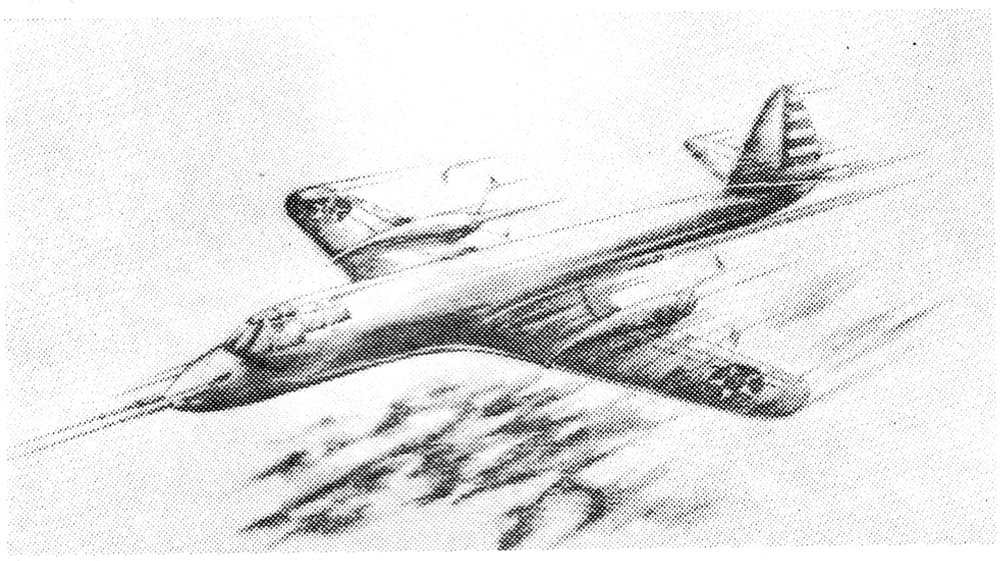
MR. MAC'S FIRST FIGHTER

by Frederick W. Roos

Soon after its incorporation on July 6, 1939, the McDonnell Aircraft Corporation approached the U.S. Army Air Corps concerning the possibility of obtaining a contract for development of a fighter airplane. Although nothing came of this immediately, it did result in McDonnell being included among the approved manufacturers who received the Air Corps' revolutionary "Request for Data R40-C" early in 1940. This document was issued with the intent of unleashing the design and innovation skills of the aircraft industry, which responded enthusiastically with no fewer than 23 new fighter aircraft designs. One of these, submitted on April 11, 1940, was McDonnell's Model 1, an "Interceptor Pursuit Airplane" of conventional layout except for being driven by two wing-mounted pusher propellors which were turned, via shafts and right-angle gearboxes, by an engine buried in the fuselage. Other unusual features of the Model 1, which had been under development since the fall of 1939, were full-span flaps and the incorporation of boundary-layer suction on the wings.

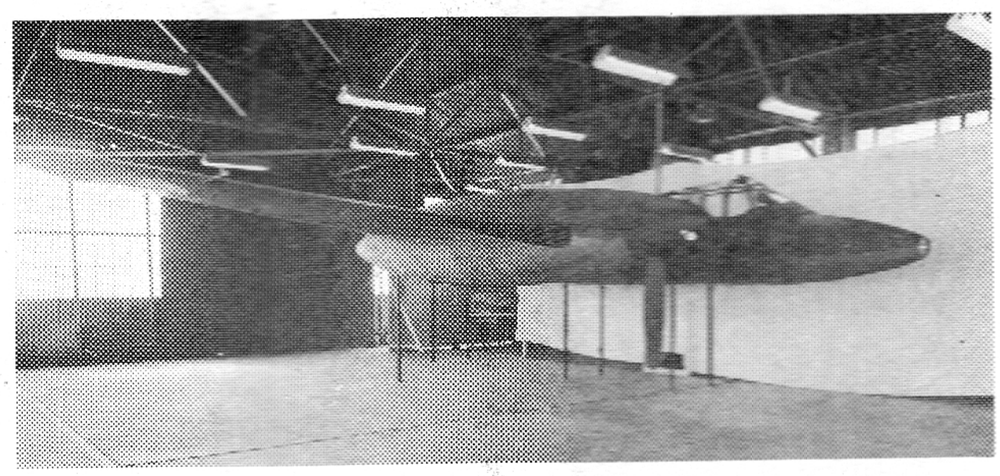


McDonnell Model 1, the unbuilt direct predecessor of the XP-67.

McDonnell's design, while not winning a contract, impressed Air Corps officials sufficiently that they purchased engineering data for $3000 (McDonnell Aircraft's first sale). Encouraged by this, the McDonnell team returned to the Air Corps on June 30 with a revised version of Model 1 and a new, conventionally-powered aircraft, the Model 2. Though not immediately accepted, Model 2 was further developed over the ensuing months, with the result that the Army Air Forces (AAF) signed a contract on September 30, 1941 for two examples of the McDonnell Model 2A, to be designated XP-67.

The XP-67 was to be a mid-wing, single-seat, twin-engine monoplane, powered by experimental Continental XI-1430 turbosupercharged engines. Armament was to consist of six 37mm cannons, unusually heavy firepower for a fighter. A unique feature of the design was the continuation of an airfoil shape through the fuselage and engine nacelles.

Engineering of the XP-67 proceeded at a rapid pace, and a mock-up was constructed. This was reviewed by AAF personnel in mid-April of 1942, the result being a great many detail changes in the airplane. The only significant external change was a 15-inch lengthening of the nose to allow relocation of the gunsight for visibility reasons.



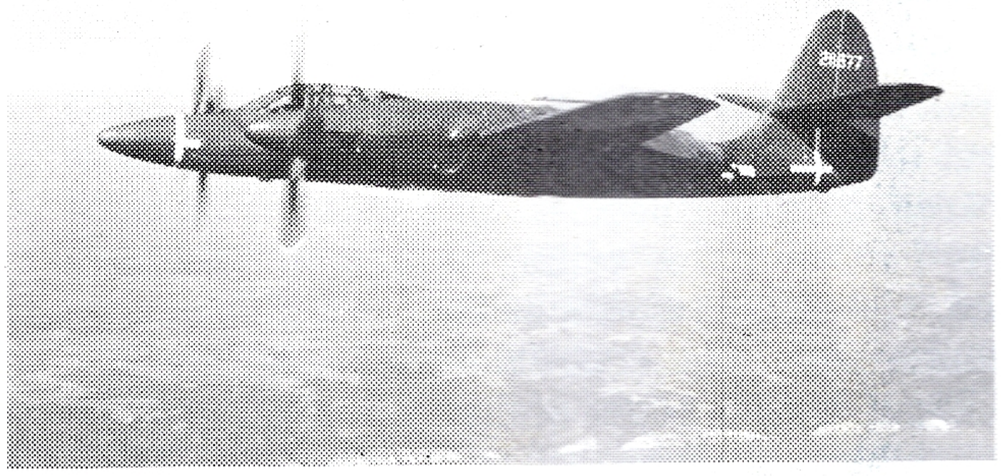
XP-67 mock-up shows unusual cooling duct inlet and two of six 37mm cannons.

Fabrication of the first prototype continued during 1942 and 1943, in parallel with a series of wind tunnel tests of models of the airplane and a full-scale nacelle and engine. It soon became apparent that the unusual cooling duct configuration incorporated into the XP-67 would require redesign to provide satisfactory cooling. One other change resulting from these tests was that raising the horizontal tail by 12 inches would substantially improve the airplane's longitudinal stability. Because the prototype was well along in construction, plans were made to incorporate the cooling duct and tailplane revisions after the initial flight testing. Work on the second XP-67 was held in abeyance pending results of flight tests of the first airplane.

Nearly-complete XP-67 prototype in shop just before painting. Origin of "Flying Fillet" nickname is obvious.

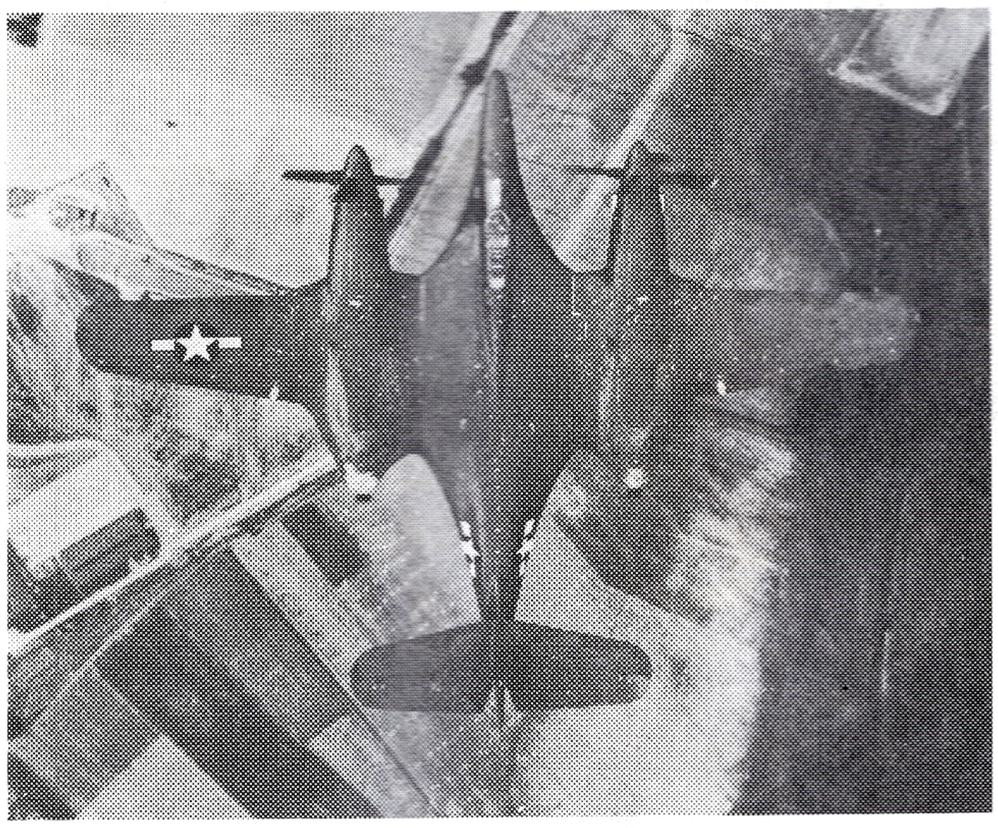
The completed XP-67 prototype was rolled out and began taxi tests early in December, 1943. Fires started in both engine nacelles during engine runup December 8, resulting in a delay of the first flight while the necessary repairs and modifications were made. Once these were completed, the airplane was trucked to Scott Field and prepared for its first

flight, which took place on January 6, 1944 with McDonnell test pilot E.E. Elliot at the controls. This turned out to be an inauspicious flight, lasting only six minutes because of an emergency landing necessitated by engine problems. The second and third flights of the XP-67 were successful, but on February 1 the bearings in both engines were burned out when they overspeeded, and the airplane was returned to the McDonnell plant for repair and modification.



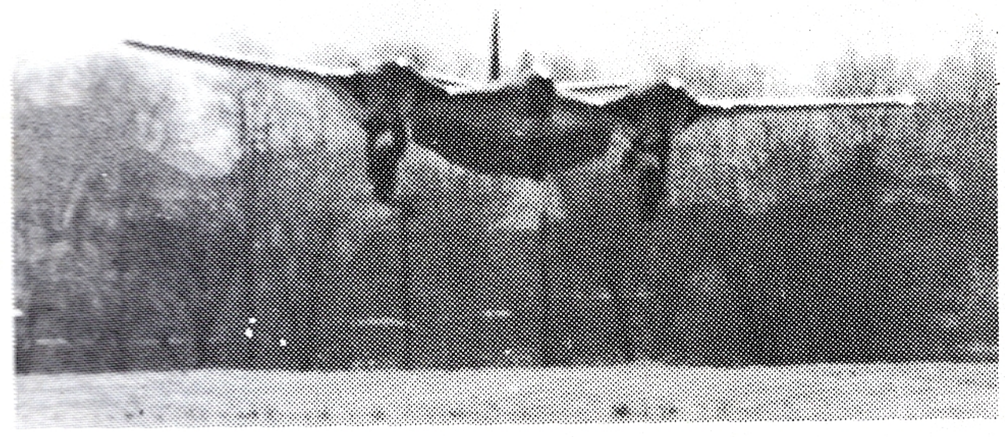
The XP-67 in flight over the Mississippi after cooling duct inlet and tailplane modifications.

