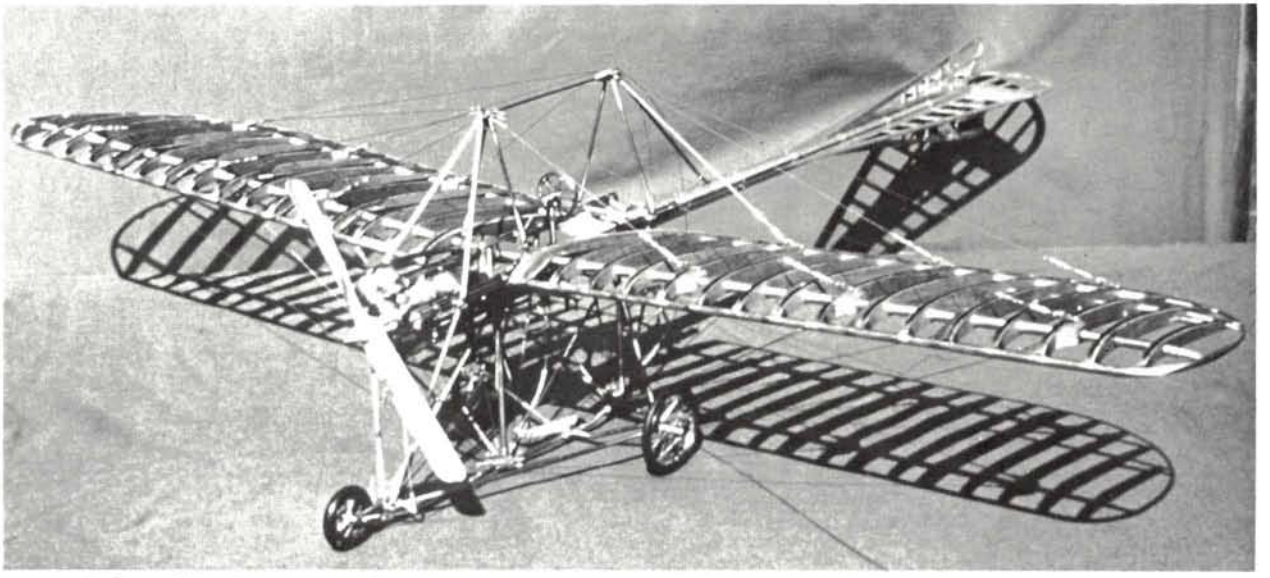
Smithsonian

Presentation

By Dr. Paul E. Garber
(Curator Emeritus)

A TAPED INTERVIEW WITH HARRY JOHNSON AT THE TIME OF THE PRESENTATION OF THE MODEL PICTURED AT RIGHT



"I found Mr. Johnson and Mr. Shaw discussing this beautiful model which Mr. Johnson is assembling". This model, currently on display at the Air & Space Museum, has a 43" wing span.

July 22, 1959 - This is Paul E. Garber, Head Curator, National Air Museum recording an interview with Harry Johnson who with his brothers Louis Johnson and Julius Johnson constructed an airplane in 1911; an improvement on an airplane which they constructed in 1909. As I arrived in our Aircraft Building Shop, I found Mr. Johnson and Mr. Shaw discussing this beautiful model which Mr. Johnson is assembling, they are now putting the wooden figure of a man into the cockpit, but actually there is no cockpit, strictly speaking, because the man sits upon a band of canvas. There is no safety belt. Mr. Johnson explains that the hands of this figure were carved separately so that they could be fitted around the wheel which controls the airplane.

Mr. Shaw: Do you notice how the magneto is operated by a lever on the steering wheel and how cleverly it is contrived so that the lever actually operates the magneto in this model? Mr. Johnson has explained that the pilot would hold that lever over in retard until the engine gets going.

Mr. Garber: No safety belt, I see. Did you ever fly this one yourself?

Mr. Johnson: No, No, Lou did it and then the fellow that we taught to fly but I never flew as a pilot. Lou flew this for a whole year but it cost a lot of money to teach a fellow to fly. At that time we were interested in the development and sale of Marine engines and there were some persons who thought we shouldn't waste our time on airplanes. We had to make money so we finally gave up the airplane and went to Marine engines.

Mr. Garber: You carved your own propeller too didn't you?

Mr. Johnson: Yes, I made that myself. I carved the one on the model and I carved the one on the airplane.

Mr. Garber: What wood was in the original, mahogany?

Mr. Johnson: No, spruce and walnut. But I made this one of maple and mahogany because they are of a similar color. I wanted to put more strength in the propeller on this small model.

Mr. Garber: Where did you get your basic idea for this airplane? Was it from seeing another airplane or reading books or magazines?

