make arrangements to return the airplane to Wright Field. Consequently, by late June 1945, the airplane had been received at the Foreign Equipment Branch, Vandalia, Ohio (naturally, since the airplane was now a British Type!) and from there it was sent to the NACA laboratory at Cleveland, Ohio for modifications.

When the airplane was first shipped from Bell it was painted in the standard AAF colors and markings. The British repainted it with their typical camouflage scheme of gray and green with all the undersurfaces being painted a bright yellow. British national markings and a British serial number, RJ 362/G, were also applied. The RAF name that was given to the YP-59A was "TOLLGATE."

Recently Mr. R. C. Wright, Chief Librarian at Farnborough was contacted, and he was kind enough to provide several very interesting notes on this particular airplane. Part of the material that he provided was in the form of extracts from a diary that was kept by "T" Flight. This information is repeated here because it so clearly points out some of the problems the British experienced, plus an excellent example of British humor.

"April 1944. The Bell has been gaily dropping static vents on the unsuspecting citizens of Farnborough and/or Fleet. We'll have to think of a new knot that won't break. The engines also have been removed now and as yet we know not where the new ones are coming from.

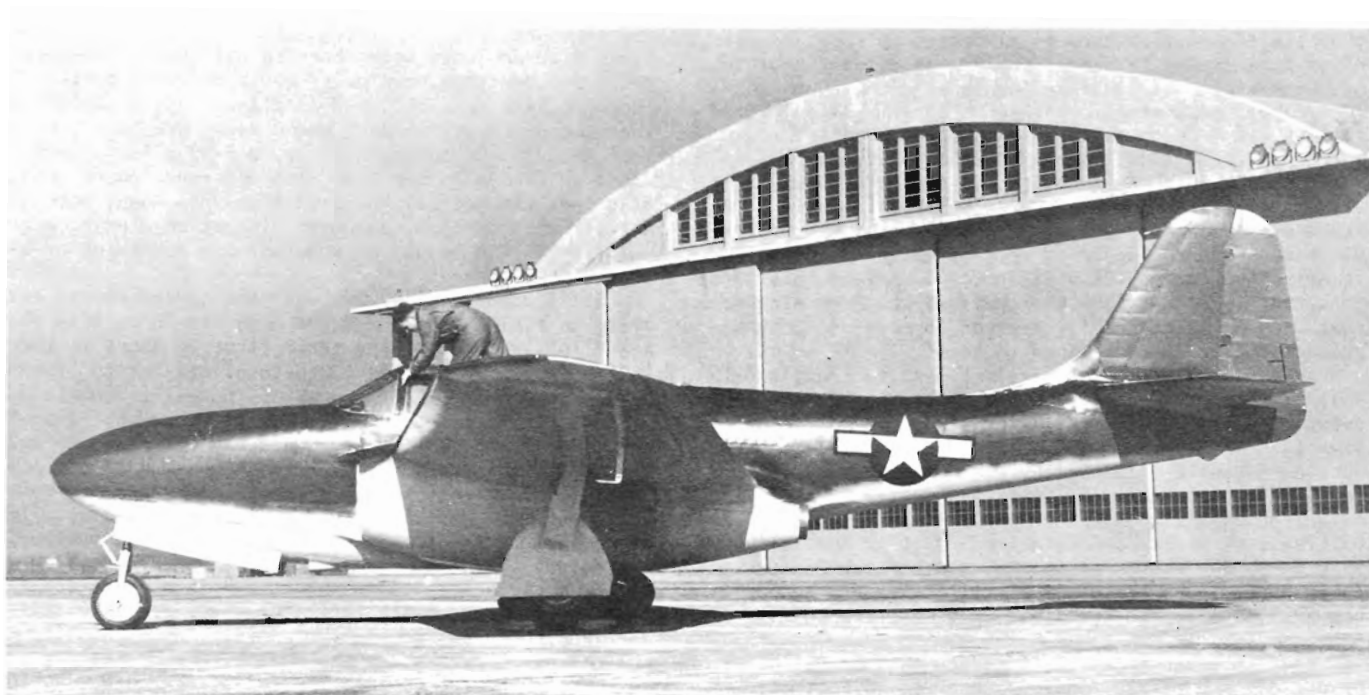
"May 1944. The Bell is still minus engines and nobody seems to be very interested in the poor thing.

"June 1944. The Bell, after having some 200 odd modifications applied to it, is to be sent back to America, and will probably never fly again here.

"July 1944. Bell still here, but in bits and has been hidden away in a Bersoneau hangar.

"August 1944. The Bell is going to Rolls Royce. We wish them joy - they know not what they have taken on. We have done only 60 of the outstanding modifications on it."

Originally the British Air Commission had requested



Navy's first jet airplane, YP-59A, 42-108778, BuNo 63960, at NAS Patuxent River in January 1944. (National Archives)



BuNo 63960 at Patuxent River in July 1947 with redesigned vertical tail surfaces and ventral fin. (W. Larkins)



Navy P-59B-1, ex 44-22658, BuNo 64108, at Patuxent River, Maryland in April of 1947. (Photo - W. Larkins)



The YP-59A, 27-6, which was assigned to the Royal Air Force and carried serial RJ 362/G. (Royal Aircraft Establishment)

that six YP-59A airplanes be allocated to them, however, after considering this request, it was decided that two of the Y airplanes could be furnished without any serious damage occurring to the AAF program. This initial request was made in early July 1943 and resulted in the shipment of the first Y model, 27-6. However, by December 1943 a further agreement was reached whereby a production P-59A airplane was to be sent to England instead of a second YP-59A. Having received the Y airplane and then encountering so many varied problems on it must have caused the British to reconsider this agreement, for in August 1944 they advised the Army Air Force that they no longer really desired to have one of the production airplanes shipped to them!