Meanwhile, the AAF had been studying the possibility of installing GE turboprop or turbojet engines in the XP-67, concluding that the turboprop installation appeared quite promising, but turbojets alone would be unsatisfactory. McDonnell took an alternative approach, proposing production versions of the XP-67 that would be powered by two Allison or Rolls Royce engines in the forward ends of the nacelles and turbojets in the rear, replacing the turbosuperchargers. Emphasis at this stage was on long-range reconnaissance or ground-attack missions for the airplane. However, the Army preferred to have the basic configuration of the XP-67 proved by flight testing before making decisions regarding completion of the second prototype or production versions, so no action was taken on these proposals.



Highly unusual planform of the XP-67 is emphasized in this flight view.

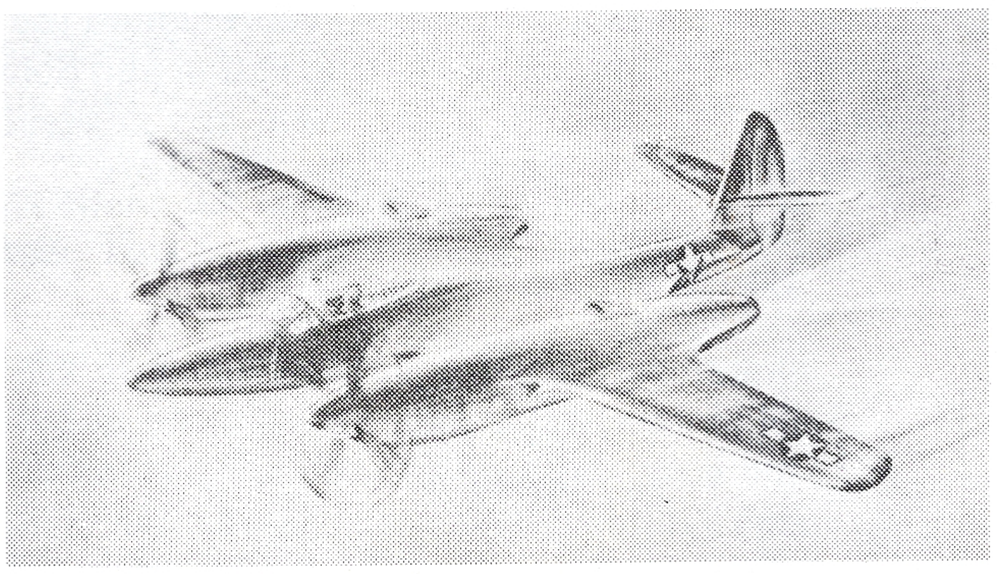
Flight testing of the prototype XP-67 resumed at Lambert Field on March 23, and improvements resulting from the cooling duct and tail modifications were immediately apparent. Contractor flight tests continued for several weeks, followed by an evaluation by three AAF pilots on May 11-13. They found the airplane satisfactory in many respects, but criticized it for lack of power, marginal stability, and poor visibility. Testing continued through the summer of 1944, with concentration on drag reduction and stability improvement.



XP-67 just prior to touchdown reveals interesting flap arrangement.

Almost everything was ready for the official performance tests by the AAF when, on September 6, 1944, the XP-67 was destroyed by a fire which began during a test flight. McDonnell pilot Elliott managed a successful emergency landing at Lambert Field, but the aircraft came to rest in such a way that the flames were blown across the fuselage, literally cutting it in two. In view of the great length of time required to repair the airplane, or to complete the second XP-67 airframe, coupled with the superior performance available from jet fighters then under development, the AAF decided to terminate the XP-67 program.

While McDonnell's first fighter was not a success in itself, it provided the company's engineering team with a valuable design and development foundation upon which the eminently successful line of McDonnell jet fighters was later built.



What might have been! Proposed P-67E reconnaissance airplane with one Rolls-Royce Merlin and one turbojet in each nacelle.

The Gateway News

AIAA

Newsletter of the St. Louis Section, American Institute of Aeronautics and Astronautics

Number 4 | Now in Our 28th Year | May 1978

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MEET YOUR NEW OFFICERS

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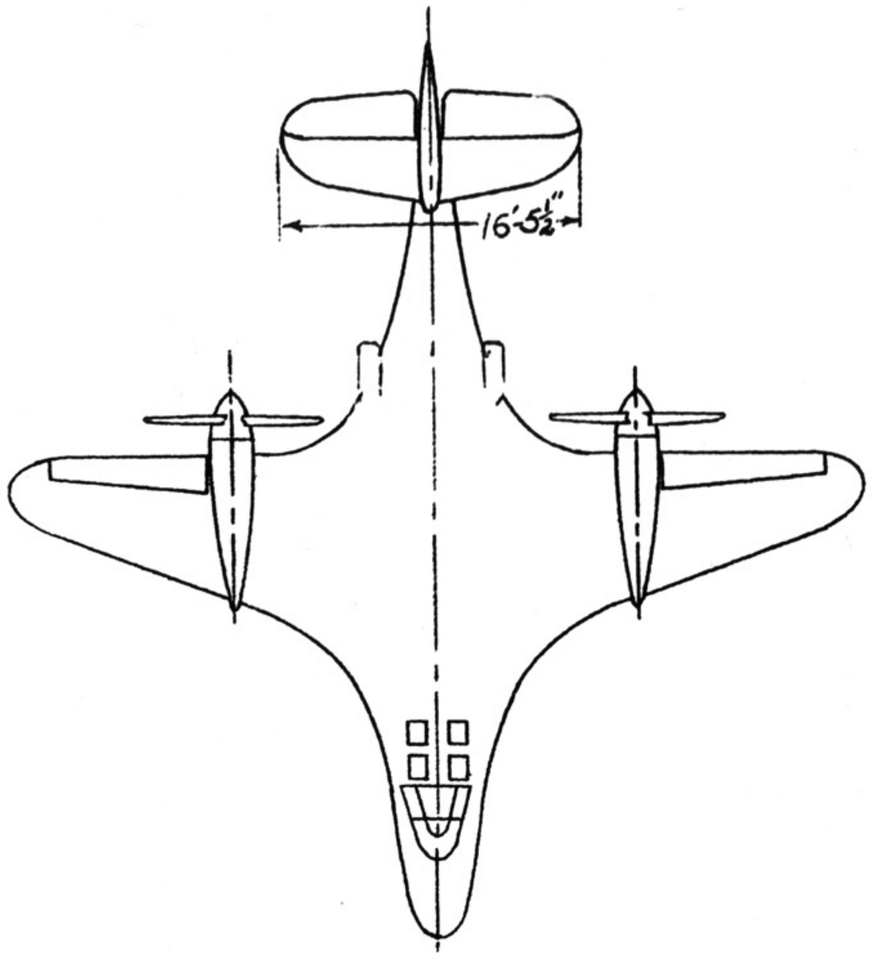

GROSS WGT. 13,826 #

463 MPH / 22000 FT.
395 MPH / 5000 FT.
ALLISON V-3420 ENGINE

GROSS WGT. 15,755 #

533 MPH / 27000 FT.
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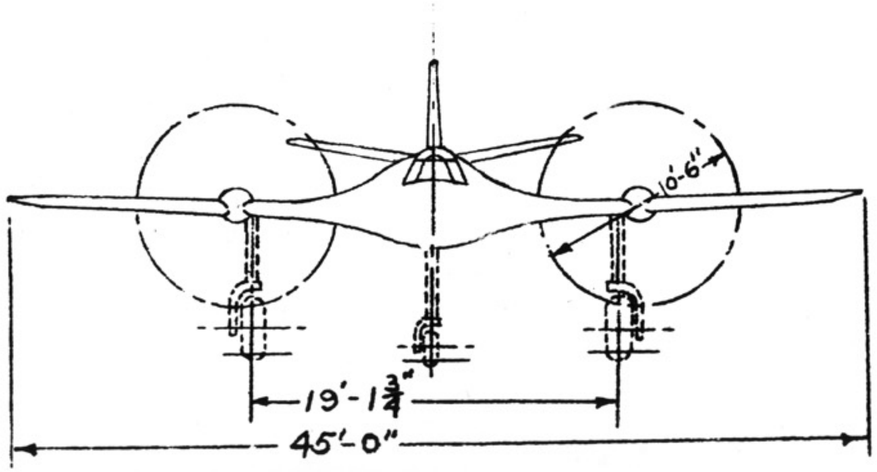
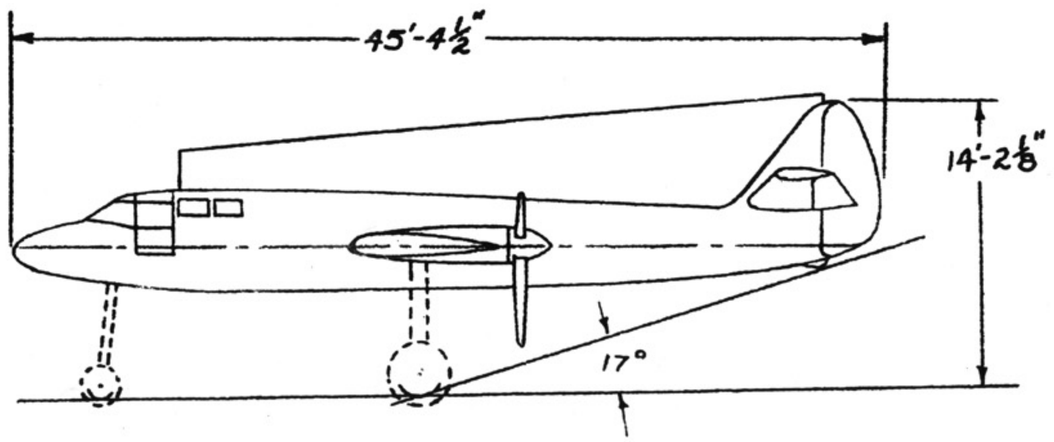
PRATT + WHITNEY H-3130 ENGINE

