ON A FLYING WING AND A PRAYER

PUSHING THE EDGE OF THE ENVELOPE

BY **GENERAL ROBERT L. CARDENAS, USAF (RET.)** AS TOLD TO AND WRITTEN BY **JAMES P. BUSHA**

SPRING, 1944. My head wound had healed but my back was still killing me when I jumped off the train in occupied France. I had recently escaped from neutral Switzerland after being blown out of my B-24 Liberator while making my 20th bomb run into Germany. Although I landed on the German side of the lines, I was able to swim to the Swiss side of the border where I was interned for a short time before making a run for it. Technically speaking, I wasn't supposed to be in Europe at all. I'd made my way to England in 1943 under false pretenses by ferrying a Douglas C-54 Skymaster from the United States. I had orders to return to Wright Field where I was a flight evaluation test pilot, but I got sidetracked and conned my way into the 44th Bomb Group as a pilot. That's what I was doing when my luck ran out.

Back Home Things Had Changed

I became a guest of the French underground and slugged it out with the Germans on the ground until D-Day. Then all hell broke loose, and a month later I was on my way back home to Ohio via England aboard a C-47. When I rejoined the Flight Test Division at Wright Field, a lot had changed since I'd left. One of the most notable was the fact that propeller driven aircraft were not the fastest thing in the skies anymore, as the jets began to take over.

Actually, my first encounter with a jet was somewhere high over Germany as I was returning to England from another bombing mission. An Me 262 came sneaking up behind me so damn fast that I thought I had stalled the Liberator out! That was the first time I'd witnessed the new propulsion system and realized that our vast and superior air armada was obsolete. I had the pleasure of flying and evaluating some of the captured Luftwaffe jets over the skies of Ohio that included the Me 262 and the Arado 234, and I quickly joined the ranks of many others who sure were glad the Germans didn't have these at the beginning of the war! But that wasn't the only thing that that concerned the U.S. military and the Prime Minister of England when war broke out.

A Radical New Concept is Launched

There had been a meeting between the United States assistant Secretary of War, the leading generals, and Winston Churchill discussing firm evidence that Hitler was going to invade England. That was of great concern because if the Germans invaded, there would be no air bases in which to continue to fight the war. That night a requirement was born to build an airplane that could fly 10,000 miles and carry 10,000 pounds of bombs. And through that vision was created two very large propeller driven bombers: the XB-35 Flying Wing and the XB-36 Peacemaker. Because of their size and the jet engines on many other new aircraft being developed at that time, a

The second converted XB-35 airframe 42-102368 to YB-29-NO configuration with eight J-35-A-5 turbojets giving it an almost 500mph top speed. (Photo courtesy of Stan Piet)

requirement for longer runways and less populated areas to test them were deemed not only safe, but necessary.

My boss, Col. Albert "Bullet" Boyd, head of flight test division, started sending teams out to the barren California wasteland known as Muroc in the summer of 1946. Glenn Edwards, Danny Forbes and I were one of the first batches sent, and we were called "Los Tres Amigos" which means three friends. We also had a civilian flight test engineer named Richard Smith. Glenn had the Convair XB-46 and I, as chief test pilot of the bomber division, had the North American XB-45 to evaluate. Both Glenn and I shared Danny as copilot, so we had the fun of flying and Dick Smith had all the work of reducing our data into readable form.

Introduction to Flying Wings

We were fooling around with a lot of other things out in the desert during that time, including the small twin-engine pusher Flying Wing called the Northrop N9MA. It was in preparation for my later test work in the XB-49 Flying Wing. I had to wait for Northrop to convert an XB-35 into all jet engines first, and then for the company to finish Phase I research before I took over.