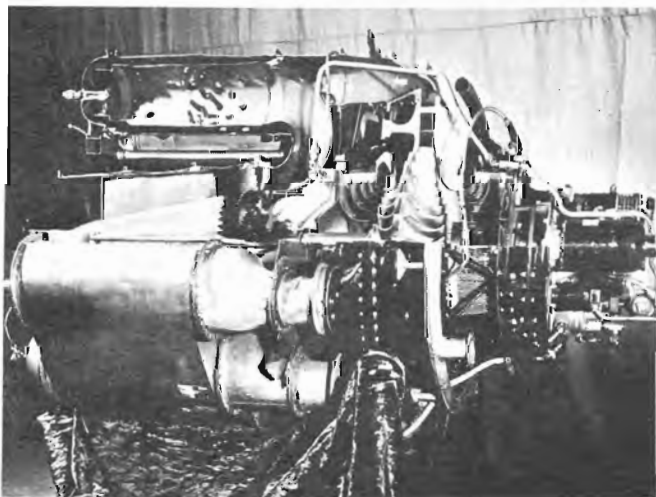
In exchange for the Y airplane sent to them, and in fulfillment of General Arnold's original request, they eventually sent one of their jet airplanes to the United States. The airplane that was sent was the first production Meteor I, S/N EE 210, which was shipped from England in early February 1944. The pilot for the first flight of this airplane at Muroc, on April 15, 1944, was British test pilot John Grierson. Back in April 1943, Wing Commander Wilson of the Royal Air Force had traveled to Muroc and there he made a flight in the number one XP-59A to become the first British pilot to fly the American jet.

Shortly after Kelley left Muroc, another Bell test pilot, Alvin M. (Tex) Johnston, arrived on September 25, to help Jack Woolams with the flight test program. Johnston remained at the site through the middle of November 1943, and returned to Muroc again on December 31, 1943 to take over the duties of Representative-In-Charge to relieve Woolams, enabling Jack to return to Buffalo to handle more pressing duties there. On January 2, 1944, Johnston was joined by another Bell pilot, R.J. O'Gorman.

Due to the fact that the three "X" airplanes were used primarily to solve engine problems, the first Army Official Performance tests of the XP-59A airplane were made in October 1943 on an I-16-equipped YP-59A. Even then, the performance tests could not be completed because of engine surge problems that limited flights to a maximum altitude of 20,000 feet.

The I-16 was an improved version of the basic I-A design with the engine developing 1,650 pounds of thrust at 16,500 rpm. This engine was the first satisfactory American turbojet to be released for quantity production, and it was also the first engine to be given a "J" designation when it became the J31. Though the I-16 was a greatly improved model, it was still necessary in most cases to prematurely overhaul one before it reached the allowable total time between overhauls of 50 hours.

All of the test area in and around the north end of



Cut-away of an I-16 engine clearly showing the reverse flow design of this engine. The I-16 was a later model of the basic I-A. (Photo - USAF)

the lake was in a restricted air zone because of the classified projects being carried out there. However, every now and then, curiosity would overcome better judgment, and some of the P-38 pilots flying out of the Lockheed plant at Burbank, would sneak over for a quick look around. On one such visit, a P-38 pilot suddenly found an XP-59A on his tail with all appearances indicating that the jet was going to shoot him down, being in a restricted section, and with discretion winning over valor, the P-38 headed back across the mountains at a high rate of speed!

Still other flying visitors came to the secret test area, this time from the Muroc Army Air Force Base where new pilots were acquiring their first 20 hours in the P-38. Orders were given to these pilots not to fly "over" the north end of the lake. However, in mid-June of 1943, Lt Royal D. Frey was flying "near" the end of the lake when he saw an airplane take off from the small cluster of buildings. Though too high to make out any details, he watched as the airplane continued its take-off and climb. As the airplane began to climb out, its shadow was cast against the almost pure white surface of the dry lake bed below, and as he watched this shadow, he could see that the shadow airplane had a long trail of "smoke" coming from it and yet from the real airplane there was no trace of this. In retrospect, what he probably saw was the shadow cast by the heat waves from the jet engines. After its takeoff, he lost sight of the airplane until several minutes later when it suddenly and rapidly passed by him in a steep, rolling climb. However, this brief encounter was enough to let him see that this airplane had no propellers.

Returning to the base, he reported the sighting of this propellerless airplane to the other pilots, but being men of logic, they assured him that he must be "drunk" since it was obvious that an airplane could not fly without a propeller. Realizing the error of his ways, he dismissed the matter from his mind until several months later, when news of the jet airplane was released, and then he knew that he had witnessed a flight of one of these airplanes. The airplane he saw was probably the number two or three plane during an aileron response test to check out some newly-designed ailerons.

When a group of people must work long hours and under adverse conditions, it is not unusual for them to adopt a trademark, and such was true for the Bell crew. As their trademark they took to wearing black derby hats, and it is reported that to see a group dressed in desert togs and black derby hats bowling or drinking at some bar was indeed a sight to behold.

On still another flying encounter, Jack Woolams used his derby hat as part of a practical joke. Army Air Force planes were always flying somewhere in the area, and so he had decided to have a little fun at their expense. The equipment he needed, in addition to his hat, was a Halloween mask and a P-59. One day a flight of Army fighters were peacefully flying along when suddenly they were joined by another airplane. Imagine their surprise when they saw that this airplane had no propellers, but the real shock came when they saw that the pilot of this strange new airplane was a cigar-smoking, black derby hat-wearing----gorilla!

The extreme secrecy of the jet project had from time to time proved troublesome, however, on one occasion at least, this secrecy requirement presented somewhat of an actual hazard. The situation developed on September 24, 1943 during a photographic mission with another aircraft. When the two airplanes had taken off the weather was clear, but abruptly and almost without warning, a terrific sandstorm came up out of the east. At the end of their mission and with the XP-59A beginning to run short of fuel, it was necessary to head for home base. Arriving over the area of the base, the pilots found the ground completely obliterated. So severe was the sandstorm that the accompanying aircraft proceeded directly on to Burbank for a landing. However, Woolams flying the classified XP-59A had no other choice but to chance

a landing, and so it was necessary to make an instrument landing during the height of the storm, fortunately, without mishap.

Jack Woolams had won his wings at Kelly Field, Texas in June 1938 and after serving with the 79th Pursuit Squadron he returned to the University of Chicago to get his degree. Graduating in June 1941, he joined Bell as a test pilot. His work with the XP-59A was just a preview of things to come, for by 1946 he had reached the position of Chief Test Pilot for Bell and was preparing to be the first man to reach supersonic speeds in the new Bell XS-1 rocket-plane. However, Jack Woolams was to meet his death on August 30, 1946 in the tragic crash of the Thompson Trophy racer, Cobra I.

Though much of the flight time was being spent on power plant experimentation, it soon became apparent that several problems existed with the airplane itself. One of the problems that was becoming obvious was that the airplanes were underpowered even when the engines were operating at peak performance. The need of a weight reduction study to help solve this problem was even more apparent when one considered the fact that the power-plant installation in the XP-59A was about 25% less in weight than that in the P-39, yet the gross weight of the XP-59A was about 25% more than the P-39--being approximately 10,300 pounds. Mechanical problems were encountered with the 37mm cannons, the pressure cabin and the ailerons and flaps. Aerodynamic problems appeared in the combined form of poor spin characteristics and a low level of directional stability.

