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The First Australian Aeroplane and Engine: The Work of L.J.R. Jones

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SUMMARY This paper examines the early work of L.J.R. Jones, who was an outstanding figure in the field of aeronautical engineering in Australia in its formative years. Prior to World War I he had designed and constructed three aircraft and their engines, achieving flight in a steam-powered machine in June 1911. His designs were highly innovative and were carried into effect in his own workshop. He was the first Australian to become airborne in a machine in which both airframe and engine were of his own design and construction. He was generally ahead of his contemporaries in carrying his work into effect. Neither historians nor engineers have given him adequate recognition.

1. INTRODUCTION

Leslie John Roberts Jones was born at Bathurst, New South Wales, on 4 June 1886, the younger son of William Henry Jones and his wife Rosina, nee Dumbrell. His father was a picture frame maker and carpenter, and from him Jones gained valuable experience in woodwork. He was educated at St. Stanislaus College, Bathurst.

He developed an interest in aeronautics from an early age, and later claimed that this proved to be so detrimental to his schooling that his father forbad him to continue his enquiries until he had reached 21 years of age. He constructed primitive models, including ones made with feathers and cork which were launched from an upstairs window, in order to test their behaviour during descent. Other, hopefully more advanced, models were made from wire and calico.

The only real thing "of an aerial nature" that came to Bathurst during his childhood was a hot air balloon. He was taken to see it by his elder brother William, but in later years did not remember much about it "except that there was a big bag, and a trench with a fire in it and a man who was throwing something onto it with a cup, probably kerosene".[1]

His family subsequently moved to the inner Sydney suburb of Glebe, where he was apprenticed in engineering to Edge and Edge Ltd, a firm of electrical instrument repairers. He worked subsequently as an electrical instrument repairer for the New South Wales Railways, and for the Sydney Morning Herald newspaper where he remained for a year and a half. He also gained some experience in marine engineering with the Union Steamship Company. At the age of about 18, he developed an interest in the science of x-rays, working in the field designing and building his own basic x-ray machine which was advanced for its time.

2. EARLY RESEARCH

In 1907, while he had a position as an x-ray operator in a Sydney hospital, and with "a fair amount of time to myself to think", Jones again turned his attention to flight and the design of flying machines. After reading an article on early experiments by the Wright brothers, he built a model of their glider using light sticks and tissue paper. Spurred on by his brother's disbelief in anything to do with flying, the model was launched. "The result was what we should have expected and my brother was satisfied he was right, but I wanted to know why".[2] During this period he had attended a number of lectures by Lawrence Hargrave, and read what little information was then available to him in the developing field of aeronautics.

Initially, Jones gave his attention to the development of an aircraft engine which would develop sufficient power for flight with the least possible weight. He contemplated a turbine driven by gas pressure obtained by chemical action, but he later observed that "it would have been too dangerous and it had to be dropped". He then began early design work for a petrol internal combustion engine with four cylinders placed crossways running as a four cylinder double acting engine. However, there were too many mechanical problems to be overcome if the engine was not to be too heavy. Jones later stated that his previous experience of the internal combustion engine in motor cars, motor cycles and motor launches had left him with no particular love for that form of power. Accordingly, he turned his attention to the development of a steam turbine engine.

3. FIRST DESIGNS

At this stage his brother joined him in his work. William Jones was a commercial photographer by trade and consequently he recorded in great detail several years of the work and experiment which followed. These photographs survive today, are of high quality and constitute an excellent example of the imaginative recording of history as it was made.

The following account of the design and construction of the first engines and aircraft by Jones and his brother is drawn in part from a hitherto unpublished record by Jones of their work in the period 1907 to 1911. The result was later described by one his contemporaries as "the first Australian aeroplane and engine"[3] although it was not the first to fly. Jones was, however, the first to commence construction of both, and his achievement is enhanced by the fact that he developed them to the stage of actual flight within a few years.

