

## The Ligeti Stratos



Charles and Helena Ligeti came to Australia from Czechoslovakia in 1977. In those days, Czechoslovakia was part of the USSR. Charles was a qualified Chemical Engineer and soon found employment here in that field. This was not his main interest, however. Charles was an aircraft enthusiast, and Australia at the time was on the doorstep of a new era in amateur aviation. Air Navigation Regulation (exemption) 95:10 was paving the way for the rebirth of do-it-yourself flight, a re-democratisation of aeronautics to the point of being able to design, build and operate your own aircraft with the minimum of governmental oversight and control.

Charles' father had been an aviator during the Second World War, flying with the Hungarian Luftwaffe. He was later a pilot with Czechoslovakian Airlines. Not only that, he was also an inventor with many government sponsored patents to his name. Like his dad, Charles also had an inherent ability to think outside the box when it came to design, and it was natural that he wanted to follow in his father's footsteps. Helena too had innovative ideas and insisted that their aviation project be progressive and ground-breaking. She suggested they investigate joint wing concepts, and Charles agreed. He began working on an aircraft design that was truly different to just about anything that had ever flown before.

And so the Ligeti Stratos was born, first as an idea, then as some concept sketches, then as a flying model. The first model was a remotely controlled, fibreglass glider. The test flying showed mixed results, but highlighted several changes that needed to be made to improve lateral and directional stability. These changes were incorporated on subsequent, smaller, models and the issue was quickly solved. All these models were used to examine the theory of connected wing tips and to experiment with different orientations between upper and lower wings. The goal was to achieve stable flight in yaw and roll, as well as safe stalling characteristics. Experiments were also conducted to establish which types of control surfaces offered the best potential for pitch-less lift and sideslip manoeuvres. A man carrying, foot launched glider was also constructed to compete in the Melbourne Birdman Rally. This was not only a lot of fun, it provided really valuable insight into the problems that lay ahead in scaling up their designs to person carrying, powered aircraft.



It wasn't until late 1983 that Charles and Helena felt confident enough to begin construction of the prototype S1 Stratos. But even by that stage, they were continuing to design the aircraft as they built it. Their construction techniques were also developed as they progressed, mainly based on those of other aircraft builders in the area with whom they had been consulting and assisting. The aircraft was to have its engine at the rear, driving a ducted fan in pusher configuration. The cockpit was to be enclosed and very streamlined. The lower wing would also act as a canard type forward control surface. The couple worked together for over a full year, with many late nights, constructing this very unusual little plane. They came in for a certain amount of criticism from other builders and pilots, who often expressed the opinion that such a strange looking aircraft would never fly.

Such was the unconventional appearance of the diminutive Stratos, that even other original designers were dismissive of its potential. Charles and Helena remained undaunted, however, completely determined to see their project through.



In 1985, the S1 Stratos was ready to fly. Everyone who saw the finished plane seemed to be of the opinion that the build quality and the way in which the couple had eventually mastered the complexity of the design were a real credit to them. Charles intended to do the test flying himself, but he had no flying experience whatsoever. So Helena insisted he do at least ten hours combined time in a Cessna and a glider, which he dutifully did. However, with only ten hours under his belt, he was hardly your average test pilot. Yet he felt that with such an unconventional aircraft, he had a moral obligation to be the first to fly it. Before the first flight, however, there were three months of ground testing to be carried out to further validate the predicted handling of the craft.

On 25<sup>th</sup> April 1985 at Penfield Aerodrome in Sunbury (35km from Melbourne), Charles Ligeti flew the Stratos for the first time, executing a number of circuits and a safe landing. Filled with confidence in the aircraft's handling, Charles flew the Stratos every spare day he had after that. The people who had earlier said the Stratos would never even fly were now silent, as they soon discovered that not only did it fly, there was no other 95:10 aeroplane in the air that even came close to its performance. Soon the Stratos was winning awards because of this performance and its totally original design.