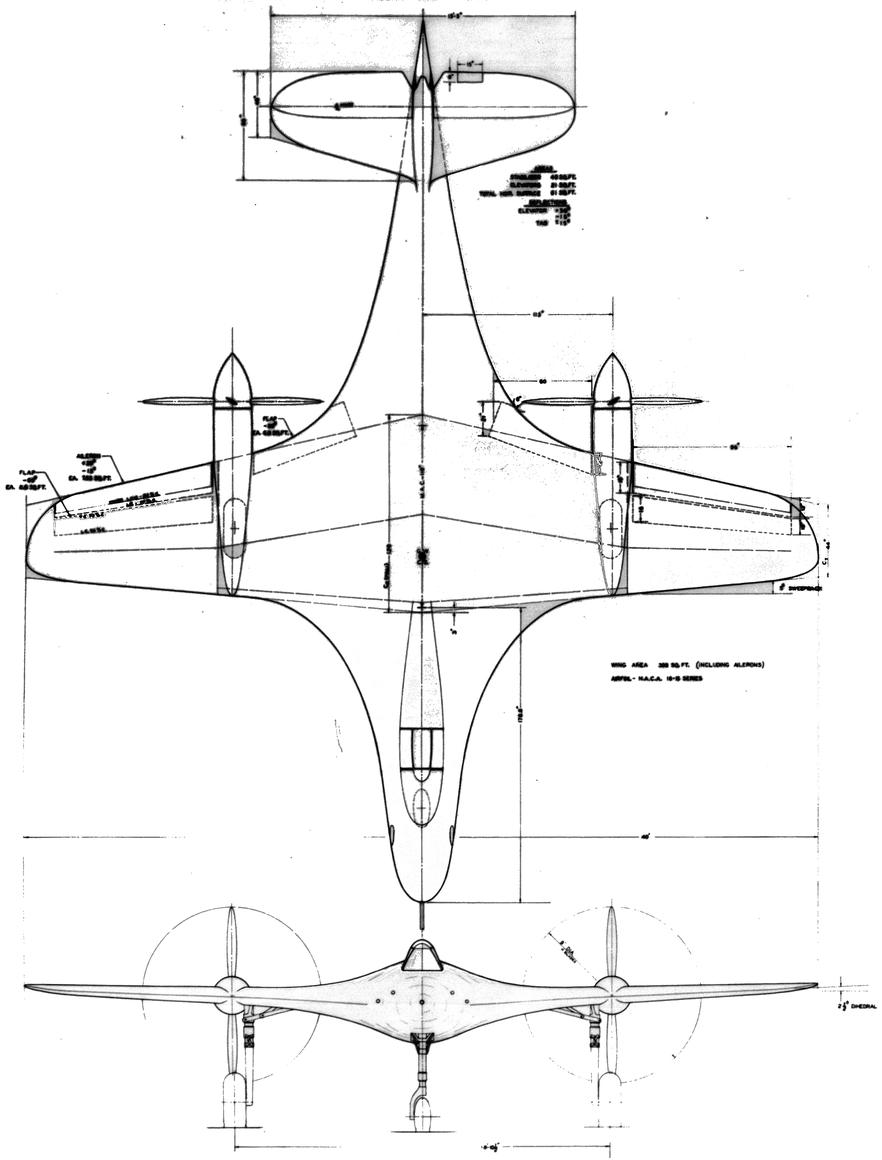
GROSS WGT. 16937 #
2180 MILES

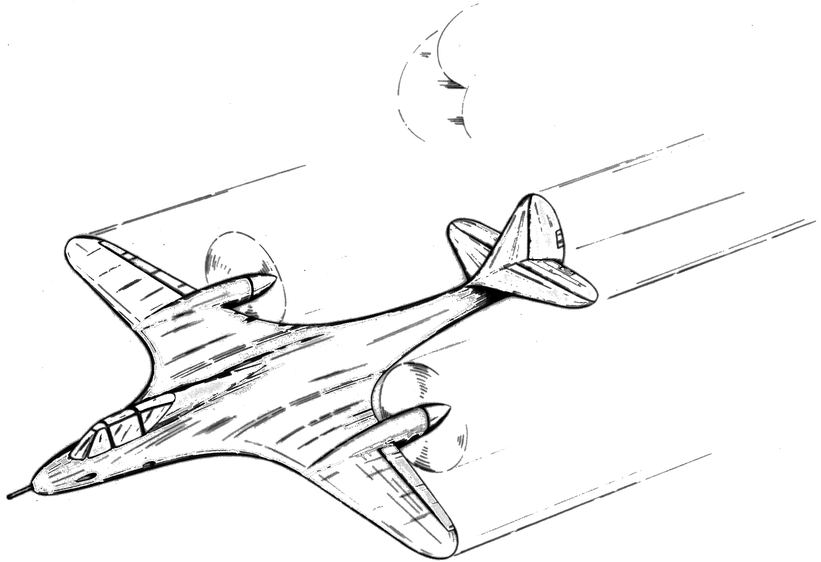
P+W H-3130

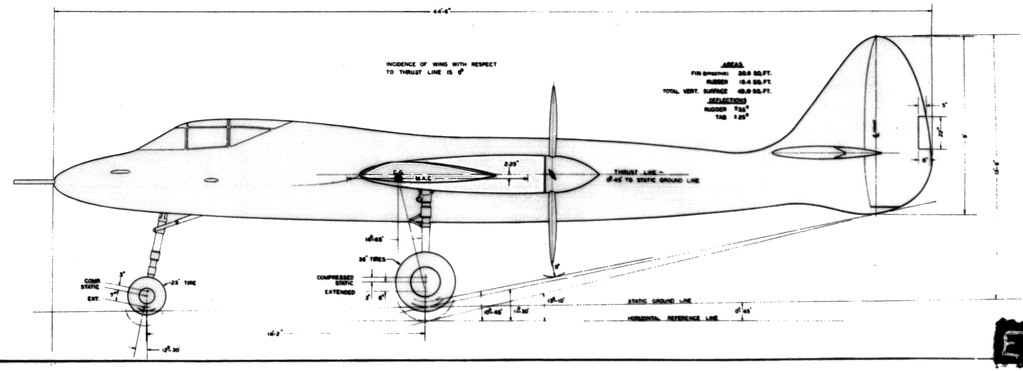
RATE OF CLIMB S.L.	3220'
ABSOLUTE CEILING	35000'
STALL SPD.	76 MPH
RANGE	440 MI.
T/O (50' OBSTACLE)	2350 FT.







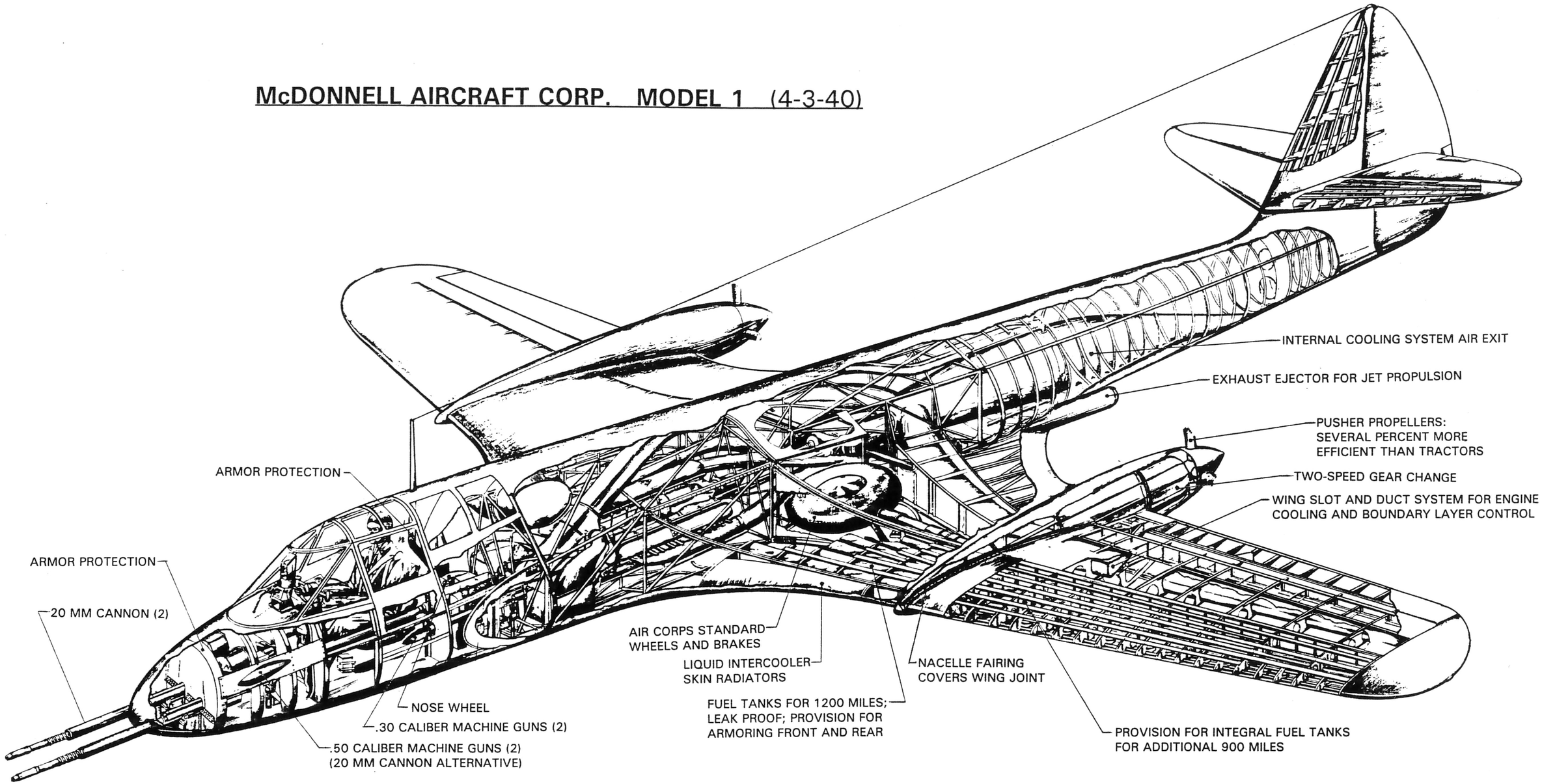


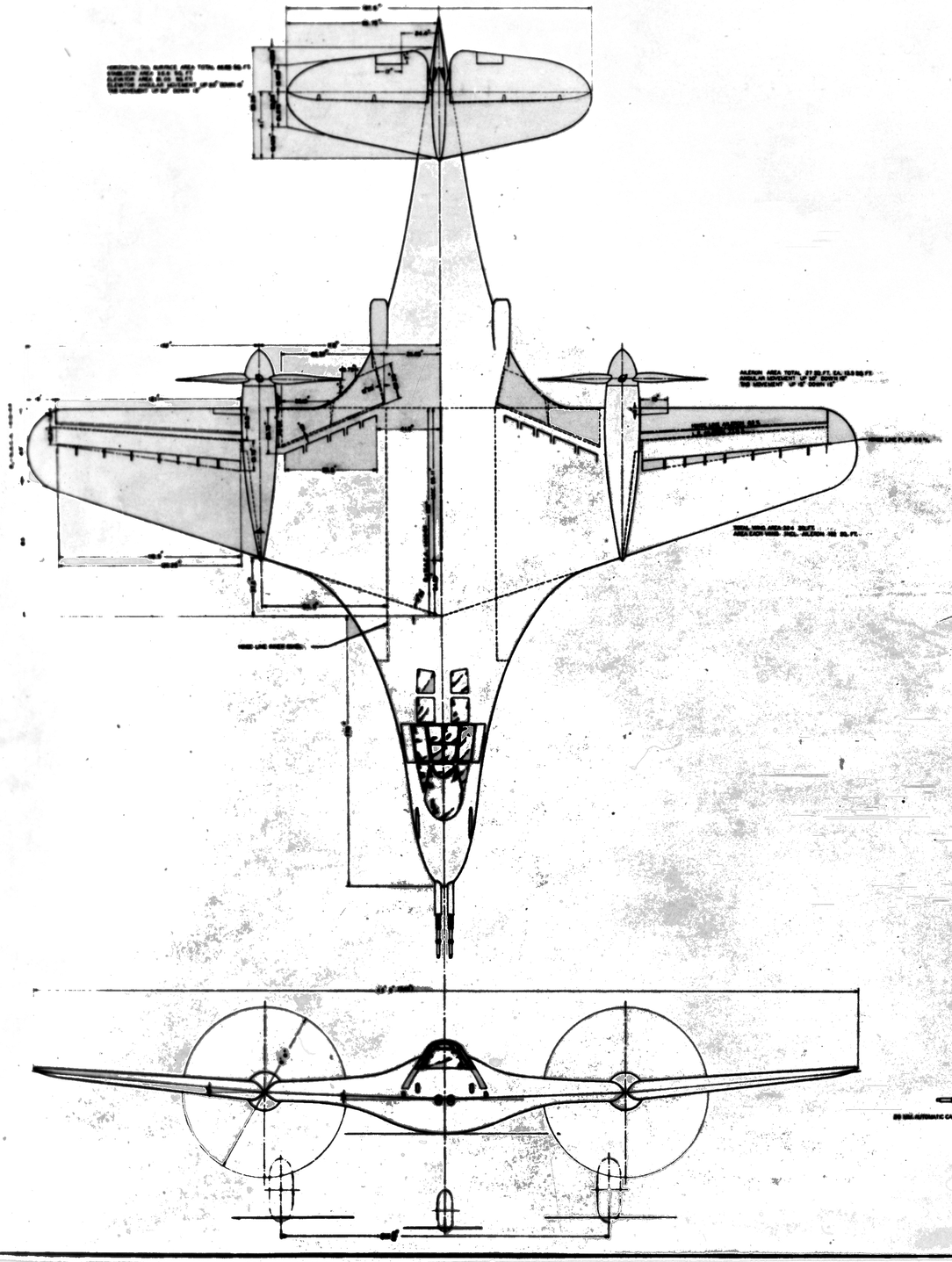


			GENERAL ARRANGEMENT	T
		McDONNELL AIRCRAFT CORP. LAMBERT - ST. LOUIS AIRPORT		SHEET 3-100

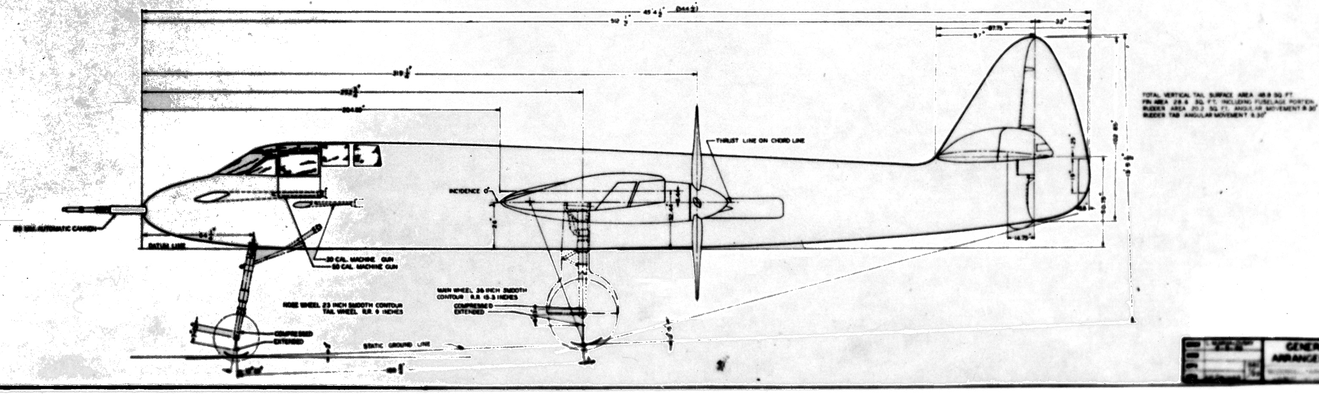

L. MIHALOVSKY

McDONNELL AIRCRAFT CORP. MODEL 1 (4-3-40)





