

SCHUYLER KLEINHANS  
by Charlotte Kleinhans Wood

Some of the engineering talent of Sky Kleinhans is inherited. He was born in Pittsburg, Pa on Feb 3, 1905, the son of a designer of large rolling mill machinery for the steel mills.

Sometime after the death of his father, and when he was about 11 years old, his mother, grandmother and younger sister decided to travel the U.S. and see where they might like to live. My father remembers fondly a 7 or 8-day trip from Chicago to Seattle on the Great Northern Railroad with several washouts in Montana and rerouting over odd, makeshift tracks. His mother must have been a nervous wreck.

Eventually, by train and boat they arrived in Los Angeles in 1916. Graduating from Hollywood High, Sky studied at the University of California Southern Branch (now UCLA), U.C. Berkeley where he majored in chemistry. In 1924 he attended the Massachusetts Institute of Technology, switching to math, physics, and anything to do with airplanes and boats.

Tuition and travel were expensive in those days and Sky made one summer trip home to California in a homebuilt car, a Model T chassis from the junk yard, an overhauled engine and two bucket seats with a trunk fastened behind...no fenders, no roof or doors. When it rained he put on a square of oilcloth with a hole for his head--in effect, a sedan of sorts with his head sticking through the roof--great fun! Of course, he got mud and gravel in his hair but it was inexpensive travel and he really saw the country.

After graduation from MIT in 1927 he took a job with the Keystone Aircraft Company in Bristol, Pennsylvania as a design engineer. There he saw Virginia swimming and diving in the Delaware River and married her in 1928.

Then came a series of aircraft design jobs with fledgling airplane firms including Metal Aircraft in Cincinnati. Sometimes in those early years a plane could be designed, built and test-flown in four to five months. In 1930 he joined Sikorsky Aviation, working first on flying boats for the Navy, then designing flying boats for Pan-American Airways. About that time the Depression was catching up to even United Aircraft Company which owned Sikorsky. The Kleinhans family, which now included two young daughters, moved in August 1933 to Los Angeles where Sky went to work for Donald Douglas. At that time Douglas was building Dolphins and several other flying boats for the Navy and Air Corps. A good new job and at \$50.00 a week!

At Douglas, Sky worked on flying boats, the DC-4, the B-19 in 1935 and was Chief Designer until WWII began. About 1942 he became Assistant Chief Engineer. Douglas built airplanes all over the country during the war...Long Beach, Oklahoma City, Chicago, and Charlotte, N.C. After the war Sky directed the DC-6, -6B, and DC-7 designs and, then in competition with the Boeing 707, the DC-8 that had the first jet engines suitable for commercial airplanes. The DC-8 was a very, very successful transport airplane. He became Chief Engineer in 1960 and a couple of years later Corporate Vice President of Research and Engineering.

design of the DC-9 was well underway, and the Douglas Company and the McDonnell Company were planning their merger in 1966. After the merger was completed, Sky retired but stayed on as a consultant and chairman of the Scientific Advisory Board for two more years before devoting his time to travel and lawn bowls, sometimes to lawn bowls around the world on his and Virginia's travels.

Ask Schuyler Kleinhans a question and he'll answer you interestingly and extensively, and if he shouldn't already know all about the subject he'll dash home, look it up and tell you the next day. A thoughtful, knowledgeable, wonderful man.



S. KLEINHANS

May 15, 1982

Dear Charlotte,

I really don't know where I should start this narrative that you asked me to make about my early life. I suppose that the best place to start is when my mother and father were married, although it was some seven years later that I showed up on the scene. Well, my father graduated from Lafayette College as a mechanical and electrical engineer in 1897, and it was one year after that in 1898 that my mother, Emily Leeds Austin, and father, Frank Brasil Kleinhans, were married in Plainfield, New Jersey. He worked for the Baldwin Locomotive Works at one time and did some work for several other companies--I believe Otis Elevator--anyway, by the time I came along he was employed by the Fisher Foundry and Machine Company in Pittsburg, Pennsylvania designing large rolling mill machinery for the steel mills primarily, although they also did some other manufacturing at that particular establishment. So, on February the 3rd, 1905, I was born at an address on Robinson Street. (I don't remember the number, but I think you have some documents that tell exactly what number it was.) In any case, it was a Dr. Adams and a nurse by the name of Peters that were involved...of course, my mother and I were there too.

My earliest memory, actually, is seeing my mother help my father put on his overcoat...so this must have been in the wintertime when he was going off to work. I'm not sure what age this would be, but it had to be before my father was killed when I was  $3\frac{1}{2}$  years old. So, I was nearly three, or maybe a little less.

Another memory was of a pony, a Shetland Pony (a rather fair-sized one) and a cart. I can remember going at different times riding in the cart. One particular time that impressed me was when we were coming back on a small road from the direction of a neighborhood called Banksville and the road ran diagonally into Rutherford Avenue where we lived. So my father got out of the cart and let my cousin Murray Klein and myself drive it home...we had to go up this other road (I can't remember the name, but we called it the Banksville Road) to Rutherford, while my father walked across vacant lots, taking it easy. I'm sure he could keep us in the corner of his eye all the time, but I can remember being a little anxious as to whether Murray was really capable of driving or not. In any case, we arrived home perfectly safely.

It was in this same cart, and same pony, that we were traveling and riding one day when we were trapped between a couple of streetcars on a very narrow road running along a canal-like area and there was no place to escape. I remember this very distinctly because there was a whip on the buggy but this whip was never used and had never been taken from its socket at any time. And much to my amazement, my father reached out, picked up the whip and I remember, used it, and that's all I can remember, because then the crash came.

Either I was thrown out due to the accident or my father threw me out (I can't tell you). In any case, the carriage was completely wrecked -- my father was killed -- and Murray Klein who was with us had a broken arm. Of course, at that moment I don't remember a thing about it. I'm putting together what I remember, a little bit, and possibly what I've heard, a little bit, in the past, although nobody I knew was there at the time of the accident, except Murray.

My next memory was an hour or so later at the most (maybe less) when we were being taken home by two men; the pony was being led and Murray was riding the pony. I was being carried by one of the men and we were descending a rather steep hill called Sebring Avenue, which was then about two blocks from our house. I don't remember getting to the house or anything more after that, actually...that's the end. But those particular points just stick in my mind, and as I said, they're really there because nobody could have told me about them.

Now, at this particular time, Frances, my sister, was about one year of age, and presumably was just walking. Well, one of the next incidents I remember was helping her to walk. My cousin, Austin Klein, and I coaxed her over to the stairway to show her how to go up the stairs. She was crawling then -- not walking freely -- and she crawled up these stairs one at a time and we stood right behind her as a regular barricade to protect her against falling, and by the time she got to the top we were so happy. We thought she'd done such a wonderful job of climbing the stairs that we called to my mother to have her come and see. Well, she came and saw, all right, but we also caught it, I'll tell you that, for having coaxed this little baby up the stairs. My mother, I remember, gave us a lecture about how dangerous it was, and we couldn't understand...after all, we felt we'd been right by her, protecting her every last inch of the way. This lecture, particularly, stuck in my mind for a number of years...as you can see, since I'm mentioning it now.

Of course, there were many little incidents of one kind or another...play things and play deals with my cousins Murray and Austin Klein. We built a pond in the lot that was next to us...we had a workshop in the basement part of the house where we were allowed to build anything we could manage to cut. My mother used to get big packing boxes from someplace. We took these boxes apart and this provided the lumber material we needed to work with. We had a reasonable number of tools and spent a great deal of time making various kinds of sleds, wagons, and other structures a couple or three boys might put their efforts towards.

The next most significant remembrance was when I began going to school. My first school was the Beechwood School, which was about a mile and a half away, I would estimate. And to get there, I had to go past the Beechview School. Now, I don't know why I went to the Beechwood School instead of the Beechview School unless it was that my mother thought

it was a better school. In any case, I went there starting when I was six years old, which would be 1911, and went there for one year. The following year, which was 1912, I was then in the second grade and went to the Beechview School. The reason I remember this very definitely was that at that time there was a national election in 1912 and Woodrow Wilson was running, Teddy Roosevelt was running, and Taft, who was the incumbent President, was running. As you can well imagine, most of the children at that time were supporting Teddy Roosevelt; he was exciting, although I don't think we knew too much about what he had done in the Spanish-American War. What I remember is the Teamsters and their wagons. They were building a sewer line just a few blocks away; the ditch for the sewer system was all being dug by hand...Italians, mostly, with picks and shovels... and wagons that were drawn by horses. These Teamsters came to school to vote because the voting booths were in the basement of the school building. They lined their wagons up: I remember there was a string of them...ten or a dozen. This voting operation, and those men coming and going and their teams driving away made a big impression on me at the time. I know that had to be 1912. When I was in the third grade...this was in 1913...I was being misled by some of the older boys. We had and we didn't particularly like a principal by the name of Mr. McMasters; so the older students (there were eight grades in this school) organized a strike. I was one of the strikers. I couldn't afford not to be because I didn't know what the school authorities would do but I knew that my peers would take it out on me if I didn't join, so I was automatically part of the strike. We raced away, with a straw effigy of the principal McMasters, and ran off --- running down a hill, but that's all I can remember. I don't know when it ended and I don't know what ever happened as a consequence of this strike. It's one of those little incidents that sticks in your mind.

