Chapter 14

Joseph Gavin and MIT's Contribution to Aeronautics and Astronautics*

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Abstract

The education, career, and contributions of Joseph G. Gavin, Jr., offer an enlightening yet under-considered window into aerospace history. Gavin's career as a Grumman Aerospace Corporation manager and executive was launched with his education at MIT, from which he received a combined bachelor's and master's degree in aeronautical engineering in 1942, and to which he dedicated lifelong association and support. Aeronautical engineering classmate Thomas Connolly, who would ultimately help to oversee development of Grumman's F-14 fighter and retire as a three-star admiral and the Deputy Chief of Naval Operations, recruited Gavin for the Navy. At commencement, President Karl Compton presciently foresaw "an unprecedented era of opportunity in the post-war period for men trained as you have in the technological professions." These dynamics indeed defined Gavin's career. Thanks to his recent MIT studies, Gavin enjoyed insights concerning aviation technologies unthinkable to the veterans surrounding

* Presented at the Fifty-Third Symposium of the International Academy of Astronautics, October 21–25, 2019, Washington, DC. For further details, see Andrew S. Erickson, "Joseph G. Gavin, Jr. and MIT's Contribution to Aerospace in the Apollo Era and Beyond," *Acta Astronautica*, Volume 181 (April 2021): 167–189. Paper IAC-19-E4.2.05.

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him at the Naval Bureau of Aeronautics in Washington, DC. Gavin was closely involved with the development of his alma mater for the rest of his life and attended his last MIT Corporation meeting a month before his death at age ninety in 2010. He served on its executive committee from 1984–1991, in addition to many visiting committees. He was also a member of the MIT Education Council and MIT's Alumni/ae Association. Following his onetime professor and master's thesis advisor, for whom it was named, he was a member of the Charles Stark Draper Laboratory Corporation in 1981, then served on its board of directors (1982–1989). In the final years of its previous incarnation as the MIT Instrumentation Laboratory (1961–1970), the 1932-established organization had developed the Apollo Program's guidance, navigation, control, and computer (GNCC) systems. Gavin also supported MIT engineering education directly, often by lecturing in the seminars of such professors as Richard Battin, formerly director of mission development for the MIT Apollo Program. This chapter draws on historical materials from MIT and Gavin's own collection, as well as interviews with him, to explore his personal and organizational connections with the institution and how they were deeply intertwined with MIT's location at the center of American aerospace development.

I. Background and Early Education

Born on September 18, 1920, in Somerville, Massachusetts, Gavin grew up nearby in Brighton. His father, Joseph Sr., had to leave school in ninth grade to help support his family when his own father was killed in an industrial accident. Joseph Sr. ultimately become partner in a national syndicate of newspaper advertising brokers [1]. He served thrice in the US Army: in 1916 on the Mexican border; in World War I as a lieutenant with the 26th Division Field Artillery, receiving the Purple Heart and having been awarded a Silver Star; and in World War II in Germany as a Commandant for the U.S. Army Military Government, and ultimately as the local authority for the U.S. 2nd Military Government Regiment, in charge of administering the Rheingaukreis (Rhine County). He retired as a Lieutenant-Colonel. Gavin's mother, Elizabeth Tay, was a commercial artist who produced major displays for shops in Boston.

Gavin's lifelong interest in aircraft and space travel began early and was encouraged in three formative phases: youthful stimulus from fiction and experience, education in engineering at MIT, and work for the Navy in Washington. As a youth he drew inspiration from Buck Rogers and Charles A. Lindbergh, traveling hours as a seven-year-old to see "Lucky Lindy" land on a small airfield in Vermont following his flight across the Atlantic in 1927. From early on, Gavin

recalled, “I was pretty sure I wanted to be an engineer… and do something with flying machines.” This was despite his otherwise supportive father’s advice: “Don’t go into that business” [2].

After attending other public schools through sixth grade, Gavin received his secondary education at the Boston Latin School; where he starred on the football team as a 180-pound tackle [3] until he broke his nose, and received an award in modern studies as a junior [4]. He was also a marksman in the rifle club. Latin School was “a big leg up, very demanding. By the time I left, I knew how to study. Several teachers conveyed the idea that if you’re going to do something, do it well.” Senior year, Gavin enjoyed assembling experiments for the Physics Department [5].

II. The MIT Years

Gavin arrived at MIT in fall 1937. After Latin School, “entering MIT was pretty straightforward.” Gavin wanted to major in Aeronautics, which required successful performance freshman year, followed by an interview. The department was highly selective because before World War II, obtaining in employment in the field was difficult. A year later, Gavin joined an Aeronautics Department class of only twenty-eight to thirty students [6].

In a then-common situation, Gavin continued to live in his parents’ apartment as a commuter student. The varsity (heavyweight) crew team [7], of which he ultimately became captain and rowed in the leading stroke position [8], allowed him to meet classmates from other departments in the then-decentralized school. This yielded lifelong friendships. He lunched and socialized between classes with other commuting students at their “5:15 Club,” which “served a great purpose” [9]. His other activities included serving as secretary-treasurer of the sophomore class [10].

