

ORIGINS OF THE BELL AIRACUDA

by Birch Matthews

This article is an excerpt from "Cobra - Bell Aircraft Corporation: The First Decade," a book written by Birch Matthews and published by Schiffer Publishing Ltd.

PREFACE - The XFM-1 multiplace fighter was the first indigenous design built by the Bell Aircraft Corporation. To the men and women of Bell, it was their Model 1 and the predecessor of many more future designs. Although what became known as the Bell Airacuda never went beyond production of a prototype and 13 service test models, it was a noteworthy turning point in the fortunes of both Larry Bell's brand new company and that of the Army Air Corps. The XFM-1 contract placed the company in the arena of military aircraft manufacturers. The significance of this airplane, however, extends beyond the parochial interests of a single company. Of much more importance is the fact that it represented a revitalization of Army pursuit interceptor aircraft development in an era when belief in the heavy bomber reigned supreme. The XFM-1 also embodied a dawning realization that more and heavier weapons were needed to engage large all-metal bombers. And finally, the XFM-1 was the first fighter specifically designed around Allison's V-1710 liquid-cooled engine, a powerplant destined to play a major role in World War II.

Virtually every history of the Bell Airacuda notes that the company was formed in July, 1935, and designer Bob Woods immediately embarked on what became the XFM-1. Actually, Woods conceived of the multiplace fighter design at least one year earlier and summarized his analyses and thoughts on paper in the form of a rather detailed three-view layout drawing. Although not precisely the same as the final XFM-1 design, the basic configuration including armament was established. All of this activity occurred while both Larry Bell and Bob Woods were employed by Major Reuben Fleet's Consolidated Aircraft. One suspects Woods privately developed his multiplace fighter concept — the drawing was made on a plain piece of paper sans any Consolidated identification — although it may well have been an idea summarily rejected by Fleet.¹ Woods was presumably aware that Larry Bell was fascinated with the idea of forming his own company, a thought process Larry began in 1933. Equally intriguing, an Air Corps pursuit pilot also advanced the idea of a heavily



armed twin engine fighter at about the same time. This was Captain Harry Johnson, an Army aviator of some renown. Whether Woods and Johnson knew each other is unknown, though quite possible. Johnson's concept of a multiplace fighter differed somewhat from that of Woods suggesting both men arrived at the same conclusion independently. Nonetheless, the multiplace fighter got off the ground, both figuratively and literally, through the efforts of both Woods and Johnson. The only missing ingredient was persuasive salesmanship and this was provided by the irrepressible Larry Bell.

THE DESIGNER - Robert J. Woods was a big amiable man with the soft, round facial features and eyes more readily associated with a kindly school teacher. He was a jovial raconteur and loved to regale friends with anecdotes about his many interests ranging from aviation and model trains to motorcycle riding. At first glance one might hardly imagine this portly 30



year old graduate from the University of Michigan was a rising star in the small Army Air Corps community which existed in the early 1930s. If one word could describe the designs emanating from Bob Woods' drawing board, it was innovative. His Consolidated P-30 two-place all-metal pursuit airplane with its cantilevered wing and high altitude performance marked the very beginning of more modern fighters in the Army's inventory.

The vital importance of Bob Woods to the formation and early growth of Bell Aircraft cannot be overstated. There was possibly no other pursuit airplane designer in the country who could have generated the fresh thinking and non-traditional design concepts that attracted Air Corps attention to the neophyte company. Larry Bell's vaunted reputation as a salesman would have been ineffectual without the designs of Bob Woods. To his everlasting credit, Larry recognized and fostered the talent of his young designer. Together, they were a perfect

The XFM-1 is shown here at the Buffalo Airport during an engine ground test. Blower under the left wing supplied radiator cooling air. (Bell via Matthews collection))

team and this mutual strength allowed Bell Aircraft to become established and grow even in the worst of economic times.

1934 DESIGN STUDY - Bob Woods conceived a revolutionary airplane design intended to intercept and destroy high altitude enemy bomber formations using extremely powerful cannon armament in an age when .30 caliber machine guns were standard offensive weapons for pursuit planes. This was in 1934, nearly *two years* before the XFM-1 Airacuda contract was awarded. Even more interesting, he was then working for Consolidated Aircraft. Woods was aware of the new Allison V1710 liquid-cooled engine development program and selected a pair to power his multiplace fighter design. The Allison

were turbosupercharged and supposedly capable of developing 1,100 horsepower at 2,600 revolutions per minute to a rated altitude of 15,000 feet. Each engine, driving a pusher propeller, was mounted in a wing nacelle. The forward end of each nacelle was armed with a flexible 37 millimeter aircraft cannon. This was potent firepower. Woods' 1934 design was in fact the first configuration of what evolved into the Bell Model 1 *Airacuda*.