I used to detest Fridays because on Friday we always had a spelling test, and the spelling test consisted, it seemed to me, of 100 words --- I suppose it was fifteen. But I always dreaded this day, because I had more than my share of misspelled words on those tests. Essentially every Friday as long as I was in those schools I was unprepared for the spelling test.

Starting the fourth grade, I was back in the Beechwood School. I remember particularly liking arithmetic and the division: first short and then long division. Later when I was in the fifth grade I turned out to be particularly competent in this division business because I was the only student who knew how to divide fractions -- one trinomial by another.

I started at the Pittsburgh Academy which was downtown in Pittsburgh in the fifth grade. I used to take a streetcar. My cousin Austin Klein went there, too. I think my grandmother influenced the school choice...she was dissatisfied with what we were learning in the public school, and so we went to the Academy. This turned out to be a very interesting place because all the students were older. We were the youngest students. Actually, they didn't really have what we call a fifth grade, but with two students they just slipped us in and we started going along. This was when I first became involved with what you might call true mechanical drawing. There was a mechanical drawing office there and instructors. Since we were interested they let us go ahead and draw. I thought I was designing a steam engine but as I look back on it now, I realize what I was really doing was tracing a drawing of a steam engine rather carefully, learning mechanical drawing. I thought I was doing a great job.

About the end of the fifth grade in 1915 my grandmother's Uncle John Vermuele, with whom she was living and managing his household, died. They lived in New York on Staten Island. My grandmother, after straightening up the estate, came to live with us. It was the fall of 1915 and the beginning of 1916, and I was going to the Pittsburgh Academy. To flash back a year or two, though, I remember having visited my grandmother and her Uncle John in New York with my mother and sister. Another time I actually went alone.

I was put on the train with a tag attached with my name and address and where I was supposed to go. I remember distinctly being insulted that I had to have a tag attached --- I tucked the tag inside my shirt where nobody could see it. On the train I insisted on riding on the observation car almost all the way to New York. There was a vacationing trainman riding along and he had a watch. He compared his watch to my watch and there was an hour's difference in the time. I worried about this difference in time all day long. Eventually I learned that he was coming from Chicago and his watch was on Central Time, whereas my watch was on Eastern Standard Time. I arrived safely in New York and when I came through the big iron gate from the railroad platform was met by my grandmother.

On a previous visit with Frances and my mother we had oranges every morning for breakfast, but the oranges were always cut in half, and a little orange spoon was used to dig the segments out. Well, children aren't very adept at doing this kind of thing, and I was all for peeling the orange and eating the little sections. But this was prohibited...that wasn't the proper way to eat an orange, so we had to suffer along.

In New York was an automobile that belonged to my grandmother's Uncle John...it was a 1912 Peerless: a large sedan with the front part open, right-hand drive, with great large brass levers for shifting gears and for the emergency brake. The rear part of the car was enclosed... the rear seat with a couple of jump seats, so five people could sit inside the automobile. The seat next to the driver would provide another seat for somebody. I remember particularly that I was privileged to sit with a chauffeur to really supervise what was going on. We made several trips at different times in this automobile. It had large tires in the rear and rather smaller tires and wheels in the front with spare tires for each size wheel.

Let me give you some idea of just what automobiling was in those particular times with the condition of the roads. I remember that we mounted a real expedition. Mother and grandmother decided that (this was in the summer of 1915, after my grandmother's Uncle John had died, and my grandmother was straightening up the estates) they would take a trip by automobile and the destination was Trenton, New Jersey. I don't remember why they were going to Trenton except that it's the capital of New Jersey...I'm not sure. In any case, this trip was very carefully planned, and I remember that they had an alternate trip plan: if they couldn't get as far as Trenton, but if they got to New Brunswick and it was getting too late, they would turn around at New Brunswick and come back home. Now, they were talking about going from Staten Island which introduced an additional problem, because you had to go from Staten Island to the mainland on a ferry. You had only to go across the Kil Van Kul, a matter of a few hundred yards wide at that point to New Jersey, but there was no landing station on the other side. So what you had to do was to catch the ferry on Staten Island at the foot of Clinton Avenue where they lived which went down the Kil Van Kul to New York Bay, and you crossed New York Bay to land at the end of Manhattan Island, down at the Bowery. Then from there you could catch another ferry that took you back towards Hoboken, New Jersey, across the Hudson River, and you were on the New Jersey mainland. From there you followed ordinary roads...I think it was called the Philadelphia Post Road, the main road to Philadelphia. Not a very elaborate road, but it was the main road nevertheless, and it was along this road that we went. I remember we got as far as New Brunswick; I don't think we got as far as Trenton. Then it was time to turn around and go back to Staten Island. Really, an all-day trip, from early morning until essentially dark.

As I mentioned earlier, as soon as my grandmother got the estate and household straightened out she then came to live with us. During that winter I don't remember anything specially particularly happening. We went

sledding on the snow on the hills that were in front of our house; we did a lot of that at different times. The following summer (1916) my grandmother and my mother decided it was time to make changes. There was really no reason why they should live in Pittsburgh; there was nothing to hold us there, although my Aunt Bess (my mother's older sister) and her husband Uncle Oscar Klein lived not very far away. But the Kleins had decided that they were going to move from Pittsburgh and go live in the Western part of the United States. Uncle Oscar, particularly, had in mind going to Washington, near Seattle or somewhere in that area, because there were a number of opportunities there: particularly, there was a lot of land being homesteaded at that time. Uncle Oscar ordered a freight car, loaded all of their things into it, and just to protect it so to speak went along himself...he went in the freight car and traveled all the way clear across the United States with their goods. Eventually, he stopped at a place called Edmonds, Washington, about 20 miles or 25 miles north of Seattle, between Seattle and Everett, Washington. He then rented a small farm, about 7 or 8 acres, to live in until he decided what he wanted to do.

Another point that I probably should elaborate a little bit more on is the Legner family: Mr. and Mrs. Legner and their two children, Wolfram...the oldest boy...and Eleanor, the girl. This family was acquainted with my mother and father long before I was born. Mr. Legner had been the comptroller of the Fisher Foundry and Machine Company where my father was the Chief Engineer...and the families had become exceptionally good friends. As a small child I often visited the Legner family. One of the interesting things about that family was that Mr. Legner was anxious to have them leave the Philadelphia area in the summertime when it was so hot and go to Lake Erie where it was cooler and more comfortable. But he didn't like to have Mrs. Legner and the children go alone...so he arranged for my mother and myself and Frances to go along. We had a cabin on the edge of Lake Erie and we spent a couple of months there during the summertime. The first summer was spent in Waldameer which is just West of Erie, Pennsylvania, by about a dozen miles or so.

It was while we were at Waldameer that I really got close up to my first airplane...it was a Curtiss flying boat that had a forced landing out in the water in front of our house about a quarter mile. Wolfram and I had a boat at our disposal and so we went out there as quickly as possible and found that we were very welcome by the crew because they were badly in need of somebody to take one of the members of the crew ashore with a magneto to have the magnets recharged so that could get the engine started again.



Then, the following year...1913...we spent at North East, which was a place right on the lake again, but about 15 miles east of Erie, Pennsylvania towards New York State. I don't remember anything very significant happening there except going boating and swimming and doing all the summer things that children do. Then, in 1914, we were again in North East and the only significant thing that happened was the start of World War I. One day the newspaper came.. a boy shouting with the headline about a great German defeat. It was a newspaper with a headline about four inches tall that said, "Germans in General Retreat"...and Mrs. Legner, who was from Germany and was a very loyal sort of German Citizen as well as a good loyal American One, when she saw the headlines...I remember she just fainted and fell on the grass. It was a little hard for me to understand why...it seemed like it was an ordinary newspaper with just some big headlines...but later I realized it was quite a shock to her. Then, in 1915, we were back at Waldameer again...it was just our usual summer as I recall.. getting sunburned, being blistered...and re-blistered. Then, in 1916 we stopped to visit the Legners on our way to California...this summer camp was now at Red Rock, Ohio, which is near Ashtabula. We were on our way to the West Coast then and only spent a few days with them, just in passing, which was very pleasant.