The spin tests on the XP-59A airplanes were started late in December 1943 with Woolams serving as the test pilot. However, it was quickly discovered that it was extremely difficult to recover from a spin, and so the tests were postponed until a fix could be developed. This problem was not unexpected because in March 1943 Bell had received the NACA reports on the YP-59A spin model that had been tested in the NACA vertical spin tunnel and from the results of these model tests it appeared that the airplane was just marginal in regards to spin recovery. Bell had also been unable to decide upon any practical changes that could be made to the airplane to improve its spin characteristics. However, after reviewing the same NACA model spin data, the Engineering Division at Wright Field stated that even though the results indicated marginal recovery, it was felt that the spin tests could be performed on the full scale airplane without undue risk. After the problem was encountered with the actual airplane, it was then necessary to add a ventral fin in order to produce a satisfactory spin and recovery. With this modification being made, the spin tests were completed on February 11, 1944 with Jack Woolams again flying all of this test program.

In order to evaluate the military potential of the production P-59A-1 airplanes, it was necessary to carry out the accelerated service tests, operational tests and tactical suitability tests using the Y model airplanes equipped with the I-16 engines. Three YP-59A airplanes were used for these tests, 27-5, 27-7 and 27-9. Testing on these programs began February 5, 1944 with personnel from the Air Forces Board, Army Air Force Proving Ground Command and Materiel Command cooperating on the effort. All of the testing was conducted at Muroc with the tests being completed on February 18, 1944. In order to provide comparative data the YP-59A airplanes were flown in competition against a P-47D-20 and a P-38J-15. Unfortunately, for the overall P-59 program, the Y airplanes fared rather poorly against these propeller-driven machines. In performance and maneuverability the jet airplanes were outclassed by the P-47 and P-38. The one advantage that the YP-59A did have was in radius of turn and in comparison tests the XP-59A easily turned inside the P-38. However, either the P-38 or P-47 could break off combat at any time by diving away or by using full power zooms.

In evaluating the YP-59A airplanes and applying these results to the proposed production airplanes,



Results of crash landing in YP-59A, 27-13, 42-108780, by Jack Woolams, June 25, 1944. (Photo - USAF)

consideration was given to all contemplated modifications planned for the P-59A-1 airplanes, but it was the decision of the Army Air Forces Board that the planned modifications to the production airplane would not significantly alter its flight characteristics or performance from the YP-59A models tested. Several rather far-reaching conclusions were made as a result of these tests, but the opinion of the Board was clearly spelled out when they stated,

"After careful analysis of all tests conducted by the Materiel Command Service Test Agency, the Proving Ground Command and the Army Air Forces Board, it is not believed that the P-59 airplane is operationally or tactically suited for combat nor is it believed that any modifications to this aircraft, short of a completely new design, would improve its combat suitability..."

In summarizing their conclusions on the overall value of the P-59 airplane, the Board stated,

"...although the aircraft is not suitable for combat, there is a requirement for a limited number of subject airplanes to be utilized for jet training and for general Air Force familiarization. The Army Air Forces Board is further of the opinion that use of jet propelled aircraft will become widespread in the immediate future and that the P-59, although unsatisfactory for tactical use, is an excellent aircraft for purposes of conducting research on jet power plants and pressure cabins. The P-59 will also make an excellent training ship in that its low wing-loading makes the airplane very safe for transition flying and the fact that it has two engines is an added safety factor."

Thus it was that, based on the performance of these YP-59A airplanes, the fate of the P-59 airplanes was sealed, for in March 1944 General Arnold stated officially that the P-59A did not appear to be the answer for an Army Air Force jet propelled fighter airplane. He further felt that the Lockheed XP-80 was more promising and that the P-59A airplanes would now be used for training purposes.

The completion of the spin program pretty well finished up the Bell test program at the desert site, and preparations were then undertaken to move the remaining effort back to the Buffalo area. The only tests not carried out at Muroc were the dive tests which, for various reasons, were scheduled to be conducted at the Niagara Falls plant at some later date. These dive tests were finally resumed at the Bell facilities in June 1944 with a YP-59A, 27-13, being used for the tests. Jack Woolams was the test pilot for this program. During the fourth dive test, on June 25, the main landing gear suddenly and quite violently extended. This accident occurred because of the high negative pressures being generated on the wing lower surfaces during the high speed dive with the result that the landing gear was literally pulled open. When this happened, the landing gear retracting links, which also served as side braces, were broken and both of the main landing gears swung freely in the breeze. Woolams did make a successful belly landing at the Niagara Falls

Airport which resulted in only slight damage to the bottom of the fuselage, nacelles and wings. As a result of the accident, it was decided to provide the airplane with landing gear "up-locks" to prevent further such problems.

In order to demonstrate the dive capabilities of the airplane, the dive tests were again resumed in November 1944, but this time with a production P-59A. On each of the first four dives a structural failure of some type occurred in the horizontal stabilizer assembly. After each of these failures the damage was repaired and the structure beefed up prior to the next dive. The judgment exercised in continuing these tests in the face of the repeated structural failures is certainly open to question. However, Bell naturally desired to minimize the disparity between the actual airplane capability and its design specification, and so the dive tests continued. On the fifth dive at about 25,000 feet, luck ran out when the entire empennage was carried away, leaving Woolams trapped in the cockpit with a jammed canopy. Exhibiting that quality that makes for an outstanding test pilot, Woolams had the presence of mind to twist around in the cramped quarters of the cockpit until his back was against the seat and then he pushed the canopy loose with his feet and thus was able to safely exit from the doomed airplane. The rest was almost routine except that when his chute opened it popped so hard that he lost both his flying boots. After landing he had to run about a mile and a half in his stocking feet, in about six inches of snow, before he found an inhabited farmhouse. Bell was able to dispatch one of their new helicopters to him quickly enough to save his feet.

As a result of the incompleteness of the demonstration dive tests, and the failure that occurred during the attempt, all of the YP-59A, P-59A-1 and P-59B-1 airplanes received a flight restriction, limiting the maximum air speed to 400 mph and speeds at various altitudes consistent with a Mach number of 0.70.

Still another problem that came out of the dive tests was that the airplane exhibited excessive longitudinal stability in the form of a positive (nose up) pitching moment at a Mach number of about 0.77. This characteristic resulted in a tendency for the airplane to pull out of a dive as the high Mach numbers were approached, thus making it quite difficult for the pilot to hold the dive attitude due to the high stick forces encountered.