The 1934 preliminary design represented a quantum leap forward considering what was then available in Army pursuit airplanes (Table 1). Two of the three pursuits in service at the time Curtiss' P-6E and Boeing's P-12E - were partially fabric covered open cockpit biplanes reminiscent of World War I fighters. The most modern of the three was Boeing's P-26A, a low wing airplane design that still clung to externally braced flying surfaces as well as an open cockpit. All three pursuits had fixed landing gear. Only the P-26A managed to break the 200 mph barrier. Collectively they would be no match for the high flying, heavily armed long range bombers then being contemplated by Army Air Corps leaders.

Woods understood the limitations of contemporary fighter airplanes. He had designed the most recent pursuit in service, Consolidated's P-30 two-place interceptor. These airplanes came of line at the beginning of 1934, and were followed in quantity by the P-30A (subsequently redesignated PB-2A) in 1935. They were aerodynamically clean incorporating retractable landing gear, cantilever flying surfaces and semi-monocoque all-metal construction. A turbosupercharged 700 horsepower V-1570-61 *Conqueror* engine pulled the P-30A up to a rated altitude of 25,000 feet and a maximum speed of 275 mph, an 18 percent increase over the aging P-26A. The P-30/PB-2 airplanes set a design trend for years to come.

Woods believed he could significantly improve on the Consolidated pursuit, but not with the old Curtiss *Conqueror*.² The Army's new Allison V-1710 engine, first demonstrated at 750 horsepower, was now delivering around 1,000 horsepower and gave promise of more to come. The immediate goal was 1,100 horsepower. Even at 1,000 horsepower, this engine provided an enterprising designer with a sizable 43 percent power increase over the best *Conqueror* engine. For what Bob Woods envisioned in 1934, however, even 1,100 horsepower was insufficient. The answer was not one V-1710, but two packaged in a streamlined airframe utilizing twin vertical tail surfaces, reminiscent of contemporary Lockheed designs. Woods required over 2,000 horsepower because the airplane he envisioned would weigh in at a hefty gross of over 11 tons (see Table 2), radically high by contemporary fighter airplane standards. He needed a design of this proportion to accommodate the planned offensive armament: two type M4 37 millimeter aircraft cannon capable of hurling 1.25 pound projectiles at a muzzle velocity of 2,000 feet per second over a range of 4,000 yards.

The multiplace fighter was to be a veritable flying battleship. In addition to offensive armament, Woods included six machine guns for defense (either .30 or .50 caliber). Two fired in the forward direction from flexible side turrets in the nose of the massive fighter. Four more flexible guns provided defensive coverage to each side of the fuselage as well as from above and below. A crew of five would man the airplane. In addition to the pilot, there was an aircraft commander who also served as navigator and copilot. A gunner was positioned in

TABLE 1 - AIR CORPS PURSUIT AIRCRAFT IN SERVICE DURING 1935

Type	Max Speed	Engine	Yr 1st Del	Remarks
P-6E	193 mph @ Sea Level	V-1570-23 600 hp	1931	Open cockpit, fabric covered biplane, fixed landing gear
P-12E	189 mph 7,000 ft	@R-1340-17 500 hp	1931	Open cockpit biplane, fabric covered wing, fixed gear
P-26A	234 mph 7,500 ft	@R-1340-27 800 hp	1934	Open cockpit, externally braced monoplane, fixed gear

Source: Ray Wagner, "American Combat Planes", 3rd edition, Doubleday & Company, Garden City, New York, 1982.

TABLE 2 - PRELIMINARY DESIGN CHARACTERISTICS 1934 MULTIPLACE FIGHTER

Empty Weight	11,600 lb	Crew - Five	1,000 lb
Fuel - 1000 Gal	6,000 lb	Oil - 60 Gal	450 lb
Normal Gross Weight	23,000 lb	Wing Span	90 ft - 0 in
Wing RArea	1,300 sq ft	Overall Length	56 ft - 10 in
Allison V-1710 (2)	2,200 hp	Power Loading	10.45 lb/hp
Armament	3,600 lb	Radio	200 lb
Pyrotechnics	100 lb	Wing Loading	17.7 lb/sq ft
Misc. Equipment	50 lb	Total Useful Load	11,400 lb

Source: Drawing dated 19 September 1934 by Robert J. Woods.

TABLE 3 - MILITARY AIRCRAFT PURCHASES 1926-1936 (COMBINED ARMY & NAVY)

Year	Units Sold	Value
1926	552	\$6,154,000
1928	1,219	19,066,000
1930	747	10,723,000
1932	593	10,389,000
1934	437	8,837,000
1936	1,141	27,836,000

Source: Irving B. Holley, "Buying Aircraft", U.S. Government Printing Office, 1964.