MODEL 1		BID 1	BID 2	BID 3	BID 4
WEIGHT EMPTY	LB.	11,733.7	12,480.7	11,448.7	12,260.7
USEFUL LOAD	LB.	2260.1	2340.8	2078.3	2176.5
GROSS WEIGHT	LB.	13,993.8	14,821.5	13,527.0	14,437.3
ANGLE = FOR NORMAL DESIGN G.W. C.G.		2°	2°30'	2°30'	2°30'
C.G. LOCATION AFT. OF NOSE	INCHES	232.34	223.31	229.03	229.04
DESIGN GROSS WEIGHT LANDING GEAR RETRACTED	% MAC.	17.73	18.78	19.45	19.44
EXTENDED	% MAC.	17.13	18.13	17.85	17.86
MAXIMUM FORWARD C.G. POSITION	% MAC.	16.79	17.77	17.47	17.51
MAXIMUM AFT. C.G. POSITION	% MAC.	19.49	20.65	20.28	20.28



GENERAL ARRANGEMENT

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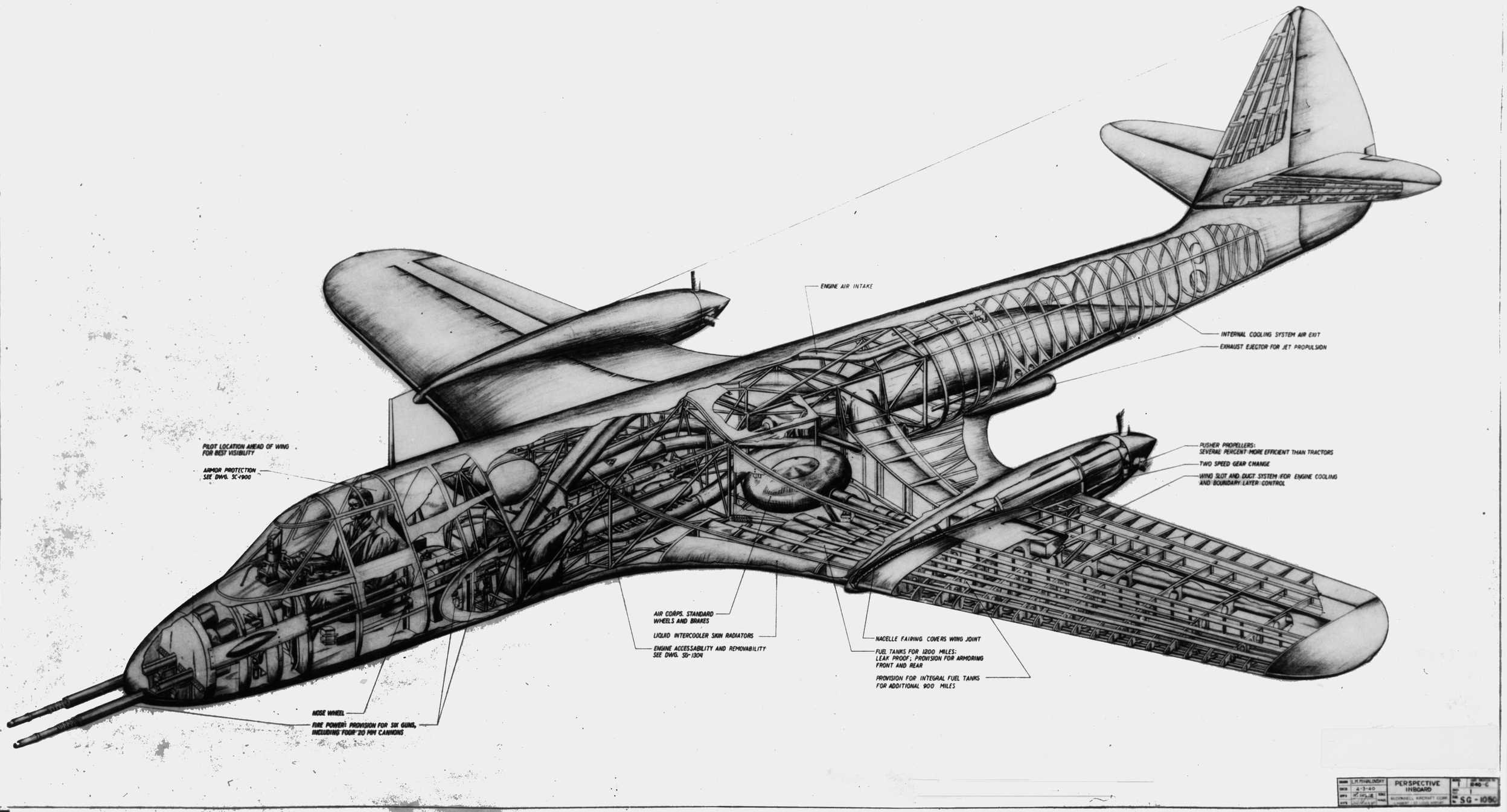


MODEL 1: INTERCEPTOR PURSUIT

FROM "DESCRIPTION OF NEW AND NOVEL FEATURES" ENGINEERING REPORT NO. 6

WAR PLANES, TOO, NEED SMOOTH COMPLEXIONS

A satin-smooth skin means much to a woman's beauty. But to a war plane, a sleek, smooth skin is more than a matter of appearance. It's a matter of performance.

For when fighter planes fly at speeds in excess of 400 miles per hour, even the slightest bumps and irregularities on flying surfaces, can affect speeds and operating efficiencies.

That's why at McDonnell, we not only take extra care to see that rivets are driven exactly and evenly, but also employ special methods to assure smoother surfaces on metal "skins".

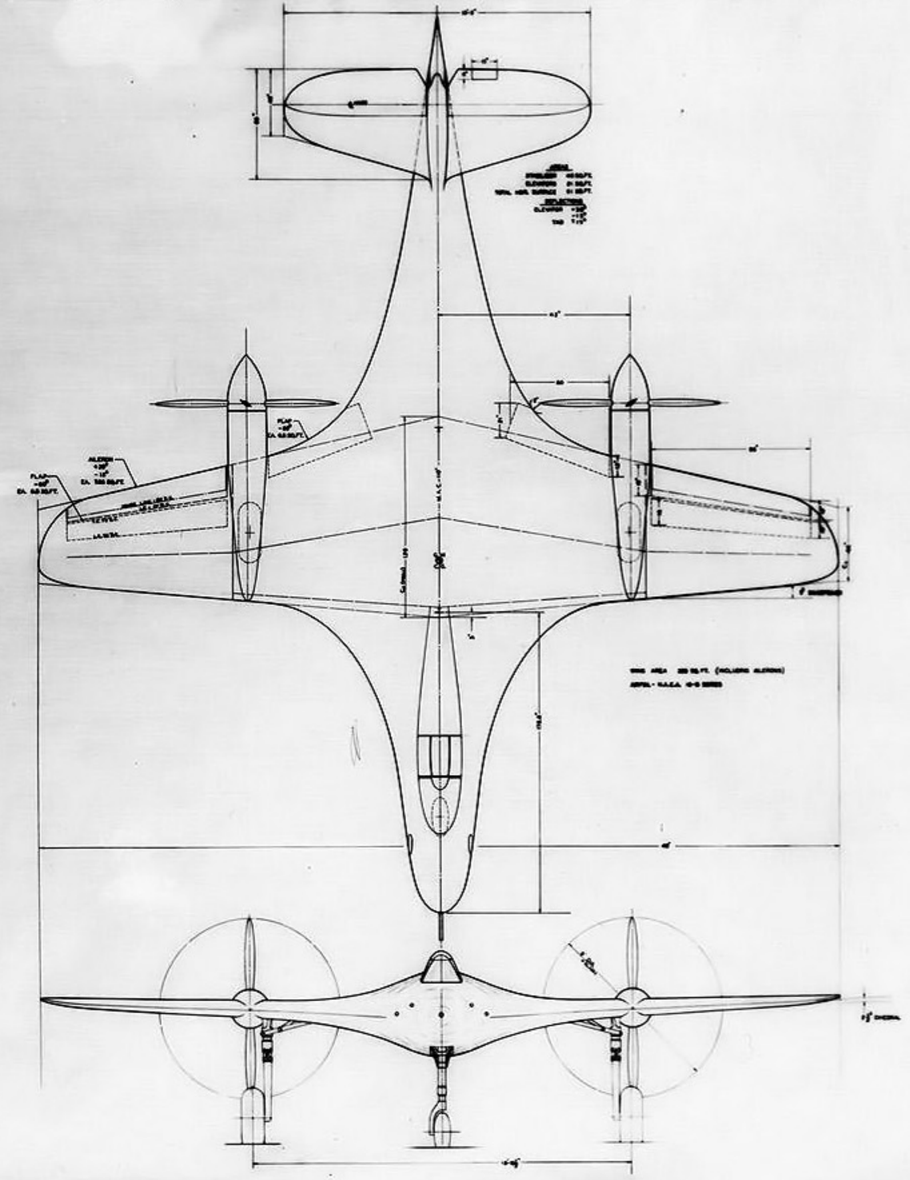
For we believe that good craftsmanship is as necessary as good design. Both are vital in the production of aircraft worthy of the men who fly them.

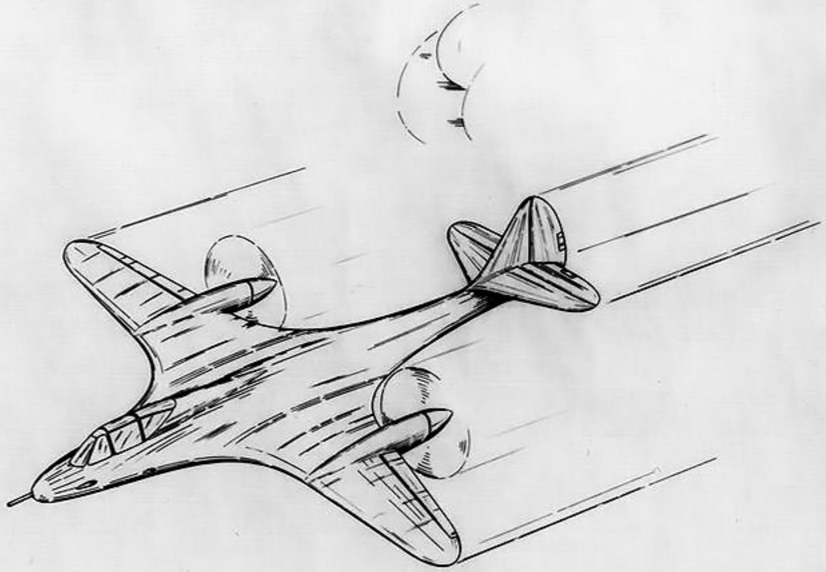
The development of special techniques for controlling skin contours, represent only a few of many refinements employed at McDonnell to assure the production of highest quality aircraft and parts.