Mr. Johnson: We made one like this before, you know, but we didn't have very good ideas then. We made that in 1909. We weren't trying to copy any existing airplane. There weren't any around at that time that I knew of, but I remember a man named Benoist and another named Bleriot. I think he crossed the English Channel and I did see some pictures of that, but that's all the part I can remember having seen.

Mr. Garber: These wings are much like those Bleriot designed and used.

Mr. Johnson: The shape of them?

Mr. Garber: Yes, and Bleriot used wing warping like you do here.

Mr. Johnson: The Wright Brothers used warping too. All of their airplanes were something like this but the same principle of wing warping was not new with this one here, we knew.

Mr. Garber: Now for your steering control you have a rudder bar there for your feet and that moves the vertical rudder, on a vertical axis. Were those controls crossed over, that is: when you pushed your right foot, did you turn to the right or was it as in a sled or bicycle that when you pushed the left end you turned to the right?

Mr. Johnson: We made it like a child's wagon.

Mr. Garber: Yes, that is quite logical and I have often wondered why others didn't make the rudder bars move the same way. I remember that it was awkward for me to learn to move the rudder bar in a different manner than I had been accustomed to on a sled and bicycle.

Mr. Johnson: We preferred to turn the bar the way we were going.

Mr. Garber: Now for warping you turned the wheel itself, turning it as in an automobile and I guess that as you pulled down on the right side you would raise the trailing edge of the right wing.

Mr. Johnson: When you pulled down on the right side you raised the left wing of the airplane upward and the right side went down.

Mr. Garber: Then if you were making a right turn you would push your left foot forward and that would bring your right foot back a bit then at the same time you would pull down on the right side of the wheel and that would raise the left wing upward so that you would bank to the right.

Mr. Johnson: That's right.

Mr. Garber: That is instinctive and logical; and then to control the elevators the pilot would pull the whole wheel assembly to him and that would cause the airplane to climb.

Mr. Johnson: Yes, that would make the tail end of the airplane lower than the front end and set at such an angle that it would lift.

Mr. Garber: Now that's the controls and they certainly are understandable. I see that you have a brake here; you have a long metal sleeve there by the pilot's right leg. There is a handle on that rod in that sleeve and as the pilot pulls up on the handle a wire at the bottom end of that rod pulls up the front end of a drag bar, the other end of which digs into the ground and acts as a brake.

Mr. Johnson: The drag on the ground slows the airplane after landing.

Mr. Garber: That is certainly an early use of a brake. You don't have the front wheel of your three-wheeled landing gear steerable do you? Was steering on the ground just by using the rudder of the airplane itself?

Mr. Johnson: It rolled on all three wheels but there was light weight on the front wheel; that made it easier to lower the tail section of the airplane and lift the airplane off the ground.

Mr. Garber: That takes care of the controls. Of course you pushed the wheel assembly forward in order to descend. Now let's discuss the wings. Did you have metal spars for them?

Mr. Johnson: No, those were of wood and so were the ribs. There wasn't much metal in the wings.

Mr. Garber: Where did you get your wing section from? That is, the curvature of the wing. Did you get that out of a book? Did you just think that a curved wing was a good idea or was it from looking at some bird, maybe?

Mr. Johnson: I don't recall seeing any curved wings before. We just made the structure as light as possible and also to have strength; that required the bridge structure as I call it. The cross pieces or ribs were made like bridge crosses and the spars were the same way. They have longitudinal sections separated by upright sticks between them.

Mr. Garber: Then the wing section was not some particular shape that you were copying from some book. You realized apparently that you had to have curved wings but where did you get that idea from? Why aren't these wings flat like a kite?

Mr. Johnson: I think we must have gotten that idea from somewhere; maybe from some picture but I don't even recall the magazines that were out at that time.

Mr. Garber: There was "Aeronautics," put out by Ernest Jones and from time to time he would publish what he called, "structural aids."

Mr. Johnson: We might have gotten something from those magazines.

Mr. Garber: Do you remember a book called "Vehicles of the Air," by Lougheed? It came out about 1909 and had drawings of a number of airplanes of that time?

Mr. Johnson: No, I don't remember that one.

Mr. Garber: Then apparently your information came from a few photographs and magazines that you might have seen, and in that way you learned something about what others were doing. But there is so much original work in this that it doesn't look as though you copied it from anyone except the shape of the wing. The tail section is something like that which was on the Antoinette airplane of that day, and I think there was a Bristol which had a similar tail group.

Mr. Johnson: Wasn't Antoinette a man who tried to race an airplane across the Straits of Dover?

Mr. Garber: Antoinette was the name of the airplane; the pilot was Hubert Latham.

Mr. Johnson: Had a square-end wing didn't he?

