

Aircraft industry pioneer

An obituary of Vishnu Madhav Ghatge

V. M. Ghatge, a grand old man of aeronautics, was born in village Hasur in Kolhapur (Maharashtra) on 24 October 1908. He died on 6 December 1991 after having been struck down with cancer which was diagnosed in the earlier part of 1991.

A well-known personality in India and abroad for the pioneering work he did in the field of aeronautical education and design, Ghatge was known to his friends and admirers as an artist, a scholar and a philosopher.

Ghatge's early schooling was in Kolhapur. Later, he graduated from S. P. College, Pune, following which he obtained an MSc in Physics at the Royal Institute of Science, Bombay. He did his thesis work at Kolaba observatory on the topic of vortex formation.

Having secured distinction in MSc in 1932, he was awarded a foreign scholarship by Bombay University. Ghatge availed it in 1933 by gaining admission in The Kaiser Wilhelm Institute at Göttingen, Germany. He studied under eminent scientists like Betz, Flugge, Tollmien, and finally worked for PhD under Professor Prandtl, an academician whose scientific work is the foundation of present-day aerodynamics. Ghatge chose 'Model experiments for the relative motion of air columns of different temperatures' as his topic. As this study related to cumulus clouds, a scientific phenomenon of great importance to gliding, the Gliding Society of Germany funded the research. Ghatge obtained the doctorate in 1936, and, after his return to India the same year, he took professorships in physics for four years in Pune and Bombay before he could secure for himself a job in aeronautics at Hindustan Aircraft Limited, Bangalore.

He worked in the HAL design office for two years. In 1942 he moved to the Indian Institute of Science to start a postgraduate diploma course in aeronautical engineering. He remained at the institute until 1948. He taught fluid mechanics, solid mechanics and aircraft design, besides supervising experiments in the low-speed wind tunnel. Those who studied under Ghatge remember him with great affection and high regard

as he was not only an excellent teacher but also a friend and philosopher who would guide and help the young engineers in their chosen careers and direct their energies in creative pastimes.

In 1948 Ghatge took the position of chief designer at HAL to develop an *ab initio* piston-engined trainer, the HT-2, which he and his team accomplished during 1948-52. The HT-2 aircraft went into production and found service with the Indian Air Force for two decades.

On the occasion of presenting the type certificate for the first Indian designed and produced aircraft, the HT-2, on 3 January, 1953, the minister of communication, while paying tribute to the efforts made at HAL, remarked that



the day signified a definite stage in the development of the aircraft industry in India as it marked the dawn of India's emancipation from dependence on the Western countries for aircraft design and construction. He very understandingly went on to say that original design work in India was entirely new and he could well appreciate the extraordinary difficulties which must have been overcome by the designers during the initial period of the project. Ghatge not only developed the HT-2 but laid the foundation of aircraft design and development activity in India, a singular achievement when one looks back into the history of the aviation industry in the country.

Ghatge was involved with many aircraft projects during the period 1948-1967, but those which went into production were Pushpak, a piston-engined light aircraft used by flying clubs; Krishak, a piston-engined aircraft used by the IAF for air observation patrol duties; and HJT-16 Kiran, a basic jet trainer used by IAF for intermediate pilot training. During this period, development of a 2500-lb thrust, straight jet engine was also undertaken under the technical leadership of Ghatge, but unfortunately this did not go beyond the prototype stage.

In the late fifties, the Government of India approved the launch of fighter aircraft development (HF-24 Marut). This project was, however, assigned to a German team under Kurt Tank and many of the Indian designers trained and nurtured by Ghatge were transferred to this project. This caused a kind of split in the design department. This was a source of great unhappiness to Ghatge since he had assiduously developed a design team to take on more challenging tasks under him as the years rolled on. Later on, an integrated design organization was restructured at HAL but by then Ghatge had left HAL.

Ghatge held very strong views on the direction, level and pace at which the Indian aircraft industry should operate and these were at variance with those held by the policy makers of the day. His step-by-step approach to develop design knowhow in the country did not find favour with government machinery as the operational arm of the defence services became more demanding and the ministry decided to rely heavily on licence production. Ghatge was awarded Padma Shri in 1965 for pioneering work in the field of aeronautics both in educating and training designers and also for demonstrating Indian ability to design and develop several aircraft in the country without outside help.