For the engine, a turbine of the De Laval type was designed and construction commenced at the rear of their Glebe home. Two rotors and casings were constructed at the same time. The turbine shaft was of small diameter, and the bearings were spaced well apart. This allowed the rotor to deflect slightly. The bearings were ball bearings, the inner race forming a cone that was free to spin on the shaft as another bearing. This was intended to remove all risk of seizure. The centre disc of the rotor was made of aluminium alloy, the blades were steel, the shroud ring was made of steel shrunk on over the blades. The rotor is reported to have been machined with negligible eccentricity and near perfect balance. The casing was made of aluminium and the four jets were bronze. This turbine turned over at about 30,000 revolutions per minute with steam pressure of 600 lbs per square inch.

The turbine having been constructed, it then became necessary to develop a steam generator that would produce the amount of steam required. As before there was no worthwhile technical information available to them on this subject, so they set about obtaining information as best they could.

A start was made with three coils of copper tubes, one within the other. These were heated with a large kerosene burner. With this generator they were able to get the turbine running, and so begin to determine the loading and hence the size of the generator that would be necessary.

In the light of this experience, they then constructed a larger generator with three units each of three coils of copper tube, similar to the first one. There was no water level in these generators; the water was forced in with a pump and and was flashed straight into steam. They had continuous trouble with this equipment, the worst being the burning out of the copper coils.

Having got the turbine and the generator running some time in 1909, a realistic load was needed for the next step, and this could only be obtained by the use of airscrews together with suitable reduction gear.

They decided that the best way to do this was to work out the design for the proposed aircraft using such information as they had been able to collect. In particular, Jones and his brother relied on Sir Hiram Maxim's book Artificial and Natural Flight, for there was little else they could find at the time. Having obtained this rudimentary and rather limited information, they then set out to take their work to the next stage by designing and constructing a complete aeroplane. This took shape in 1909 and 1910 in the narrow backyard of their terrace home in Hereford Street, Glebe. Photographs show the aircraft at various stages of its construction, increasingly encroaching on the airspace of their neighbours who displayed continuing tolerance and occasional interest.

The airframe itself was evidently the simplest part of the whole construction. Work had commenced on the framework of the fuselage in 1908. It was a structure of triangular cross-section made of oregon wood and wire bracing and initially featured an outrigger to carry two propellers, one on either side. A simple undercarriage consisting of two bicycle wheels and a rear skid was fitted. The wings were of two-span construction drilled to reduce weight, and had reinforcing spacer blocks. The covering was calico starched for tightness and fitness, and was fitted by his sister and aunts.

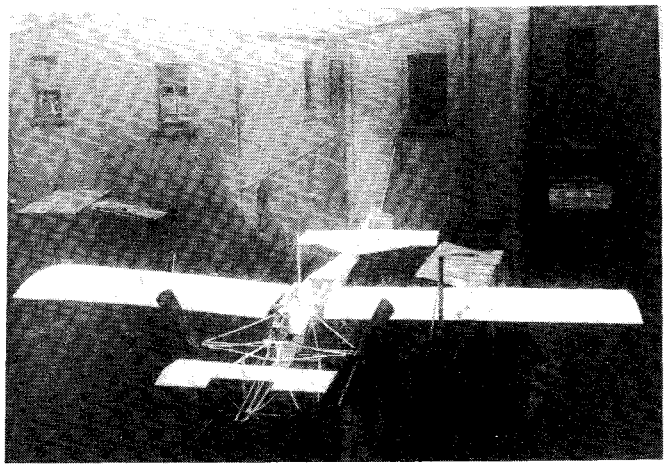

Illustration 1: Jones' first aircraft when completed.

The principal dimensions of this first aircraft in its initial version were:

Overall length 33 ft; span 30 ft.

Mainplanes area 168 sq.ft.

Mainplanes span each plane 14 ft.

Mainplanes chord 6 ft.
Mainplanes camber 3.5 ins, point of max. camber 24 ins behind leading edge.

Ailerons 2 each 4 ft; span 2 ft; chord area 8 ft; control by wheel on elevator lever.

Tail plane area 30 sq. ft; span 10 ft; chord 3 ft; incidence adjustable in flight.

Elevator area 17.5 sq. ft; span 7 ft; chord 2.5 ft; extended on outrigger in front of machine control by lever.