Mr. Garber: Yes, we have a model of that one here in our Early Bird Case. The internal structure of your wing, then, was made from built up spars and built up ribs, each having a sort of a bridge truss shape, is that it?

Mr. Johnson: Yes, that's right.

Mr. Garber: The covering was what kind of cloth, was it muslin?

Mr. Johnson: No, it was rubberized linen.

Mr. Garber: Was that a commercial product or did you make it up yourself?

Mr. Johnson: We bought it that way.

Mr. Garber: There was a Goodyear cloth which was rubberized and then there was a material called Penacloth which was put out by the Pennsylvania Rubber Company, so there were available at that time some fabrics that were impregnated.

Mr. Johnson: It might have been an experimental cloth.

Mr. Garber: So then you put it on with the warp and woof running at right angles spanwise and chordwise, parallel with the spars. The Wright brothers put theirs on diagonally so as to get some additional bracing from the fabric, but apparently you put yours on straight across.

Mr. Johnson: That's right. And then we put rib strips on like you see here to keep the fabric from tearing where the tacks are, and we also had rib stays inside which were wires to keep the wing from being bent backward diagonally.

Mr. Garber: That takes care of the wing and the controls; now let's consider the construction of the fuselage and landing gear. In the fuselage you used steel tubing. Did you braze it or was welding in use that early?

Mr. Johnson: No we had to braze it.

Mr. Garber: Langley used brazing on his aerodromes. The landing gear of your airplane I see is something like that used by Glenn Curtiss, so although you may have copied the Bleriot wing you did not copy the chassis from that airplane. This longitudinal boom which constitutes the principle member of the fuselage, aft of the pilot, is very unusual. I had once seen a somewhat similar structure in a Smith Monoplane but apparently this idea was original with you.

Mr. Johnson: With us it was just a means of carrying the elevator and rudder far back.

Mr. Garber: I notice you don't have any long guys or stays, extending from the front of the fuselage out diagonally to the entering edge of the wing, to serve as a preventer for any tendency to backsweep, nor do you have any stays extending from the trailing edge of the wing back to the tailboom. Apparently you have all the stiffness that you need there in the tailboom itself and you have told me that you made that out of pieces of sheet metal that you formed into conically-tapering tubes and then riveted them together; but in the model here you have turned the boom out of a piece of aluminum rod. This is certainly beautifully done.

Mr. Johnson: That cooling system is interesting.

Mr. Garber: Yes I thought we ought to take up next

the engine.

Mr. Shaw: I think he was one of the first to develop that method of cooling.

Mr. Garber: The Antoinette used surface cooling along the fuselage. You have no drag at all for your radiator. In most airplanes the radiator was placed up front and was of a square shape. It created more drag than any thing else.

Mr. Johnson: That's right.

Mr. Garber: This engine here you tell me is based on those that you had been making for use in boats. This is a four-cylinder shape with the cylinders arranged like two vees staggered with one another. What was the bore and stroke?

Mr. Johnson: The bore was five inches and the stroke was four inches. It was two cycle.

Mr. Garber: Those little spark plugs on this model are certainly well made; did you use a Mea magneto?

Mr. Johnson: No it was a Bosch magneto.

Mr. Garber: Then I guess the distributor was on the magneto itself. Did you use dry cells for starting the engine?