Ghatge had many distinctions. He was fellow of the Royal Aeronautical Society of London, the Indian Academy of Sciences, the Aeronautical Society of India and the National Institute of Sciences of India, and member of the

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Institute of Engineers India and the Institute of Aeronautical Science USA. He was recipient of the Sir Walter Puckey Indian Prize for contribution to production engineering in India, and the National Design Award.

Ghatge retired as general manager of HAL in 1970. After retirement he remained active in the general engineering field rendering consultancy services to industry in the corporate sector. Ghatge would have had some satisfying moments in his retired life, when, on the occasion of his 75th birthday HAL, jointly with Aeronautics R&D Board, Indian Institute of Science and Aeronautical Society of India, organized a two-day seminar in October 1983, on 'Design and development in aeronautics'.

Ghatge found an outlet for his creativity in portrait painting which was done mostly in water colours. He had not received any formal training but had practised figure drawing from books during his school days. He had a good eye for colour schemes and was equally good at black and white shading and sepia stump work. A voracious reader of Marathi literature, a Sanskrit scholar, and a knowledgeable critic of Indian classical music, Ghatge, in the best tradition of his generation, was a well-rounded personality. He was extremely sociable, the heart and soul of a convivial gathering in a club, and could keep one amused for hours with his forays into diverse subjects.

A keen golfer, he was elected captain

of the Bangalore Golf Club in 1957, and later he was a founder member of the Karnataka Golf Association and its first president.

In summing up his own philosophy of life he is known to have said: 'Quite often in life the determined pursuit of an objective or goal is much more exciting and interesting than the achievement of the goal or objective, after which one feels a certain measure of disenchantment or disappointment. Climbing to reach the top of the hill is more exciting than reaching it.'

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ABSTRACTS

MRSI medal lectures

The Bangalore local chapter of the MRSI hosted the third annual general meeting of the Materials Research Society of India at the Indian Institute of Science, Bangalore, during 9-11 February 1992. The meeting was attended by 290 participants from more than 65 organizations.

The inaugural address was given by the President of MRSI, Prof. C. N. R. Rao. The MRSI honour lecture entitled 'Metallic structures: a magnificent obsession' was delivered by Prof. T. R. Anantharaman, Director, Thapar Corporate Research and Development Centre, Patiala. In addition, there were two special lectures. Prof. B. Ilshner, Swiss Federal Institute of Technology, Lausanne, Switzerland, spoke about 'Chemical and microstructural gradients in solid materials' and Dr A. Jayaraman, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, highlighted 'The role of high pressure in materials research'. The symposia lectures and poster sessions attracted lively participation. The abstracts of MRS-I medal lectures are given below.

Grains and grain boundaries in electronic materials

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Use of polycrystalline semiconductors, magnetic materials, ionic conductors, electronic conductors and ferroelectric materials for fabricating electronic components has led to the study of grain boundaries and their influence on electronic properties. Several techniques to control grain size and grain boundary segregation and phases in these materials have been developed in our laboratory.

Polycrystalline silicon has been successfully used to fabricate photovoltaic cells with AM1 conversion efficiency of >10%. A novel technique to cast polycrystalline silicon ingots for this purpose inside a split reusable graphite crucible has led to the possibility of low cost production of this material. Migration of impurities to grain boundaries of silicon and conse-

quent increase in their electrical activity and deterioration of photovoltaic properties have been studied.

Control of grain boundary mobility and grain boundary phases during sintering of ceramics such as ferrites, beta alumina, zinc oxides, LaCrO₃ and superconducting ceramics have led to the optimization of their engineering properties. In many cases, liquid phases present at sintering temperatures were found to play an important role. Our recent work on grain alignment of bismuth-oxide based superconductors has led to the attainment of critical current density >2500 A cm⁻² (at 77 K, OT)

Photoquenching of EL2 in semi-insulating GaAs

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The well-known intrinsic defect EL2 in gallium