I thought the little Wing was a "cute" airplane, but you had to be very careful on takeoff. I sat way up front on top of the Wing, so when I took off and the Wing tilted upward, even two degrees, it felt like I was going over backwards. I immediately shoved the stick forward and the nosewheel

General Cardenes stands by a war prize Arado 234 that he flew while stationed at Wright Field after WW II. (Photo courtesy of James P. Busha)

hit the ground—I felt like a jackrabbit bouncing down the runway. Another feature I had to get used to was the Wing had no tail, so the rudder pedals were used differently. I could shove both pedals in at the same time with no noticeable change in my flight. But, when I kicked the right rudder or left pedal separately, it activated a split flap out on the wingtip that created drag. The drag at the end of the wing then turned me about the wingtip. I didn't know the difference after flying it for a while and just got used to it.

In 1947, as I waited for the XB-49, we shifted gears and took aim at the "brick wall" known as the sound barrier. Col. Boyd selected me as operations officer and command pilot of the B-29 that dropped Chuck Yeager. He'd been strapped in the Bell X-1 as he punched through the sound barrier. The scientists assigned to the project included members from MIT, Caltech, and NACA (forerunner of NASA) and they thought we were moving way too fast. NACA even called us "a bunch of cowboys." In a way I guess we were, but we were test pilots and damn good ones to boot! The X-1 program was a success, but it didn't last too long, so by the end of 1947 I was beginning my next project: the Northrop XB-49 Flying Wing.

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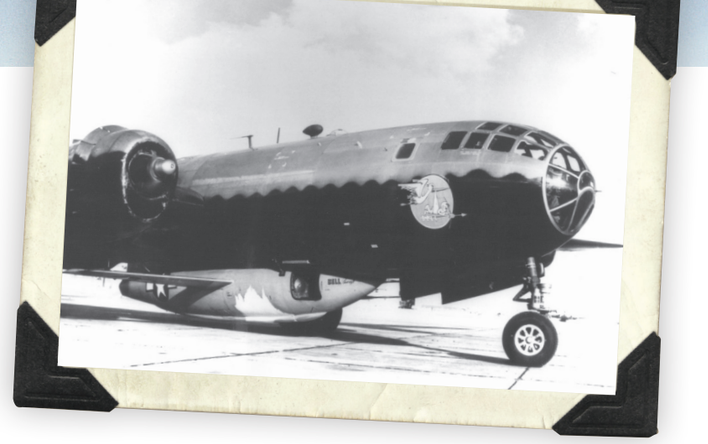
The Northrop X/YB-35 programs was beset with numerous technical problems that saw its production cancellation as early as 1944, but engineering development continued to aid in the jet-engine post-war YB-49 series. (Photo courtesy of Stan Piet)

Enter the Jet Wings: They Were Different Birds!

I was supposed to have flown the prop version of the Wing called the XB-35, but I was too busy with the X-1 project. Besides, I had told Col. Boyd that any engineer who put a propeller out on the trailing edge of a wing did not deserve to keep his diploma! The air coming over the top of the wing is a different temperature, velocity, and dynamic pressure than that coming under the bottom. Those little propeller blades had to cut through two different air masses in micro seconds and that caused flutter—same thing they found on the B-36 Peacemaker. I told Col. Boyd I would not fly the XB-35 unless they put jets in it. They did, and I did, as I began Phase II testing at Muroc.

Northrop supplied us with two of the all-jet Flying Wings. YB-49 no. 42-102367 was instrumented for stability and control while YB-49 no. 42-102368 was built for performance flight tests. I was checked out in no. 367 by Northrop test pilot Mr. Max Stanley, a really good pilot and all around nice guy. Checking out a new pilot in the XB-49 was no easy task. The pilot sat up high with his head looking out of a bubble while the copilot seat was buried in front, below where the pilot sat. Max gave me his blessings and in early 1948 my crew—copilot Danny Forbes and flight engineer Sgt. Cunningham—took delivery of no. 368 and flew it from the Northrop factory at Hawthorne to Muroc (70 miles) in 20 minutes to begin military performance flight tests.



While waiting for the XB-49 Wing to be completed, Cardenas became the operations officer of the team that broke the sound barrier and was command pilot on the B-29 that dropped Yeager in the Bell X-1A.