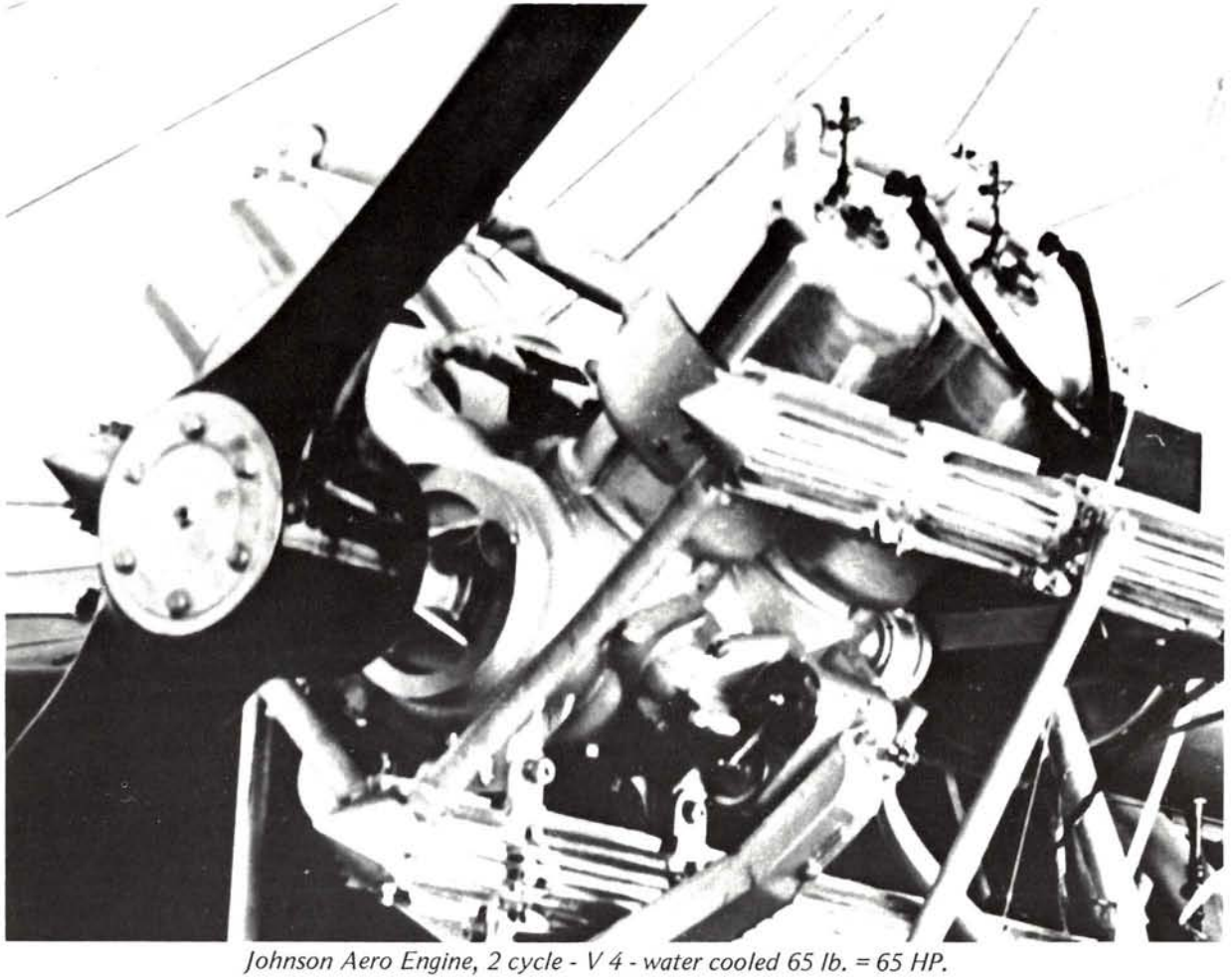
Mr. Johnson: No we didn't need that. Turning the propeller would start the engine all right.

Mr. Garber: Did you use any booster?

Mr. Johnson: No, we didn't need it.

Mr. Garber: Where is the carburetor?

Mr. Johnson: We had a pipe here for carrying the gasoline through a needle valve. That's the needle valve, there, where we would adjust the gasoline while the engine was running and get the maximum speed out of it, the right mixture. There was no throttle on the engine. It was a one-speed engine and to start it we would prime the engine, put gasoline through the exhaust opening here and turn the propeller to start, and when the engine starts, the aviator pulls on this little valve control here, the one here by his right knee, and opens up to allow the gasoline to run through the screen; and with the engine running we adjust this lever here and then that can stay that way. It usually stayed that way for a long time and to control the engine he has a push button on the steering wheel which grounds the magneto to kill the spark, and he just cuts the engine in and out for control as when coming in for a landing on the ground. It had no throttle on it, and it works very well that way and we had the advantage of not needing any throttle. And then when the engine is running the aviator only has to fly the airplane.



Johnson Aero Engine, 2 cycle - V 4 - water cooled 65 lb. = 65 HP.

Mr. Garber: Then you didn't move the spark lever back and forth in order to control the speed of the engine?

Mr. Johnson: No, we never did that.

Mr. Garber: With the rotary engines there was a button on the top of the control stick, called a "blurp button" which was depressed to cut out the ignition for the engine. Sometimes when it would be cut in and out, the pilot would get a face full of castor oil. What kind of oil do you use in your engine?

Mr. Johnson: We used a good boat oil like we had used in Marine engines but I can't think of the make of oil we used at that time.

Mr. Garber: Now in this tank here which is even with the entering edge of the wing, this triangular-sectioned tank, - does it include an oil tank? Did you mix the oil with the gasoline?

Mr. Johnson: Yes, we did mix oil in the gasoline tank here and there was no other oiler on it.

Mr. Garber: Now what is this header on top of the top of the gasoline tank?

Mr. Johnson: We called it the steam dome at that time. It collected the water as it came hot from the engine and the steam collected in this. It has the steam escape here just as you have in the automobile at the top of your radiator, and here is an overflow tube the same

as in an automobile so that the water and steam could escape down here. The water was in there only about 2/3 full.

Mr. Garber: Oh yes, you are speaking of this small tube that comes out of the front center and bends around to go down toward the left side, and I guess this top opening is where you put the water in.

