

Online Interactive session with Dr. B. R. Pai

I would like to begin my report with a quote-

“The best classroom in the world is at the feet of an elderly person.”

On 6th January 2020, the students of Mustifund Aryaan Higher Secondary School were blessed to meet one of the most brilliant minds of India none other than Dr. B R Pai. Dr B Ramachandra Pai graduated in mechanical engineering from IIT Madras in 1965 where he was a



merit scholarship holder. He then won the CSIR Burma shell scholarship award for post graduate studies in the United Kingdom. He obtained his MSc in engineering from the prestigious Imperial College of London and also secured a PhD from the same. He was appointed as a research engineer at the English Electric company in the UK and

then spent 4 and a half years at the International Flame research foundation in Holland. Because of his love for our country, he returned to India and joined CSIR's Kohinoor that is the world famous National Aerospace Laboratories (NAL) Bangalore in 1975. He became the head of department of propulsion division in 1987 and was also appointed as the director of NAL from 2002-2004.

His fields of research are combustion, heat transfer and energy systems. He has 10 patents under his belt along with over 75 publications in national and international journals!! Dr Pai is a great flying enthusiast and is an instructor for powered hand gliders. He flew the first hand gliders developed in NAL. He has solo flying capability for

helicopters. Dr Pai also said that flying gives a lot of insight to aeronautical engineering and encouraged his fellows to have a go at practical aeronautical activities. I am humbled by the extent of Dr Pai's knowledge and his experience at national as well as international level. Finally the most awaited time had come. Dr B R Pai began his session

Throughout the session Dr Pai told us the different bugs that bit him. Don't worry! They are not the usual bugs, they were the bugs of curiosity and passion which instilled a zeal in Dr Pai's mind. He told us that he was bitten with 4 bugs namely flying, bioenergy, astronomy and engines. Lets see what he had to tell us about them.

I. Bio-Energy Bug

Bio-energy is the method of getting energy from organic wastes especially from Sewage treatment plants. Dr Pai saw that there was sewage treatment plant just near NAL. The sludge in the sewage plant releases methane which can be used to generate energy. Sewage is allowed to settle in the tanks and the sludge settled at the bottom of the tank is collected in a

large digesters. The sludge is then kept for 3 weeks in the digester during which it decomposes and the water in the tank is sent back to the river or stream. During the process anaerobic respiration releases methane gas which is

collected at the top of the digester. The gas is then collected in containers and burnt by the authorities. Dr Pai thought that he could use the methane gas to run the aircraft engine and generate power. The government approved the project and provided a turbo prop



K & C VALLEY SEWAGE PLANT

aircraft engine which would run on sewage gas! People laughed and didn't believe that it would work. Dr Pai collected methane gas from the stinky sewage plant and started his experiment. He set up a power station in the sewage plant where he converted the old engine into a dual fuel mode that is it could run on biogas as well as kerosene. They got funds and built a 2000 m³ gas holder. Finally he was successful in making a gas turbine engine which could generate power up to 0.8Mega Watts. Hot gas that was produced was used to generate heat. One company came forward to help Dr Pai to make an industry out of his technology but unfortunately the company went bankrupt and the project collapsed. At this time Dr Pai said, -

“In spite of all your efforts final result may or may not come out.”



VIEW OF GAS TURBINE PLANT OPERATING ON SLUDGE GAS

II. Flying Bug

The then chairman of ISRO Dr. Satish Dhawan had an opinion that every aeronautical engineer must have some flying experience. So NAL got some powered hand gliders.