The last few days at Muroc were in part used to provide passenger-carrying flights to the Bell mechanics in the open cockpit of the number one airplane. By February 18, the base was practically disbanded with the airplanes and other associated equipment being turned over to the Army Air Force. The flight operations at the Muroc site, as far as the experimental flight testing by Bell, was officially closed on February 27, 1944, with all Bell personnel except for service and engineer-

ing departments having returned to Niagara Falls. It is certainly to Bell's credit that during their operation at Muroc, a total of three XP-59A and six YP-59A airplanes were assembled and flown for a total accumulated flying time, free of major mishaps, of 242½ hours.

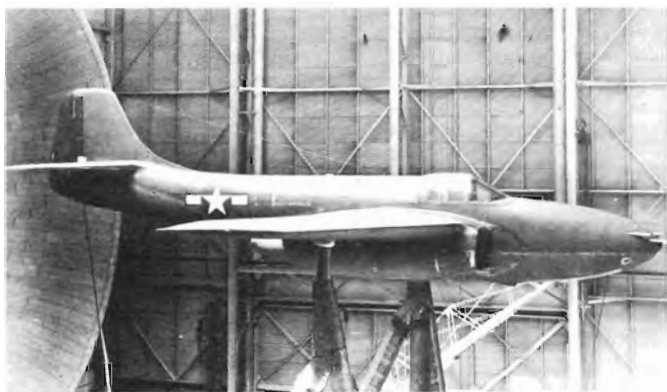
Just as Bell was closing out its test program, another jet program was beginning, for a few weeks earlier, the United States had acquired its second jet airplane, the Lockheed XP-80. The XP-80, nicknamed "LULA-BELLE", made its first flight at Muroc on January 8, 1944 with Lockheed's chief engineering test pilot, Milo Burcham at the controls.

As already mentioned, the YP-59A airplanes initially were almost identical to the XP-59A airplanes. However, as a result of continuing design studies and analysis of the flight test results, several modifications were made to the Y airplanes which altered their exterior appearance. These modifications for the most part were a field service type of change and therefore they were not necessarily made at the Bell plant. The major modifications made to the YP-59A airplanes were:

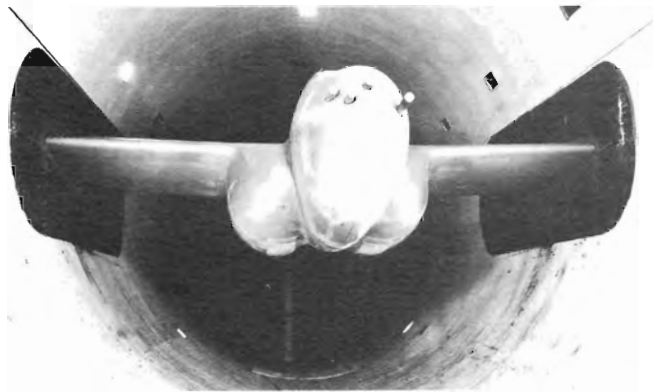
1. Replacement of the original rounded wing tips with squared-off tips. This resulted in a change in wing area from 400 square feet to 386 square feet, with the wing span being reduced from 49 feet to 45 feet 6 inches.
2. A new "squared-off" vertical stabilizer and rudder were added along with the addition of a ventral fin.
3. The pilot-static tube was moved from under the left wing to the vertical stabilizer.
4. The aft fuselage was strengthened.
5. The fabric-covered flaps were replaced with metal-covered flaps.
6. Metal-covered, pressure-balanced ailerons were installed.
7. Main landing gear up-locks, mechanically operated from the cockpit, were installed.

Two of the YP-59A airplanes were used for full scale wind tunnel testing at NACA facilities. Bell 27-14 and 27-15, were tested in the NACA full scale tunnel at Langley Field, Virginia and the NACA 20-foot altitude wind tunnel at Cleveland, Ohio, respectively.

Bell had originally proposed, in late June of 1943, to build 300 P-59A airplanes. However, after considering Bell's proposal, the Army Air Force decided on the procurement of 100 of the production type airplanes. Before deciding on the procurement of the 100 airplanes, rather than 300, the Army Air Force had considered the advantages and disadvantages of the two production orders. Even though the facilities existed at the Bell factory for the production of 300 jet airplanes, such an order would result in a loss of approximately 600 P-63 airplanes. The production order for 300 planes would also have absorbed the entire I-16 production capability of General Electric, and some of the I-16



YP-59A, 27-14, in the NACA Langley Field Full Scale Wind Tunnel for stability and control tests. (Photo - NASA)



YP-59A, 27-15, in the 20 foot test section of the NACA Lewis Altitude Wind Tunnel, intakes faired over. (NASA)

engines were required for the Navy's FR-1 airplanes. The final reasons for settling on the 100 plane order were that that quantity was sufficient for the proposed three-squadron fighter group and for additional test purposes. The formal contract with Bell was approved on March 11, 1944 with the unit cost per airplane being estimated at \$123,477.00.

As a result of continuing design studies to improve the range of the P-59 airplane, it was decided to install an additional 66 gallon fuel bag in each of the outer wing panels, beginning with the 21st airplane. Because this modification affected the interchangeability of the wing panels, the airplanes, beginning with the 21st, were redesignated as P-59B-1s.

On October 10, 1944, Bell received somewhat of a surprise when he was verbally notified that production on the P-59 was to be terminated with the 39th airplane. However, in reply to this, Bell felt that he should have been consulted as to the most economical point at which to stop production, and after further consideration between the Army Air Force and Bell, it was decided to cancel 50 of the P-59B-1 airplanes. The total production was then to be 20 P-59A-1s and 30 P-59B-1s with all of the P-59s having been accepted by August 27, 1945.