Mr. Johnson: Yes that's right. The water starts to flow here from the water pump which is at the back of the crank shaft. From there, the water is carried from these tubes here and up into here, and enters the water jacket here on the left side along this tube of the fuselage, and goes right and left, and then circulates through the four water jackets, and then comes out here into this hose and then through that hose and then enters into the steam dome.

Mr. Garber: Oh yes, I see that it flows out from these tubes just behind the aviator's seat where one bends to the right and the other bends to the left and then the water flows into the center unit and then is piped into the longitudinals. It comes out of that tube just in front of the foot bar and then it goes from there to the pump. That is a complete circulation which continues all the time that the engine is running. The air-cooling flanges are fastened to the longitudinal tubes to increase their radiating surfaces. Those longitudinal tubes are not only the structural members for the fuselage but also, being hollow, provide pipes through which the water flows so that it can be cooled before re-entering the engine, and these flanges increase that cooling.

Mr. Johnson: Those flanges were soldered on to the tube to improve the heat conductivity. The air stream helped to cool the water. This system worked very well.

Mr. Garber: It almost looks like you would have had more cooling surface than you required, but that is certainly better than not having enough. Now we have covered the construction of the wings, engine, fuselage, tail group, and under-carriage. Next: how about flying it. You say that the center of gravity is located just about in a line forward of the rear wheels of this three-wheeled landing gear.

Mr. Johnson: Yes, and the center of pressure was about 1/3 back from the front of the wing.

Mr. Garber: Then your center of pressure was forward of your center of gravity, and your center of thrust was in a straight line from the propeller shaft back through this long telescoping boom to the tail group. That is a good distribution of forces. With the engine started, could you hold the airplane back with the brake? I mean, this brake here that is pushed into the ground when you pull up on this handle. Or do you have to have someone to hold the airplane back for you while you were revving up the engine?

Mr. Johnson: We had around 250 pounds of thrust, measuring it with a spring balance and a rope tied to a tree. Sometimes we would tie the airplane to the tree until the engine was running up or sometimes we had some men to hold it back. A man on each wheel here at the back could hold it. We have a picture of two men doing that, but most of the time we used a rope tying it to a fence or a tree, but out in the field sometimes when there wasn't anything to tie it to we would use men to hold it back and that gave them quite a lot of work to do, too.

Mr. Garber: Did you have a slip knot in the rope which the pilot could release or did you have someone on the ground to let the rope loose?

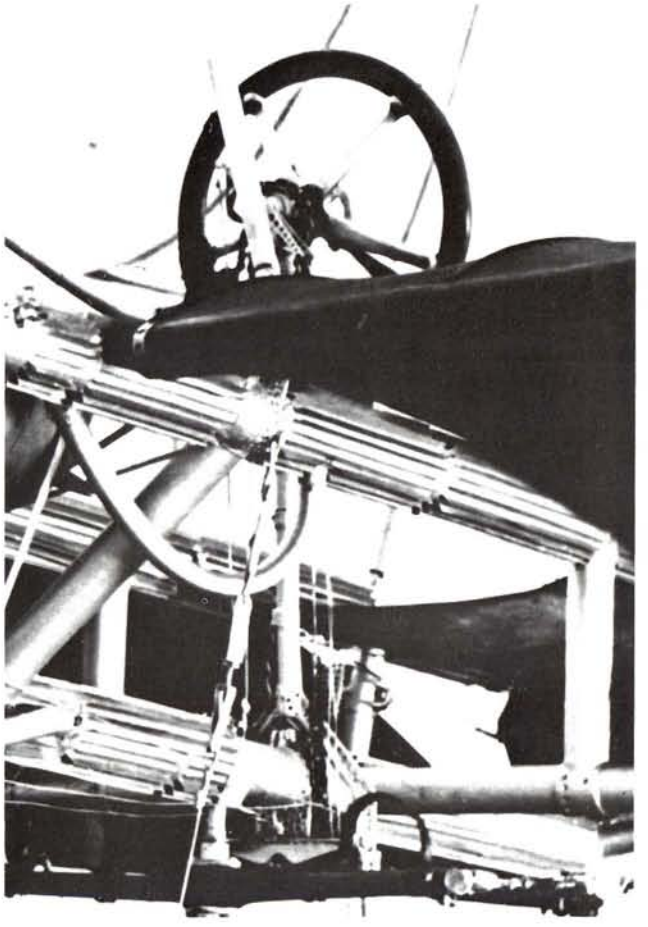
Mr. Johnson: A fellow on the ground would do that. The pilot has to use a step ladder in order to get into the seat.