TABLE 4 - WRIGHT FIELD STUDY - MULTIPLACE FIGHTER

Design Number	No. 301	No. 313
Engines	Two - R-1820-17 675 hp @ 10,000 ft	R-1535-5 700 hp @ 9,000 ft
Gross Weight	12,646 lb	8,030 lb
Fuel & Oil Load	3,045 lb	1,020 lb
Crew	4	2
Armament	Five .30 cal. flexible machine guns	Two .30 cal. fixed, One .30 cal. flexible, One .50 cal. fixed machine guns
Bombs	Twenty 17 lb bombs	Ten 17 lb bombs
High Speed	205 mph	273 mph
Operating Speed	175 mph	233 mph
Rate of Climb	1,180 ft/min	3,300 ft/min
Endurance	6.1 hours	2 hrs + 1 hr with overload
Service Ceiling	21,00 ft	35,000 ft

Source: Lt. Col. H.C. Pratt, Division chief, Materiel Division, in correspondence to the Chief of the Air corps, 16 February, 1935.



each engine nacelle and a third manned machine gun positions in the aft fuselage and doubled as the radio operator.

Early photograph of the Bell XFM-1 taken at the Buffalo Municipal Airport possibly before first flight (Bell via Matthews collection)

DEPRESSION CONSIDERATIONS - A large multiplace fighter by its very nature was an expensive piece of machinery for the Army to buy in the midst of the Great Depression. Military aircraft purchases, never abundant following World War I, were in steady decline after the stock market crash of 1929, as illustrated in Table 3. Only 437 military airplanes of all types were procured in 1934, for the combined Army and Navy air services. With skimpy budgets, the Air Corps lived on meager rations during the 1930s. Bob Woods and Larry Bell were acutely aware of this fact. Their first design needed to be versatile as well as innovative and capable of replacing several current or planned aircraft if it was to be financially attractive. As a consequence, Woods envisioned his multiplace fighter in various other configurations suitable for bombing, ground attack, chemical weapons delivery and long range patrol depending upon the useful load employed.

Air Corps planners routinely assessed future requirements and formulated requests for design studies or invitations to aircraft companies to build and submit prototypes for Wright Field evaluation. The burden of funding prototype airplanes fell upon the manufacturers. Unlike today, there was little likelihood of any profit in research and development. If the Army accepted a manufacturer's product, it was then purchased, hopefully accompanied by a production order. A significant example of this operating mode is found in what became the Boeing B-17 bomber. The Air Corps was interested in long range, high altitude bombers in 1934, and indicated that manufacturers wishing to respond should build an example - at no expense to the Army. This approach eliminated all but the financially strongest competitors. On the other hand, the military represented a major customer. In this respect, it was the only game in town and you had to pay to play. Once competing prototypes were built, they were evaluated and a winner

selected. A successful design might then be placed in open competition for a production contract, a rather disquieting possibility for the originating contractor.

Boeing aggressively sought the heavy bomber business promised by Air Corps interest in this weapon. The company was busy studying such an airplane and proposed their Model 299 design which promised to be far in advance of anything then flying. In a formidable demonstration of confidence and entrepreneurial risk, the Boeing board of directors agreed to build a prototype to the tune of \$600,000, a huge sum in 1934. The airplane became an immense success thus vindicating Boeing management's decision.

ENTER CAPTAIN HARRY A. JOHNSON - Fortunately for Bell Aircraft, the multiplace fighter program began a different way. Historian Walter Boyne relates that "Hap Arnold had, as early as 1933, expressed his disappointment in the performance of single- place pursuit aircraft as a bomber interceptor. He wanted to see a heavily armed, multiplace fighter developed, one which could destroy a bomber in a single pass."³ As DeWitt Copp noted, Henry H. Arnold was one of A Few Great Captains in the Air Corp and his comments received attention.⁴ If Arnold didn't plant the multiplace fighter seed, he at least gave it nourishment. Perhaps in response to Arnold's concerns, the Materiel Division at Wright Field initiated a 1934 study and reported results in a January 1935 letter to the Chief of the Air Corps, Major General Benjamin D. Foulois.⁵ Wright Field's study evaluated two designs. The first (design 301) was a modified B-10 airplane "used as a bombardment accompanying weapon." The second design, designated 313, was "a two-place pursuit type designed to meet the requirements of the latest Air Corps Directive for pursuit" aircraft. Table 4 summarizes the study results and illustrates that performance



and armament characteristics of both concepts were not particularly impressive and could hardly have been expected to climb, overtake and destroy bombardment aircraft anticipated in the near future. The Wright Field deliberation concluded that "a multi-seat fighter version of the Martin B-10 bomber, and the problem of carrying the required weight of fuel and ammunition in a structure stressed for pursuit design factors seemed insurmountable."⁶ Their conclusion was not unwarranted within the constraints of the study. It simply suffered from a lack of imagination and not enough horsepower.

The Martin B-10 all-metal monoplane first flew in prototype form during 1932. In its heyday, this airplane was quite impressive and capable of outperforming the Army's best contemporary pursuits, a matter of some concern to Hap Arnold and perhaps embarrassment to others. The production version B-10B bomber was powered by a brace of Wright R-1820-33 air-cooled radial engines each capable of delivering a maximum 750 horsepower. With a gross weight of 14,600 pounds, the B-10 had a power loading of 9.73 pounds per horsepower. Bob Woods' concept, in contrast, had the advantage of more powerful engines in a much cleaner airframe and even with an estimated gross weight of 23,000 pounds, its power loading was within about seven percent of the Martin bomber. Tasking a briskly maturing 1931 design to perform as a multiplace fighter simply exceeded its inherent capabilities. The B-10 was old technology in a rapidly advancing field. Design number 313 used in the Wright Field study was only marginally better, lacking adequate speed, altitude performance and armament.