My early tests consisted of finding out what was the best takeoff speed, climb speed, stall speeds, opening of bomb bay door speeds, and landing speeds. Every one of the tests had their own set of problems. Some were minor in nature,

Nice rear look at the massive flap and flaperon control systems of the innovative Flying Wing design. (Photo courtesy of Stan Piet)

while others almost killed me! For example, on my first takeoff in the XB-49, the gear doors blew off because the Wing accelerated too rapidly. To prevent that I could either pull the Wing up on takeoff at a high angle of attack, or pull back on the power and wait the minute and a half for the gear to retract. I knew of no pilot who liked to do either one of those on takeoff! The problem was that the entire aircraft was designed and created around the XB-35, which of course was powered by propellers and operated at slower speeds. The only thing Northrop did was to swap prop engines for jets, and of course the speed of the Wing increased.

I knew in a stall I wouldn't get a big shudder because most of the shudder you get in a stall comes from the tail, not your wing.

After takeoff, I would reach my cruising altitude and level off. In level flight I began to rock back and forth in my seat, in unison with the fuel sloshing around behind me, stored in a big rubber bag, buried inside.

Next I tried opening the bomb bay doors, and lo and behold they were sucked right off! But the worst was yet to come as I ran the Wing through a stall test.

A Test Pilot's Nightmare

I consulted Paul Bickle, who was the chief engineer at Wright Field, and he told me I was never going to get a clean stall with this airplane. Paul said the wingtip would stall first because there was not enough sweep. Paul also told me that since my rudders were out on the wingtip, in the split flaps, they also acted as trim tabs. He then told me to trim the entire split flaps either up or down instead of splitting them, and this would give me the trim control I needed. I was to try it his way instead of using the yoke, and hopefully I might get a full wing stall. I not only got the stall, but I also got the ride of my life!

I brought the XB-49 to 20,000 feet and pulled back on the throttles as I waited for the Wing to stop flying. I knew I wouldn't get a big shudder because most of the shudder you get in a stall comes from the tail. As the Wing quit flying, there was no hint of a shudder, and I had no clue what was going to happen next. It gave a lurch, went over backwards, and started tumbling. It was as if you took a nice crisp clean dollar bill out and let it go, watching it spin around its center. The engineers called it a lateral roll and said I had encountered inertial coupling, but the horrible truth was I no longer had any control of the airplane, and that reality hit me right between the eyeballs.

I had no time for prayers and no aerodynamic control. I am alive today because the throttles were not down on the console where they normally are, but were mounted up above my head. There were two handles, one for the four left engines and one for the four right engines, just an arm's length away. I was able to grab hold of the left throttle and applied full power as four powerful jet engines roared to life and wheeled me over like a cartwheel. I was thrown into an aerodynamic range of a flat spin, and that was one thing I knew how to get out of. I recovered at about 800 feet over the ground at Muroc.

After I landed I wrote a one-page report that stated, "This aircraft is never to be intentionally stalled." I then went to Poncho's Happy Bottom Riding club that night and had a well-deserved drink!

Tragedy Strikes

I continued to fly the Wing and finished most of the performance testing. I was just about to start the Stability and Control phase when I was given the opportunity to finish my aeronautical engineering degree at USC. I pleaded with Col. Boyd to let me go and he reluctantly did, as long as I could find a replacement to finish the tests. Well, that was the easy part because my old friend Glenn Edwards had helped Dr. Perkins write the book on stability and control at Princeton. On May 20th and 21st of 1948, I checked out Glenn in the XB-49 as I gritted my teeth in the copilot seat, helpless and just along for the ride. Glenn, of course, did a fine job, and I left for Dayton to pick up my sweetheart, get married in Las Vegas, and hightail it back to California to start school.

Just 15 days later on June 5th, my good friends Glenn Edwards and Danny Forbes were killed while flying XB-49 no. 368 at Muroc. When it hit the ground it hit upside down so flat that it didn't have much of a transverse motion. The wing areas outboard of the engines were found 15 miles downstream. It was a tragic loss of the entire crew and of friendships that will never be forgotten. Col. Boyd of course called me up and told me to finish the tests in the other airplane.