In 1986, after much deliberation, and with assistance from a financial broker, Charles and Helena started their own aircraft company. They then took the Stratos to North America and Canada. Everywhere they showed and demonstrated the plane, it was much acclaimed. They even won awards at Oshkosh. Back in Australia and buoyed with optimism about the future, they set up a facility to construct the first production Stratos. Much had been learnt from the prototype by this stage, and the S2 Stratos was to be significantly different to the S1. There would be increased cabin size, side stick controls, a slightly larger engine (24hp to 28hp), with elevator only on the canard wing and aileron only on the main wing.







The Stratos was fast, manoeuvrable and efficient, with a high lift to drag ratio. However the S1's weakness was that it was underpowered, with a poor rate of climb and long takeoff run. Wanting to improve the performance with the S2 and faced with a lack of engine choice, Charles modified the aerodynamics to gain extra lift efficiency per unit horsepower. The S2 would have airflow optimising splines on the fuselage sides. It would also have a curved channel along the fuselage that led into the fan duct. This would make use of the low pressure created by the induction flow as another form of lift. The elevator length would be extended to near full span of the canard, also to increase the amount of lift produced. The S2 in reality would be a very different aircraft to the S1 and would require new moulds and tooling. However, working with their

usual dedication and efficiency, the Ligetis had the first production aircraft ready for testing after only one year.

The S2 design changes would indeed create extra lift, but they also created an unexpected side effect in that, although the aircraft would stall at a lower speed, it would have a much more pronounced stall than the S1, more similar to a conventional aircraft, and would need more altitude to effect recovery. The S1 had a gentle canard style nose bobbing style of stall. Unfortunately, Charles expected the S2 to have similar stall characteristics.

On 22<sup>nd</sup> September 1987, at Penfield Aerodrome, Charles prepared the S2 for its first flight. The CG location for the flight was not recorded, but it is apparent that the considerable aerodynamic and handling differences between the S1 and S2, particularly the plane's stalling characteristics, caught Charles off guard. These were the days when quite stupid rules resulted in all test flying having to be done below 500 feet. During the first test flight, Charles stalled the aircraft but was unable to recover before impacting the ground. The accident claimed his life. All design work on the Ligeti Stratos was put on hold from that tragic point.