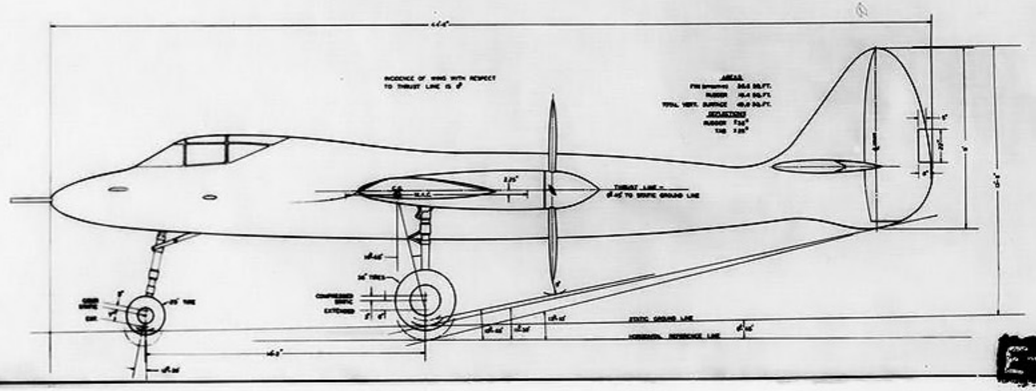
To that end, enlightened and experienced management, loyal, skilled and interested personnel, are working together three shifts a day —striving to perform each operation better and faster—never forgetting their responsibility in maintaining McDonnell's reputation of meeting production requirements . . . *on schedule.*

McDONNELL *Aircraft Corporation*

Manufacturers of PLANES · PARTS · PLASTICS · SAINT LOUIS-MEMPHIS ·







SECRET

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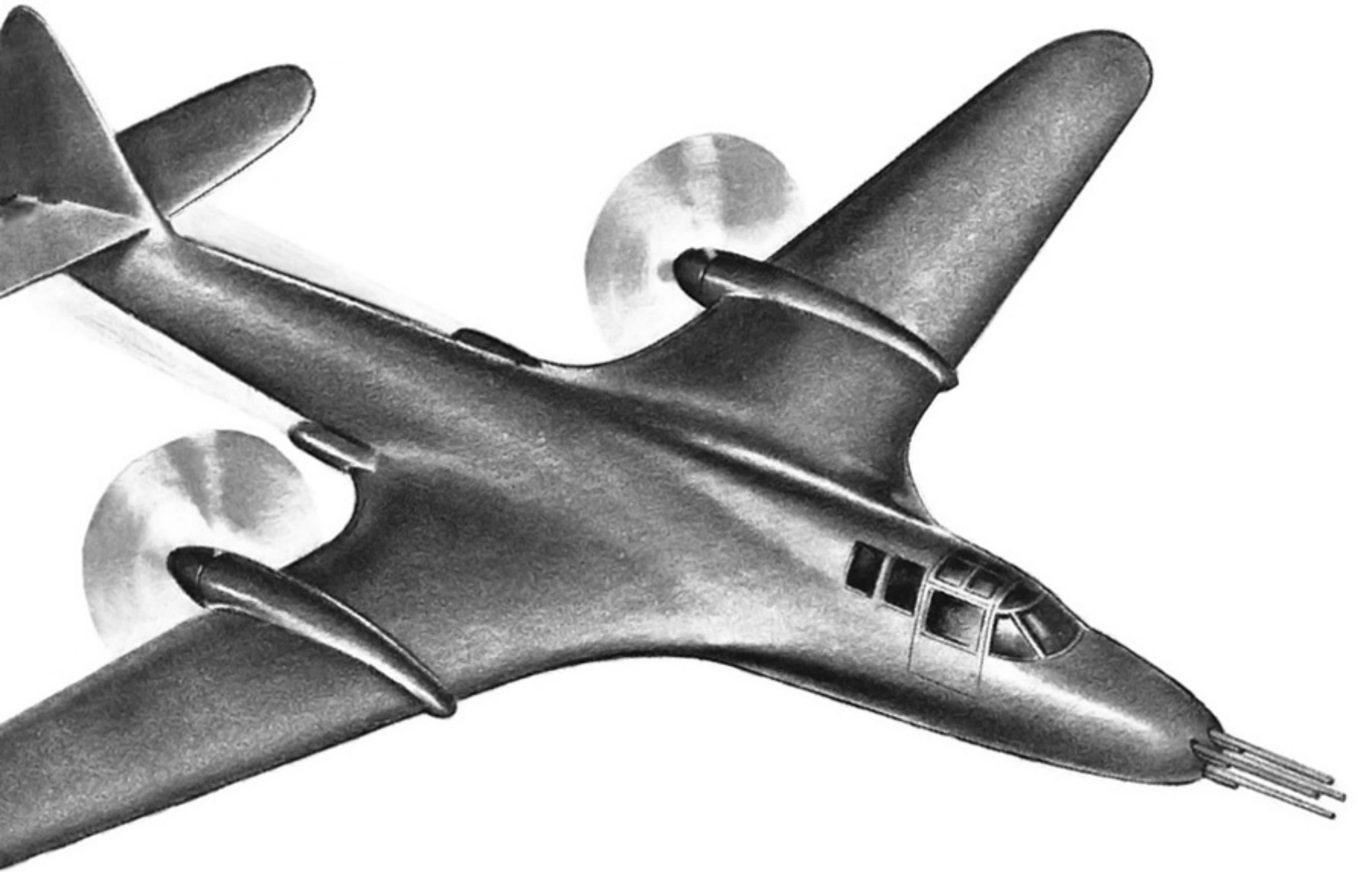
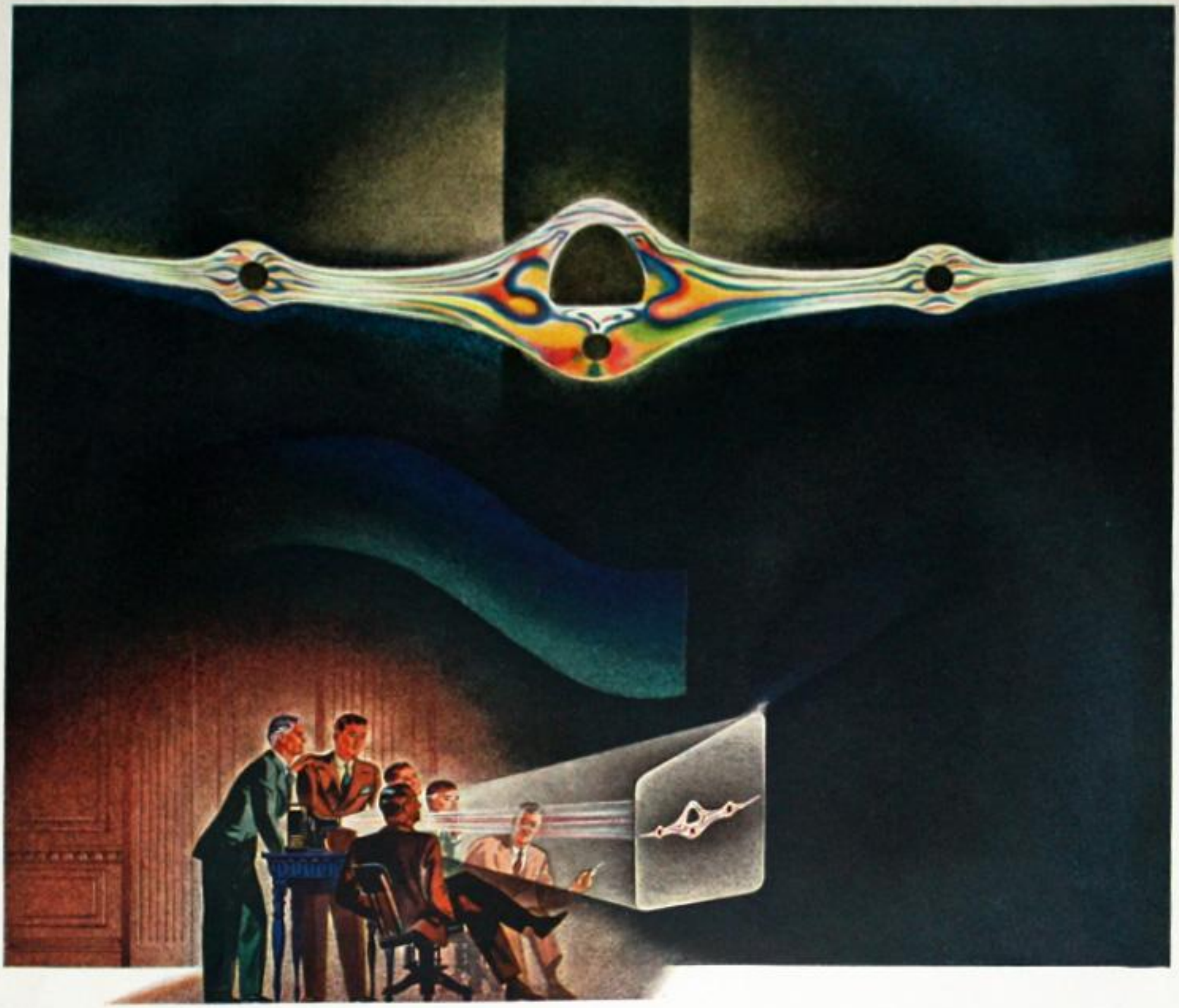




Portrait of the Solution to a Mathematical Problem

As colorful and beautiful as a rainbow, this could be a portion of a butterfly's wing. Actually, it is a color picture of the stress patterns of an airplane spar, taken by means of a polariscope, under laboratory conditions which simulate the air loads encountered by an airplane in actual flight.

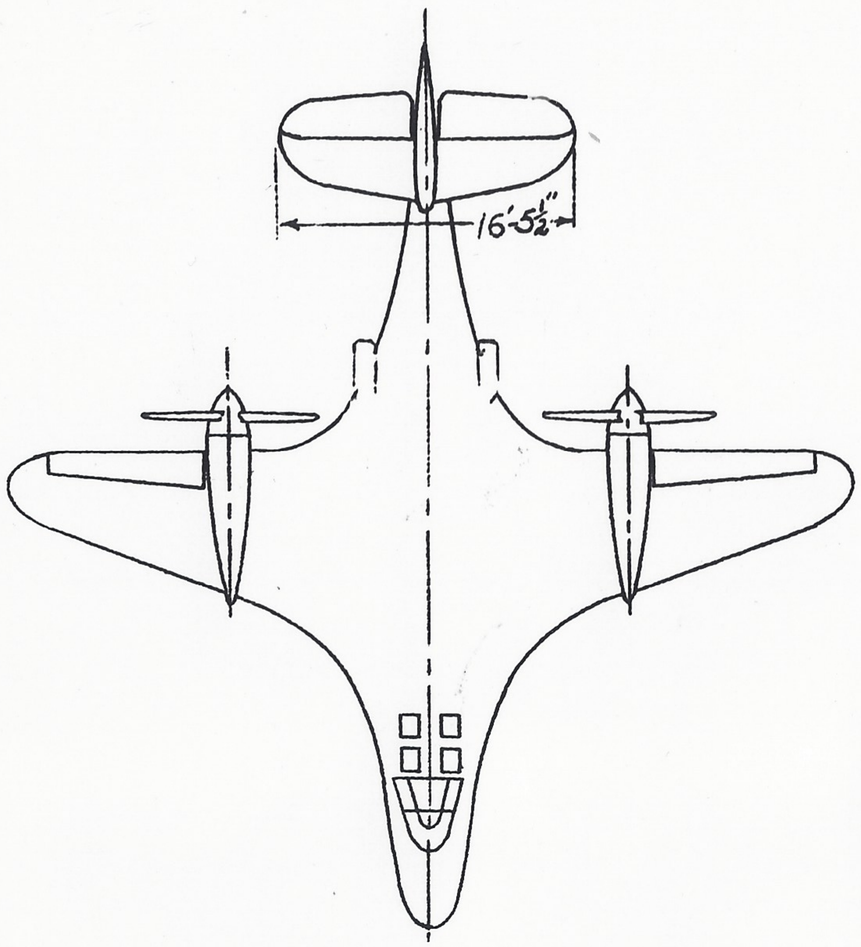
This optical method of stress analysis known as *photo-elasticity,* supplements, and to a large degree eliminates, much of the long drawn out and laborious work necessary in the mathematical determination of stresses.

Working toward the further development of photo-elasticity, with the Department of Applied Mathematics at Washington University, McDonnell engineers believe this method of stress analysis will contribute greater speed and accuracy to the determination of structural components and materials necessary in the development of even lighter, stronger, and more efficient aircraft.

Right now, of course, all our plants are working 24 hours a day making planes, parts, and plastics for our Armed Forces. But in busy laboratories and research departments, our designers and engineers are working constantly toward the needs of the future as well as the present.

