

Chapter 9

The History of the Aerospace Engineering and Mechanics Department at the University of Minnesota

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1929 to 1958 - From Aeronautical Engineering to Mechanics

The University of Minnesota first offered courses in aeronautical engineering to undergraduates in mechanical engineering in 1926. This was 13 years after the first aeronautical engineering program in the U.S. was established at MIT. In early 1928, Ora M. Leland, Dean of the College of Engineering and Architecture, proposed to the Minnesota Board of Regents that an independent department of aeronautical engineering be established. He believed that "Minnesota is favorably located to become a center for this field of engineering for the Northwest." Leland recommended that the new curriculum continue much as it had from within the mechanical engineering department.

A special lectureship was given to John D. Akerman, who not only taught during the 1928-1929 school year, but also helped design the final form of the department. In the fall of 1929, the Department of Aeronautical Engineering at the University of Minnesota officially opened its doors to students. John Akerman, then an associate professor, served as its first department head, a position he would hold for nearly three decades.

Consistent with Akerman's background, the department's curriculum reflected the interests of industry. Born in Latvia, Akerman began his aeronautical studies at the Imperial Technical Institute in Moscow under the pioneer aerodynamicist Nickolai Joukowski. Akerman was also acquainted with Igor Sikorsky and maintained contact with Sikorsky after both immigrated to the USA. When World War I started, Akerman served as a pilot for the Russian Imperial Air Service. After the Bolshevik take over in 1917, he fled to France and served as a pilot in the French air force. He moved to the United States after the war in 1918.

Akerman's aeronautical interests led him to the University of Michigan, where he earned a bachelor's degree in aeronautical engineering in 1925. Akerman stayed at Michigan until 1927,

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¹ Ora M. Leland to President L. D. Coffman, 4 February, 1928. College of Engineering and Architecture, Department of Aeronautics, 1929-1940 File, President's Office Papers, 1911-1945. University of Minnesota Archives.

doing coursework for a master's degree and working on a subsonic wind tunnel endowed by the new Guggenheim Fund for the Promotion of Aeronautics. He left Michigan for a position as chief design engineer at Hamilton Metal Plane Company in Milwaukee before finishing his master's degree. In 1928, Mohawk Aircraft Corporation, located in Minneapolis, hired Akerman as the chief engineer for their new low wing monoplane. It was this position that brought him to the Twin Cities and created the opportunity for Akerman to begin teaching at the university.²

The Aeronautical Engineering department at Minnesota offered eighteen courses its first year. These courses dealt primarily with hardware, pilot knowledge, structures, instruments, electrical systems, navigation, and communications. Charles Boehnlein of the Department of Mathematics was the professor for the more theoretical courses that dealt with aerodynamics. His three course series introduced the concepts of aerodynamic forces, stability, propeller theory, and laboratory practices. Professor Joseph Wise from the civil engineering department taught two classes on structures as applied to airframes and landing gear. Instructor Gustav Hoglund took responsibility for the laboratory courses, which covered airplane design, airplane parts and their construction, and airships.

Course offerings expanded during the 1930s with the addition of new faculty and new interests in industry. In the mid-1930s Akerman began studying the effects of high altitudes on pilots. He believed the next advancement in aircraft technology would be stratospheric flight "where high speeds are possible and bad weather is not encountered."³ On October 23, 1934 Dr. Jean Piccard, a Swiss chemical engineer, and his balloon-piloting wife, Jeanette Piccard, ascended to 57,579 feet in a cloth balloon to record data on the stratosphere. The flight and the Piccards' possible contribution to his own project attracted Akerman's attention. Jean Piccard began experimenting with balloons in the early 1930s with his physicist brother, Auguste. With Dean Samuel Lind's approval, Akerman invited both Piccards to Minnesota, but only Jean became a faculty member—first as special lecturer, then as Professor in 1938. In addition to the stratospheric coursework, the faculty added courses on seaplanes in 1930 and dirigibles in 1931, both taught by Professor Wise.

Minnesota's Aeronautical Engineering department produced substantial numbers of talented engineers, thereby fulfilling industry's growing need for professional employees with formal aeronautical knowledge. In 1936, the program in Aeronautical Engineering became one of the first 10 programs accredited by the Engineering Council for Professional Development (the precursor of ABET). The Department has been in continuous accreditation since then. During the 1939-1940 school year, 3034 students were enrolled in aeronautical engineering programs across the United States and Canada, and 455 of those students studied at the University of Minnesota.