Roughly coincident with the Wright Field study, Captain Harry A. Johnson, an Air Corps pursuit pilot of some renown, submitted through channels a three page letter recommending "a multiengine, multi gun fighter."⁷ Johnson envisioned a design armed with no less than four fixed .50 caliber guns in the nose of the airplane, one flexible .50 caliber and two flexible .30 caliber machine guns for perimeter fire. Two engines would be necessary, Johnson believed, to obtain sufficient performance. He worried that his proposal was "radical in the extreme," but felt strongly that a more balanced air force -

bomber advocates were riding high - was necessary and "at least one experimental model (of the multiplace fighter) should be built and tested."⁸

Johnson's letter directly to the Chief of the Air Corps, Major General Foulois, a rather an improbable approach in this day and age, nonetheless received attention. Foulois forwarded Johnson's letter to Wright Field for comments and recommendations. Materiel Division Chief, Brigadier General (temporary) Henry C. Pratt, viewed the idea with skepticism concluding "that such an airplane is not an efficient military weapon, an opinion born out by the comparatively low performance figure of such types," referring, of course, to the recent Wright Field study.⁹ The multiplace fighter received even less enthusiasm from the Air Corps Board at Maxwell Field in Montgomery, Alabama. Board president and commandant of the Tactical School at Maxwell, Colonel Arthur G. Fisher, was basically negative and recommended that "no attempt should be made in this design to include pursuit performance" and the multiplace fighter should only be developed "if it does not interfere in any way with progress in the development of bombardment, attack, observation and interceptor type pursuit" aircraft.¹⁰ Obviously if these other four aircraft categories were struggling along on limited Depression era funding, by definition there would be nothing left for a multiplace fighter. Without overtly recommending that the proposed project be rejected, Fisher clearly let it be known what he thought of the concept. The multiplace fighter now had two strikes against it. One more and it would be out.

Captain Johnson's enthusiastic promotion of heavily armed multiplace fighters appeared on the verge of extinction together with Larry Bell's hopes of forming a company and building such an airplane. Even though the struggle to promote the new fighter was taking place in the months before Bell Aircraft Corporation actually began operations, it is safe to assume that Larry was avidly promoting the idea. The Air Corps and aviation manufacturing communities were small and close knit in those days.

Exactly when Larry first learned about the multiplace fight-

This full front view of the XFM-1 illustrates the size of the multiplace fighter compared to the man under the right wing. (Bell via Matthews collection)

This unusual full rear photograph reveals details of the XFM1 design. Wing openings outboard of nacelles exhausted air flow from Prestone radiators. (Bell via Matthews collection)

er idea is unknown. What is understood, however, is Larry's role in subsequently selling the concept to the point where an Air Corps requirement was issued, the first step in a procurement process. By his own words, Bell was busy promoting the revolutionary design with Major Oliver P. Echols who became Chief of Engineering Branch at Wright Field late in 1934.¹¹ Echols apparently felt that Bell's preliminary designs and ideas had merit even if some at Wright Field did not. It was Echols who told Bell about the need for an official requirement before any procurement action could take place.¹² The key to promulgating a requirement resided at Langley Field with Brigadier General Frank M. Andrews. At the time of his appointment to command the recently formalized General Headquarters (GHQ) Air Force on 1 March 1935, Andrews was accorded the temporary rank of Brigadier General.

Larry wasted little time getting to Virginia. He quickly arranged to present his ideas to Andrews. It was not an easy job. In his own words he was having "a helluva time with General Andrews and his staff."¹³ Bell recalled years later that in one large meeting, someone put forth the idea that the airplane "ought to have some guns in the back" in addition to the forward firing 37 millimeter cannons. The meeting rapidly disintegrated into a preoccupation with this notion much to Larry's increasing consternation:

"I thought anyone would have sense enough to know that you didn't need guns in the back (of the multiplace fighter) if you went fast enough. In that tense moment when I was stuck, it sort of inspirationally came to me, and I said, 'that makes about as much sense as putting teeth in the ass of a tiger.'"¹⁴

Larry's earthy though vivid metaphor broke the rising tension and no doubt evoked some laughter, but it would be several more days before he learned if his analogy and more important, the multiplace fighter concept, was accepted. After several hectic meetings, the General invited Bell to play a round of golf at historic Yorktown in the southeastern part of Virginia, site of Cornwallis' surrender to George Washington during the American Revolutionary War. The golf game was followed by a formal dinner at the General's home. Larry tells what happened next:

"The party was all assembled. There was a big cut glass bowl full of punch. General Andrews poured a glass of punch for me, and one for himself, and said, 'I would like to drink a toast.' So everyone snapped to attention, his staff and their wives, and I did too. I had no idea who the hell the guest of honor was supposed to be, who the toast was for, or anything else, but General Andrews said, 'I just want to drink a toast to Larry Bell, the best goddamned salesman in the airplane business.'"