"CLIPPER " POWERED HANG GLIDER

A Powered hand glider is a simple aircraft with a strong cloth as wing and a tricycle hanging from it. The Pilot and the engine are under the cloth suspended from a hanging point. Our director Vyankatesh Prabhudesai sir

was one of the first passengers of Dr. B R Pai. Describing his experience, Dr Pai said –

“You feel like a bird. Taking off and hanging in the sky. Going up and down and sometimes the birds meet you in the sky....It’s fun”

The powered hand glider project was started by NAL in 1988 and it was developed indigenously in the Raman Research institute. He took his first lessons of flying at Indian Institute of Science which was later shifted to Jakkur. After 10 Hrs of the lessons, you could fly it solo. It was used for aerial photography, spraying medicines on crops etc. They attached a camera to the powered hand glider to take mesmerising aerial photos. Like regular aircraft, even powered hand gliders had to take permission from control tower. In the December of 2008 a microlight rally was initiated from HAL airport to Mangalore which was 310 Km away. They crossed the western ghats with powered hand gliders. It was very risky as they couldn't land the aircraft anywhere if it malfunctioned. They landed on the beautiful Malpe beach in Mangalore which was hosting an air show. It was a great success for Dr Pai and his team. A student of Manipal Institute of Technology made a short film of the show. Dr Pai showed it to us and it was magnificent.

III. Engine Bug

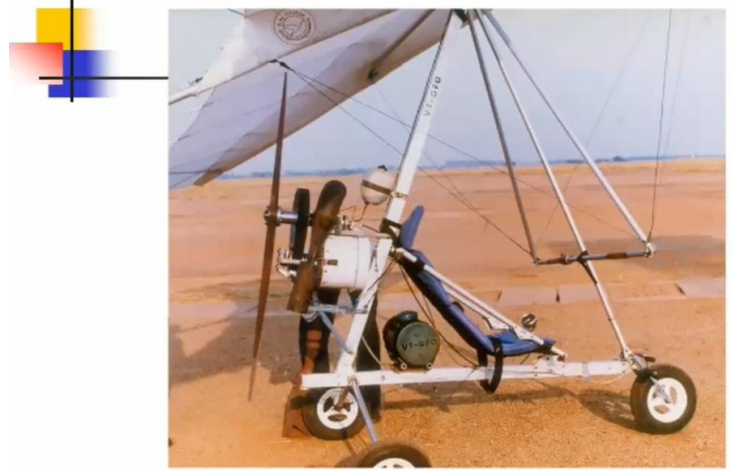
Nowadays most of our vehicles have 2 stroke or 4 stroke internal combustion engines. Rotary engine is an engine which rotates instead of going up and down like an IC engine. It was developed by German scientist Wankel. The NAL lab got a Wankel Engine which is a small engine of 10Kg and made a single seater powered hand glider. The engine runs the propeller which pushed the aircraft further. The pilot can press the accelerator at his foot to speed up the glider. The bar in front of the glider is used to change the direction of flight. If the winds are calm, flying is a pleasure but during harsh turbulent weather, the flight is rough and as Dr Pai describes it –

“Its like riding a horse who doesn’t want to go anywhere!”

The Wankel engine powered hand glider made its maiden flight on 26 February 1998 from Jakkur. It was a proud moment for Dr Pai and his

team. National Geographic channel also made a short movie of the iconic moment which was showed to us by Dr Pai. The video also showed us the prestige of NAL that is Hansa aircraft and also gave us its specifications. Dr Pai and his team had worked hard to overcome the defects of Wankel

Engine such as overheating and made it in such a way that could propel a powered hand glider. Dr Pai added that NAL continued to make



■ Altair with Wankel Engine power plant



■ Maiden flight of Wankel powered PHG

Wankel Engines along with the DRDO. He is planning to use the engines to make a hybrid aircraft which is an electric aircraft!

IV. Astronomy and telescope making bug

The childhood interest of Dr B R Pai was to study the night sky and make his own telescope. He briefed us about the basic types of telescopes and their mount. There are mainly 2 types of telescopes namely reflecting and refracting telescopes. An amateur would have a 6" or 8" diameter aperture. While studying overseas, Dr Pai found a book which guided him to make his own telescope! If you grind 2 glass panes together for hours in a specific way applying some grinding powder, you will find the glass in your hand becomes concave and the other becomes convex. After polishing it thoroughly for hours again, You could get a proper mirror. He made a powerful 6" telescope through which he could see the sun, moon's craters and even Jupiter's moons as clearly as the screen you are watching now. The problem was that there was no proper mount for it. After coming back to India he thought of making a proper mount for it. It was an equatorial

horseshoe mount which was aligned with the rotation of Earth and moved along with the Earth so that you can continue to look at your object. Dr Pai also informed us that NASA will be sending men and women to the south pole of moon to find out about the water there. He also emphasised that our