In 1926 Daniel Guggenheim organized the Daniel Guggenheim Fund for the Promotion of Aeronautics. Guggenheim intended the fund "to promote aeronautical education throughout the country, to assist in the extension of aeronautical science, and to further the development of commercial aircraft, particularly in its use as a regular means of transporting both goods and people."⁴ The fund endowed seven of the ten schools that offered aeronautical engineering degrees at that time. Minnesota was not one of these. Since Minnesota received no Guggenheim funding, a major impetus for moving towards engineering science was missing. Instead, the department remained practice-oriented with little focus on the theoretical side of aeronautical engineering.

³ Akerman, lecture notes, file J, Akerman Papers, University of Minnesota Archives.

⁴ Harry F. Guggenheim, *Report of the Daniel Guggenheim Fund for the Promotion of Aeronautics, 1926 and 1927*, New York.

Those courses that were added in the 1930s mostly fell into the category of practice, not engineering science. In some cases, the faculty even dropped some science-based engineering courses.

In the late 1930s, the University administration began showing concern over the direction of the department. The department's and the school's competitiveness with other universities depended on a state-of-the-art, progressive curriculum. Consequently, Dean Samuel Lind of the new Institute of Technology (IT) felt obligated to evaluate his departments critically. He favored upgrading the curriculum, but the demands of WWII dictated that universities contribute to the war effort by training the largest number of scientists and engineers possible, as well as providing applied research. Lind thus postponed restructuring the curriculum until the war was over.

As one way of satisfying the country's demand for engineers during the war years, the University of Minnesota was one of seven universities participating in a unique educational experiment. One hundred and two young women from all parts of the country were selected to study aeronautical engineering at the University of Minnesota. These young women were employees of the Curtiss-Wright Corporation and were pledged to work in engineering departments of that company after graduation. They were called the Curtiss-Wright Cadettes. The Cadettes were intended to replenish Curtiss-Wright's dwindling supply of engineers. While in school, these women received room, board, tuition, and pocket money (\$10/week). They were expected to work 40 hours/week with 30 hours of classroom instruction and 10 hours of supervised study for a period of 10 months.

The course of study for the Cadettes included drawing, structures, mechanics, aerodynamics, machine shop, materials testing, and aluminum fabrication. Those who doubted the engineering capabilities of women were soon proved wrong and before long the faculty found themselves teaching material far more advanced than originally envisioned. In the 10 months the students earned approximately two and one half years of college credit in engineering subjects.

Nearly 100 Cadettes completed the course and went on to Columbus, Ohio in December of 1943. The majority worked at Columbus until the end of the war. Some advanced to full engineering positions and some to supervisory jobs.

In 1946 the university began negotiations with the U. S. Government to acquire the idle Gopher Ordnance Works and its accompanying 8,000 acres of land south of the Twin Cities. The university finally purchased the installation in March 1948 for \$1. This became the site of the Rosemount Aeronautical Laboratory (RAL), which would serve as the Aeronautical Engineering department's primary research facility for almost 15 years. Faculty members designed and installed a number of wind tunnels at Rosemount, including a hypersonic wind tunnel capable of producing speeds between Mach 7 and 11 and air temperatures of 3,000 degrees Fahrenheit. The RAL would be the site of significant research for both industry and the military. Graduates of the Department who worked at RAL developed a total temperature sensor for the Navy and then formed the Rosemount Engineering Company to produce it commercially. Rosemount Engineering became one of the world's largest suppliers of air data and other flow sensors. The company later divided into Rosemount Inc. and the Sensor Division of B.F. Goodrich Aerospace.

Dean Lind retired in July 1947. After a year-long search, the Board of Regents approved Athelstan Spilhaus, a professor of meteorology and the director of research at New York University, as the new Dean of the Institute of Technology. Spilhaus officially took office in January 1949 and brought with him a vision of developing the scientific foundation of Minnesota's engineering programs. He advocated a focus on fundamentals and aspired to leadership in theoretical research. He believed that a science-based curriculum and research were the principal components of a

strong engineering program. In 1950, Spilhaus reported that within the Institute of Technology the "development of graduate instruction and research is emphasized."⁵

