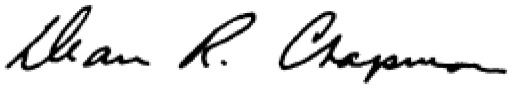

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Memorial Tributes: Volume 8

Dean R. Chapman

1922-1995

By Robert T. Jones and Hans Mark

Dean R. Chapman, professor at Stanford University and former director of astronautics at the National Aeronautics and Space Administration (NASA) Ames Research Center, died at his home in Saratoga, California, on October 4, 1995.

Dean was born in Fort Sumner, New Mexico, on March 8, 1922, one of three children. The family moved to Arizona for a short time and finally to Southern California in 1926. Dean was very close to his younger brother, Tom, and older sister, Carmen, as they grew up. Dean and Tom did almost everything together, from play to work. This included selling magazines door-to-door and delivering newspapers. The newspaper route meant getting up at 3:30 a.m. each morning to deliver them before going to school. Dean and Tom also loved to play basketball. The many hours devoted to basketball and selling newspapers may have contributed to Dean's average grades in high school. After high school Dean and two of his friends made plans to enlist in the Army Air Corps; however, there was a requirement of some college credits to qualify for preflight training, so it was off to Los Angeles City College (LACC) for Dean and his friends, Don and George. Don and George both completed their college requirements and enlisted in the Air Corps. Dean, however, was encouraged by a professor at LACC to take the entrance examination to the California Institute of Technology (Caltech). This professor

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was impressed with Dean's keen mind and intellect and was convinced that Dean would reach higher goals with an education at Caltech than with service in the Air Corps. Dean agreed, took the entrance exam, and was accepted with a scholarship. Dean graduated from LACC in 1941 with the highest scholastic honors in the class. At Caltech he distinguished himself academically and was also the star of their basketball team. He obtained a B.S. degree in mechanical engineering (highest scholastic average in class) and an M.S. degree in aeronautical engineering (outstanding student award for his class).

Upon graduation Dean accepted a position at the National Advisory Committee for Aeronautics (NACA) Ames Aeronautical Laboratory, now the NASA Ames Research Center. World War II was still being fought and there was some concern about essential personnel being lost to the draft; there was also some concern about essential security at the laboratory since the lab was located on United States property (Moffett Field). The government decided to draft all of Ames people into the Navy, thereby solving the aforementioned problems. So, Dean became an ensign in the Navy.

This created some strange inequities; some of the supervisors couldn't pass the physical exam and were given only the rank of chief, which created situations in which supervisors were outranked by subordinates. After the war Dean went back to Caltech and obtained his Ph.D. degree in aeronautics in 1948.

As a scientist Dean had some unusual qualities that would have an impact on his future performance. In addition to being an outstanding engineer, he was also an outstanding mathematician—a very unusual combination of talents. He also had a knack for simplifying a problem and reporting it with great clarity in the literature.

Dean started his career at Ames working in the 40x80-foot wind tunnel, which was, at that time, the largest wind tunnel in the world; however, he soon transferred to the 1x3-foot supersonic wind tunnel where he spent a good portion of his

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career. Much of Dean's early research centered on skin friction, base pressure, and heat transfer. For this work he received the Lawrence Sperry Award in 1952, one of the outstanding honors in aeronautics given annually by the Institute of Aeronautical Sciences. He also pioneered the use of gas mixtures for use in wind tunnels at high Mach numbers to avoid the problems of gas liquefaction.

Dean did a considerable amount of theoretical and experimental research on the character of separated flows and their effects on the heat transfer in these regions.

In 1957 the Soviet Union launched its first Sputnik, signaling the beginning of the space age. In 1958 NACA was renamed the National Aeronautics and Space Administration. Ames Aeronautical Laboratory was renamed Ames Research Center.

Dean's career at Ames Research Center spanned the years from 1944 through 1979. During this period he was to become one of the world's leading authorities on such subjects as skin friction, boundary layers, base pressure, separated flows, turbulence, use of gas mixtures in wind tunnels, arc-jet development, entry aerodynamics, ablation analysis, thermal protection, hypersonic real gas flows, computational aerodynamics and fluid dynamics, shock wave analysis, and tektites.