The tide turned in favor of the multiplace fighter. Andrews weighed in on the side favoring this new type of airplane and he was about to issue the requirement document, so vital to Larry and his fledgling company. The General rationalized a requirement by drawing a distinction between the pursuit airplane and a fighter, thus circumventing the negative comments

of Pratt at Wright Field. Fisher's comments on priority were simply brushed aside. Rank truly does have its privileges and besides, GHQ Air Force was the customer. Foes of the multiplace fighter viewed it as impractical because it was too large and too heavy. The weight problem would be compounded, they maintained, by a perceived need to design the airframe to pursuit limit load factors thereby requiring a more robust structure. Andrews reasoned, on the other hand, that multiplace fighters need not be designed to pursuit load factors and that lack of maneuverability was not a constraint; rather, multiplace fighter missions would consist of long range patrols providing a first line of defense against fleets of attacking bombers. These cannon-armed airplanes would close with the enemy and begin firing at great range and with heavy firepower. What Andrews envisioned almost 60 years ago was a forerunner of aircraft standoff weapons employed today.

If the patrolling multiplace fighters were unsuccessful in blunting the attack, pursuit interceptors would be alerted and ordered up to finish the job. The inherent short range of pursuit aircraft would not be a handicap (in theory at least) for by that time, the Air Corps would know where the enemy was located and have sufficient warning to make a direct intercept. Although this line of reasoning had a logical ring at the time, its utility would prove highly questionable come 7 December 1941.¹⁵ In reality, combat radio communications were often tenuous at best, dependent upon vacuum tube technology having an unfortunate proclivity for breaking down at the worst possible moment. Early warning networks and radar were things of the future. Nonetheless, General Andrews went on to conclude that "pursuits and fighters are complementary . . . and regardless of the results of this (multiplace fighter) evaluation it is believed that a definite need for this type of aircraft exists in the U.S. Army, due to the geographical characteristics of sensitive areas (read Panama Canal Zone and our possessions in the Pacific) that require long range coverage."¹⁶

Andrews' strong unequivocal endorsement of the multiplace fighter was a pivotal event in the future of Bell Aircraft





Designer Bob Woods (center in white shirt and white shoes) poses with some of the engineering staff with the XFM-1. (Bell via Matthews collection)

Corporation. Without his support, the probability of Bell remaining in business long enough to become established was problematic at best. This is not to imply that Andrews was a willing accomplice to Larry's ambitions. The General no doubt believed in the potential of multiplace fighters and the tactical role he foresaw. His support for the concept was further beneficial in that it helped counteract an overriding Air Corps focus on heavy bombers at the expense of fighter development. In that respect alone, what became the Bell XFM-1 was a significant step forward as the Air Corps slowly began to modernize. From this perspective, the Bell Airacuda was a conspicuous turning point and worth the cost and effort.

With a requirement in hand (actually it was forwarded to Wright Field) Larry Bell still faced another hurdle. Air Corps procurement policies, periodically subjected to Congressional displeasure, typically required submittal of a sample airplane for evaluation at the manufacturer's expense. Such a process was beyond the financial wherewithal of Bell Aircraft. Again, fate intervened. Once the decision was made to obtain an experimental multiplace fighter, the Materiel Division recommended a funded three-phase procurement (Table 5). Phase one consisted of competitive detailed engineering studies to adequately define the proposed airplane. The winner of this initial study would then build a full scale mockup and perform key component static structural tests during phase two. Phase three was construction of a single prototype airplane. The Materiel Division reasoned that by paying contractors to perform engineering studies and build mockups, the Air Corps would receive "better designs and more detail data before committing to the major expense of a prototype airplane."¹⁷

TABLE 5 - MULTIPLACE FIGHTER PROCUREMENT PLAN

Phase	Task	Estimated Cost
One	Preliminary engineering Studies	\$25,000
Two	Mockup and static testing	\$80,000
Three	Prototype construction	\$250,000

Source: Brig. Gen. A.W. Robins correspondence, 26 August 1935.

THE PROCUREMENT - Amazingly, less than seven months elapsed from the time Captain Harry Johnson wrote his letter to Major General Foulois urging procurement of a multiplace fighter, until the Air Corps Chief requested program approval from Assistant Secretary of War, Harry Hines Woodring. The date was September 3, 1935.¹⁸ Foulois advised his boss that there was money available in the fiscal 1936 Experimental Fund to get the program rolling, and the fiscal 1937 budget request contained additional money for a prototype airplane. Sixteen days later, Foulois received a one word written answer from Secretary Woodring: *Approved*.¹⁹ The 1930s were far and away much simpler times.