Akerman exerted little effort in support of Spilhaus's vision and eventually resisted it. The turbulent relationship between Akerman and Spilhaus hindered the development of engineering science in the Aeronautical Engineering department. In the spring of 1951, Dean Spilhaus's made his first major attempt to personally redesign the Aeronautical Engineering department. Enrollment had reached its lowest point at this time because of the mistaken perception of a surplus of engineers and the need for soldiers for the Korean War. The budget mirrored the drop in enrollment. Spilhaus pushed departments to reduce their costs as much as possible without risking their students' educations. As a means of eliminating the duplication of courses and thereby reducing costs, Spilhaus proposed making Aeronautical Engineering a division of Mechanical Engineering as it had been up until 1929. In this instance, Spilhaus was out of step with the rest of the country. Many aeronautical engineering programs started as options within mechanical engineering departments, as happened at Minnesota. However, by 1951, the trend was for independent departments of aeronautical engineering—Iowa State and Purdue being two such examples. Mechanical engineering coursework no longer met the technological and theoretical requirements of the aeronautical industry.

Despite decreases in enrollment and Spilhaus's perspective on the state of the department's curriculum and leadership, the Aeronautical Engineering department produced a number of notable graduates including Donald "Deke" Slayton, one of the original Mercury 7 Astronauts. However the curriculum was still extremely practice-oriented. Spilhaus refused to give up his quest to see Minnesota's engineering curriculum develop its strength in basic science, engineering science, and its "underlying principles," and an overhaul of the aeronautical course requirements was a priority for him. Spilhaus's second attempt to remedy the sluggishness he saw in the Aeronautical Engineering department came in May of 1957. He proposed a radical modification to the department—a merger with the Department of Mechanics and Materials and the subsequent removal of John Akerman as head of the combined department. Mechanics and Materials granted only graduate degrees, but taught undergraduate courses in mechanics. Aeronautical engineering was a professional department that granted mostly undergraduate degrees. Spilhaus intended the merger to combine the strengths of both departments and eliminate the weaknesses he saw in the aeronautical engineering program. Dr. Benjamin Lazan, Associate Dean of IT and head of Mechanics and Materials, took over as head of the combined departments in 1958.

In bringing John Akerman to the University in 1928, Dean Leland had hoped to create a program in aeronautical engineering with close ties to industry. The University of Minnesota Aeronautical Engineering department, however, was never able to establish relations with large aviation companies like those of the Guggenheim Schools. Except for some kit aircraft companies, all aircraft production companies in the state of Minnesota folded by 1931 because of financial failure or their inability to build working aircraft. Dean Leland's hope that Minnesota would become a major center for airplane manufacturing was not to become a reality.

⁵ Athelstan Spilhaus, *The Biennial Report the President of the University of Minnesota approved and adopted by the Board of Regents 1948-1950*, 27 December 1950, Vol. LIII, no. 60.89.

1958 to 1992 - The Ascendancy of Mechanics

Dr. Lazan was a well-known researcher in the mechanics of materials whose orientation was toward engineering science. Lazan moved the department in the direction of engineering science by means of the faculty he hired. All faculty hires under Lazan were in the areas of solid or fluid mechanics with no faculty hired in aeronautical engineering. In the post-Sputnik era, research funds were re-directed to engineering science-oriented programs. During this time, the external funding base for the department changed from projects at RAL to projects on the main campus. The extensive facilities and personnel at RAL required large externally funded projects. Professor Rudolf Hermann was one of the world's leading experimental aerodynamicists and was instrumental in obtaining the large grants and contracts necessary for the existence of RAL. When Hermann left the University in 1962, there were few faculty who wished to continue the large aeronautical based projects at RAL. As a consequence of reduced funding, RAL closed its doors in the mid-1960s.

Dr. Lazan was forced to resign as Department Head in the early 1960s due illness; however, during his tenure as Department Head, he hired most of the faculty who shaped the Department in the 1960s and 1970s. Professor P. R. "Pat" Sethna replaced Lazan in 1966. Pat Sethna had received his Ph.D. from the University of Michigan in Engineering Mechanics and joined the University of Minnesota in 1956. His specialty was non-linear systems and he had a very strong applied mathematics orientation. Under his leadership the Department continued its orientation towards engineering science.

In 1972, the name of the Department was changed from Aeronautical Engineering to Aerospace Engineering and Mechanics. Up to that time courses had been designated Aero. or M&M (Mechanics and Materials) depending on whether they had been part of the old Aeronautical or Mechanics and Materials departments. The new course designator AEM (Aerospace Engineering and Mechanics) was adopted for all courses. Despite the name change, the department was still heavily oriented toward theoretical mechanics with an applied mathematics flavor.