McDONNELL *Aircraft Corporation*

Manufacturers of PLANES · PARTS · PLASTICS ★ SAINT LOUIS - MEMPHIS ★



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ALLISON V-3420 ENGINE

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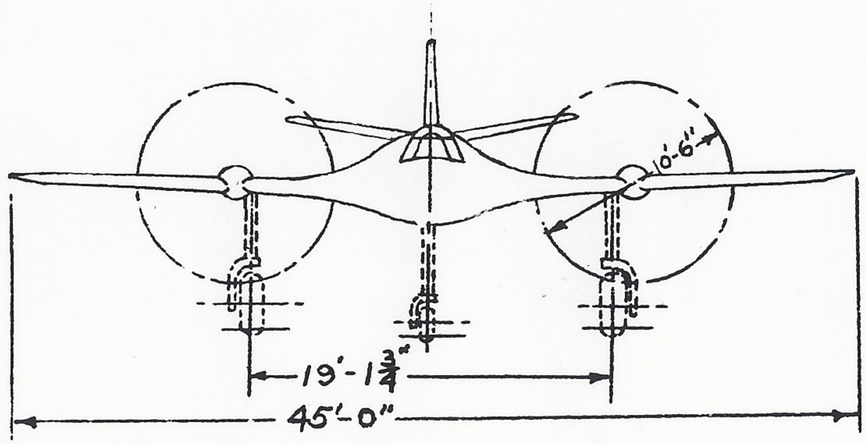
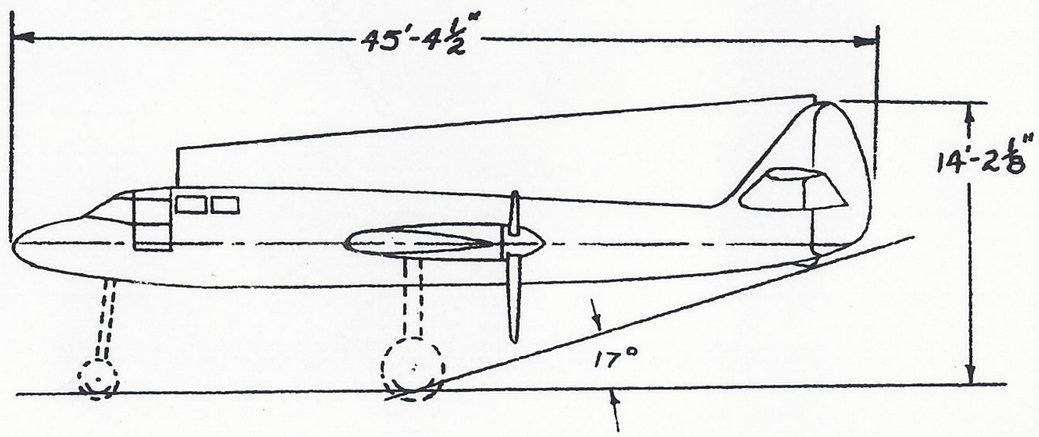
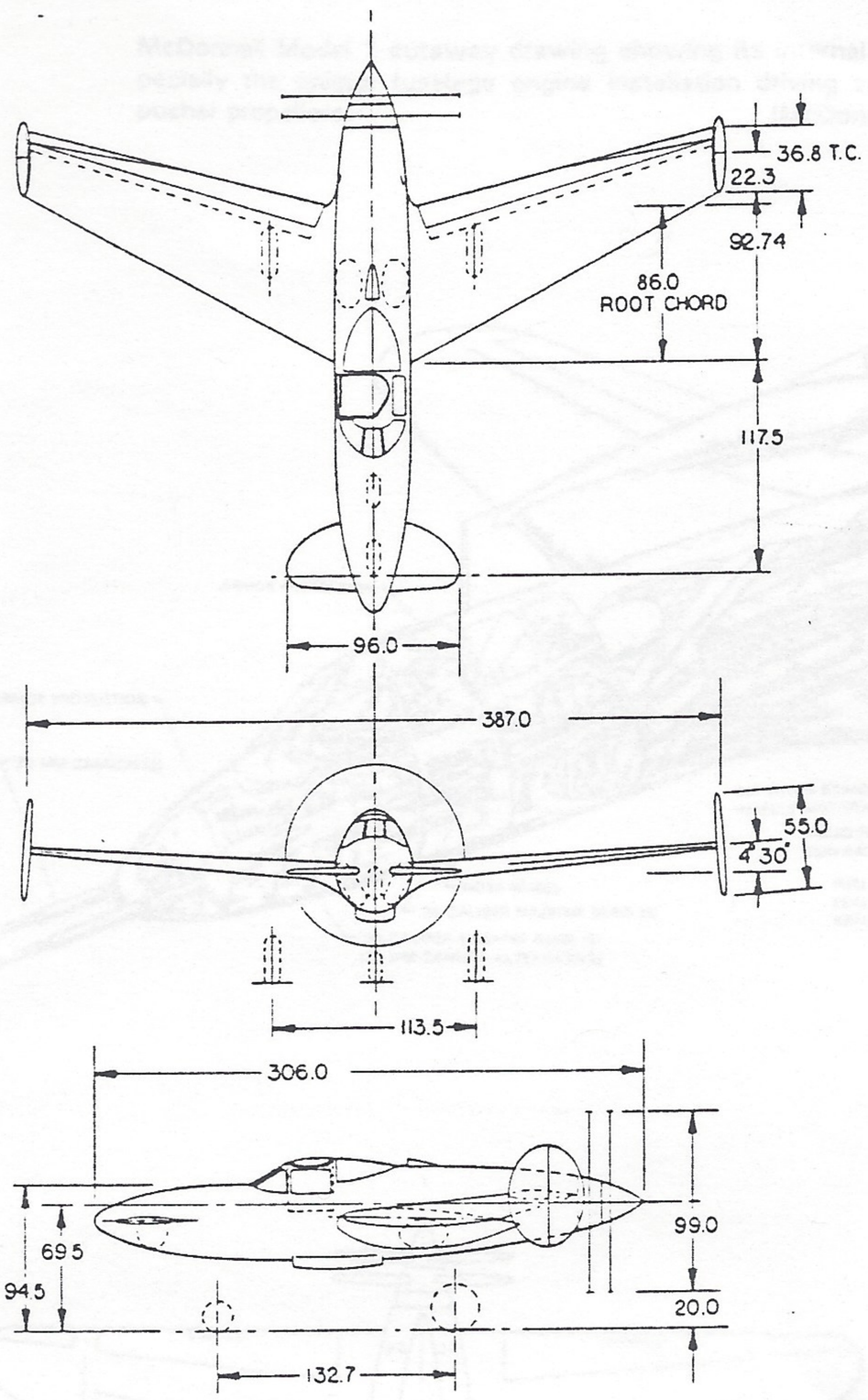
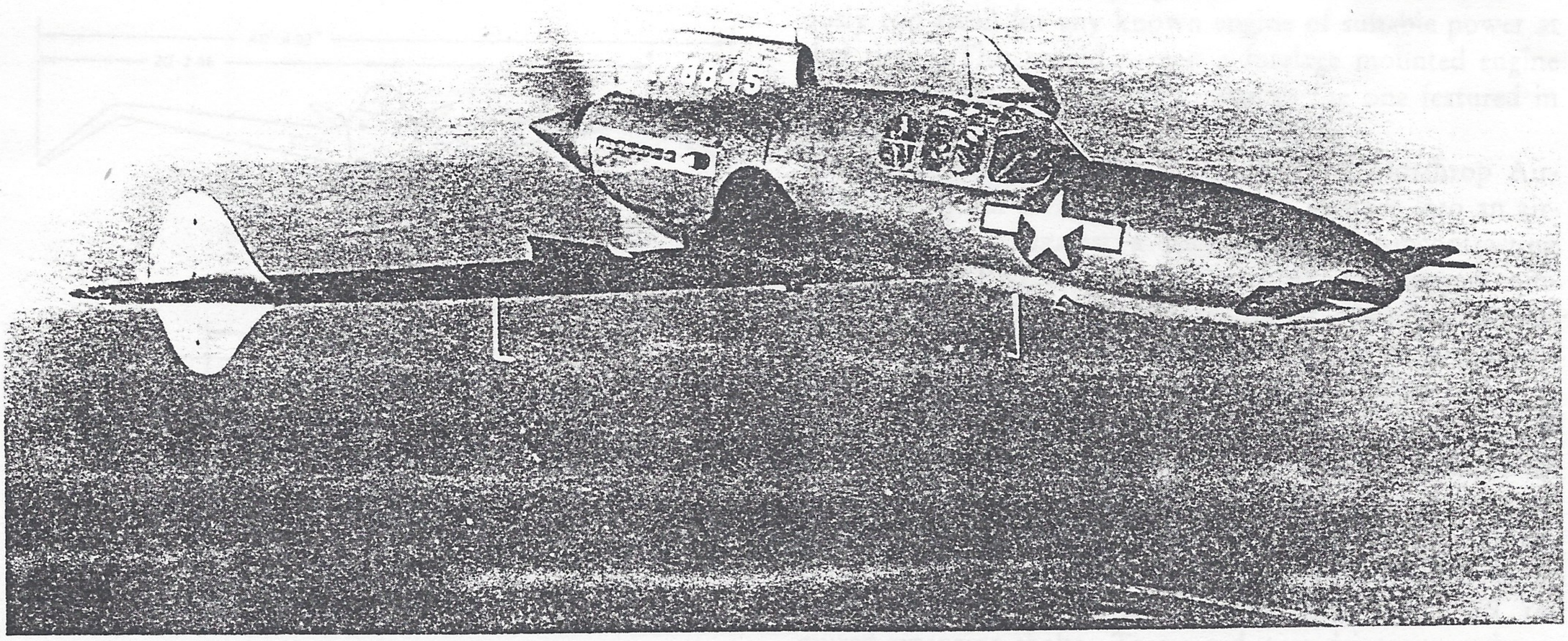




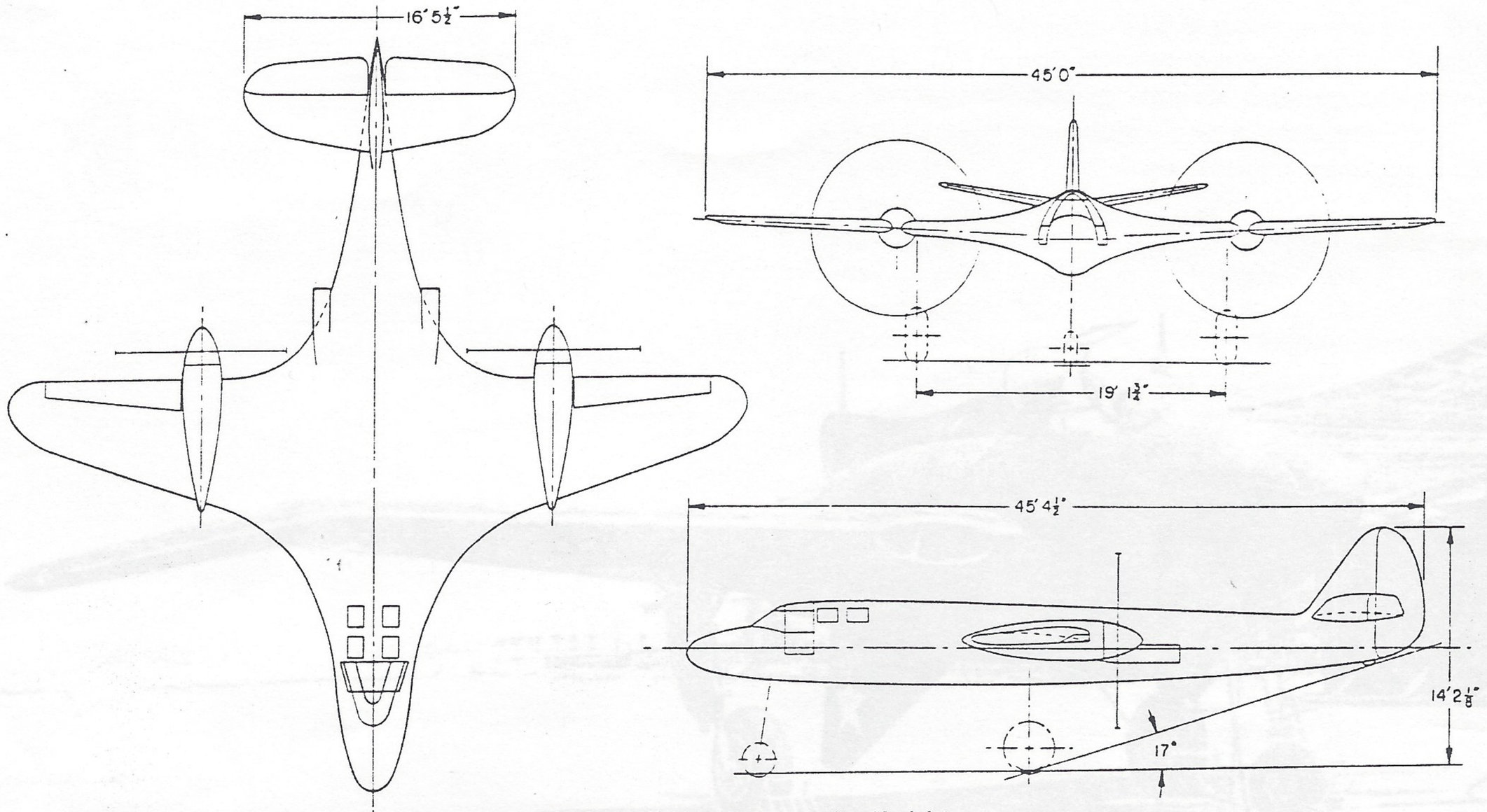


Curtiss-Wright Corp. Model P249-C, St. Louis Plant

McDonnell Aircraft Corporation — McDonnell's Model 1, while appearing somewhat conventional, was possibly the most radical design submitted. Externally it featured virtually unprecedented streamlining, incorporating large airfoil shaped fillets at the wing-fuselage juncture, a prototype of the now well known blended fuselage, as seen today on the B-1 bomber. The more radical features of the Model 1 included a fuselage mounted engine with power being transmitted to a pair of two-speed pusher mounted propellers, via geared right angle drive shafts in the wing. The Model 1 was submitted in four versions differing only by engine installations; the Allison V-3420, the P&W H-3130, the P&W X-1800-A2G and the Wright Tornado. As the result of preliminary engineering analysis, the last two models were eliminated from further assessment. The performance of these proposals was below the minimums specified in the