After my Uncle Oscar and Aunt Bess and their children Murray and Austin Klein were actually out in Washington, my mother and grandmother decided that they would sell our house and make a trip around the United States, deciding along the way where they thought they might like to live, and what changes they might make in their lives. The first thing they did was to decide that they would go along by easy stages and visit Uncle Oscar and Aunt Bess in Washington. We took the train...we went from Pittsburgh to Chicago...and at Chicago you had to change: not only change trains but you had to change stations in those days and still do, I guess. We took the Great Northern Railway and went from Chicago to Seattle by the Great Northern. It took about 7 or 8 days to go from Chicago to Seattle at that time. Our train went slowly, I would say, along through the northern states, across the Dakotas when it got into Montana around the Glacier National Park it ran into a number of washouts and had to be re-routed. Eventually we got to Seattle a couple of days late. From my point of view, this was a great thing...I got a chance to see what was going on and talk to the trainmen. There was great excitement about all the washouts and the odd tracks onto which we were re-routed. I'm sure it made my grandmother and mother a little nervous...but I at least enjoyed the extra excitement.

Well, having arrived in Edmonds and moving in with the Kleins, the large house was adequate for everybody and we stayed there during the summer. This is in 1916... we were there all of June and July and part of August, I guess. Then my grandmother and mother decided it was time for them to move on; they decided they would go to California, see San Francisco...maybe Los Angeles...and

return to the East across the lower part of the United States. To do this, it looked like the simplest transportation was to take a steam ship from Seattle that would stop at San Francisco and go on to Los Angeles. That way they could get off if they wished or go on if they saw fit. This particular ship we took was called the President. It was one of the ships of the President Line, the first really large ship I had ever been on and I enjoyed it very much. Because the ship wasn't too big and we were on it long enough... because it wasn't a very fast ship...long enough to get acquainted with the crew and the people. It didn't carry a large number of passengers...it carried mostly freight and a wide variety of materials. The ship had come from Alaska and had stopped at several Alaskan ports. It was then unloading at different ports all the various materials that had been shipped from Alaska to Portland, to San Francisco and eventually, of course, some of it to Los Angeles.

Well, after we boarded, the ship stopped first at Victoria, Vancouver Island, and stayed there essentially overnight while they loaded and unloaded cargo. There wasn't enough time for us to go sightseeing because it was nearly dark by the time we got to port...and the ship left early the following morning. Then we went out through the Straights of San Juan de Fuca into the Pacific Ocean and proceeded to go down the coast. It stopped the next day at Astoria, Oregon, at the mouth of the Columbia River, unloaded cargo, picked up additional cargo, and then went on down the coast to San Francisco.

At San Francisco they did stop for a couple of days, and that gave time for us to explore the city. We had a chance to see San Francisco Bay and ride on the ferry boats... which is a nice way to see San Francisco. Unfortunately, there are very few ferry boats nowadays since they've been replaced by bridges, both across the Golden Gate and across the bay to Berkeley and Oakland. After a couple of days in San Francisco when the ship was re-loaded it proceeded on to Los Angeles and landed at San Pedro.

At that time San Pedro was a very small harbor and larger ships could not go far in. There was a sort of an estuary. I remember distinctly that this ship came in 'round the point...there was no breakwater but there was a sort of a sandspit out towards the river that is now Cabrillo Beach and there was a little island there...a sand island called Dead Man's Island. The ship came up the channel to where it was to dock and then they just turned it around. In turning, the ship itself couldn't maneuver...this was done with tugboats. I remember that the channel was so shallow that in turning the ship around they stirred up great quantities of mud. This sticks in my mind as just one of the interesting events.

After being unloaded and getting our baggage organized we went by the way of the Pacific Electric Railway... really an inter-urban system...the red cars as you probably knew them as a very little girl...and we traveled on the Long Beach Line from San Pedro up to Los Angeles and went into the station which used to be at Sixth and Main Street. It was a large station and from there with our baggage we went to the Alexandria Hotel. It was the largest and most affluent hotel in Los Angeles at that time. We started to stay there just for a few days or maybe a week and then we were planning to go on to Phoenix, Arizona. My mother and grandmother liked Los Angeles and enjoyed the hotel, so they elected to postpone the rest of the journey on to Phoenix and decided they would stay in Los Angeles for the winter.

It was now August 1916 and they had no reason to hurry so they decided they'd stay for the winter and as a consequence they looked for a house to rent. It had to be a furnished house since they didn't have any furniture with them. They looked in the newspaper as people do and they found one advertised that was down on 45th Street and the number was seventeen hundred and something. It turned out to be the Kelsey's house and after renting this house we became acquainted with the Kelsey family.

Once we were established in the Kelsey household, it was time to go to school. The Kelseys themselves lived in another house that was on the back end of this property... a very nice house, but a little bit smaller than the main house that we rented. So, I was registered in the Santa Barbara School at the corner of Santa Barbara and Western Avenue. At that time there were only Anglo children in the school...and at the present time, only Negro children in that particular school. The neighborhoods have changed over the years. In this school I was then put into the eighth grade...this was based on an evaluation of the record I had and the subjects I had taken and studied; but it was a mistake because I was too young to be in the eighth grade. This was a disadvantage for me because I was competing with children who were several years older, and it just made it much harder. I don't think I learned as much as I might have learned, and I certainly missed essential English classes and grammar that I would have studied in the normal seventh and eighth grades. This was sort of self-adjusting a year or two later, but in any case it was a mistake. While attending the Santa Barbara School, besides the usual reading, writing and arithmetic, they had a mechanical training course in woodworking. One of the first things I did was to learn how to make various kinds of wood joints which culminated in making a table-ette. It is a rather sturdy thing about fourteen inches square and probably two feet high and strong enough for an elephant to stand on. My mother had this table in her house for a number of years. It was a little bit lopsided, but on average it was a pretty good job, I thought. The instructor apparently thought so too, because he asked

me after I had finished it...which I had done sooner than most of the other students in the class...whether I would like to make a ukelele. Well, I didn't know much about ukeleles but I had been studying the violin. I first started playing the violin...that is, taking lessons...when I was five years old in Pittsburg, and had been given lessons and instruction ever since. This ukelele idea was really appealing to me, and I agreed that I would like to make one. He had some molds and other equipment and he showed me how, so we started out to make a ukelele. Well, unfortunately, I did not get it finished before the term ended, but I had all the main frame made and the neck carved out...but I didn't have the proper kinds of tools to work with at home during the summer and so it was laid aside temporarily.

Actually, this term started in 1916 and ran through to 1917, and in the springtime of 1917 is the time that the United States entered World War One. This rather changed things, particularly changed the priority of things that people were doing. It caused my mother and grandmother to choose to not to go on to Theonix and return to the East. They decided they liked California so well that they would stay here. They didn't want to continue just to rent a house from the Kelseys so they decided that they would actually build a house...14306 Valerio Street, Van Nuys...a home in San Fernando Valley. When they made this decision, my Uncle Arthur and Aunt Adelaide, who were living in Monticello, New York at the time, decided that they would move to California too. They had a son Charles, about nine years younger than I, and a second son Elliott, who was born in Van Nuys in 1919. Then, my Aunt Bess and Uncle Oscar...who were up in Seattle but had rented the farm and had not really committed themselves to any large investment that would hold them there...decided that they would come to California too. So, we bought property...I say we, but I mean my mother, grandmother, and uncles and aunts...in Van Nuys in the San Fernando Valley. There were three plots of land purchased...five acres each. My grandmother had one five-acre lot...my mother had one, my Uncle Arthur had one...you've been on and seen these properties on Valerio Street. Then there was a vacant one or so that belonged to somebody else and finally, Uncle Oscar and Aunt Bess had another five-acre plot. We lived there for quite a little while, all during 1917, the fall of 1917, and the spring of 1918. I remember distinctly the fall of 1918 when the war ended in November...it was celebrated by everybody.