In the early 1970s, the aerospace industry underwent a severe recession due to the end of the Vietnam War and the termination of the Apollo Program. Undergraduate enrollments plummeted. At the same time there was a substantial reallocation of funds from engineering, sciences, and liberal arts to the health sciences. Again there were proposals to merge the Aerospace Engineering department with Mechanical Engineering. This did not occur, but the department lost a number of faculty positions during this period and there were essentially no new faculty hires from the early 1970s to the early 1980s. During this period enrollments gradually increased but never reached the level of the late 1960s.

In the late 1970s expenditures in the aerospace field began to increase dramatically. This increase was driven primarily by increased defense spending. The demand for aerospace engineers rose sharply and enrollments in the Department grew. In 1989, enrollments peaked at about 600 undergraduates and the AEM Department had the largest undergraduate enrollment of any engineering department at the University of Minnesota. The number of faculty members also increased to a maximum of 21.

A number of new young faculty members were hired beginning in 1989, including the first two female faculty. These younger faculty members had, for the most part, a more applied orientation than did the more senior faculty members. This was to have important positive implications for the future. Nationwide, research funding priorities in engineering began to shift from theoretical to applied. This shift was due to the perception that theoretical engineering research performed at universities had produced relatively few practical benefits. Experimental and computational

research began to replace "pencil and paper" studies. In the late 1980s and early 1990s, the number of research dollars per faculty member in the AEM Department was the lowest of all of the engineering departments at the University of Minnesota.

1992 to 2003 - A Balanced Department

In 1992, Pat Sethna retired and Professor William Garrard became Department Head. Garrard received his BS in Mechanical Engineering and Ph.D. in Engineering Mechanics at the University of Texas at Austin. He joined the faculty of the University of Minnesota in 1967. Despite having never taken a course in aerospace engineering, Garrard had a strong interest in the field and did his Ph.D. thesis on satellite attitude control. Garrard worked with the Honeywell Systems and Research Center in Minneapolis as a consultant and further developed his interests in the application of advanced control theory to control of aerospace vehicles.

During the 1990s, many of the faculty hired in the 1950s and early 1960s retired. Most of these had a theoretical mechanics orientation, and were replaced by faculty members with much more applied interests. Some of the remaining senior faculty members, realizing that national priorities for research favored more practical work, changed the focus of their research. The result was a large increase in funded research in the Department. In fact, the research dollar per faculty member in the AEM Department became one of the highest of all the engineering departments at the University of Minnesota. Research in computational fluid mechanics and hypersonics, experimental fluid mechanics, smart materials, and aerospace systems flourished.

With the end of the cold war and the dissolution of the Soviet Union in the early 1990s, the demand for aerospace engineers decreased and enrollment in the AEM Department declined. In addition Aerospace Engineering was no longer seen as a glamorous field and was eclipsed by computer science. During the 1990s, state support for higher education also decreased substantially as a percentage of the operating expenses of the University of Minnesota. This resulted in a series of retrenchments and reallocations at the University. The number of faculty members in AEM declined to 16, the same number as the lowest point in the early 1970s. As this is written in February of 2003, the state of Minnesota faces its largest deficit in history. The resolution of this deficit is not clear but its potential effect on the AEM Department and the University of Minnesota is likely to be severe. The survival and success of aerospace engineering at Minnesota, however, stand as evidence to the fact that the department has shown a vital sense of flexibility to change, a characteristic that should carry it well into the future of aerospace engineering.

Some Notable Early Faculty Members

H.W. Barlow. Professor H.W. Barlow came to the University as an instructor in September 1932. He was a native of Cleveland, Ohio, and obtained his BS degree from Purdue and a MS in Aeronautical Engineering at Minnesota. Professor Barlow worked with John Akerman on designing and building racing airplanes for Colonel Roscoe Turner, holder of several long-distance speed records from New York to Los Angeles and back and from England to Australia as well as a famous pylon racer. One of the pylon racers designed at the University of Minnesota is in the National Aerospace Museum. This aircraft was designed to be neutrally stable in order to increase performance and was a very early example of an aircraft purposely designed for reduced static stability, a feature prevalent in most current high performance aircraft. Another aircraft designed by Barlow and Akerman was a streamlined single-seat land monoplane that was expected to have a top speed of 400 miles per hour. Barlow later joined the faculty at Texas A&M.