Apparently the first effort to preserve the number one XP-59A as a museum piece began in late February 1944, when Captain Ezra Kotcher, who was then the aircraft project engineer on the P-59, suggested such a move. The idea of retaining this rather historical aircraft was acceptable to the Army Air Force, and in late August 1944, Brig. General Carroll advised Bell that instructions were being sent for the storage of the first XP-59A at Muroc and the original flight engines at Wright Field to preserve them until their final disposition could be decided. By February 12, 1944, when the first steps to preserve the airplane were made, the number one XP-59A had accumulated a total flying time of 59 hours, 55 minutes. It is doubtful that many more, if any, flying hours were added between February and August, and so this time is probably quite representative of the total flight time acquired during its some 23 months of service. After several months of negotiations and red tape, it was decided that the airplane would be given to the Smithsonian Institution, Washington, D. C., and on April 18, 1945, the Smithsonian officially requested the acquisition from Wright Field, where it had been sent after initially being stored at Muroc. Following arrival at the Smithsonian, it was installed in the aircraft building where it remained until it was removed for storage and repair. When first displayed at the Museum, in addition to the national markings, the airplane carried the yellow serial number 2108784 on both sides of the vertical stabilizer, a large numeral "1" was painted on both sides of the fuselage nose just forward of the cockpit and the name "MISS FIRE" was lettered on the left side of the nose. Also, the second cockpit had been removed so that the airplane now resembled its original flight configuration. This airplane has recently been restored by the National Air Museum staff and when space permits, it will again be placed on exhibition. Prior to being displayed, it is being stored at the Preservation and Restoration Facility at Silver Hill, Maryland.

The third XP-59A, 27-3, was eventually modified to have the second cockpit, and January of 1946 found this airplane still flying at Muroc. By this time, however, it had been repainted all silver and a large numeral "3" was carried on each side of the fuselage just below the open cockpit. In addition to the national markings, the airplane displayed its serial number on the vertical stabilizer. At this time the airplane was being powered by two General Electric I-18-3 engines.

At this writing, additional information concerning the fate of the other two XP-59A nodes, 27-2 and 27-3, is not available. However, the number two and three airplanes are officially listed as having had reclamation completed (their usable parts reclaimed) in October

1945 and April 1947, respectively.

The production allotment of the 20 P-59A airplanes was originally to be six to the Materiel Command at Wright Field with the other 14 airplanes being assigned to the 412th Fighter Group of the Fourth Air Force. Originally, the entire P-59B production of 30 planes was scheduled for delivery to the 412th. However, the requirements for the P-59A airplanes (44-22609 through 44-22628, hereafter referred to by their last three digits) was amended with only one airplane being delivered to Wright Field and the remaining 19 going to the 412th with the provision that the other five airplanes would be made available to the Materiel Command when there was a requirement for their usage. By December 1944 the delivery schedule was finalized with one P-59A being assigned to Wright Field (number 609), two to the Army Air Force Proving Ground Command, Eglin Field, Florida for use in familiarization and training of ground crews on the P-59, two to the Air Forces Board, Orlando, Florida, and the remaining 15 P-59As going to the 412th. Number 619 crashed at Dayton while being ferried to Palm-dale and was washed out on November 13, 1944, 618 and 620 arrived at Bakersfield on December 9, 1944 for survey and their parts were reclaimed in January and March 1945, and 626 also underwent reclamation at Bakersfield in March 1945. In all likelihood the remaining P-59As were all delivered to the 412th and served with it from June 1945 onward.

The distinction of being the first jet airplane to travel outside of the United States, of course, goes to the YP-59A that was shipped to England. However, the first jet airplane to actually fly outside the borders of the U. S. was P-59A-1 number 610. This airplane was flown from Wright Field via the regular air transport routes to Ladd Field, Alaska, making stops at Great Falls, Montana and Edmonton, Canada and arriving on December 9, 1944. While at Ladd the airplane was attached to the Extreme Temperature Operations Unit of the Cold Weather Test Unit. It underwent 69:40 hours of flying time while stationed at Ladd without experiencing any major problems associated with the low temperature operations. The final disposition of this airplane was to the War Assets Corporation in June 1946.

Delivery of the P-59B airplanes (44-22629 through 44-22658) presented a problem because there just were not enough I-16 engines available. By the end of November 1944 Bell had sufficient engines for 26 airplanes (20 P-59As and 6 P-59Bs), and because of the Navy's priority on I-16 engines for the FR-1 program and General Electric's production failures, it was estimated that additional engines for the P-59 program would not be available until the summer of 1945. It was therefore decided that the last of the P-59B airplanes would be accepted without engines and placed in outdoor storage by Bell until the engines became available. In late December 1944 Bell was instructed that the last 28 P-59B-1s were to be prepared for outdoor storage with each of these airplanes being flight tested and accepted prior to being placed in storage. Bell had four sets of engines in flyable condition, and the flight testing of the last airplanes was to be accomplished by the successive installation and removal of these engines until all planes had been flown.

The total of 28 planes to be stored was later reduced to 24 when it was decided that the engines would not be removed from the last four airplanes flown. However, by June 1945, this requirement was again changed, and Bell was instructed to store 16 of the planes without flight tests. The other eight were to be flight-tested and accepted, after which the engines would be removed and the airframes prepared for storage. When sufficient engines became available, Bell would install them in the planes and prepare them for flyaway. The final delivery instructions issued to Bell, in late 1945, for the P-59B airplanes were--19 to the 412th; one (650) to NACA, Cleveland, Ohio; three (651, 657, 658) to the U.S. Navy



Second production P-59A was first jet airplane to land in Alaska, arriving at Ladd Field December 9, 1944. (USAF)



A service P-59A as seen at Santa Maria, California in August of 1949. (W. T. Larkins)



Remains of P-59A that crashed November 13, 1944 on Township Road, 3 miles SE of Dayton, Ohio. (Nat'l Air Mus)



A service P-59B-1-BE at rest at Chico Army Air Field, California on the 28th of May, 1945. (USAF Photo 36081AC)

Patuxent: one (652) to Freeman Field, Indiana; and four to Independence, Kansas for storage. This accounts for 28 airplanes, and it is possible that the other two may have been retained by Bell for tests.

The 412th Fighter Group was formed on November 30, 1943 at Muroc. From this location it moved to Palmdale, California in June 1944, to Bakersfield, California in late 1944 and to Santa Maria Army Air Field, California in July 1945. A large number of P-59 airplanes, upwards of 25 or more, were stationed at this field, but by late June of 1945 all of the P-59 airplanes had been assigned to Base Operations or one of the Squadrons (Training) of the 440th Army Air Force Base Unit. As of September 1945 the 412th Fighter Group consisted of the 29th Fighter Squadron, 31st Fighter Squadron, 445th Fighter Squadron, 361st Fighter Squadron, 615th Air Engineering Squadron and the 624th Air Materiel Squadron. In October 1945 the 361st Fighter Squadron became a Service Group for the 412th Fighter Group with the 615th Air Engineering Squadron and the 624th Air Materiel Squadron being assigned to the newly-formed 361st Service Group. In December 1945 the 412th Fighter Group was transferred to March Field, Riverside, California. After the transfer to March Field the 412th was equipped with P-80s, in April 1946, and on July 3, 1946 the 412th Fighter Group became the 1st Fighter Group, still being equipped with P-80s. The Group now consisted of the 71st Fighter Squadron (445th FS), 94th Fighter Squadron (29th FS), 27th Fighter Squadron (31st FS), 39th TAC Recon Squadron and the 361st Service Group.