We lived there in 1920. But about that time my Uncle Oscar Klein moved his family (my Aunt Bess...or Elizabeth, my mother's oldest sister and their two children...Murray, who was about three years older than I...and Austin, who was one year older) back to Edmonds, Washington. Uncle Oscar decided they should go back to Edmonds and live there. I think he really missed the fishing that he was very fond of. Austin, of course, went with them...and he

later attended the University of Washington studying music. But, like myself, he wasn't sufficiently talented to be a professional musician and so became involved in other kinds of work and eventually was the Inspector of Naval Materials for the United States Navy Department in Seattle.

I went to the Van Nuys High School. During this time, I was able to finish the ukelele, and was proud of my workmanship. Later on, although, when I looked at it I realized that it was a bit amateurish. I had it for many years and I only gave it away because we no longer had much storage when we sold our Sumac Lane House in Santa Monica Canyon and moved. But, having made the ukelele, I got the idea that I thought I could make a violin. My first attempt at a violin was not very well planned, actually. I had no instruction from anybody. The neck of the violin was made out of the trunk of a pear tree. It was nice white wood, fairly easy to carve but reasonably hard...about like maple would be. For the frame of the violin, I don't remember just what wood I used or how I bent it. But I remember distinctly that the front and the back were both made out of pine wood. The back should have been made out of some kind of maple and they were actually (both front and back) too thick and not well-enough shaped. The neck of the fingerboard was made out of a piece of mahogany...of course it should have been made out of ebony...but as it turned out when finished it was playable. The violin sounded all right...but had a rather thin tone because it was just too massive, too heavy; however, it was fun to play on once in a while. My violin teacher, Mr. Berlich, Concert Master of the LA Philharmonic Symphony, played on it at different times... and I remember clearly he said, "You know, this thing isn't bad considering what kind of a box it is." This was a little insulting but a little complimentary at the same time. I don't remember what happened to it.

I finished the year at the Van Nuys High School, becoming extremely interested in chemistry. I don't know exactly what sparked this particular interest but it turned out that the science department at the Van Nuys High School at that time was very very poor. There was just one science teacher (and I've forgotten her name now); generally speaking they were easygoing classes. She taught biology and she taught chemistry and maybe she taught physics if they had any physics course there at all. In any case, it was so poorly organized that I decided I wanted to study more seriously; so I transferred to Hollywood High School and traveled fifteen miles there and back each day on the Pacific Electric Railway red cars. I went there during the years 1920-21 and 1921-22. A Dr. Gray was head of the Chemistry Department and Dr. Sandefor was head of the Physics Department. Now the difference between these schools was that Van Nuys High School had maybe five or six hundred students, whereas Hollywood High School had over 2000, so they were able to provide greater variety. In addition to that, Hollywood

had originally had a graduate high school (a postgraduate school, I should say) which had given more academic standing to Hollywood High School. But in 1919 all those postgraduate high schools were abandoned and combined together at the Vermont Avenue Teacher's College. It formed the Southern Branch of the University of California which eventually became UCLA. We'll talk about that a little bit later. I studied chemistry, with which I was very absorbed, and I studied chemistry not only that year... my Junior year...but I also studied it in my Senior year along with the physics course required and the usual mathematics that went with it. I finished high school in 1922.

Having finished the high school course, the next problem was deciding on where I thought I ought to go to college. My grandmother, my mother and I discussed the subject rather elaborately and considered all the possibilities. My real desire was to go to MIT. This probably was fostered by Dr. Gray who had taken a great deal of interest in me and helped me a great deal. But MIT was clear across the United States a long way away and there was a large tuition fee to be paid. The cost with the transportation added just seemed to be unreasonably high.

The next choice was to be CalTech. I made an application to CalTech and was instructed to show up and take the entrance examinations. They didn't accept any students except by examinations, at that time anyway...and I imagine it's still the same. When Jared Abell went to CalTech in 1946 I remember he was required to take the same entrance examinations. After the exams I had considerable fear and worry because it was obvious to me that I had failed the English examination. And the rumor had it that if you failed anything...it didn't matter, even if you put the comma in the wrong place...CalTech simply wouldn't take you. So, I had a considerable amount of worry on this particular point, and decided that I had best give some thought to where else I might go to school.

One of the obvious places was the new college that had been formed in 1919 by putting all the postgraduate high school courses together, starting what turned out to be the southern branch of the University of California... so-called SBUC at the time. As I mentioned before, it eventually became part of UCLA...but SBUC was only a two-year college for a number of years and they didn't have any particular scientific or engineering college. I know now that that doesn't make much difference...that the first two years everybody has to take the same courses anyway... but it seemed important to me at the time and it became important to my grandmother and mother too.

The other possibility was USC and I gave some thought to that. Since it was a private college we were back into the question of tuition, although one would be able to live at home. But the trouble with USC was that it was

a classical college...at that time, with some chemistry and some physics courses but no real engineering school or scientific school. So that thought was abandoned.

An additional possibility was the University of California at Berkeley. Now, here was a large institution with complete colleges: scientific ones, engineering ones, everything that I considered important...and there was no tuition. There were some fees but no tuition...the only cost was the transportation, and the cost of living away from home. After taking the examinations at CalTech and continuing to worry about those, I decided that the thing to do was to go to the Southern Branch of the University of California for the summer, and take a course in physics that they had available. I made application to Berkeley. At the end of summer school I decided that...since the Berkeley session started on the 15th of August and CalTech did not start until the 15th of October...if I waited to find out for certain about CalTech it would be too late to go to UC Berkeley. I decided I'd better go to Berkeley. I spent two years at Berkeley and belonged to the Lambda Chi Alpha fraternity house. During the summer vacation of the second year, which must have been 1924, we were again discussing colleges and the curriculum and the advantages and disadvantages of the different ones...and the question of MIT came up again.

My grandmother asked me about it and I said well yes I'd still like to go to MIT but unfortunately it just cost too much...and she thought about this for a few days and she said, "Well, I don't think that would be beyond what we could afford to do, and if you'd like to go there, you may. So, I immediately made application to MIT, transferred my record from Berkeley, and started in the fall of 1924.

I remember I went on the train, and particularly I went back to Chicago and from Chicago on the New York Central Railway to Albany, New York. From there I transferred to another railroad...I've forgotten its name now but it goes from Albany across Massachusetts to Boston. It went through all those little cities in Massachusetts, through the countryside, and since it was October, the trees were just beautiful. All the leaves were turning red and yellow and orange, there were so many maple trees, and the countryside was absolutely lovely.

I arrived in Boston and went over at once to see MIT, to get oriented a little bit, and to decide where to live. There were two possibilities: either you could live in the MIT dormitories or you could live off campus either in Cambridge or in Boston if you wished. So I looked at the bulletin board and on the bulletin board it listed a lot of available boarding rooms. The dormitories were very disappointing because they were so barren, with nothing but a desk and your bed...almost looked like you were living



in a box. I finally selected a house on Beacon Street across on the Boston side of the Charles River. It was a doctor's home with a large room on the fourth floor and nice pictures on the walls; there was a desk and generally it was more homelike and comfortable. So that's where I established my residence.

It turned out to be a very nice place and the Gouldings... Dr. Goulding and his wife...were very pleasant and nice to me. The only mistake that I made in choosing that room was that every day I had to walk across the Charles River...across the Charles River Bridge...to MIT. In the fall this was beautiful and I remember in the Springtime it was absolutely elegant, but in the middle of the winter I learned the middle of this bridge was unquestionably the coldest place in the United States. You could save a nickel by walking instead of by riding the streetcar that ran along Massachusetts Avenue across the bridge and into Cambridge...but once you got out on the bridge, when you were really beginning to get cold, it was just as freezing to go back and catch the streetcar as it was to keep going, so I almost always ended by walking except when it was raining severely or snowing. If it was just cold why we just froze to death so to speak and kept walking. And it was nice, really, when I look back on it, it was very enjoyable. Sometimes the Charles River would freeze...not too often because the wind would disturb it... but when it would freeze, the fraternities along Beacon Street on the Boston side of the River would get their shovels and clear the snow off of the ice, water it with a hose and make and ice skating rink. Very often they would play various kinds of ice games. Near the bridge the river did not freeze very often...but further up the river where it ran back into a sort of an estuary called the Fenway...this part was very sheltered and the water would freeze there and it would freeze smoothly and this made a very nice area for winter sports activities. In Springtime the MIT Crew was using the Charles River for rowing and so was the Harvard Crew. Harvard was up Massachusetts Avenue about another mile... but the river turned, so from the Harvard Square to their part of the river where their boathouse was was about the same distance as from the MIT up to the Harvard yard.