The Foulois letter to Secretary Woodring is intriguing in that it recommended competition for the intended multiplace fighter be limited to just two contractors: Bell Aircraft Corporation and the Lockheed Aircraft Company. Foulois told the Assistant Secretary that yes, Bell is a brand new company, but their chief engineer, Mr. Woods, "is responsible for the (Consolidated) PB-2 airplane, which is probably one of the outstanding military airplanes in the world today."²⁰ High praise from the Chief. He further explained that Larry Bell had previously

been general manager for Reuben Fleet and had just taken over Consolidated's vacated Buffalo plant.²¹ In other words, the key elements were in place and Bell appeared qualified to perform the work if a contract was awarded.

In putting forth the idea of using just two competitors, Foulois was actually parroting the words of Wright Field Materiel Division Chief, Brigadier General Augustine W. Robins, who initially proposed this limitation. Justification for this approach is revealed in Foulois' letter to Woodring. He noted that Bell "made a rather complete study of the multi-seat fighter problem . . . and these data have been informally presented to the Air Corps," referring to an extensive four month study prepared by Larry and Bob Woods.²²

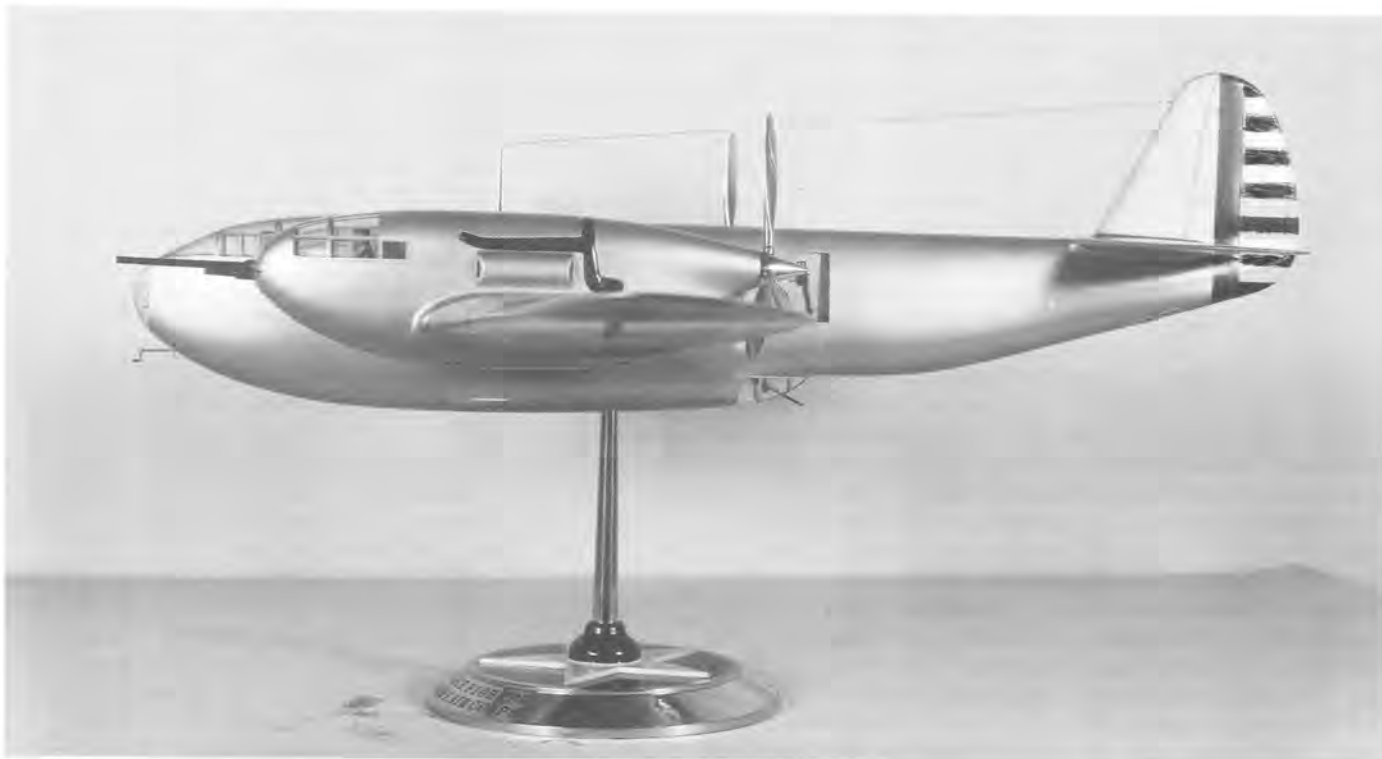
Robins bolstered his case to Foulois for utilizing Bell and Lockheed in the study phase by noting that only these two contractors expressed an interest in the project. Certainly there were other well established aircraft companies with multi-engine design experience. Such firms as Boeing, Curtiss, Martin and Douglas come readily to mind.