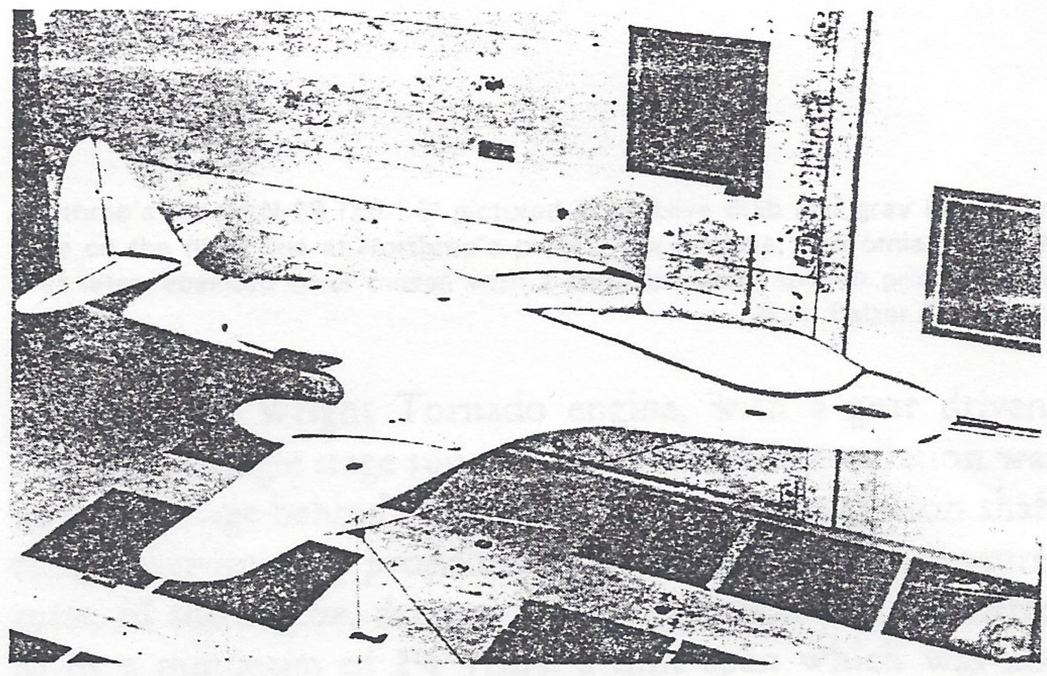
Curtiss Wright XP-55 (S/N 42-78845, first airplane) second place winner in the F.Y. 1940 pursuit competition; its unusual configuration is clearly evident in this flight photo over the Missouri landscape. (Curtiss Wright)

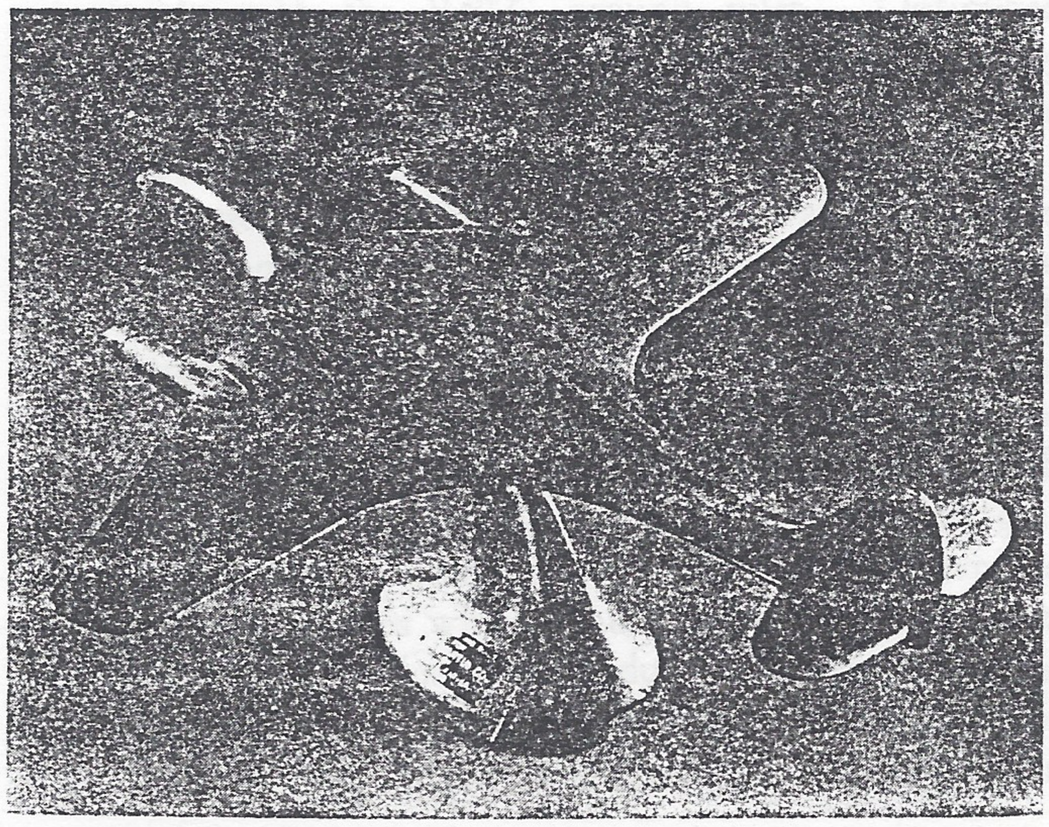


McDonnell Aircraft Corporation Model 1

Type Specification XC-622, with engines of 1,850 and 2,350 hp respectively. Proposals for the Allison V-3420 and the P&W H-3130 models featured geared superchargers which were two-stage and two-stage, two-speed respectively. Armament installations on all four versions consisted of two .30 caliber machine guns and two 20 mm cannons.

Other novel features of the Model 1 besides the right angle propeller drive, included gear driven radiator cooling fans, and an attempt at boundary layer control. With the fuselage mounted engine and the novel power transmission system, it was the heaviest of all the designs submitted and showed poor performance for the power utilized. It was estimated that it would take 42 months to develop and procure the engine and power transmission drives. While ranking 21st and 22nd out of 26 entries, the Model 1 inspired a measure of interest within the Air Corps that led to the procurement of engineering data and a wind tunnel model. It was also suggested to McDonnell that further study of the elaborately faired structure would be desired. McDonnell did in fact continue to study the overall concept, evolving it into the Model 2, that was later procured as the XP-67. In all probability the Model 1 would have faired no better than the Model 2. The superabundant streamlining was ahead of