I forgot to mention that I majored in chemistry when I went to Berkeley but I was not required to take the first year chemistry course there because I'd already had the equivalent; so I started taking organic chemistry which they listed as one of their sophomore courses and physical chemistry, then given usually as a junior course. Physical chemistry particularly appealed to me. I don't know exactly why but I think it was the physics as well as the chemistry involved that made it particularly interesting.

Also, I had always been interested in airplanes and airplane engines. To go back a bit...flash back to 1917 time...my



interest in airplanes was stimulated by an airplane show in Exposition Park in Los Angeles. There was an exhibition of World War I airplanes that had been shot down and were out of commission for one reason or another...several dozen of all different kinds. The show was to interest the public in the war effort and I presume a Liberty Bond drive...I don't remember that particular part of it. But I remember having a chance to examine each of these different airplanes in considerable detail and see the different kinds of engines they were equipped with.

There was no Aeronautical Engineering work being done at Cal Tech...they didn't have any courses...and there was one professor who had one minor course at Berkeley...a sort of an introductory course, a get-acquainted course with aeronautical things.

But at MIT I knew they had a course in Aeronautical Engineering and when I got there I investigated this along with chemistry and physics. Their aeronautical engineering was sort of a central school. They farmed out their different subjects. In other words, the fluid dynamics was actually in the physics department and some of the stability and control aspects of aircraft was in the mathematics department. They were doing it for the aeronautical students. Some of the general structural courses were either in the Civil Engineering Department (the structural framework)...or elasticity, given in the Physics Department. So, from my point of view, the aeronautical engineering course prescribed was a little disappointing because it looked like most of the time was being spent in the other colleges and departments. When I talked about this with an advisor...and I've forgotten who he was...he sent me to talk to the head of the Mathematics Department. This man talked to me, found out what I was interested in and what I wanted to do. He said, "Well, I think probably it would be better for you to be in the Mathematics Department rather than the Aeronautical Engineering Department or the Chemistry Department. The Mathematics Department was planning a course...they called it 9C...which was a mathematical major with a physics and science option. Really, it amounted to what we now call engineering physics. For me, it was a very satisfactory solution because it provided flexibility for me to study the subjects that I was particularly interested in at that time.

The head of the Mathematics Department was Professor C. L. E. Moore. I always remember his initials because they spell Clem, and some of his associates used to call him Clem although I think his name was Clarence. He was one of the original founders of the American Mathematical Society and was the Director of MIT at that time of all the mathematical research being done by the various mathematical staff. There were a lot of interesting people in this department besides Dr. Moore. Dr. A. B. Phillips,

who later became head of the department, wrote a small engineering book for differential equations that practically every engineering student in the United States was required to study, was there. Norbert Wiener who was later of cybernetics fame was one of the members of the staff there and I met every day with Woods and Bailey (Dr. Woods particularly) who together wrote the calculus book practically all engineering colleges around were using for the study of differential and integral calculus. Woods also wrote a well-known advanced calculus book. A Dr. Wilson, Edwin B. Wilson, who had been an assistant to Gibbs at Yale when they developed Gibbs' Thermodynamics was a professor. He went to Harvard shortly but I later got to know him too. For me this was a very nice school. I studied what I wanted and I enjoyed it very much.

Since MIT was a long way from home and the transportation costs were high, I couldn't go home for any vacations except in the summertime. So I spent the Christmas vacation time and holidays with the Legners in Philadelphia. The Legner family had been friends of my mother and father long before I was born, and they were really very happy to have me come and spend the time there. It was a very pleasant thing...any time I had a vacation I could go. It became a home away from home. Their son Wolfram Legner was near my age and he eventually became a professor of German at Harvard and Georgetown University.

Well one of the other interesting things that took place during these several years were the trips back and forth between California and Boston. Sometimes I went by railroad from Los Angeles to New Orleans...stayed in New Orleans a day or so and caught a boat. The Southern Pacific Steamship Company was a subsidiary of the Southern Pacific Railroad that ran steamships from New Orleans around Florida. The boat went through the straights of Florida up the Atlantic Coast, stopping at New York...then from New York to Boston I went either by train or by the so-called Boston Night Boat which went up Long Island Sound and through the Cape Cod Canal. It was an overnight journey...a very educational trip. I made a couple of trips in this way...very interesting because I learned a bit more about the United States and more about the Atlantic Ocean and the Gulf, and a little more about how to operate steamships which was very interesting to me being so closely allied to aeronautical engineering, not by the size of the units but by the fundamental fluid mechanics. Ships and airplanes have a great deal in common and I found this extremely interesting.

My interest in boats came from the original West Coast trip on the President Line when we went from Seattle to California. When I was studying at Berkeley I had a fraternity brother (A X A) who was studying naval architecture. They had a very limited course...what he really did was take a mechanical engineering course with a so-called Naval Architecture Option...only about a half a dozen courses

at that time. When talking with him about the classes and reading his books I became sufficiently interested in Naval Architecture that when I arrived at MIT I also inquired about the Naval Architecture classes, but I found out that their courses in Naval Architecture were about fifteen years out of date. Professor Feabody was getting old and nearly ready to retire. He hadn't made any real improvement in the course structure for the previous fifteen years. But they did have a professor who had been a lieutenant in the Danish Navy, during the World War I. He was an expert on submarines and he gave some very interesting courses. One of these I took on submarines and their general fundamental characteristics and I made a considerable analogy between submarines and airships, the principal difference being only the density of the fluid in which they were working. From this class I got to know Professor Hofgard fairly well. He had a contract with the Navy Department to make a stress analysis of the Airship Shenandoah, which crashed in 1925 (the Navy Department was investigating what was wrong with the structure---why it broke where it did). They had a contract with Professor Hofgard and another with Professor Frost for elasticity analysis. Professor Hofgard took advantage of me, I would say (not that I was unhappy about it) to work on this analysis...and that's where I gained my real knowledge of lighter-than-air craft. Just to do the work I was assigned...which was just slave work... I still had to get busy and made an independent study of airships and to some extent of submarines...but it turned out, as I mentioned, this was the same thing. Again my horizon was expanded and I enjoyed it very much.

For transportation back and forth to California one time I got a small Model T Ford chassis from a junk yard in Cambridge and overhauled the engine in my spare time. I kept it in the alley behind the house where I was living... nobody objected...and got it in running order. I used this one time to come back to California. What a trip. The car had nothing but an engine, the chassis, and a couple of bucket seats and a little trunk that had been put on... and it was just a little steamer trunk that I'd put behind the seats. I fastened it onto the chassis and put all of the junk that I wanted to transport inside there and away we went. The car had no cover or fenders or anything. When it was wet or rained it was a pretty damp deal. I stopped at a dimestore and got some oilcloth...a big sheet of oilcloth, cut a little hole...enough to stick my head through...so I could wrap it all around me and over the seat and trunk...in effect I had a sedan of sorts with my head sticking out of the roof...this was fun! But kind of dreary sometimes too when you got in the mud.

I remember distinctly a time in Missouri when the gravel roads kept throwing mud up. Every once in a while if there was any water available you'd have to stop and wash off some of the mud off your face and out of your hair and your hat. Still, this was a very interesting trip I made and very inexpensive because I never had to stay in a hotel.

I had enough blankets in the trunk that when I really got tired why I just went to sleep anywhere...alongside of the road. Oh, I turned off on a little side road of course, but I just went to sleep...when I was rested I woke up and went on again. During the first part of this trip a classmate from MIT was riding with me until we reached his home in St. Louis where I stayed for a few days. I remember one time in Kansas it rained so hard that the machine which had no cover on the engine at all just got drowned out and stopped cold, so I ran it off the side of the road, and the road was muddy with ruts and holes. In the flash of lightening I saw a haystack in a field...not too far away...so I crawled through a barbed-wire fence and managed to get over to this haystack and pull some of the hay out from underneath and snuggled inside to wait for the thunderstorm to go by. Then I would go on again...so I thought. But actually, I was so tired I dropped off to sleep and when I woke up the sun was shining and everything was bright and it was the next day. I went over thinking I'd have to dry out the engine and get this little car going, but when I took hold of the crank...(there was no starter) and gave it just one turn, away the engine roared. It had had a chance to dry out in the early morning sunshine. On that trip I went through the upper part of New Mexico and down the Rio Grande River from Taos to Santa Fe and then to Albuquerque and on home to Hollywood. I can remember now how enjoyable the whole trip was and how extremely inexpensive.