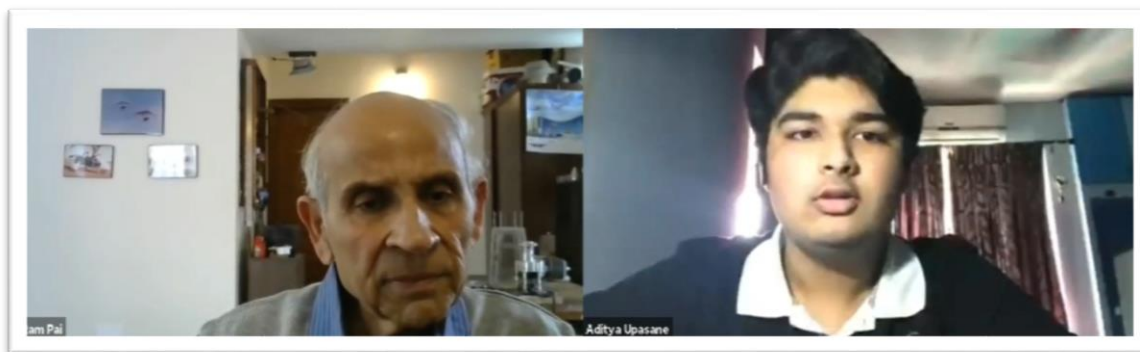


generation is very lucky as new technologies such as AI, drones etc. have a huge scope and new fields like environmental study and planetary movement are rapidly coming up.



Now the mind boggling question and answer session begins..

The first question was asked by Aditya Upasane.



Q. During WW-II , gliders like AS-51 and Antonov A40 were used to deploy troops and light tanks behind enemy lines by dragging them by aircrafts. However the gliders could carry less payload. If such gliders were made today then what would be the changes if their payload capacities had to be increased.

Ans. There has been a lot of activity on this area and hobby flying has made a tremendous progress. Gliders are now made with composite material like glass fibre composite or carbon composite which make them very light. Aerodynamic shaping is done very nicely so as to get less drag and high lift. In India NCC is encouraging gliders and some efficient gliders are also available in the market.

The next question was asked by Aditya Parsekar.

Q. How do you tackle the breathing problems due to lack of oxygen at high altitudes

Ans. In powered hand gliders we don't go that high. The maximum is 7000ft but oxygen is not a problem. Oxygen is an issue only at height of 10,000ft or above. For us the main problem is that it becomes very cold. We wear many jackets but still it's still too cold. A powered hand glider in some country had gone to a height of



24,000ft! To this question Vyankatesh sir added that he was shivering at the height of just 1000ft!

Now, Siddhant Das stepped forward to ask another question,

Q. What would you do if you were bitten by bugs which were totally different? What if you had interest in engineering, medical and animations at the same time?

Ans. Interesting things are happening in every field. You either do medicine first then do engineering or vice versa. I know some people who did that. Everything is interrelated now. Medical electronics is great field which is coming up. Each subject is vast and interesting. The



choice that you make depends on your likes and circumstances. *“Don't wait for*

best. Grab every opportunity that you think is good option and keep looking at the other side. ”

Time flies when you are enjoying. All the students of MAHSS were privileged to hear the words of an eminent personality Dr. B Ramachandra Pai. You embarked upon us that *“You should not give up even though others discourage you.”* You advised us to discover our passion and follow them. It was really a memorable session which he would cherish throughout our life. I would also like to thank our director Vyankatesh sir for introducing us to many national and international personalities like Dr B R Pai. Thank you all.

Written by,

Pradneya Shivanand Prabhudesai

XIth Regular