In addition to the A and B models stationed at Santa Maria, there was also one YP-59A stationed there, and it had been modified to have a second cockpit. This airplane was sometimes used to take ground personnel and nurses (there was a field hospital at Santa Maria) for their first jet flight. This airplane was 27-16, 42-108777, and in June 1946 it was given to a school in Northern California, Cal Poly, and from here it was later acquired by Ed Maloney for display at The Air Museum, Ontario, California.

Quite a bit of flying was done with the P-59s at Santa Maria, and in relating some of his experiences with the P-59, Mr. C. B. Coenen, had the following story to tell concerning a wheels-up landing:

"One pilot, name unknown, made a good initial takeoff, but in landing he neglected to put down his landing gear. Despite repeated exhortations over the R/T, he came in wheels up and skidded on the engine nacelles for about 50-100 feet before he realized his error. He gave it power, took off and came around and made a normal wheels-down landing. The engines had to be changed and major repair performed on the nacelles and frame to put it back in flying condition."

In January 1946 the inactivation of Santa Maria was undertaken, and at this time many of the P-59s were flown to March Field for use by the 412th. The remaining P-59s were ferried directly from Santa Maria to other locations in the United States, with several of them going to Land Grant Colleges. All of the P-59s delivered to March Field were shortly disposed of, as by July 1946 there were no more P-59 airplanes at March Field. The P-59s given to colleges were used for instructional purposes and then junked. One exception was P-59B-1, 44-22656, which was originally given to Purdue University. This airplane was sold by Purdue in 1956 to the Harold Warp Pioneer Village, Minden, Nebraska, and it is now on display there.

From March through July 1946, 17 P-59s (three P-59As including 617 and 623, and 14 P-59Bs--629, 634, 635, 636, 637, 639 thru 645, 648 and 654) were assigned and delivered to the U. S. Army Aberdeen Proving Ground, Maryland. These airplanes were used for static aircraft vulnerability experiments and then salvaged. The planes were not flown after their delivery to Aberdeen, and all were apparently scrapped by 1949. The last P-59 on the Air Force inventory was 44-22633 which was salvaged at Muroc

as a ZF-59B on October 4, 1948.

The three P-59Bs that went to the Navy had relatively longer lives. Number 651 became BuNo 64100, coming into Navy service on October 17, 1945 and last being noted on November 30, 1949 with 167 hours flight time. Number 657, BuNo 64109, was delivered on February 12, 1946 and scrapped at Norfolk on December 22, 1947. Both of these planes were first used for jet familiarization at NATC, Patuxent River, Maryland. Number 658, BuNo 64108, was delivered on January 15, 1946 and used by Tactical Test at NATC, Patuxent River. It crashed on December 8, 1947 with 142 total airframe hours and was subsequently barged to Norfolk for scrapping on April 16, 1948.

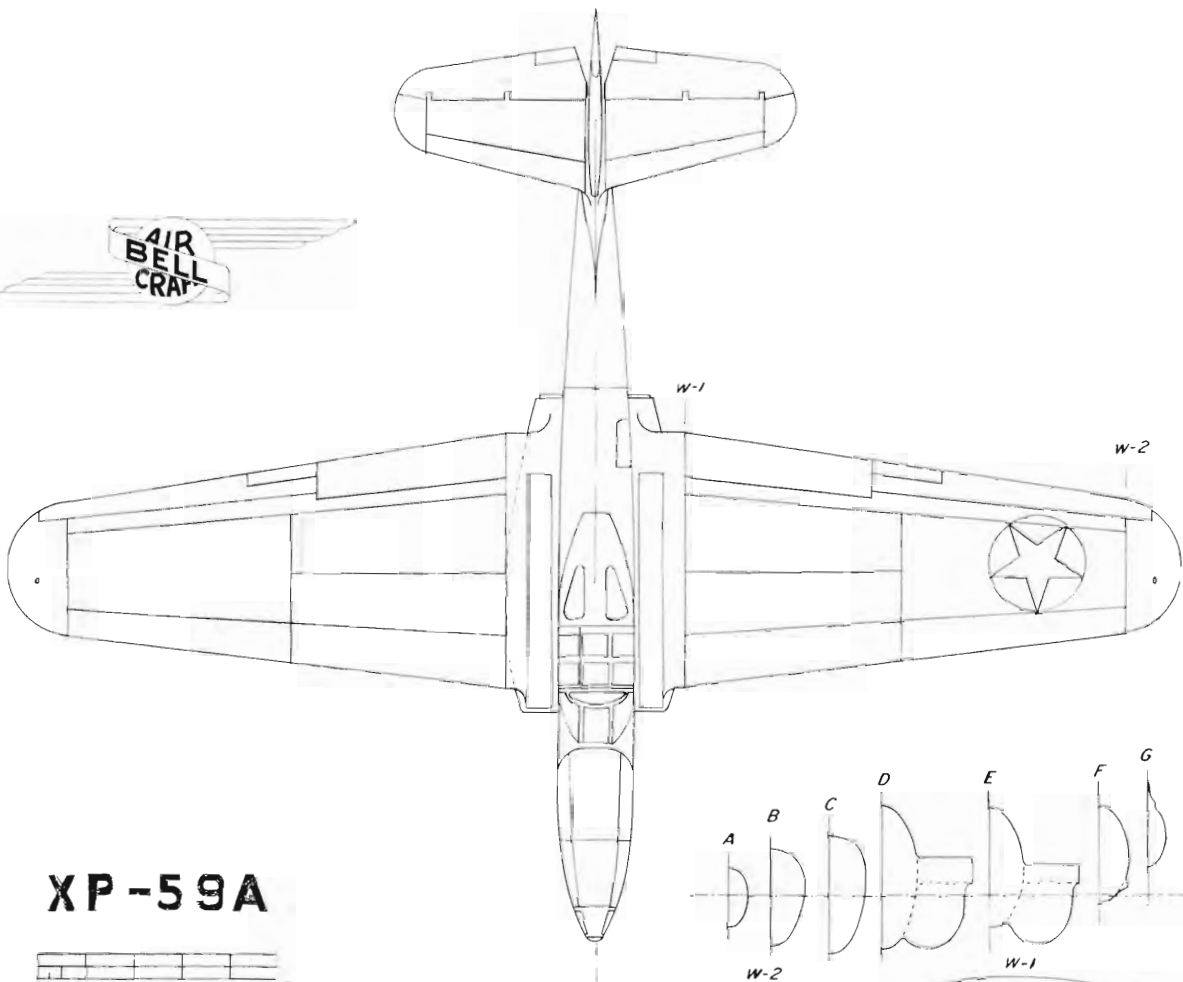
Another P-59 that survived the years is P-59B-1, 44-22650. After being at NACA, Cleveland, it arrived at Kirtland Air Force Base, New Mexico in 1947. The airplane was to be used as a target in the development of proximity fuses for artillery shells at a test site located along the foot of the Manzano Mountains, just east of Kirtland. Although many airplanes were destroyed during this program, the P-59B somehow was spared from being used as a target, and during the period from 1947 to 1951 it remained at a little dirt airstrip in Coyote Canyon, Manzano Mountains.