Mr. Garber: I see, and so with the pilot at the controls and the engine running, the airplane would be released either by cutting or untying the rope or by having the men let go, so then the airplane would roll along the ground and when it gained sufficient speed the pilot would pull back on this wheel column, thus depressing the tail, inclining the airplane upward, and up he would go. Did you ever measure the rate of climb or the extreme altitude?

Mr. Johnson: No we did not have any way of measuring it. We probably could have arranged a way but we didn't do that. I imagine that the speed at which we took off was about 30 miles an hour. We would find that out by an automobile running along side of it while the man in the car would watch his speedometer.

Mr. Garber: How fast was the airplane flying as it came in for a landing?

Mr. Johnson: I guess that speed was about 35 miles per hour maybe, just a little faster then what it took off at. We could slow it down by this push button which would cut the engine in and out. In the air the speed was about 50 or 60 miles an hour, straight and level without a tail wind; but at that time we had no way of measuring it. That is just our guess. We never tried for altitude, sometimes we would say it was up about a mile high but we just said that. The airplane would look pretty small if



Steering yolk is conventional - it straddles the main lower tube of the fuselage. Forward is down, back is up, turning the wheel creates a normal bank. Note the rudder bar at bottom of photo, with leather loops to hold flier's feet.

it was as much as a mile high up. We have some pictures of it way up high and it looked pretty small. It could have been a half a mile high, but that is just a guess after all. We had no way of measuring how high we were, but Lou always said that it felt mighty high.

Mr. Garber: Well now Mr. Johnson you have been very obliging and patient to answer all of these questions. We have discussed this airplane along the same method that I used in the Navy when I was teaching recognition of enemy airplanes. We have also considered

the structure and performance, but I wish that I could hear from you some anecdotes of the times when you and your brothers were building and flying this airplane. You have told me that this was constructed as an improvement over the one you and your brothers made in 1909. May I suggest that Mrs. Johnson and you might have lunch with me. We can continue our conversation there.

Mr. Shaw: While you two are at lunch I'll glue these hands together around this wheel.

Mr. Garber: Thanks, Win. We'll be back before long.

(Later)

Mr. Garber: Now we are back from lunch. It was particularly enjoyable to have Mrs. Johnson with us. During lunch we spoke further about the airplane. Mr. Johnson said that there were two things which influenced their discontinued operations of the airplane and their further interest in aeronautics. One factor was a cyclone which demolished their factory, and another factor was their hope to get a contract for some airplane engines from Russia. That was after the beginning of World War I in Europe, 1914. The Johnson airplane had continued in flight through 1913 and during that year the brothers were thinking of developing a more powerful engine. The engine as shown in this model had 4 cylinders but the brothers intended to develop the type with 6, 8, and possibly 12 cylinders. The Russians became interested in the most powerful Johnson engine, and the Johnson Brothers invested a great deal of money and effort into the development of the 8 and 12 cylinder engines. The Russian government was rather unsettled at that time and it seemed difficult for the agents of that nation to make up their mind. When the Johnson Brothers learned that the Russians preferred a 12 cylinder engine they decided that it should be of the 4 cycle type, but the brothers could not obtain a magneto of sufficient power and reliability to use in the ignition system. Had the Russian government ordered the 8 cylinder engines in quantity or had the brothers been able to get an experimental contract for development of the 12 cylinder engines and been able to produce a prototype that was satisfactory, the Johnson Brothers might well have gone into the business of manufacturing airplane engines and developing more advanced examples of their airplanes. But, not receiving such encouragement the brothers decided to concentrate on Marine engines. Also there were some financiers who were considering investing money in the Johnson Company. The investors believed that aviation was an unstable field and they would not agree to put their money into the Johnson Brothers' enterprise when the state of aeronautics was so indefinite, and considered to be unreliable. Moreover, there was the thought on the part of these investors that if any of the Johnson Brothers were injured in the course of their flying, that their company would thereby be deprived these services, thus reducing or even closing the operations of the Marine engine plant. So those three factors: the severe damage to their plant by the tornado, the loss of the Russian contract, and the attitude of investors caused the brothers to give up airplanes and airplane engines and concentrate on Marine engines. For a while the brothers made a small gasoline-engined unit which was attached to a bicycle and called the Johnson motor wheel. (I remember that these were sometimes built into 4-wheel wagons and used by boys for transportation around the neighborhood. A friend of mine had one about 1916 which he and I would frequently go from my home which was then near the Naval Observatory, all the way over to my friend's family's summer home in Virginia.) After that the brothers got into the making of outboard motors, they being the first ones to use a rope for starting the engine. Now, of course, Johnson outboard motors are famous and the company itself is very substantial. Mr. Louis Johnson and Mr. Harry Johnson are retired from their business and Clarence is continuing it. Julius Johnson I was told had withdrawn his investment several years ago into another line. Clarence was the youngest of a family of 7 children but at the time when the airplane was being made and flown he was too young to participate other than by lighting bonfires so that the pilot could land the airplane when evening was coming on. At present time one of the five brothers and one of the two sisters have passed away. Mr. Johnson is there anything that we haven't covered in our discussion here in the shop or at lunch?