Less credible was Robins' final argument and one, it should be noted, not included by General Foulois in his letter to Secretary Woodring seeking project approval. Robins complained that "there is a large amount of work in evaluating designs and the introduction of a third competitor will result in considerable delay as well as an increased cost."²³ This is a curious argument. The delta cost and schedule delay associated with convening an evaluation board to review proposals and then phase one studies from three or four contractors instead of two was trivial relative to the overall cost and perceived significance of the program.

In the face of stern Congressional oversight, however, the Air Corps dared not award a sole source contract to Bell even though the company had developed the multiplace fighter concept to an attractive and innovative state. Competition was key in government procurement and avoiding it was to invite significant political wrath. A second potential contractor was needed and the Army turned to Lockheed Aircraft. Whether or not Lockheed's foray into the multiplace fighter competition was solicited by the Air Corps has been obscured with time. However, Lockheed did evaluate the concept and like Bell, presented their findings to the Army. Lockheed was not then an Army contractor, but could point to a significant amount of manufacturing experience with their *Electra* 10 transport, a point Bell could not make. Lockheed's proposal was based upon their superb twin-engine commercial transport and this provided a sound basis for their multiplace fighter cost estimate. Although Foulois found Lockheed acceptable as a potential source, he did note their multiplace fighter study was "not as advanced and refined" as that provided by Bell.

A cynic might suspect Wright Field did not go to any great lengths to invite competition for the study, preferring instead to explore the unique design proposed by Bell, although this can't be confirmed. Was Lockheed merely intended to be a stalking horse for the Bell design? Surviving references seem to suggest this possibility, although such thoughts are rarely put in writing by career oriented military officers. Ironically, the final Air Corps evaluation results were stunningly close.

Foulois comment about a precursor four month study by Bell provides a glimpse of what was taking place in Buffalo preceding Consolidated's move to San Diego during the spring and early summer of 1935. Putting a finer edge on the matter,



the hand of Larry Bell is now discernible. He and Bob Woods were promoting their airplane concept to anyone in the Air Corps who would stand still long enough to listen. When they first became aware that a potential might exist for an experimental multiplace fighter is hard to say. One suspects it was in late 1934 or early 1935, perhaps while Wright Field was studying the matter. It may well have been sooner if either Woods or Bell learned that Captain Johnson was extolling the same basic idea. If this was the case, Bob Woods could have even been the inspiration for Johnson's letter to the Chief of the Air Corps recommending evaluation of such an aircraft, although their concepts were somewhat different particularly with respect to armament. Remember, the officer corps was a small cadre in those days and it is a fact that Woods began studying the concept most likely during the summer of 1934.

Chronologically, Johnson urged evaluation of a multiplace fighter in his letter of January, 1935. By the end of February, Wright Field published their study of the concept, albeit with an unfavorable conclusion. Based upon the Foullois comments, Woods and Bell were actively evaluating the feasibility of a multiplace fighter for about four months, most likely beginning in April 1935. Lending credence to this scenario is an overlay drawing prepared by Woods dated May 1935. The overlay compared his Allison powered configuration with a more conventional two engine tractor design of 80 foot span. The purpose of this layout was to compare frontal area of the two designs. The origin of the tractor engine design is a mystery. It may have been conceived by Woods, but it might also have been part of a Wright Field study. In any event, inspection of this drawing makes it apparent that Bob's design was far more compact and possessed significantly smaller frontal area and appreciably less wetted surface area than the tractor model. Presumably his design had a more favorable drag coefficient. Woods' drawing was an effective visual sales tool. The bottom

line is that both Woods and Bell were forging ahead with a multiplace airplane design while both were ostensibly still working for Consolidated Aircraft. More to the point, the Bell Airacuda concept was on paper one year before the company opened its doors in July, 1935.

Bell's entry into the military fighter plane arena was indeed based upon an extended study and for that matter, considerable personal promotion. Larry Bell was an excellent salesman, a fact hardly attested to by General Frank Andrews. It was one of his greatest strengths and he employed this skill to advantage months before leaving Consolidated. Confirmation is found in an unpublished 1945 manuscript about Bell corporate history. While still with Reuben Fleet, this manuscript tells how Larry "continued to develop his own plans. He inquired of Army and Navy officials as to their attitude toward a new business in Buffalo; he received no discouragement, though there were no commitments either."²⁴ This was in early 1935, and one imagines Larry wasted little time before testing the waters to ascertain the degree of Army interest in the multiplace fighter studies of Bob Woods.

Who originated the multiplace fighter concept? One really can't be absolutely sure at this late date. The most likely candidate is Bob Woods based on his 1934 design. In Brigadier General Benjamin Kelsey's book, *The Dragon's Teeth*, he unequivocally states there "were instances where contractors researched tactical concepts and possibilities, coming up with proposals that had not yet been formulated as approved military requirements. This source was very real and valuable. For instance, Larry Bell scouted the Air Corps and proposed the multiplace fighter."²⁵ Kelsey makes no mention of Harry Johnson. In any event, Bell and Woods nurtured Air Corps interest in the idea and seized the opportunity to push their version of the concept. Their efforts were rewarded. Bell received Wright Field contract W-535 ac8347 on 30 December 1935.