In 1951, the P-59 and a Japanese Oscar were placed as a war memorial in front of Kirtland's base headquarters building. However, the maintenance of the airplanes proved to be costly, and in about 1953 a new base CO decided that the airplanes were an eyesore and so the two planes were moved to the Base Reclamation Area where they were to be destroyed. Fortunately, R. F. Arnold, Base Supply Officer with the New Mexico Air National Guard recognized the historical significance of these airplanes, and he arranged to have them transferred to the Air National Guard Supply account. For the next couple of years they shared the flight line on the west side of Kirtland with Air National Guard F-80s.

Then in 1955 someone from the Air Force Museum noticed the P-59, and shortly thereafter the New Mexico Air National Guard received a request to donate the airplane to the Museum. Thus, on December 23, 1955 the P-59 was presented to the Air Force Museum in ceremonies conducted at Kirtland. Brig. General John P. McFarland, then New Mexico's assistant adjutant general for air, Air National Guard, presented the airplane to Brig. General W. M. Canterbury, then Commander of the Air Force Special Weapons Center, Kirtland. General Canterbury then took the necessary steps required to have the airplane forwarded to the Air Force Museum.

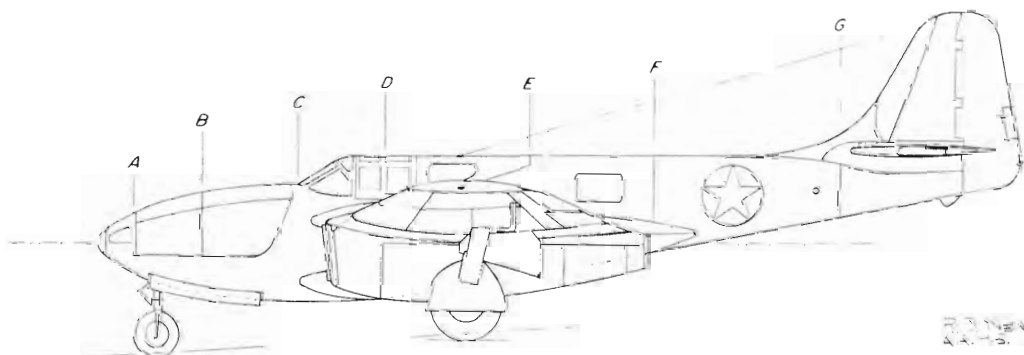
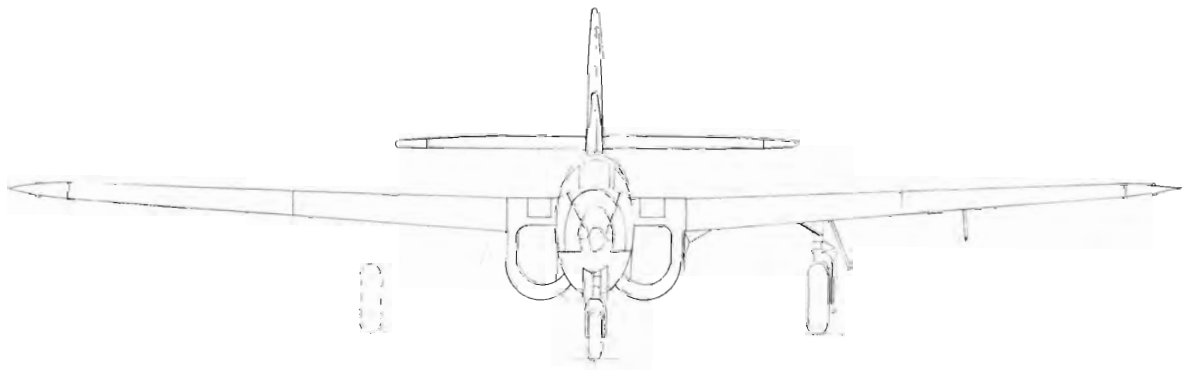
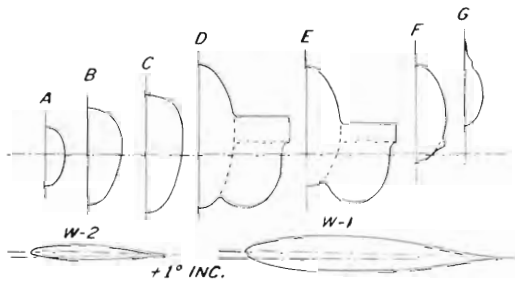
The news that the United States was active in the jet propulsion field and, in fact, had flown a jet-powered airplane was not made public until late in the afternoon of January 6, 1944, when this information was released from the Army Air Force pressroom at the Pentagon. Being typical of wartime news releases, this joint Army Air Forces-Royal Air Force announcement was rather vague and offered very few details of the airplane. Basically, it gave a brief history of jet propulsion, which included such information as the fact that Group Captain Frank Whittle had designed and developed the jet engine and that the Gloster airplane had first flown in May 1941. The release went on to say that the Bell experimental airplane, powered by General Electric engines that were based on the Whittle engine, first flew on October 1, 1942 with Robert M. Stanley as pilot and that on the next day Col. Laurence C. Craigie flew the airplane to become the first Army officer to fly a jet. The release failed to mention the location where the first flight occurred, the name of the airplane, or its designation.