Jean Piccard. Dr. Jean Piccard was already a world famous balloonist when he came to the University in 1936. He taught courses in stratospheric flight while doing research and conducting

many pioneering balloon flights. Dr. Jean Piccard and his wife, Dr. Jeanette Piccard, made their first stratospheric flight in October 1934, in Detroit. Before coming to Minnesota, they were associated with the Bartol Research Foundation of the Franklin Institute. At that time, they were foremost among the five or six persons with scientific knowledge of the stratosphere. Jean's twin brother, Dr. Auguste Piccard, was also a stratospheric pioneer. Together the brothers designed the balloons and their gondolas for the first stratospheric flights attempted, and together they conducted those flights in Switzerland. Jeanette Piccard was the pilot of the famous Piccard balloon expeditions. She was the first licensed woman balloonist in the world and the first woman to ascend into the stratosphere.

One of Dr. Jean Piccard's first projects at the University was constructing an unmanned hydrogen-filled transparent cellophane balloon for ascents 10 to 14 miles into the stratosphere. The balloon was successfully flown on June 24, 1936. Three aeronautical engineering students—Harold Hatlestad of Minneapolis, who built the radio equipment for the flight, Robert Hatch of St. Paul, and Robert Silliman of Duluth—maintained radio contact with the balloon from the station on the roof of the University armory. Jean Barnhill was a graduate student who worked with Dr. Piccard and aeronautical engineering students Harold Larson and Lloyd Schumacher in cutting by hand the sixteen 33-foot long tapered gores that made up the 25-foot high balloon. The 'orange peel' gores were fastened together by a revolutionary product, inch-wide strips of cellophane covered with adhesive, called Scotch tape, developed by the Twin Cities' 3M Company. Jean Barnhill was the first woman to graduate from the University in Aeronautical Engineering, and was also a championship pilot in national air races. She married Robert Gilruth, another graduate of the Department. Robert Gilruth was later instrumental in development of swept back wing technology in the U.S.⁶ and played a key role in the U. S. Space Program as Director of the NASA Johnson Manned Space Flight Center during the Apollo program.

Rudolf Hermann. The Rosemount Aeronautical Lab (RAL) provided an important research facility that helped the Aeronautical Engineering Department attract the kind of faculty members capable of advancing the department as a research entity. By 1960, RAL housed a continuous-flow transonic tunnel, continuous-flow and blow-down supersonic tunnels, and a high temperature hypersonic wind tunnel. The facilities at RAL attracted some top researchers to the Aeronautical Engineering Department at the University of Minnesota. One of these was Dr. Rudolf Hermann.

Rudolf Hermann earned his Ph.D. in physics from the University of Leipzig in 1929 and in 1935, he completed his Doktor habilitation (Dr. habil.), the second doctorate required of all professorial candidates in Germany. Hermann's first engineering position was in the Department of Applied Mechanics and Thermodynamics at the University of Leipzig from 1929 to 1933. In 1934 he took over as head of the supersonic wind tunnel division at Aachen, a position he kept until 1937.

In 1935 the Luftwaffe Technical Office introduced Wernher von Braun, the German rocket pioneer, to Rudolf Hermann who was working at Aachen as an assistant professor in addition to holding his position in the wind tunnel center. Von Braun's group had difficulty with the aerodynamic design of missile fins and turned to Hermann and his facilities at Aachen.

Because of the significant role supersonic aerodynamics played in rocket design and the distance of the Aachen lab from Peenemünde, von Braun felt that the rocket group needed its own supersonic wind tunnel and its own supersonic specialist. Hermann joined the Peenemünde group in April 1937 as Director of the Supersonic Wind Tunnel Laboratory of the Army Rocket Experimental Station. The construction of two supersonic tunnels was Hermann's priority. The

⁶ John D. Anderson, *A History of Aerodynamics*, Cambridge University Press, Cambridge, 1998, page 427.

first tunnel was a 20-second, blow down tunnel with a 40-centimeter-wide test section and a maximum running speed of Mach 4.4. The second was an 18 x 18 centimeter continuous-flow tunnel with a maximum speed of Mach 3.1. The theoretical design of the De Laval nozzles used to accelerate the tunnel flows to supersonic velocities proved to be an extraordinarily complex task. Nevertheless, Hermann and his team perfected the designs for the testing facilities while providing novel methods for acquiring transonic and supersonic data, such as drop tests from an altitude of 7000 feet. Through these tests, Hermann and his staff gathered supersonic flight data on the aerodynamic design of the A-5, a redesigned A-3 rocket used to test guidance systems. The lessons learned from the study and testing of the A-5 were later incorporated into the design of the V-2 rocket. This experience gave Hermann the status of chief aerodynamicist for the V-2 rocket.