Two views of a beautifully detailed model of the Bell YFM-1, from the Air Force photo files at Wright-Patterson AFB, Ohio. (R.E. Williams collection)

This was for phase one and the preparation of specifications and a detailed design. The company went on to win phases two and three after an extraordinarily close competition with Lockheed. Bell won the contest by a scant four tenths of a point over the Lockheed proposal. The Air Corps designation for the new multiplace fighter was the XFM-1, but to Larry Bell and his staff, it would always be their Model 1. □

REFERENCES

1. Consolidated had been awarded the P-30 contract after Detroit Aircraft folded; however, their primary thrust was then in the field of flying boats, both commercial and for the Navy.
2. The Consolidated P-30/P-30A were the last two production airplanes to use the Conqueror engine. Curtiss produced the XP-31 powered with a V-1570-53 Conqueror, but only one airframe was constructed.
3. Walt Boyne, "Sky Tiger," *Airpower*, Vol. 1, No. 1, September 1971, p. 22.
4. DeWitt S. Copp, "A Few Great Captains," Doubleday & Company, Garden City, New York, 1980.
5. Transmission of the Wright Field study to the Chief of the Air Corps is documented in a 2nd Endorsement dated 16 February 1935, by Lt. Col. H.C. Pratt, Materiel Division, Wright Field, in response to a letter submitted by Captain Harry A. Johnson who was advocating multiplace fighters.
6. *Ibid.*, p. 24.
7. Correspondence from Harry A. Johnson at the Command and General Staff School to the Chief of the Air Corps, 18 January 1935.
8. *Ibid.*, p. 3.
9. Pratt headed the Materiel Division from July 1930 until 5 March 1935, according to information gleaned by Robert L. Cavanagh from the Air Corps News Letter, Vol. XVIII, No. 5, 15 March 1935. Pratt's permanent rank at that time was Lieutenant Colonel; however, he carried the temporary rank of Brigadier General as head of the Materiel Division. Pratt's successor was (temporary) Brigadier General A.W. Robins. Robins apparently could not assume command immediately for he was then attending the War College. Pratt apparently continued in charge of the Division at his permanent rank until Robins arrived. This explanation was offered to the author by R.L. Cavanagh in correspondence dated 6 March 1995.
10. Correspondence from Colonel A.G. Fisher to the Chief of the Air Corps in the form of a 3rd Endorsement to Johnson's letter, dated 15 July 1935.
11. Air Corps News Letter, Vol. XVIII, No. 5, p. 127. Information provided courtesy of Robert L. Cavanagh in correspondence to author dated 6 March 1995.
12. Larry Bell recorded interview during a trip to Phoenix, Arizona, circa 1946. The interview was transcribed by the Bell public relations department and furnished to Walter Boyne via correspondence dated 25 January 1971.
13. Bell recorded interview, *op.cit.*
14. *Ibid.*
15. In reality, only the perfection of radar finally provided a measure of early warning against aerial attack. Even sophisticated radar systems are imperfect and only asymptotically approach a complete solution to the fundamental problem.
16. Fisher correspondence, *op.cit.*
17. Correspondence from Brigadier General A. W. Robins to the Chief of the Air Corps, 26 August 1935.
18. Correspondence from Major General B.D. Foulois to the Assistant Secretary of War, 3 September 1935.
19. *Ibid.* See first endorsement on page 3.
20. Foulois letter to Harry Woodring, *op.cit.*, p. 2.
21. Fleet moved his operations out of Buffalo during the summer of 1935, and relocated in San Diego.
22. *Ibid.*, p. 2.
23. Robins correspondence, *op. cit.*
24. Bell Aircraft Corp., "An Aviation Story," Tenth Anniversary Edition, July 1945, p. 16. This was a private publication by Bell Aircraft to commemorate their 10th anniversary. In a foreword, Larry Bell wrote: "Ordinarily one does not write the history of a company ten years old. But the ten years which began in July, 1935, were filled beyond ordinary measure with events destined to shape the course of the world for generations to come." Bell was right as world events overwhelmed everything else. Because this history was written such a relatively short time after the company was founded, it is considered an excellent source document especially with respect to event dates and statistics in general. In addition, all of the principals were alive and still working with the company.
25. Benjamin S. Kelsey, "The Dragon's Teeth," Smithsonian Institution Press, Washington, D.C., 1982, p. 55.

ABOUT THE AUTHOR

Birch Matthews joined the AAHS in 1960 and has contributed ten previous articles to the JOURNAL on the subjects of Bell airplanes, air racing, Merlin racing engines and racing fuels. This article is an excerpt from his third book which is about the history of Bell Aircraft Corporation during its first decade. A past AAHS president and ten year member of the Society's board of directors, Birch has also written historical articles for several newsletters, numerous technical papers, and was a contributing author for two technical books. He is now retired after working for TRW in various engineering capacities over the past 29 years. He lives with his wife and daughter on the Palos Verdes Peninsula in Southern California.