Rudder area 8 sq. ft control by pedals

Propellers (2) diameter 6 ft; pitch 12 ft; revs per minute 500.

This was followed by the less straightforward turbine and generator, which went through several phases of development before the whole machine was put to a practical test. In order to reduce the revolution speed of the turbine from 30,000 per minute to 500 per minute, chains were used in preference to gears. Radiators were then constructed out of tubes formed from brass with light brass headers, mounted in the slipstream of the two propellers. However, during testing early in 1910 one of the chains snapped causing the engine to race. The shroud ring burst and smashed its way through the casing, damaging the equipment, nearby property, and to a lesser extent, the inventor himself.

Consequently, a second turbine was constructed, using instead a worm reduction arrangement with two shafts to drive the propellers, thus reducing the revolution rate to 2,000 per minute, with further reductions being possible if necessary. However, Jones and his brother were not happy about the safety of this engine under load. They therefore used its components in the construction of an internal combustion engine which they had initially

rejected. The two cylinder engine which they built ran well enough, but suffered from continual overheating. "As our business was to make a machine fly and not play around with engines, this threw us back to where we started."

Their next attempt at powering their flying machine took the form of a seven cylinder rotary engine on the principle of the Gnome engine. A design was worked out, drawings made, and construction started - all in their own premises. The design called for the use of steel cylinders with aluminium alloy cooling vanes, with other parts machined from solid iron and steel in their own workshop. They did all their own castings using a brick furnace in the backyard. They experienced considerable difficulty in casting the aluminium vanes on to the steel sleeves of the cylinders. Eventually the engine was completed and installed in the airframe, which was modified to use a single propeller 8 feet in diameter and with a pitch of 4 feet 6 inches. During testing the master rod failed under the load, and the engine failed to develop what Jones considered would be adequate power. "By this time we had had enough of hard work and expense, we had an aircraft on our hands and a scrap heap full of parts of experimental engines".

There were various other experiments with the engine - the aircraft was nearly ready and they were anxious to have an engine to power it. Consequently Jones reverted to the use of a steam engine in his efforts to build an aircraft that would fly. A highly superheated three-cylinder steam engine was built using the appropriate parts from their earlier efforts. The necessary heat was provided by kerosene fed from a tank under the pilot's seat. The engine drove a propeller 8 feet in diameter, and "when tried out looked like giving useful results". With this encouragement, and more from a storm which damaged the airframe, the aircraft itself was modified. In effect, the first aircraft had been so "strained and knocked about by the testing of the various engines and exposure to the weather", that a second aircraft was constructed. The triangular fuselage section was abandoned in favour of a rectangular section devoid of covering, and the forward elevator which was evident in early photographs was removed. It was a mid-wing monoplane, constructed of oregon timber as spruce was virtually unobtainable. In place of the two propellers on outriggers, a single propeller was mounted in the centre to drive the aircraft.

During the course of Jones' work, in September 1909, the Australian Government announced a competition for the production of an aeroplane suitable for military purposes. A prize of five thousand pounds was offered to any natural born Australian or naturalised British subject with not less than two years residence in Australia. The competition is a separate story in itself. It attracted an amazing range of entrants, all claiming to have resolved the initially impossible set of conditions which the government laid down. One of the conditions was that the whole aircraft, including engines and propellors, should as far as possible be constructed in Australia by Australians.[4] Jones' machine was one of the more serious entrants,[5] but like every other entrant, he failed to meet such requirements as the ability to hover in a stationary position. The competition ultimately lapsed. Jones continued with his work, and narrowly missed being the first person to leave the ground in an aeroplane constructed in Australia and powered by an Australian-built engine. History has cast aside detail and accorded this honour to John R. Duigan, on 16 July 1910.[6]