At MIT, one of the other interesting things that happened was a proposition from the Huff-Dalin Company...this was an airplane company in Ogdensburg, New York, on the St. Lawrence River in the northern part of New York State. They had a small staff of people and some contracts with the Army and Navy for airplanes...and the Army Air Force particularly was requiring them to furnish more aerodynamic calculations and stress analysis than they normally were used to making. One of their men had an acquaintance at MIT and inquired whether there were students that were interested in doing some aerodynamic work. They got in touch with me and I thought it would be interesting work, so I took on a number of aerodynamic calculations for them...performance calculations mostly with some stability and control. In addition we did a certain amount of stress analysis. They paid me a very nominal amount...I can't remember how much...I'm sure it was starvation wages...but it was interesting and I was encouraged by the MIT staff. It had one advantage...I became acquainted with them, and this Huff-Dalin Company eventually moved to Bristol, Pennsylvania and was re-financed. They had a contract with the Army for a dozen airplanes more than they could otherwise handle financially because they had won a competition in 1926 and their bomber...a single-engine bomber called the LB-1...had made a new world's record for load-carrying. To handle such a contract they had to completely reorganize the company...refinance it...changed its name and move it to larger quarters...and that's

how it happened to be moved to Bristol, Pennsylvania and became the Keystone Aircraft Company.

In due time at MIT I finally came to the place where I had to start thinking about getting a job and supporting myself. When I finished my work at MIT in the summer of 1927 with an S.B. in mathematics I took a job with the Keystone Aircraft Company in Bristol, Pennsylvania. First I went back to California for a short vacation, then back to visit the Legners and from the Legners' house over to Bristol, Pennsylvania where I became a full-time employee of the Keystone Aircraft Company. While I was at Keystone working as a design engineer doing mostly stress analysis and aerodynamic calculations...and some design work too... the whole engineering department had only thirty people.

This was the time I met your mother, when I worked for the Keystone Aircraft Company in Bristol in the summer of 1927, that I found a room on Radcliff Street, the main street running along the Delaware River. It was beautiful...the trees were out...it was just as idyllic as you could ask anything to be. I lived at number 512 if I remember correctly... and across the street were some beautiful large homes and a block or so beyond was an Elks Club. The Club had a dock out in the Delaware River where they had a number of diving boards attached at different heights...I don't remember just how high. There was a street that ran down to the water's edge, an extension of a little street. I walked down there one day and there was a very attractive girl diving off of the diving board into the river. I watched her...she was very good. And I thought, "That's a kind of a nice girl... I'd like to know her." I knew a few of the men who worked in the same office and went to dinner with them often but I didn't know any town people. So I kept my eye out to see if this girl might show up sometime. In due time, I saw her walking along the street and tried to contrive a way to meet her. One day, one of my friends, Carl Bloomer, came along and said I've got somebody I think you ought to know...and it turned out to be this girl named Virginia Winterstein, now your mother! Well, Carl and I had a bit of rivalry over this girl. It was friendly enough but he did have some dirty tricks he played on me. One was... he would drive his car down and park it in front of her house and then he would walk about four blocks to dinner... and of course when I came along I thought he was in her house talking with her and so I'd go on about my business. Eventually, I caught on to this gag. Then at other times when I'd go see your mother he would just stop in to see her mother. Once I brought your mother a box of candy and she had just opened it, actually, when Carl came in with two or three friends to see Virginia's mother again. I remember distinctly he saw this box of candy and he picked it up and he offered a piece of the candy...to Virginia, and her mother...and then to his friends, saying, "Well, have a piece of candy I bought Virginia yesterday!" I could have torpedoed him right then and there...but this rivalry went on for a long time...and somehow I gained an

inside track and married the girl. Carl always remained a very good friend of ours. Several years later, Tish, you and your mother and Aunt Pauline spent the winter of 1932-33 in Florida with his mother and sister Ritah and her daughter Mary Jane. Virginia and I became better acquainted so that by the beginning of 1928 we had decided that we should marry and start a home of our own.

To go back a little, one of the things that I thought might be of interest to you was the visit we made to the Kleinhans family in 1912 when I was about seven years old. We visited my grandmother who lived in Easton, Pennsylvania. My grandfather had died in 1908. The interesting thing there was the house itself on a point..oh..less than 100 yards from the house was a fire station. It was completely equipped with a fire engine and horses and all the paraphernalia...and it was of course extremely interesting to a child my age. Fortunately, I was there when the fire gong went off and the horses broke out of their stalls and ran quickly and got into their positions next to the fire engine right beneath the harness which was all supported from the ceiling by various clips and pulleys. It just dropped down on the horses and the firemen clipped up a few of the fittings that they had to make fast and away the thing went in a cloud of dust...so to speak. This happened a couple of times while I was there...it was wonderful! I also got a chance to meet some of my father's brothers and sisters...his oldest brother Will had a farm about a half a mile away from Grandmother Kleinhans on one of the main roadways. Not on Kleinhans Avenue, as I recall, but it might have been...and then his youngest brother...Arthur...was running the greenhouses and the general horticultural business including a florist's shop that they had had for some years in the center of Easton. And James Kleinhans, an older brother and his wife... I've forgotten her name now...and they had two children... a boy and a girl. The girl's name was Eleanor; the boy's name I don't remember now. Then we met also my father's older sister, Emma Heinline, who lived a mile or so away... maybe a little more...who had two boys. They were ten years or so older than I so we didn't have much in common... they just said, "Hello, nice to meet you." Then, of course, there was my father's youngest sister Jeanette; she was married to a man by the name of Post who worked for one of the railroads and who died a few years later.

Actually, when Virginia and I were engaged...and it was in the springtime of 1928...we took my Ford Roadster and decided that we would go to Easton and see if we could find my uncle and aunts and say hello to them. But it took longer to get there than we had anticipated and we had started late so it was quite late when we arrived. We finally found the corner...Kleinhans Avenue...but the firehouse was gone...so my landmark was missing. The farmhouse...I called it a farmhouse...at least the house that my grandmother lived in...was gone...so that didn't orient us very well. The greenhouses which I thought were just

back of the fire station turned out to be about four or five blocks away. But we finally found them, and Virginia waited in the car while I went through the greenhouses and finally found my Uncle Arthur where he was working. He was glad to see me when he found out who I was...and we talked for a while. He suggested that I go down into the town and see my Aunt Jeanette who he said was then running a sort of a needle and knitting shop of some kind... not very far away from the florist's shop. But it was so late we decided that we couldn't stay longer, so we returned to Bristol along the Delaware River down through Trenton.

We talked our wedding plans over with Virginia's family and it was finally settled. On May 25th (1928) we were married in St. James Episcopal Church, Bristol, Pennsylvania and went on our honeymoon to Washington, D.C. I had acquired a Model T Roadster by this time. Somehow Virginia's father thought it might be nicer if we took his Packard sedan and so we took his Packard sedan to Washington. I'm not sure what your mother told you about this honeymoon in Washington on the tape she made for you...and I don't want to repeat things. We went all around Washington, we saw all the monuments, and we spent a lot of time in the Smithsonian Museum. This was my influence and Virginia was willing to go along although I think she got pretty tired of museums. I couldn't resist going back to it nearly every day we were there. But we did see other things too. The Mayflower Hotel is where Virginia and I were staying during the honeymoon.

After returning to Bristol we lived in a very nice little house...in Harriman. Harriman was a suburb of Bristol, really...a part of the city...but it had been independent at the time of World War I when the Harrimans built the Harriman shipyards there. This was a very very nice little house...it was red brick...a row house, actually, with a living room downstairs and a sort of a dining room-kitchen... and upstairs there were a couple of rooms...a bedroom and a bath. Virginia's family supplied a great deal of the furniture...we bought some and fixed up a lot...we re-finished and refinished. I think your mother may have told you about that. And then we had an offer.