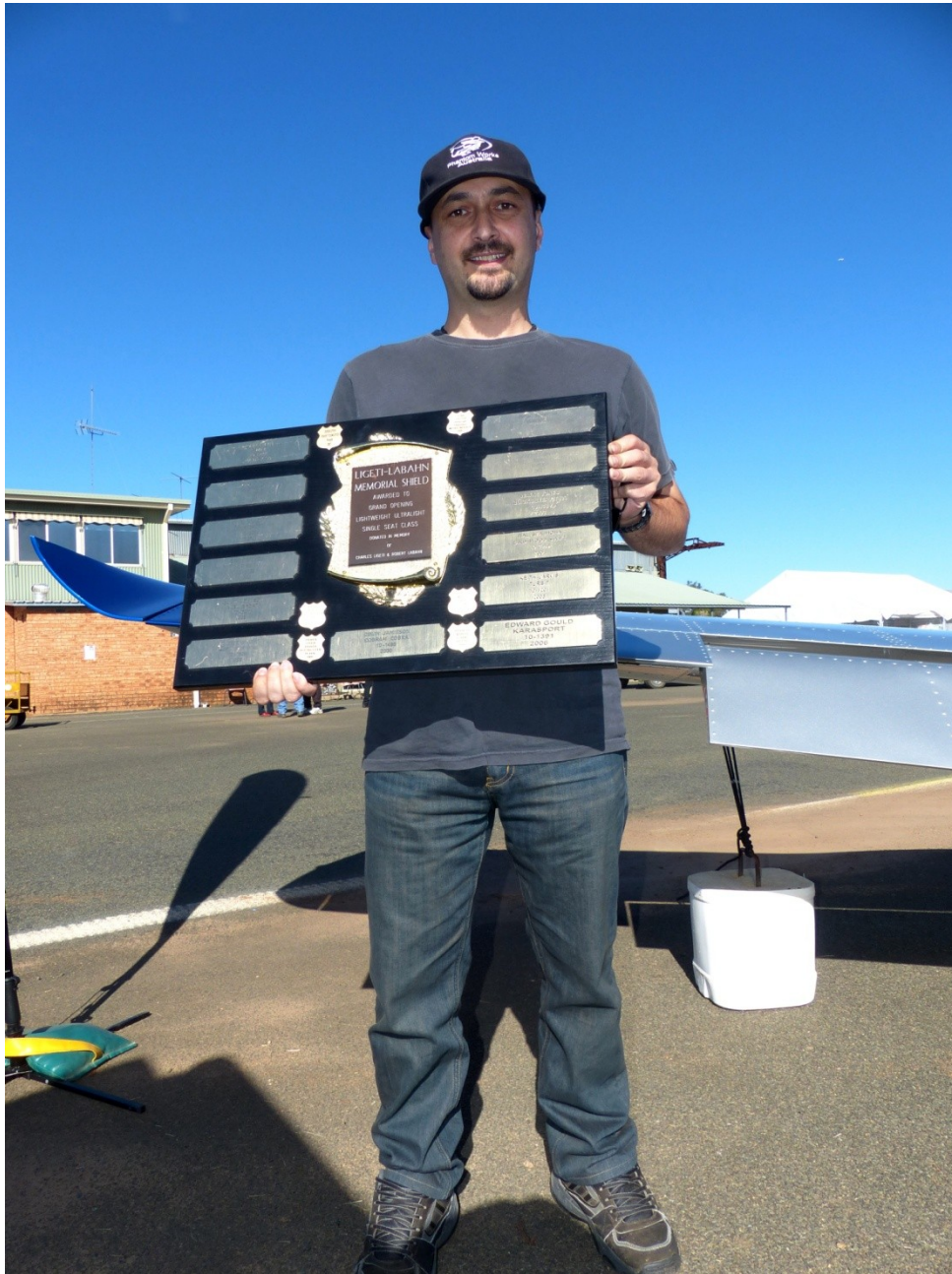
Today

After Charles' death, Helena closed the business and ceased being involved with aviation. She and Charles had two young children, Klaudia and Ron. Faced with the financial realities of life as a widowed mother, Helena worked in various administrative jobs to support her growing family and provide them both with a good education. She never remarried.

Ron Ligeti has always revered his late father's memory, so it was only natural for him to pursue a career in aeronautics. He is a graduate of RMIT with a Diploma in Aerospace Engineering and a Certificate in Advanced Composite Construction (1998). In 2008, he attended a course in advanced composite structures at Stanford University in the US. He is currently employed on composite aircraft structure research with Boeing in Melbourne and has worked on projects for B777, B787, F18, CH300, F35 and other aircraft.

Ron has always dreamed of resurrecting his dad's project and turning the Stratos into a commercial success. After almost a lifetime of thinking about it, he believes Charles's conservative approach to flight testing was compromised with the testing of the S2 prototype due to business pressures and the need to meet the expectations of his financial backer.

When Helena first heard that Ron had firm plans to build a new Stratos, she was understandably very nervous. However, after a lot of discussion between mother and son, she has now become quite supportive. On her first visit to Ron's workshop, she was surprised to see that he had already machined and laminated both wings and bonded them to the fuselage. She decided to get involved by offering to help him layup the fuel tank and blow the canopy. Just recently, she told Ron that building this new aircraft is an interesting and worthwhile thing to do in life. Ron thinks she is even becoming a little excited about it, and is feeling a genuine purpose in helping him in what way she can. Ron believes the project is *"bringing back positive memories of when she was building with Dad, and of us kids when we were little."*



Ron Ligeti holding the Ligeti Labahn Memorial Shield at Natfly 2014