4. ACHIEVEMENT OF FLIGHT

By early 1911, the year in which Australia crossed the aviation threshhold, the time had come for Jones to put all this experimentation to the test. Arrangements were made for the use of a field at "Eden Glassie", the property of Herman Hollier at Emu Plains well to the west of Sydney. The complete aircraft was dismantled and carried by horse and cart from Glebe to Emu Plains. The journey commenced in the dark on 19 May 1911, and was completed about twenty-four hours later. Jones noted that only one motor vehicle was seen during the whole journey. For the residents of Penrith and Emu Plains, the passage of this strange vehicle through their towns was rare entertainment indeed. It marked, as the Nepean Times noted in lengthy and partly conjectural account, the advent of the aeroplane to the district, and rapidly became the main topic of conversation. By Sunday, 21 May 1911, "in the presence of only a few local residents ... matters had so far progressed that a trial was given of the engine, which proved to work most satisfactorily". The paper's enthusiastic reporter went on to remark on the number of rumours which took hold of local residents "as to when the machine would be given its first trial flight. It was definitely stated (by people who did not know, of course) that it was to fly on Tuesday afternoon, and naturally a large crowd of people drove over from Penrith - press representatives, as well as others - to witness the spectacle. The rumour, however, proved to be altogether without foundation, for on arrival there Mr Jones was found to be quietly proceeding with the work of putting his machine together".[7] Jones did his utmost to discourage the inquisitive onlookers, and he and his brother proceeded to set up camp in the field with their machine. They were aided by their sister, who stayed in a nearby house. According to a letter written by Jones shortly afterwards, his aircraft attracted favourable comment at this time by McDonald and Coles, the two mechanics who were accompanying J.J. Hammond on his tour of Australia in 1911 on behalf of the British Aeroplane Company (later Bristol) in an attempt to sell Boxkite aircraft to the Australian government for military use.[8]

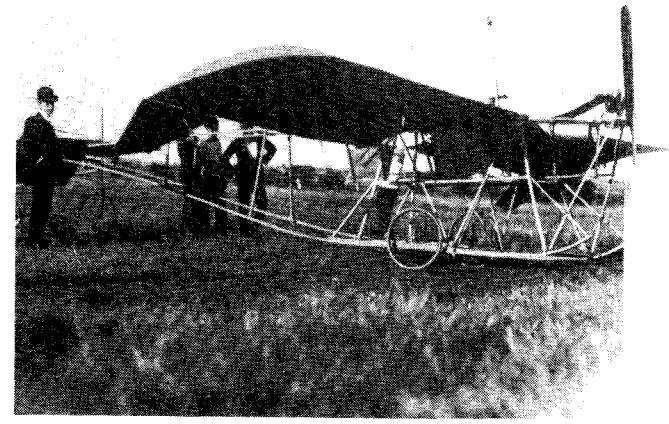

Illustration 2: Steam-powered aircraft ready for flight, 4 June 1911.

Jones and his brother first had to learn to spend some time in getting the use and feel of the controls. In short, they had to discover the sensation of flight for themselves before they could bestow it on their creation. After much testing of the assembled aircraft and engine, Jones' machine finally made its first successful steam-powered flight on 4 June 1911 at Eden Glassie. In his own words, "in spite of everything we got the dear old thing to where it would lift off the ground for us under its own steam and fly short distances".[9] Unfortunately, after a number of flights, Jones had one of his many adverse encounters with the weather and the aircraft was damaged beyond repair.

In an effort to apply the lessons they had learnt, Jones and his brother then constructed their third aircraft, a much lighter machine. Initially, it too was fitted with a steam engine, but it was overturned and damaged before the machine could be completed for testing because the engine had not been adequately secured to the airframe.[10] It was replaced by a more conventional Pannard car engine. Contemporary photographs show that this aircraft was spare and light in the extreme, and exhibited significant "wing warp". The fuselage was a simple three-cornered frame of wood and wire with a cruciform tail for both horizontal and vertical control, with a light undercarriage. It was without ailerons. This machine was too weak to remain airborne for long but was successful at the experimental level, adding to the lessons that had been learnt from his first machine. However, it too was damaged beyond repair by a storm in the early part of 1912.

In February 1912, Jones responded to the Commonwealth Government's advertisement for "two competent mechanists and aviators" to be appointed to the Department of Defence. In his application, Jones set out his experiences with his aircraft over the previous five years, adding that he had had (presumably due to his brother's activities) "a little experience in the use of the Camera, should this at any time be required ...".[11] Although his application was not successful - the appointments going instead to Eric Harrison and H.A. Petre - it is an important document, being a contemporary, detailed, and illustrated account of his activities in the design and construction of aircraft in the years up to 1912.