We hadn't been there very long and had an offer as head of the engineering....chief engineer if you like...of a very little company organized to build a light commercial aircraft up on the Hudson River in New York State. This brought us more money. By the way, at that time I made \$35 a week which was considered to be very satisfactory wages for the work we were doing. This job offered \$50 a week and was something that we could hardly overlook since it was an opportunity to direct things myself. So I gave up my job at Keystone Aircraft Company...and we planned to move in spite of the fact that we'd only been



living in our little house for one month. But what happened... well...the job fell through and we were out of a job...out of two jobs if you like. It turned out that we had a friend and he did recommend another job to us that he knew about. We looked into it and I took that job...with the Commercial Aircraft Company which was organized and running but not really doing anything very satisfactory. It was in Bridgeport, Connecticut. It was a company that had been organized by a group of Italians...and they had Frank Balanca...the brother of Guiseppa Balanca who had built the Balanca that held the world's endurance record, a very very fine airplane built by the Wright Company. Frank Balanca came only about once a week and stayed for an hour and they weren't getting anywhere. We worked on the design that he had been working on for a few months...but obviously it was much too big a project for the amount of money that had. So the man who was president...a man by the name of Kubelli...decided he had to do something to make a show for his stockholders. He got together with us and we decided to design and build a small commercial airplane...one with about two passengers...a little coupe kind of thing...with a 100 horsepower engine in it. The engine came from England...a Cirrus engine. We finally finished that airplane and built it by springtime. This was also the time the company ran out of money and they had to stop paying us.

Another job turned up in Cincinnati, Ohio, with the Metal Aircraft Corporation. They were making an airplane called the Flamingo. So we packed up our things in the Ford Roadster...closed our apartment on West Street in Bridgeport, Connecticut...and took some of the furniture we had, left it with Virginia's mother in Bristol, and went on to Cincinnati. This was summertime in 1929. My job with the Metal Aircraft was assistant chief engineer. We'd only been there for about two weeks and the Chief Engineer...a man by the name of McGraykin...became sick and not only left me with all his work as well as my own, but with a job of teaching a class for him at the University of Cincinnati. Now, he gave this class at night...and it turned out to be several times a week. While I had no trouble volunteering to do that for a few days, it turned out to be a burden. I had to leave Virginia alone at a time when she shouldn't have been left alone. She didn't know anybody and she was carrying a baby...you. We managed along, and the work was very interesting. The airplane we were building was a very nice type...an all-metal airplane with a 400 HP Wasp engine. Once one of our airplanes was going to Philadelphia...so Virginia got a ride to visit her mother. The pilot was worried about whether she was going to have the baby at any minute...and I think he called her Ismerelda. "Ismerelda, how are you getting along with that baby?" was his constant question. He flew her to Philadelphia and she had a chance to visit with her mother, returning on the train I guess. I've forgotten now how she got back... she must have come on the train.



The depressing conditions of the Depression -- the preliminary conditions -- were beginning to show and most people realized that things weren't just everything they ought to be...economically...in these United States. Now, one of the people who had lots of money in the Metal Aircraft Corporation was a man by the name of Warnecke of the Globe-Warnecke Metal Furniture Company that built metal furniture and cabinets for offices. Being a good businessman he apparently could see the handwriting on the wall...and he started to restrict our operations: then came the stock market crash. Trouble was perfectly obvious...so Mr. Warnecke, being the principal stockholder, decided that the thing to do was to close up that business, at least temporarily...whether it would be permanent or not he didn't know. Most of the people were laid off and our engineering people went one at a time until I ended up as being the final custodian. Mr. Graykin of course had recovered but he was away a good part of the time. We had closed the business by the middle of December 1929 and at that time Virginia and I with you now two months went by train. We sold our Model T Ford for I think \$25 and we went by train to Philadelphia to visit Virginia's mother and father over the Christmas holidays.

While we were there we were contemplating buying another Ford car. By this time the Model A's were out and we decided we should probably buy a Model A Ford...then we heard through some friend that a dealer...not very far away...in Langhorne had a Model A Ford...a demonstrator that we could get with a considerable reduction on the cost. The car, new, cost about \$500 and the reduction we got was about \$90 and it had only gone about 90 miles. A fair deal, so we bought the Model A Ford and started out on a new life.

By this time I also had a new job...a job arranged with the Sikorsky Aviation Corporation then in Stratford, Connecticut. Well, we had lived in Bridgeport before, so we were familiar with the area and the neighborhood...off we went with you as a small baby only a couple of months old in our new Model A Ford. Virginia and I and a few possessions went off to our new job. Very quickly we found a house in Lordship which was out on a peninsula across some lowlands with a causeway that ran out to this peninsula...and it was very nice...a little summer residence...but it was a little bit isolated in the wintertime. We enjoyed it very much. After a while we moved to another house...a better house...and we lived there another year or so...a year and a half. Then we moved from there to Stratford which was closer to Bridgeport itself but was on the main road to Stratford. This house on the main road at Stratford...1560 I think was the number...was about one mile from the Sikorsky Plant located right on the edge of the Housatonic River. Our house wasn't on the Housatonic River...it was about a block from the river -- we didn't have any river view. Along this main street were beautiful trees. It was a very attractive place...strictly a residential area...no manufacturing or factories of any

kind around.

When we were at the Keystone Aircraft Company, to flash back a little bit, I became involved in the design and re-design of some flying boats for the United States Navy. As a consequence, I paid a great deal of attention to flying boats and often visited the Naval Aircraft Factory in Philadelphia where most of the flying boat activity was going on. The Navy itself was building and rebuilding a whole series of flying boats known as the F Series. It came from the F boat in England that had been well-developed with Rolls-Royce engines...the first thing the Navy did was to put Liberty engines in this country...called it the F-5L. I had spent a great deal of time at the Naval Aircraft Factory getting better and better acquainted with a number of engineers who worked there. It turned out that the Chief Engineer of the Keystone Aircraft Company...a man by the name of Porter, and the President of it...and a man by the name of Huff, and another of the original founders...Elliott Dayland...had all worked at the Naval Aircraft Factory during the World War I. That's how they became acquainted and started the Huff-Daylen Company in Ogdensburg, New York I mentioned earlier. It was through these men that I met many other people in naval aircraft and became very familiar with flying boats and flying boat techniques, practices and problems.

When I outlined this to the Sikorsky people as I came to work for them...they immediately put me in charge of a flying boat that they were starting to build for the United States Navy. (This was a natural...I was acquainted with the subject.) And we built the XP-381...it was a very nice biplane flying boat with folding wings, designed to be used on a carrier as well as for general patrol purposes. Its carrier use wasn't of much concern and while it was a very nice experimental airplane it had one problem with the tandem engines. When you cut the power back, a very severe wake behind the tandem engines and their propellers, right on the tail surfaces, tended to make the airplane unstable. For pilots who didn't know about it, who tended to pull the throttle back too far or too much, the airplane would hunt up and down a little bit and if you had the timing wrong when you hit the water you could damage the hull. This is what actually happened to some of the Navy Pilots who didn't take the good advice from our test pilot...a man by the name of Burdick. He and I had done all the test flying in it and it was very pleasant along Long Island and a nice experience. We also tested and flew the various Sikorsky Airplanes like the S-39, a very nice little four-passenger single-engine airplane.

I took some very interesting trips in that plane at different times. One was to Detroit, Michigan, to an air show. On that particular flight while crossing New York State, a freight train on the Delaware and Lackawanna Railroad gradually caught up to us and passed us by...left us

standing (flying) there...which shows you how strong the wind was that day. We had to turn around and go back to Syracuse, New York to get another load of gasoline before we could continue on. We also...while at Sikorsky tested a number of S-38's, a twin-engine, amphibious flying boat... sold to Pan American Airways. They used them to pioneer most of their routes. They sometimes had a landing field on one end and only water on the other end of the route... or sometimes water on both ends...so it was a very satisfactory airplane for them. It was during this time when we were working with Pan American building a new model called the S-41 and later on, the 4-engine S-42...that I met Lindberg and some of the other Pan American personnel and got to know them quite well. After the XP-381 was finished Sikorsky then built an observation plane called the XSS-1...it was a seaplane flying boat hull...with wings right out of the top of the hull, a gull-wing affair with the engine mounted up top in a nacelle. Later on this was revised somewhat and became the XSS-2. But, all of my time was not given to those particular airplanes... often I helped with the design of the S-40...which was a Sikorsky high-winged four-engine flying boat also built for Pan American. And later on I worked on the S-41 and then the S-42. We had just started the preliminary design work on the S-43 when the depression got so deep in 1933 that one of the officers of the United Aircraft Corporation (who owned the Sikorsky Company) who was sent to cut down expenses, called me in one day and said that my job would be ending at the last day of the month.