No photographs were included, and it was September 1944 before the first ones were released to the press. The lack of fanfare and publicity on the XP-59A is certainly a far cry from today's gala and well-reported roll-outs and first flights of a new design. Of course,



XP-59A

0 SCALE-FEET 10



when the XP-59A was making its place in history, the wartime secrecy of the project prevented the airplane and the people associated with it from receiving the credit they so justly deserved. Unfortunately, by the time that details of the P-59 could be revealed, the airplane had already been delegated to a training role with the Lockheed P-80 having come into the limelight.

Commenting on the new "rocket ship", as the newspapers called it, Larry Bell on January 7, 1944 issued the following statement:

"We believe that the hundreds of successful flights made by Bell jet-propelled ships opens a new chapter in American aviation history.

"Bell Aircraft has built the first American fighter planes powered by jet propulsion engines constructed by the General Electric Company from British designs.

"They prove a new scientific principle--that planes can fly without propellers. Once a principle is proved, count on engineering genius of the Allied Powers to develop it into greater performance records, not only to help speed the day of victory but to pave the way towards new achievements in a postwar aviation world."

The release of the news disclosing the existence of a jet plane naturally touched off wide-spread speculation on the performance of this new and revolutionary airplane. Typical of the comments appearing in the trade magazines were, "Speed of the plane was placed at between 500 and 600 mph." and "Its top speed has been estimated by ground observers to exceed 500 mph." The writers of these remarks were obviously influenced by rather optimistic enthusiasm because the maximum speeds for the XP-59A were about 350 mph at sea level to 390 mph at 30,000 feet. In fact, the official performance tests carried out on the YP-59A equipped with the more powerful 1-16 engines only provided a maximum speed of 409 mph at 35,000 and about the highest speed ever quoted for any of the P-59 models was 425 mph.

Obviously the P-59 was not a success in the role for which it was originally designed, however, in another respect it was an unqualified success for the people of the Army Air Force, Bell and General Electric. Starting from scratch and several years behind the British and Germans, this team designed, produced and flew a jet-powered airplane that was to provide the United States with much-needed experience during a critical and trying period in its history.

The final report covering the development of the X and Y airplanes was issued on June 28, 1945, and the closing paragraph of this document provides an adequate summary of the program:

"Even though a combat airplane did not result from the development of the X and YP-59A airplanes, it is considered that the development was very worthwhile, since it proved that the principle of jet propulsion for aircraft was sound and practical, and the airplanes themselves will be good training airplanes for pilots who will fly later jet propelled airplanes into combat."

PHYSICAL CHARACTERISTICS XP-59A

Airplane - General:

Overall Span	49'0"
Overall Length, Cannon Tip	38'10"
Overall Height, Thrust Line Level	14'6"
Overall Height, At Rest	12'3 3/4"
Clearance, Bottom of Nacelle, Thrust Line Level	2'0"
Clearance, Bottom of Nacelle, At Rest	1'5 3/4"

Wings:

Airfoil Section N.A.C.A. Root	66,2-014
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Tip	66,2-012
Total Area, Including Ailerons and Flaps	200 sq.ft.
Root Chord (45 in. Outboard of Centerline of Airplane Splice)	10'8"
Tip Chord (266 1/2 in. Outboard of Centerline of Airplane)	5'0"
Incidence, Root	12°
Tip	0°
Dihedral, 45% Line	3°30'
Sweepback	7°
Ailerons:	
Area, Aft of Hinge Centerline	12.0 sq.ft.
Area, Balance	3.5 sq.ft.
Area, Total (Each)	15.5 sq.ft.
Movement	Up 25°
	Down 10°
Area (Each Tab)	1.14 sq.ft.
Movement	Up 25°
	Down 10°
Area (Each Tab)	1.14 sq.ft.
Movement (Tab)	Up 10°
	Down 10°
Flaps:	
Area, Aft of Hinge Centerline	12.95 sq.ft.
Area, Balance	3.68 sq.ft.
Area, Total (Each)	16.63 sq.ft.
Span (Total)	15'7 3/4"
Movement	Down 45°
Empennage:	
(1) Horizontal Stabilizer:	
Area (Stabilizer)	45.63 sq.ft.
Area (Horizontal Tail)	69.86 sq.ft.
Incidence (Fixed)	1 1/4°
Chord (Root, Including Elevator)	72"
Span	16'8"
(2) Elevator:	
Area, Aft of Hinge Centerline	10.06 sq.ft.
Area, Balance	2.05 sq.ft.
Area, Total (Each)	12.11 sq.ft.
Movement	Up 25°
	Down 15°
Area (Each Tab)	.83 sq.ft.
Movement	Up 15°
	Down 15°
(3) Vertical Stabilizer:	
Area (Fin)	17.75 sq.ft.
Area (Vertical Tail)	32.35 sq.ft.
Chord (Root, Including Rudder)	88"
Span	7'5"
(4) Rudder:	
Area, Aft of Hinge Centerline	12.60 sq.ft.
Area, Balance	2.0 sq.ft.
Area, Total (Each)	14.60 sq.ft.
Movement	Right 25°
	Left 25°
Area (Each Tab)	.63 sq.ft.
Movement	Right 15°
	Left 15°

Landing Gear:

Tread	222"
Main Wheel Axle Centerline Aft of Leading Edge of Wing	61.5"

P-59 SERIAL NUMBERS

MODEL	AAF S/N	NO. PRODUCED
XP-59A	42-108784 / 42-108786	3
YP-59A	42-108771 / 42-108783	13

P-59A-1	44-22609 / 44-22628	20
P-59B-1	44-22629 / 44-22658	30

YP-59A, 42-108773, assigned to British given S/N RJ 362/G
 YP-59A, 42-108778, assigned to U.S. Navy given BuAer 63960
 YP-59A, 42-108779, assigned to U.S. Navy given BuAer 63961
 P-59B-1, 44-22651, assigned to U.S. Navy given BuAer 64100
 P-59B-1, 44-22658, assigned to U.S. Navy given BuAer 64108
 P-59B-1, 44-22657, assigned to U.S. Navy given BuAer 64109

Note: The five P-59 jet airplanes assigned to the Navy were never given any Navy designation, but rather they were always referred to by their Army Air Force designation of YP-59A or P-59B-1.

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ABOUT THE AUTHOR: The first major Research Project to come into the JOURNAL has been done by Ron Neal, 7522 Plaza Lane, Wichita, Kansas. Ron is 28 and has been interested in aviation as long as he can remember. In 1961 he graduated from the Univ. of Wichita with a B.S. in Aero Engineering and in June went to work for Lockheed-Georgia, remaining there until January 1966 when he joined Lear Jet Corp. as an Aerodynamics Engineer.