Following these first three aircraft, Jones proceeded to put his newly acquired knowledge and experience into the construction of a fourth aircraft, commencing this project almost immediately. In 1913, he began construction of a five-cylinder rotary engine. It was of the conventional Gnome Monosoupap type, "the latest thing in Aero engines at the time". The crankcase was of aluminium alloy, the castings being made "by one of those old time tradesmen who knew his job". Most of the engine parts, including the cylinders were of steel. It was tested initially on a static frame, and started without hesitation at the first attempt. Its basic specifications included a weight of 139 lbs, a petrol tank of 12 gallon capacity, and a propellor 7 feet in diameter. After modifications, the engine was put aside and work commenced on the airframe.

"Just as we were getting interested, my brother joined up and went overseas on military service... Being with the shipping, I was tied up by the Navy (sic) for the time being, so I got on with the job". His father assisted with the project. Construction of the airframe was under way in 1915 at the family's new home at Ryde, New South Wales, where housing development was still relatively sparce, thus allowing adequate open ground for testing. The aircraft was built as a biplane to Jones' own design, with a wing section chosen from drawings in a contemporary aeronautical journal. For the first time, Jones used elementary stress analysis rather than trial and error in his design work. The airframe employed ash wood for the spars, the longerons, and the struts. The undercarriage initially featured two skids, but these were replaced with more conventional-looking V-struts and wheels as construction continued. In the wings, bracing wires were added to correct instability in the overhang of the upper wings. The forward part of the fuselage was covered with plywood and linen, which was also used to cover the wings. The rear part of the fuselage was left uncovered. The firewall and cowls of the engine were of aluminium. The upper wing had a span of 33 ft, the lower wing a span of 24 ft. The overall length of the aircraft was 25 ft, and it had an empty weight of 598 lbs with a flying weight of approximately 778 lbs.[12]

Initial flight testing commenced on 2 April 1916, when the aircraft became airborne at the first attempt, reaching a height of eight to ten feet in a straight run. Over the next few months, testing continued, although no attempts were made at flying circuits. The flight tests were hindered by unreliable engine performance, and by the inevitable spectators and reporters who were only too willing to offer advice.

On 16 October 1916, Jones enlisted for war service, and his fourth attempt at building an aircraft and engine to his own design was necessarily abandoned. The engine was greased and crated, and the aircraft was left in a shed at West Ryde. After the war, when the Jones family moved to a new house, this aircraft was discarded and eventually destroyed.

5. CONCLUSION

Jones subsequently observed that in their efforts to build and fly Australia's first locally designed aeroplane and engine, "we had learnt a lot relative to aircraft. We had learnt a lot about aircraft propellers, having built all our own, having built them up with laminations and carved them out of solid ... We had also learnt a lot about engineering that I know as an engineer I could not have learnt in any other way. It made me learn to know how ..."[13]

Speaking twenty years later, while Jones was still active in aircraft design and construction, one of his contemporaries described him as the leading figure in the application of scientific principles to aircraft amongst Australia's first group of experimental pioneers of flight in the years before the first World War. It seems clear that he was the first to begin the construction of an aeroplane and engine in Australia, and that while the progress of his designs may have been at times uneven, he was ahead of most of his contemporaries in carrying his work into effect. That he was able to successfully fly by mid-1911, a steam-powered aeroplane of his own design and construction for both airframe and engine, speaks for itself in assessing his early work.

6. REFERENCES

1. Notes by L.J.R. Jones, in private possession.

2. Notes by L.J.R. Jones in private possession.

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4. Daily Telegraph, Sydney, 2 September 1909.

5. Secretary, Department of Defence to W.H. Jones, 10 June 1910 (letter in private possession).

6. Gibson, Ron J. (1972), "Australian Aviation : The First Hundred Years", Journal of the Royal Australian Historical Society Vol.58, Part 3, September, pp.167-168. Gibson does not adequately recognize Jones' contribution and achievement.

7. Nepean Times, Penrith, 27 May 1911.

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