With the end of World War II, the Allied Powers sent representatives to occupied Germany to recruit the top scientists in a variety of fields for the benefit of science and weapons development at home. In the U.S., this operation was known as Project Paperclip. By the end of 1952, 544 German specialists were living and working in the United States because of Project Paperclip. As these scientists and engineers arrived in America, they were usually housed and put to work at military installations.

In 1945, Hermann was employed as a consultant with the Air Engineering Development Division at Wright Patterson Air Force Base in Dayton, Ohio. The American public was not told of the presence of German scientists and engineers working in the United States until early December of 1946. Newsweek magazine described the work of Hermann and his colleagues as follows: "As the war ended, [Dr. Rudolf Hermann] was building a 7,000-mile-an-hour wind tunnel in the Bavarian Alps. With six associates brought from Germany, Hermann is working on supersonic wind tunnels for the United States Army."

By 1948, some of the incoming Germans were being approved for work in American industry, and with that approval came essentially full freedom of choice. Scientists already in the United States were also being released for industry work. In fact, 516 of these German scientists and engineers and 1063 of their dependents obtained U. S. citizenship. Hermann was one of these.

In 1950, Hermann left Wright Air Force Base, and joined the faculty in the Department of Aeronautical Engineering at Minnesota. He brought knowledge and expertise in supersonic and hypersonic flight, subjects that were new to the curriculum. Hermann also taught mostly graduate level courses. The lack of graduate courses was a weak area in the Aeronautical Engineering department that was partially remedied by the addition of Hermann to the faculty.

Hermann served the University of Minnesota both as a teaching professor and researcher, much as he had in Germany. He and his family lived in one of the 25 staff houses on the grounds of RAL, where he was Technical Director of the Hypersonic Facilities. At RAL, Hermann conducted research on supersonic and hypersonic flow characteristics, rocket sleds, and ramjets, with much support and funding from the U. S. Air Force and Navy. Hermann was one of the top researchers in supersonic and hypersonic aerodynamics in the 1950s and 1960s.

In June 1962, Rudolf Hermann left the University of Minnesota to accept the position of Director of the newly founded aeronautical research laboratory at the University of Alabama in Huntsville, a neighboring facility to Marshall Spaceflight Center where Hermann's former collaborator from Peenemünde, Wernher von Braun, was in charge. During his time at Minnesota, he contributed to the Aeronautical Engineering program his knowledge and understanding of supersonic and hypersonic theory and an approach to engineering science at a time when the Institute of Technology was ready for change.

Helmut G. Heinrich. Dr. Helmut G. Heinrich was also one of the German scientists who came to America after the war as part of Project Paperclip. Educated at the Technical University of Stuttgart, "Doc" Heinrich, as his students and associates knew him, served as Chief of Aerodynamics at the Graf Zeppelin Institute in Germany during WW II. He was at Wright Airforce Base from 1946 until 1956 when he joined the faculty of the Aeronautical Engineering Department of the University of Minnesota. Professor Heinrich taught courses and conducted pioneering work on deployable aerodynamic deceleration devices, primarily parachutes. A number of undergraduate and graduate students worked on government contracts and grants under the direction of Dr. Heinrich. He invented the guide-surface parachute and several related devices that significantly improved parachute construction and performance. Heinrich developed supersonic parachutes that were considered for use in the Apollo program and his contributions to parachute systems were used for soft-landing scientific probes on Venus and Mars.

Dr. Heinrich died of a heart attack on March 7, 1979 in Houston where he had just received the first AIAA Aerodynamic Deceleration Systems Award. He was a fellow of the AIAA, a Fellow of the RAES, and a charter member of the AIAA Committee on Aerodynamic Deceleration Systems formed in 1965.