Mr. Johnson: How about the springs on the landing gear. You notice that they extend upward at an angle from their lower connection near the rear wheels. Those springs were very useful when we were rolling over rough ground, and then when we landed these springs would stretch upward so that the skid would touch the ground and help to slow us down for landing.

Mr. Garber: I see that you have made miniature springs here, and that they operate the same as in the original airplane.

Mr. Johnson: Yes, I have put it all in there exactly as it was nearly 50 years ago.

Mr. Garber: I notice that you have some heavy springs up here in the horizontal section of the control cables where they connect to the cables coming off of the control wheel. They look like whiffletree springs. What were they used for?

Mr. Johnson: Well, when the aviator pulled his control wheel back it would tend to shorten this cable here but the springs were so arranged as to take up that extra play, and similarly permitted the connections to elongate when the aviator pushed the wheel forward. That would keep the chain from coming loose on these sprockets over which the length of chain passed. Thus the spring would expand or contract to compensate for the over-all differences in the lengths of the connections to the elevators. Now, for take-down purposes we could take the wings off and lay them alongside of the body when we were going down the road or moving it from one place to another. One end of the wings would rest on this pin here and the other end on this cross bar, while the trailing edge would lay against the upper structure of the fuselage. We would tie the wings in place and then we could pull the whole machine along a country road behind a horse-drawn wagon, and then bring it into a field where we could take off. One of the fields that we used had a bluff there and we would usually take off from the top of the bluff.

Mr. Garber: About dimensions, you have told me that the scale of this model is 1:10. That is 1/10 size, every part being 1/10 that of the original. A decimal scale.

Mr. Johnson: Yes that is right; the wing span was 36 feet and the length was 34 feet. That was measured from the front of the front wheel to the extreme rear, over-all. The propeller was 8 feet in diameter and the width of the wing was 8 feet.

Mr. Garber: Do you remember the pitch of the propeller?

Mr. Johnson: Yes that was 4½ feet. The revolutions per minute were about 1200 on the ground but I don't know how fast the engine turned up when the airplane was in the air. In the air it must have been more than on the ground. We had no indicator on the machine, however. Here is another thing I had not mentioned. The cables extending from the rear spar connections on the right side of the wing to the corresponding fittings on the left side would pass over the pullies on top of these upright cabane braces here, and in that way they would

move spanwise from side to side when the wing was warped.

Mr. Garber: You told me during lunch that in all of the flights with this airplane there had never been any serious crack-ups. You said a few minor damages had occurred that were easily repaired and that the airplane was flown until 1913.

Mr. Johnson: Yes right up to the winter of 1913 but not over into 1914.

Mr. Garber: Was there any change in the design during that period?