That was about the time when you and Letitia and your Mother and your Aunt Pauline and Bruce had come back from Florida. As it worked out, it was a very satisfactory arrangement. Again, your mother and I found ourselves out of a job, but it wasn't a very great problem because I had some acquaintances in California at the Douglas Aircraft Company and the Chief Engineer, Mr. Kindelberger, whom I'd met and seen a great deal of in the Navy Department...always jokingly asked me..."Well, when are you going to come back to California?" And I'd say, "Oh, I don't know, someday, I guess..." and then he used to nag me a little bit, saying, "Well, why don't you come and work for us...the climate's a lot better!" I happened to be at the Navy Department on Sikorsky business and I saw him and I asked him if he was serious. Then I told him a little bit of the situation at Sikorsky and he said, "Yes" ...he did mean it. They had several projects...a flying boat for the Navy and an amphibious flying boat project for the Air Corps...and of course they were also building the Douglas Dolphins, a small commercial twin-engine flying boat...the one that was being used steadily to run to Catalina and back. He said that they had a considerable need for people that were acquainted with flying boats and flying boat construction and handling...so, although without an actual commitment from him, I decided that our whole family, you and Letitia and your mother and I should

go to California...I thought it would be nice for my mother to see the children. My grandmother had died the year before.

It was 1933 in the summertime...we packed up everything...closed up our house, put everything we had into a big Cadillac car we owned at that time. I told you about the Model A...well, the Model A eventually got exchanged for a used Cadillac. The Model A was a bit small for four people. It was really only a two-seater with a rumble seat in the back, but we didn't dare put young children in a rumble seat! We bought the Cadillac and it turned out to be a fairly satisfactory car...it really was a bigger and a more expensive automobile than we should have owned but it's the one we had, so we used it. On our trip to California we went first to Bristol to see Virginia's family and friends...finally said goodbye and were on our way. We plowed along very nicely...the countryside was very enjoyable...we stopped at some hotel every night because of you children and made a lot of other stops in between I might add. Eventually we got to California. We stayed with my mother in Hollywood at 2115 Canyon Drive just a couple of blocks above Franklin Blvd. Several years before mother had married Mr. Guy Kelsey...about the time I was in college. So we stayed there for a couple of weeks while we found a house and I got settled into my new job in Santa Monica with Douglas Aircraft Company...\$50 a week.

This was in August of 1933...you were 3½ years old and Letitia was 1½ years old on the trip that we made across the United States. We established ourselves in Santa Monica...your mother found a very nice house on 31st Street completely furnished only about a block away from the plant where I was to work and so I didn't have to use the car and it made the car available when she needed to use it. I walked to work...I even walked home to lunch and often you and Letitia would walk up part way to meet me. We lived in this 31st Street house about one year...a little over a year...and then we moved to a house on Rustic Road in the Santa Monica Canyon rented from Braven Dyer, the LA Times sportswriter. It was while we lived in the Rustic Canyon house that you first started early to school at the Canyon School.

I'll tell you a little bit more about my work and what I did. Actually, when I came to the Douglas Company I fitted right into the flying boat operation I told you about. Mr. Kindelberger called me aside and said, "Well, I'll tell you, one of the reasons that I wanted you to come here is that the project engineer John Weaver we have in charge is having some mental trouble and I can't convince him that he needs a rest, and I'm afraid he's going to have a breakdown. And if he does, then I want you to take over." Well, this was in August 1933...to show you how well he anticipated what was going on...the project engineer actually did have a breakdown at the beginning of December...so I took

over all the flying boat projects and put them together as one large-sized operation. Previously I'd just been working on the flying boat we made for the Navy. This was, as I mentioned, 1933. Well, work went along very smoothly...eventually the projects were finished and the flying boats tested by the Navy. We all spent time down in San Diego while the tests were made...as a matter of fact, you children were along too but you probably don't remember. We lived in a motel there. When the Army Amphibian was finally finished we decided to rebuild the Navy boat where the engines were up on top (a bit like the little Dolphin). It was decided to raise the wing thirty inches and put the engines in the leading edge and generally revise the airplane. This was done and it turned out nicely. In 1937, being Project Engineer, I was appointed to be the Assistant Chief Designer for the Douglas Company. It really didn't change what I did much except that it meant I spent more time on other Douglas airplanes instead of exclusively flying boats. I was involved in the first DC-4E (that's the DC-4 with a triple tail...the first DC-4 model)...actually it was the only DC-4 of that particular type. Later DC-4's just used the name and weren't related to it mechanically in any way. Then came the start of the B-19 in 1935...and the general work...by 1937 then I became the Chief Designer instead of the Assistant Chief Designer and I had this particular role during the models that we built in 1937... 8...9...and 1940 when World War II started.

In 1940 we started building airplanes for the allies... particularly for the French and then the British. We interrupted the B-19 work, which I had as a project as well as my other work, to build the B-23. We used the same design crew to do that and once that job was done we went back to finish the B-19...it kind of seems strange the way it happened now that you look back at it. Then, in 1941, I was made the Assistant Chief Engineer for the Douglas Company and Mr. Burton, who had previously been the Assistant Chief Engineer, was advanced to be the Chief Engineer. Of course, during the war the company expanded quite a bit...we opened the Long Beach Plant which took a few of our main engineering people from Santa Monica to man that facility. We then opened a plant in Tulsa, Oklahoma and that again took more of our staff away... and then a plant to manufacture just DC-3's only in Oklahoma City, Oklahoma. Next, a plant in Chicago to build nothing but DC-4's...called C-54's at that time for the Air Force. Now, that DC-4 was not the same as the original DC-4...this was a new airplane...a four-engine airplane... but it was the one that became famous as the DC-4, and eventually was revised and developed into the DC-6, the 6B and ultimately into the DC-7. Now, those were big changes but fundamentally they were based on the same over-all airframe...if you want to call it that...stronger, heavier, faster, with a lot more power of course. After about 1945 or thereabouts...I can't remember exactly...

the jet airplane came along, and the original one we built... the first jet airplane the Air Force had was built by the Bell Company in Buffalo, New York. Then we built a bomber... a twin engine...two engines inside of the fuselage, actually, but it did have a straight wing but we built just a couple of experimental models because the engines weren't thoroughly developed at that time. North American built a twin engine bomber too...and Consolidated built a twin engine model type. Ours was called the B-43...and the Consolidated one was the B-44...and North American the B-45. But, at that time, the Boeing Company got together with the Air Force and decided that they should build a four-engined jet airplane...and this became the B-47.

Well, I don't think you're really interested in all these airplane numbers and things like that, but the work went along. After the war was over, as I say, we built the DC-4 then we built the DC-6 and 6B and DC-7 commercial airplanes. During the 1950's we had been working on a four-engine commercial jet airplane, but the engines were really not quite suitable for the purpose...they weren't developed enough. But the Boeing Company then decided to build a four-engined jet commercial airplane that they called a dash 80 and we started to build the first DC-8's. The DC-8 and the Boeing airplane...the 707 as it turned out to be known later on...were the first airplanes that had jet engines that were really suitable for building a satisfactory commercial airplane. There had been a few attempts previously...one by the Canadians...and of course the British had built the Comet and it was somewhat satisfactory although it wasn't developed enough and they had troubles with it...one or two bad accidents. Eventually they solved these problems and the Comet existed. It differed primarily in that the engines were built inside the wings... and every time you had engine trouble you had airplane structure trouble to go with it...automatically. Whereas, the Boeing 707 and DC-8 had the engines in pods that were under the wings and somewhat forward and protected the wing against various kinds of engine troubles. Both the Boeing 707 and the DC-8 were very very successful transport airplanes...and at the time of talking...right now... (time of typing is 1:26 pm PST on 29 Jan 1983) both of them are still in extensive use all around the world.

Well, a great deal of time and effort was spent on the DC-8's and of course the preliminary design work was done on the DC-9 and by this time I was getting ready to retire from the Douglas Company, although it was a few years before my regular retirement at age 65. What accelerated it was the combining of the McDonnell Aircraft Company in St. Louis with the Douglas Aircraft Company of Santa Monica to form the McDonnell Douglas Corporation in 1967 and the increasing angina pains during the previous year. In 1958, anyway, after being the Assistant Chief Engineer for 17 years, I became the Chief Engineer and in 1960 Mr. Burton, who had been my immediate superior, became very

ill and Mr. Raymond, who was the Vice-President of En-  
solved due to the combination. The new McDonnell Douglas  
Corporation decided that financially they already had all  
they could fund in a research department in St. Louis,  
and the Douglas Advanced Research Laboratories out here  
would be combined with the Missiles and Space Division  
in Huntington Beach. This worked out, I think, satisfactorily  
for everybody. The only unfortunate aspect was that we  
ended up with a beautiful research laboratory building  
without any research department in it...but on the other  
hand the Missiles and Space people took it over and put  
it to very good use.

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