Note on Sources

The information in this paper was taken from the following four sources:

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2. Anonymous, "Fifty Years of Aeronautical Engineering, University of Minnesota 1929-1979". Department of Aerospace Engineering and Mechanics, University of Minnesota. 1979.
3. William L. Garrard, personal recollections.
4. *Aeronautical Research Facilities*, University of Minnesota, Rosemount Aeronautical Laboratories, Research Report 152, 1958

Appendix



Fig. 1. First class of seniors taking flying lessons, 1933



Fig. 2. John Akerman with his radical new tailless airplane.

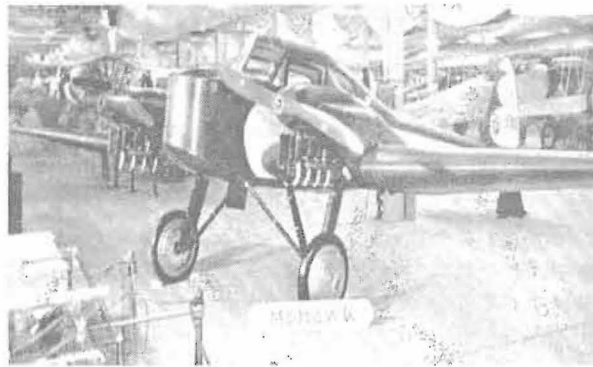


Fig 3. Mohawk first low-wing, twin-engine, cabin airplane that could fly on one motor



Fig. 4. Mohawk Pinto on floats

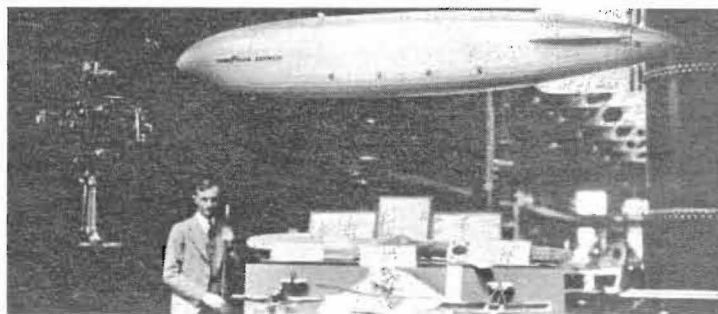


Fig. 5. Engineers' Day display

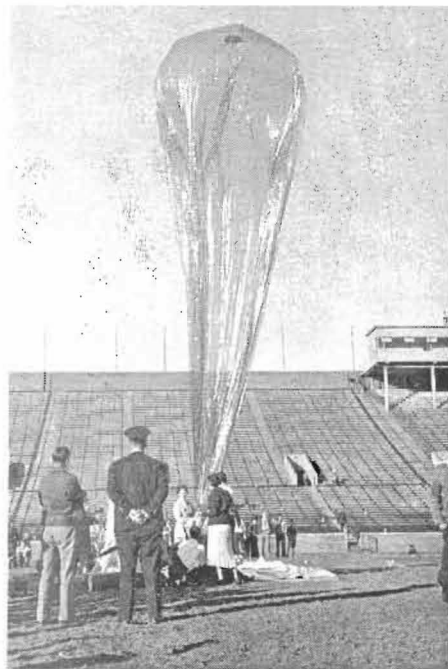


Fig. 6. Cellophane strato-sphere balloon ascent in Memorial Stadium, 1930's.



Fig. 7a. Jean Piccard and John Akerman watching balloon ascend.



Figure 7b. Jean Piccard and John Akerman before launch



Fig. 8. Aerial view of the Rosemount Aeronautical Laboratories (RAL).



Fig. 9. Cadettes in the classroom, 1943.



Fig. 10. Aerial view of continuous flow facilities (Bldg 302) RAL.



Fig. 11. Demonstration by Drs. Hermann and Heinrich at RAL, late 1950's



Fig. 12. Supersonic test set up at RAL, 1950's

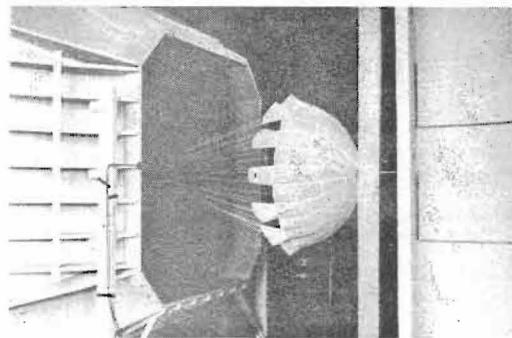


Fig. 13. Open throat test section (subsonic tunnel) with guide surface parachute, late 1950's.