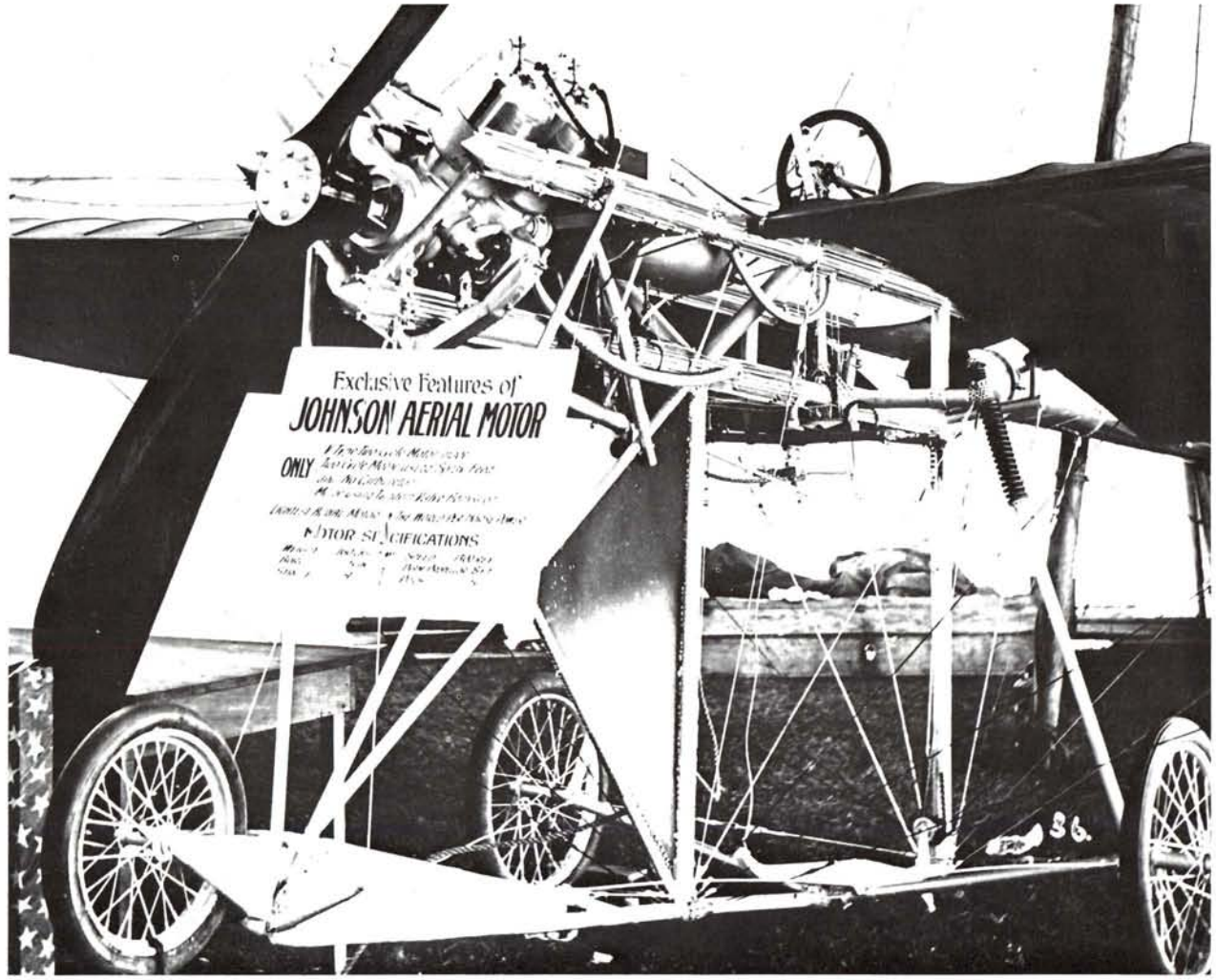
Mr. Johnson: No, this model shows how it was at the beginning and how it was all the time we were flying it. I don't recall any changes that were made all that time except these flanges here on these longitudinal fuselage pipes. At first we didn't have them on, and then we added them in order to help make the engine run cooler. They were on in 1911 however, so we must have put them on rather soon after we built it. On the model I have made them out of sheet brass, but on the airplane they are made of copper and were of L-shaped section. On the model it was quite a problem to figure out how to make them but first I ran the brass through a set of gears so as to form these parts that expand up, and then I made a tool for pinching those U-shaped parts flat. That formed the shape that would fit around the pipe. Then I soldered them together, soldering the joint on the unerneath line of the tubing on this model, but in the original airplane we soldered each piece on separately.

Mr. Garber: That is certainly a wonderful story and I marvel not only at your ingenious craftsmanship in constructing the original but also in the exquisite jewel-like precision and beauty with which you made this miniature reproduction. Is this to be accessioned as a gift from all three brothers?

Mr. Johnson: Yes that's right, from all three of us. We are very honored to have it here in the National Air Museum.

Mr. Garber: Well I assure you Mr. Johnson, and I assure your brothers that we ourselves are honored to accept it from you and to display it. I know that our visitors will be thrilled by the excellence of this beautiful model. Those brothers are yourself, Louis whom I met, and Julius who I have not had the pleasure of meeting yet.

Mr. Johnson: That's right, that is Louis J. Johnson, Harry L. Johnson, and Julius M. Johnson.



Mr. Garber: The correspondence clearly indicates that this is being given by the three brothers to the National Air Museum. At the time when I had the pleasure of seeing Mr. Louis Johnson he mentioned also a trophy and said that would be available, and I assured him that we will be pleased to have it. I will contact Mr. Beldon about that. May I confirm the address please?

Mr. Johnson: Yes. Louis J. Johnson is now at Drummond Island, Michigan. Julius M. Johnson is at Meadow Court Hotel, Bradenton, Florida, and after Mrs. Johnson and I return from a little trip we are taking, we will be back home at R.R.-1, Culver, Indiana. We will stop off at Washington as we turn back toward home after we visit some friends up North.

Mr. Garber: Thank you again Mr. Johnson; and Mrs. Johnson, we are further indebted to your husband for bringing you. I hope that you have enjoyed your visit to the Museum. We will proceed to put this beautiful model on exhibition so that we and our visitors can enjoy it. Again and always our sincere appreciation to you. Letters of acknowledgment will be sent to you and to your brothers, and we are very grateful to you personally for assembling the model here, and informing us about it.