The research project that challenged Dean the most was his work on the origin of tektites. Tektites are strange glassy objects scattered over the earth's surface at various locations. They have been studied by scientists of various disciplines for more than a hundred years, and various theories have surfaced regarding their origin. Dean first learned of tektites when he visited the British Museum in the early 1960s where he recognized features of tektites suggesting they had been shaped by the heat and aerodynamic forces of entry into the earth's atmosphere. Using a device called an arc-jet, which simulated atmosphere-entry conditions, Dean successfully produced tektite shapes. By analyzing the ablation characteristics of Australian tektites, he was able to determine their entry velocities and entry angles, thus concluding that the most probable source of tektite origin was the moon.

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H. Julian Allen, then director of Ames Research Center, congratulated Dean on this bit of scientific "sleuthing," but added, "If you are any good as an aerodynamicist, you should be able to determine from which crater the tektites came." Dean accepted the challenge. He performed specific gravity measurements on thousands of tektites and, by drawing on the results of extensive chemical analysis, was able to determine the landing patterns that the tektites traced on the surface of the earth. Using high-speed computers, he analyzed the moon-earth trajectories of all the large craters on the moon that could conceivably produce tektites. He was able to show that the crater Tycho produced landing patterns that matched those observed on the earth. In answering Allen's challenge, he was able to determine not only which of the moon's craters produced the tektites but also the particular ray of that crater (the Rosse ray). By 1965 Dean's detective work had become one of the most fascinating displays of scientific virtuosity in the annals of the Ames Research Center.

Although Dean concluded that tektites were formed by the impact of a large iron-nickel meteorite on the surface of the moon, these conclusions are not universally accepted by many scientists whose disciplines do not include atmosphere-entry aerodynamics. Dean also amassed a large collection of tektites from various parts of the world. This collection, together with the results of his many experiments, now resides in the Smithsonian Institution.

In 1963 at a ceremony in which Vice President Lyndon B. Johnson was the principal speaker, Dean was presented with NASA's highest scientific award, its Award for Exceptional Scientific Achievement. He was the first person at Ames to receive this award.

During his career at Ames, Dean received numerous other awards and honors. He received the Rockefeller Public Service Award for his outstanding work on spacecraft reentry trajectories. This furnished him the opportunity to pursue research at the university of his choice (University of Manchester in England). For his research on tektites, Dean received the H. Julian Allen Award from the NASA Ames

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Research Center in 1972. He was awarded the Dryden Lectureship in Research by the American Institute of Aeronautics and Astronautics in 1979 and received NASA's Distinguished Service Medal in 1980. He was named Hunsaker Honorary Professor at the Massachusetts Institute of Technology from 1978 to 1979. He was a fellow of both the American Astronautical Society and the American Institute of Aeronautics and Astronautics.

In 1969 Chapman was appointed chief of the Thermo and Gas Dynamics Division at Ames and thus began a distinguished career as a research leader and administrator. In 1974 he became the center's director of astronautics. In that capacity he headed the center's work in fundamental and applied research in broadly defined areas of fluid mechanics, gas dynamics, materials, computer technology, and chemistry. More than five hundred people were employed in Chapman's directorate. Probably his most important contribution during those years was the establishment of the first significant research group to develop computational fluid dynamics using the best available high-speed computers. The first massively parallel computer, the Illiac IV, was installed at Ames in 1970 and, under Chapman's leadership, became operational in 1973. Chapman's work was recognized in 1975 by his election to the National Academy of Engineering.

In 1980 Chapman retired from Ames after more than thirty-four years of service and joined the faculty at Stanford University as a research professor of aeronautics and astronautics and mechanical engineering. He continued to work in the computational study of turbulence and hypersonic flow. He was instrumental in forming the Center for Turbulence Research and served on the center's steering committee. He supervised numerous students and was valued highly by his students and colleagues at Stanford as a teacher, mentor, and friend.

Dean is survived by his wife, Marguerite; son, Donald Chapman, of Santa Monica, California; daughter, Anita Hirsch, M.D., and three grandchildren, Rebecca, Sarah and

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David Fingerhood, all of Belfast Valley, Maryland. He is also survived by his brother, Tom Chapman, of Murrieta, California, and his sister, Carmen Benson, of Downey, California.

An inspiring leader of scientific research and a good friend, Dean Chapman will be greatly missed by all who knew him.

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