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Sir Arnold Hall [lived in Wakehams on Dorney Common from 1964 until his death in 2000]

A talented engineer whose short break from academia turned into a glittering career at the heart of British aviation

By Anthony Tucker

World famous for his investigation in the mid-1950s of the mysterious and catastrophic crashes of De Havilland Comet 1 jet airliners, Sir Arnold Hall has died aged 84. The brilliant aeronautical engineer, scientist and industrialist designed the compressor for Frank Whittle's first jet engine, shaped the gyroscopic gun-sights in D-day fighter aircraft, defended the aerospace industry against nationalisation and built the giant Hawker Siddeley Group.

Hall's Comet investigation brought new technical profundity to complex failure analysis and is still seen as the model for major aviation inquiries. It revealed the scale of his reach as a scientist and administrator, and his calmness in crisis.

When the first passenger-service Comet took off from Heathrow on May 2 1952, Britain's aviation industry and its major operator, the British Overseas Airways Corporation, led the world into the era of high-altitude, high-speed civil jet flight. After De Havilland's costly and seemingly exhaustive test programmes, the world's most advanced and elegant passenger aircraft appeared to be as safe and sound as prudent engineering could make it. Orders flooded in.

In those grey post-war years, the Comet 1 was a symbol of confidence and national recovery, a harbinger of future successes for British industry and enterprise in a new and hard world. But after only two years in commercial service, three Comets failed catastrophically in flight - the last one only a few days after a normal but very costly investigation into the second accident had given the aircraft the all-clear. There was despair in industry and near-panic in government.

All Comets were grounded, all contracts were put on hold and the nation, already mourning the dead of the accidents, went into mourning for itself. At this crucial time Hall, then the youngest-ever director of the Royal Aircraft Establishment at Farnborough, was approached by the government for advice. Experts in industry and conventional investigations could produce no explanation: there were suggestions of terrorist bombs and unknown high-altitude atmospheric phenomena. Neither Lennox Boyd (miniser of transport and civil aviation) nor Duncan Sandys (supply) knew what to do or how to save British aviation prestige.

Hall's response was decisive. The industry could not be left floundering in the face of huge investigation costs, nor could the mystery be left unsolved. However unpalatable the idea was to government, the Farnborough teams had to be brought in to carry out an independent investigation of all possible causes - a huge open-ended requirement. Within a couple of days, Sandys gave the go-ahead and, within weeks, Hall had decided that some crucial stress calculations were of such complexity that mathematical theory alone could not be relied upon to provide answers.

Hall promptly built Farnborough's famous "whole pressurised aircraft" test rig, in which the stresses of flight cycles could be simulated rapidly many thousands of times on a complete aircraft. The outcome, clinched by early and massive failure of the test aircraft's pressurised cabin, explained the catastrophes, provided new knowledge of aluminium alloys under repeated stress, gave new meaning to the concept of "fatigue life", and revealed the unexpected inadequacy of conventional and hitherto highly trusted methods of stress testing and analysis.

Within two years, these findings led to the modified and very successful De Havil land Comet 4; but by then the US, and to a lesser extent France, had caught up with the British aircraft industry and the world market slipped away. For Hall, this period at Farnborough, during which he had expanded its activities, forged strong links with research establishments in Europe and the US and received a knighthood (aged just 39), was a major turning point.

He was by choice an academic; now Whitehall wanted him to stay. Instead, when his Farnborough agreement came to an end in 1955, he moved into industry, first as technical director of the Hawker Siddeley Group, then as managing director of the new group member Bristol Siddeley Engines and, later still, as vice-chairman and chairman of the entire group. In 1962 he chaired an Anglo-French Concorde design group then, in the costly wake of cancellation of three of Hawker's military aircraft projects and under growing political pressure for nationalisation of the aircraft industry, Hall broadened the base of the group so that aircraft and engines were no longer dominant. "I felt a great responsibility to the companies we had taken over and to the people we employed. I did what I could to protect them," Hall recalled.