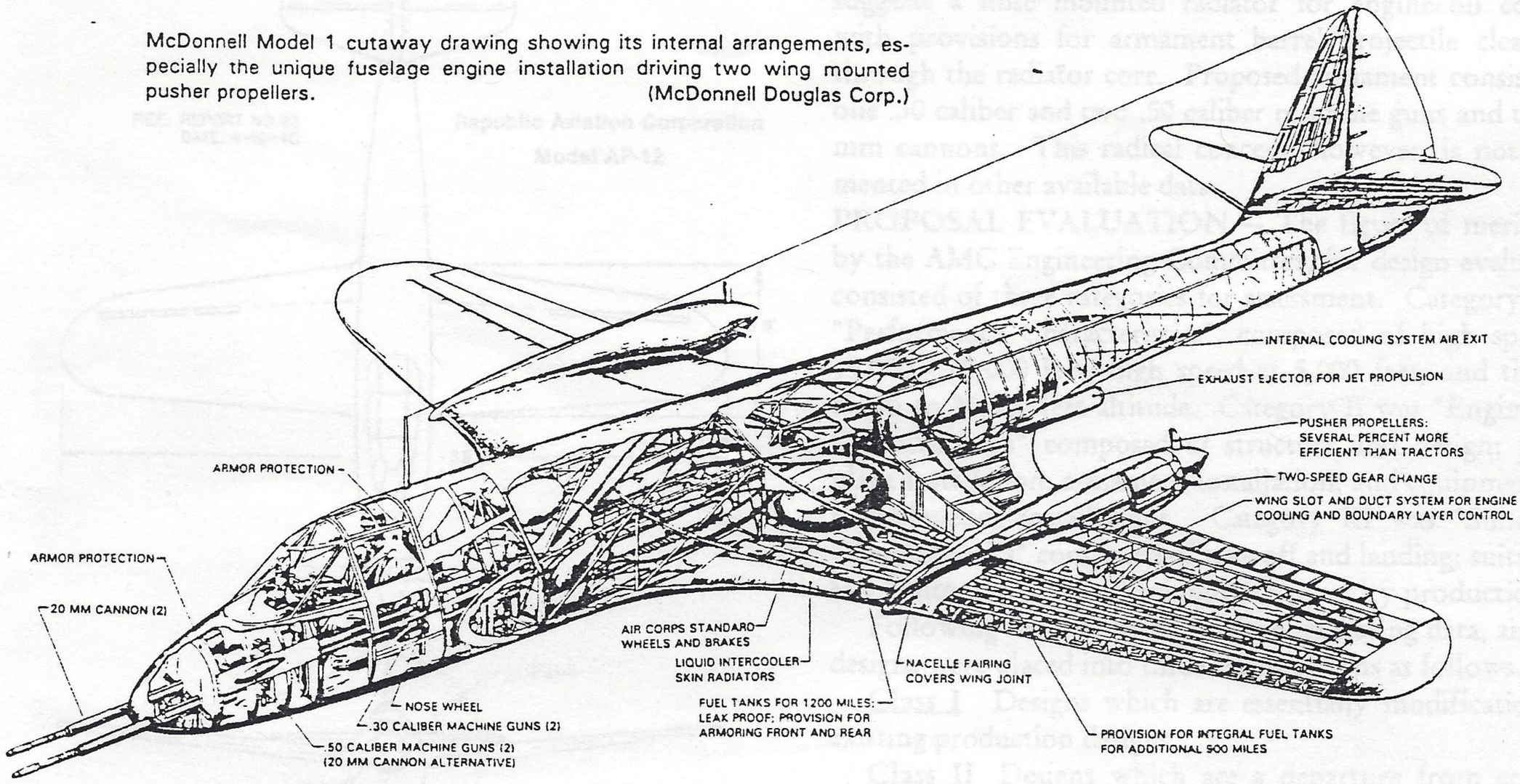


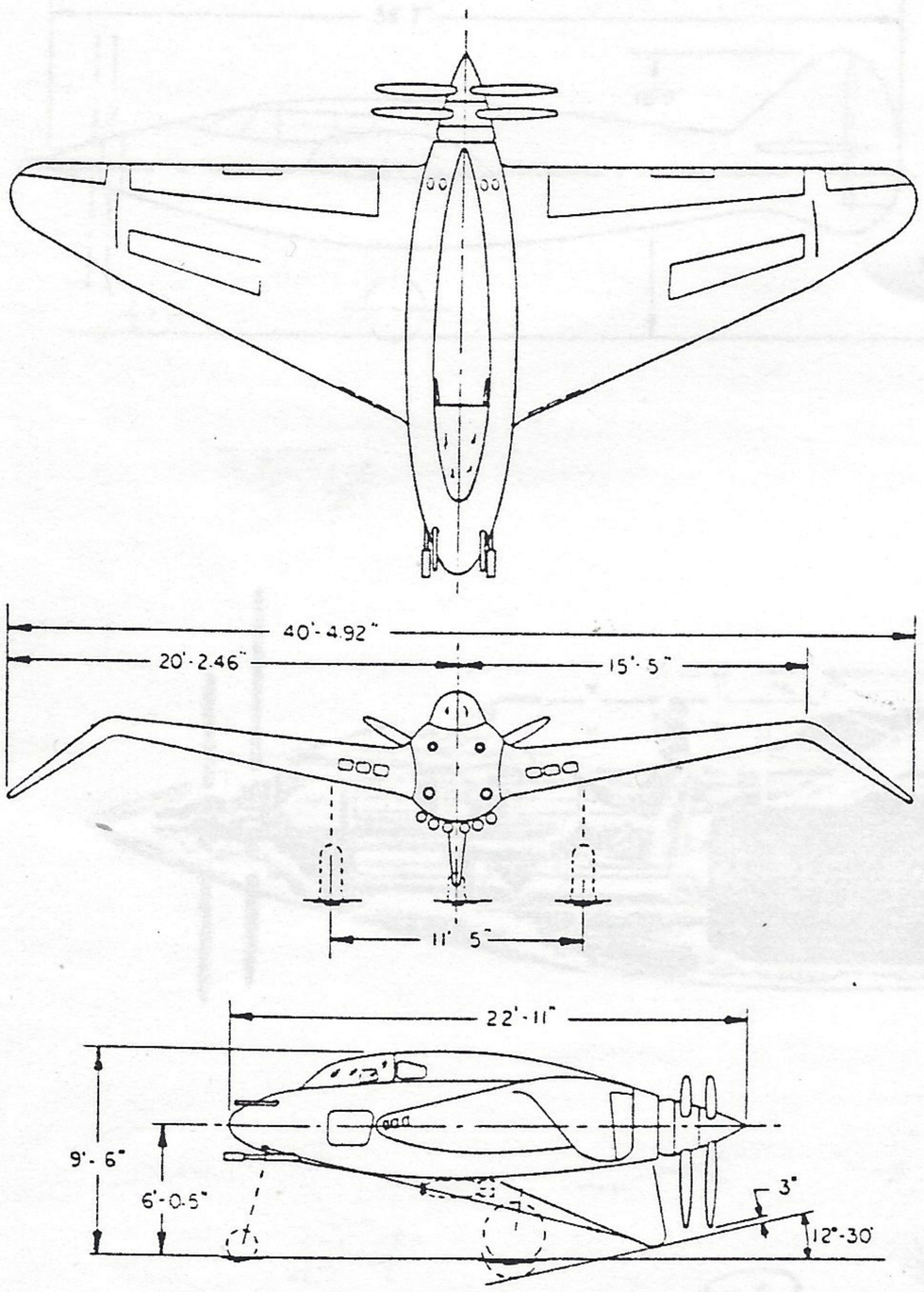


McDonnell Model 1 wind tunnel model; super streamling of the wing and fuselage is evident. Its novel and untried propulsion system weighed heavily against it in the F.Y. 1940 design competition. (McDonnell Douglas Corp.)

Model of a 1938 G.L. Martin pursuit concept. Design was originated while J.S. McDonnell was employed as Chief Engineer of Landplanes. Model design has striking similarities to McDonnell's Model 1 and follow-on Model 2 (XP-67). (McDonnell Douglas Corp.)

McDonnell Model 1 cutaway drawing showing its internal arrangements, especially the unique fuselage engine installation driving two wing mounted pusher propellers. (McDonnell Douglas Corp.)





Northrop Model N-2, N2A, N2B

its day for the speed ranges envisioned. Wind tunnel testing of the XP-67 indicated that the drag reduction expected from super streamlining was lost by the added frictional drag from the excessive wetted-area of the large fairings employed.

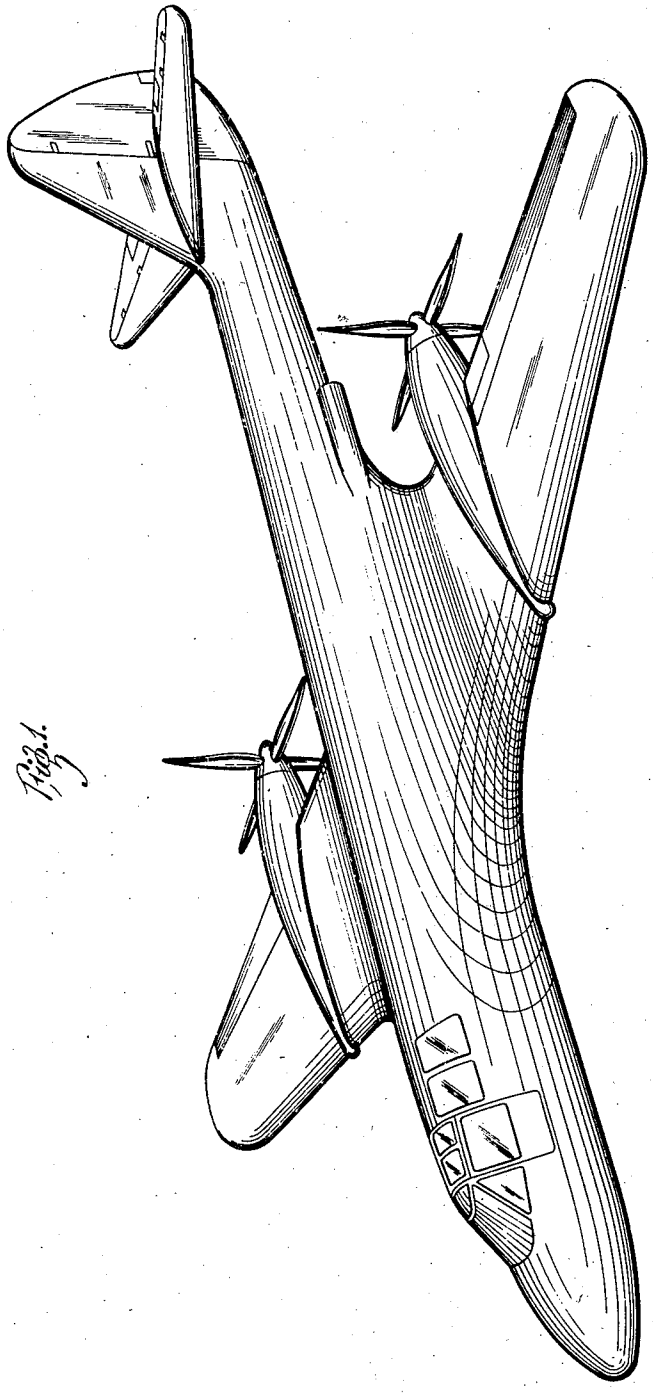
It is interesting to note that the possible origin of the concept of the Model 1 could have resulted from J.S. McDonnell, Sr.'s work at the G.L. Martin Company in 1938 where he was employed as the Chief Project Engineer of the Landplane Division. A model made by a Mr. Lyle Farver in 1938 for Martin is very similar to the McDonnell Model 1, except for the use of tractor propellers and a fully faired nose and cockpit. The propeller mounts/nacelles are obviously too small for any known engine of suitable power at that time. This would suggest a fuselage mounted engine and drive shaft arrangement similar to the one featured in McDonnell's Model 1 pusher configuration.

Northrop Aircraft, Inc. — The fledgling Northrop Aircraft, Inc. (John K. Northrop's fourth venture into an aircraft company), against a background of subcontracting Consolidated PBY empennages, established its second company project, N-2, in response to the FY 1940 fighter competition. Project N-2 was essentially a flying wing compromised by a short nacelle to house pilot, engine and ordnance. Submitted as proposals N-2, N-2A, N-2B, N-2C, and N-2D, the designs were similar in appearance, varying only in weight and engine installation. Engine installations were the P&W R-2800-A5G, the P&W X-1800-A2G, the X-1800-A3G, the Allison V-1710-E9, and the P&W R-1830-C5G respectively. All engines, except the Allison V-1710-E9, required extension shafts. Two-speed, gear driven supercharg-

Nov. 24, 1942. J. S. McDONNELL, JR Des. 134,425

PURSUIT AIRPLANE

Filed Feb. 18, 1942 2 Sheets-Sheet 1



INVENTOR:
J. S. McDonnell, Jr.,
by Cravath Swaine & Moore,
His ATTORNEYS.

Nov. 24, 1942. J. S. McDONNELL, JR Des. 134,425

PURSUIT AIRPLANE

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Fig. 2.

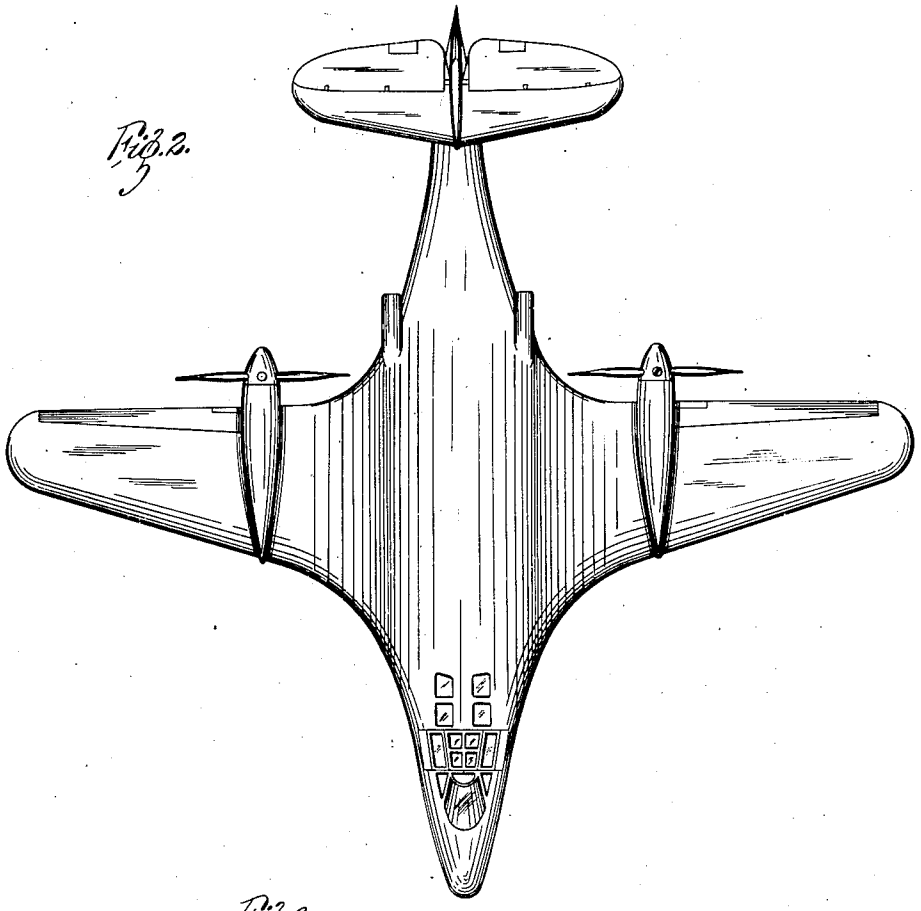


Fig. 3.

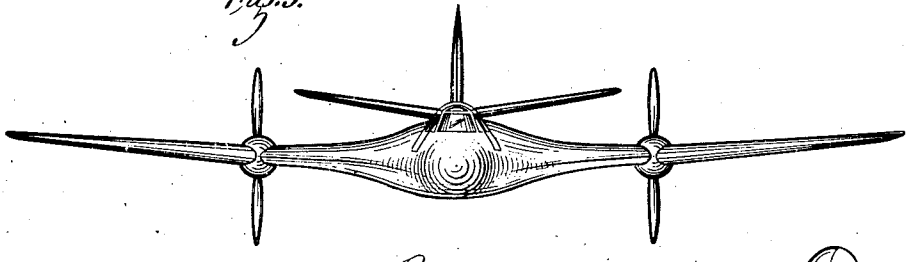
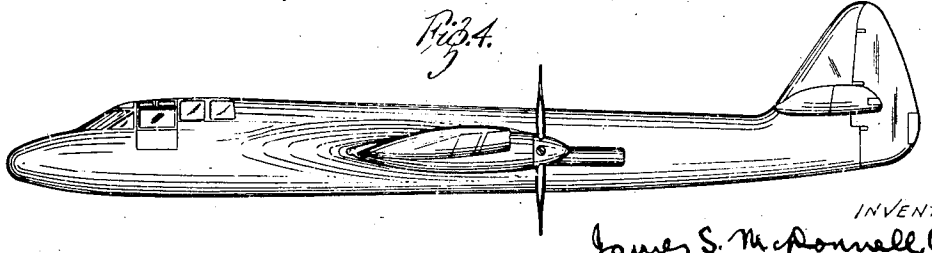


Fig. 4.



INVENTOR:
James S. McDonnell, Jr.,
by Carlton Sprague,
HIS ATTORNEYS.

Patented Nov. 24, 1942

Des. 134,425

UNITED STATES PATENT OFFICE

134,425

DESIGN FOR A PURSUIT AIRPLANE

James S. McDonnell, Jr., Clayton, Mo., assignor to McDonnell Aircraft Corporation, St. Louis, Mo., a corporation of Maryland

Application February 18, 1942, Serial No. 105,858

Term of patent 14 years

To all whom it may concern:

Be it known that I, James S. McDonnell, Jr., a citizen of the United States and a resident of Clayton, in the county of St. Louis and State of Missouri, have invented a new, original, and ornamental design for a Pursuit Airplane, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

Fig. 1 is a top perspective view of a pursuit airplane showing my new design,

Fig. 2 is a to plan view,

Fig. 3 is a front elevational view; and

Fig. 4 is a side elevational view.

I claim:

The ornamental design for a pursuit airplane, substantially as shown.

JAMES S. McDONNELL, JR.