I flew no. 367 in the fall of 1948 during a series of stability and control tests. The XB-49 in every other respect was beautiful—just like flying a fighter. But the XB-49 was not a bomber and had many deficiencies. Without a doubt the biggest problem was that the Wing was way ahead of its time. This was before the advent of computers, and the sensory and response capabilities from a human were too slow to keep up with the ever-changing dynamics of the Wing.

I have been accused of saying the XB-49 was unstable, and to clear the record, I never, ever said the Flying Wing was unstable. I said that the aircraft was marginally stable about all three axes and could go unstable at aft center of gravity loadings. That is why I would not sign off on the Wing. The XB-49 would have to wait for technology to catch up.

In November of 1948, I briefed the leaders of the Air Force about my concerns and evaluations of the XB-49. Jack Northrop was in the audience

Behold the future! General Cardenas takes off in the XB-49 as he begins his climbout to conduct test trials with the Flying Wing. (Photo courtesy of James P. Busha)

General Cardenas begins his climb out over the U.S. Capital building in Washington, D.C. after showing off the XB-49 for President Truman. (Photo courtesy of James P. Busha)

and he supported my thoughts and findings. After I spoke, Mr. Northrop stood and addressed the generals and said, "I have the highest regard for Major Cardenas and his abilities as a test pilot. Obviously I have not been kept informed," as he turned and looked at the people he brought with him. "It looks like Northrop has a lot of work to do." The briefing ended and with it so did the Flying Wing program. But it was still far from my last flight in the XB-49.

Public Relations and Pilot Problems

On February 9th, 1949, I was ordered to fly the XB-49 to Andrews AFB in Washington, D.C. for President Truman's air power demonstration. We left Muroc and flew nonstop to Andrews in four hours and five minutes, setting a new transcontinental speed record. President Truman came out and inspected the Wing and even climbed in the cockpit. While I was showing him the interior, he turned to me and said, "Looks pretty good to me son, I think I'm going to buy some!" I bit my tongue and smiled at the President, never saying a word.

Back on the ground, Truman said to General Hoyt Vandenberg, the chief of the Air Force, "Why don't you have this young whipper snapper fly this down Pennsylvania Avenue at rooftop level? I want the people to see what I'm going to buy!"

I knew my boss was never going to order that, especially flying a huge experimental aircraft at rooftop level over the heart of D.C. Well he did, and I did, and I never really realized how heavily forested the city of Washington, D.C. was. I lost track of Pennsylvania Avenue as I dodged some radio towers along the way. It was very hard to see straight ahead with all the trees while roaring over the city low level. Toward the end of my flight I thought I was in the clear; that was until the big white dome of the Capitol Building filled my canopy and I pulled up to avoid smashing into it! I was never so glad to leave Washington, but my troubles with the Wing only continued.

My boss was never going to order me to fly a huge experimental aircraft at roof top level over the heart of D.C. Well he did, and I did.

On the flight back to Muroc, over the Rocky Mountains, six of the eight engines caught on fire from oil starvation. I was forced to land on a small runway in Winslow, Arizona, and I landed the Wing on the first three feet and stopped on the last five feet. To make matters worse, the width of the main landing gear left me only four feet on each side of the runway. I could not turn the XB-49 and had to be towed back to the end of the runway by a big lumber mill Caterpillar. Northrop came out and changed the engines and we flew it home without further incident. On March 7th,1949, I flew my last stability and control flight in the "Big Lady"—all lift and no drag!

I was done with the XB-49 program as far as I was concerned, but the Air Force wasn't. General Boyd sent Major Russ Schleeh out to "spot check" some of the data flight info Glenn and I had gathered. Russ was a good pilot and flew three flights in the Wing. He not only confirmed our data points but also concurred with us our thoughts of the XB-49. On a later flight attempt, the nose gear collapsed on the lake bed, destroying the last of the test aircraft and almost killing Russ in the process. That ended the program and from there I faded off into the ozone!

Robert Cardenas later became a brigadier general. He saw Muroc AFB become Edwards AFB, named after his good friend. He also watched technology catch up to Jack Northrop's original design and witnessed firsthand the development of what he calls the "finest weapons system in the world"—the B-2 Bomber.