By the mid-1970s, when the Hawker Siddeley Group employed about 85,000 people, 50,000 were engaged in electrical and other forms of civil engineering. Hall, driven by the spirit of private enterprise and professional responsibility which he saw as essential to the creation of an effective industrial base, was vigorously and openly hostile to the government's nationalisation proposals. When the axe fell in 1977 (by a single vote in the Commons), Hall left the aircraft industry for good.

To some this was surprising, for he was very much one of CP Snow's "new men of industry" - men who, themselves technically expert, accelerated the decision-making process by downward diffusion to other experts in specific fields, and evolved a formula particularly suited to shaping high-technology projects. Hall's decision to keep Hawker in the eventually highly successful A300 (European Airbus) project after the British government had pulled out emphasised his gifts and made the government look very slow-witted.

Speculation that Hall would or could be appointed as supremo of the nationalised aircraft and shipbuilding industries was misplaced, for he was neither temperamentally nor politically acceptable. When appointed Businessman of the Year in 1975 for his "vision, courage and commercial discipline" in turning Hawker Siddeley into one of the world's most efficient industries, he said flatly that he wanted no part in any nationalisation programme. When he later spoke of being "deeply saddened" by the enforced takeover of a third of his industrial group, he was perhaps making the understatement of the century.

Hall retired in 1986, but continued to keep in touch with his scientific specialities through the Royal Society (fellow, 1953) and the Royal Aeronautical Society, of which he was president 1958-59.

His flexibility and enormous breadth of grasp are revealed by the fact that not only was he a brilliant success in the very different worlds of academic research, government laboratory administration, high-tech management and industrial development, but he was also a Whitehall insider and adviser in whom Lord Zuckerman, as chief government scientist, declared great trust.

Born in Liverpool to parents who had left school at 12, Arnold Hall grew up during the depression. Many of his older relatives were involved in maritime activities, but his father was an upholsterer and his mother a brilliant self-taught pianist. "My mother tried to teach me, but I'm afraid I was something of a disappointment to her. My interests were always in engineering and science," Hall recalled. "I was too busy making steam engines and other gadgets."

His mathematical gifts and his potential in science and engineering emerged clearly at Alsop High School at Walton, then an all-boys school, to which he won a scholarship. Sheer brilliance took him to Clare College, Cambridge, where, in addition to a first, he won the Moir Prize in Engineering, the Seely Prize in Aeronautics and the Ricardo Prize in Thermodynamics. On a post-graduate fellowship he worked with Frank Whittle and carried out the compressor stress calculations for Whittle's jet engine, the first in the world to run (April 1937), now in the Science Museum in London.

In 1938, Hall joined the Royal Aircraft Establishment where, during the war, he led the teams that produced both the advanced bomb-sight and the gyro gun-sight which, from D-Day onward, more than doubled the kill rate of Allied fighter aircraft. In 1945 he was appointed professor of aviation at the University of London and head of the department of aeronautics at Imperial College. In 1951, when his post-war academic research programme was just

getting into its stride, the death of the Farnborough director and fears of the escalation of the Korean war prompted the government to ask him to take over.

The deal was that he would do this for five years and then return to academic life. Instead, Farnborough became an unexpected springboard for a triumphant international industrial career. Although his own flexibility was clear, one of his deep lifelong concerns was the need for breadth and flexibility in technical education.

This was expressed practically through his involvement in the initiation of Warwick university, where he served as pro-chancellor from 1965 to 1970, and by his long spell as chancellor of the Loughborough University of Technology 1980-89.

He appeared to have no recreations, no passions, but in fact there were two: his family and deep-sea sailing. Late in life, when he had given up sailing, Hall said it was his great good fortune to have been blessed by a family who "always put up with my eccentricities and were never too harsh when I made mistakes". For this quiet giant who was usually right, their support was crucial.

He is survived by his second wife Iola; three daughters from his first marriage; a stepdaughter and stepson from his first wife's first marriage; and three stepsons and five stepdaughters from his second wife's first marriage.

Sir Arnold Alexander Hall, aeronautical engineer, scientist and industrialist; born April 23 1915; died January 9 2000

Anthony Tucker wrote this obituary shortly before his death. It has been revised and updated