In academics, Gavin progressed “fairly easily,” having learned the importance of “Doing your homework on time.” Emphasis on basic requirements left little choice in classes. Gavin may have been one of the last aircraft engineers to take stoichiometry, which he regarded as “the chemistry of the furnace.” The faculty was fascinating. Aeronautical engineering professor Otto C. Koppen was “designing a little airplane at his home on the side.” A Swiss engineer, stranded in America by the war, found surprisingly effective ways to teach structural engineering using examples from the Swiss rail system. In a rare elective, a Princeton professor explained the Revolutionary War “and how we nearly lost it” [11].

War clouds overhung society: “Everybody had a feeling that there was a blow going to fall.” On track to obtain a bachelor’s degree with honors in aero-

nautical engineering in 1941, Gavin was still underage to transition from the Reserve Officer Training Corps (ROTC) to military assignment. This fact, combined with his documented talent, prompted MIT to invite him and classmate Rudy Hensel to spend a fifth year as MIT's only two students, on full-tuition scholarships, completing a combined bachelor's and master's degree in aeronautical engineering. Nominally under the supervision of Professor Charles Stark Draper, who in reality was too busy "building lead-computing gunsights in the basement for the Navy" to meet with them more than once, they analyzed wave effects in MIT's closed return Wright Brothers Wind Tunnel, then the world's most advanced setup of its kind. In addition to many other responsibilities during his exceptional career, Gavin's professor would later become head of the Department of Aeronautics and Astronautics [12].

On December 7, 1941, Gavin and Hensel were working in Gavin's parents' apartment. Mid-afternoon, his father interrupted: "You'd better come listen to the radio—Pearl Harbor has been attacked" [13]. Despite some earlier thoughts about applying to the Naval Academy, Gavin had taken the Army ROTC path to MIT. He would likely have been assigned to the Army engineers. However, his fifth year at MIT proved to be a turning point. He met naval officer classmates, back for advanced education after a decade in the fleet. Some of them, led by aeronautics classmate Thomas F. Connolly, recruited Gavin for the Navy and made sure that he received the proper application papers. This launched another lifelong friendship: Connolly, who would ultimately help oversee development of Grumman's F-14 fighter and retire as a three-star admiral and Deputy Chief of Naval Operations, [14] also kept in touch to pursue his conviction that the Navy should have a role in space [15].

After completing a thesis on "Aerodynamic Damping of an Aerofoil Oscillating in Pitch" [16], Gavin earned a combined bachelor's and master's degree with honors in aeronautical engineering in 1942. He graduated in Walker Memorial Hall with blackout curtains drawn—German submarines then threatened the East Coast [17]. At commencement, MIT President Dr. Karl T. Compton declared, "our success in this war may very possibly depend in a large degree on the wisdom and efficiency with which the professional manpower of this country is handled and trained," particularly specialists in "'strategic' technological professions." He presciently foresaw "an unprecedented era of opportunity in the post-war period for men trained as you have in the technological professions" [18]. These dynamics indeed defined Gavin's early career.

III. Extraordinary Experiences and Their MIT Connections

Following graduation in 1942, Gavin entered the US Naval Reserve as an engineering officer with the rank of Lieutenant. He spent four years in Washington, DC, posted at the Fighter Design Branch of the Naval Bureau of Aeronautics [19], then housed temporarily on the National Mall. In the bureau, Gavin "met several very competent mentors." Branch head Commander Jack Pearson made him the branch's expert in a nascent field: jet engines. Gavin "met very interesting people:" Orville Wright, aircraft engine experts from Westinghouse and Pratt & Whitney, and British jet engine pioneers including British Royal Air Force engineer Air Commodore Sir Frank Whittle [20].

Thanks to his recent MIT studies, Gavin enjoyed insights unthinkable to the "old salts" surrounding him. Most importantly, even though he had not heard so much as a "whisper" about jet engines at MIT, he immediately appreciated their significance as a revolutionary technology that would unlock tremendous potential by increasing aircraft flight speeds by several hundred miles per hour. Some of the more senior naval aviation specialists dismissed the new development's potential, affording Gavin unusual opportunity and responsibility for his age [21]: "Things were moving very fast in those days, and it was very stimulating to be part of it" [22].

Involved in the early work on jet aircraft designs and propulsion, Gavin served as the project officer on the Navy's first jet airplane, the McDonnell FH-1 *Phantom*. When severe weather trapped his boss in Washington, Lt. Senior Grade Gavin—almost the most junior officer present—ran a mockup board on McDonnell's second jet fighter for the Navy, the F2H *Banshee* [23]. Gavin later received a commendation for his contributions to the Navy's jet fighter program.

The Navy offered him a chance to stay and undergo flight training, but he "decided I wanted to build something." Piloting flying machines was a path not taken for Gavin:

> "I think that as a designer, you have the feeling that 'I could fly this thing,' no question. 'I know it so well that I could fly it.' While I had the urge [to get and maintain a pilot's license and fly], by Apollo 11 I was accustomed to saying [to astronauts], 'It's ok to go fly it.' That's something you don't say without thinking about it." [24]

In 1946, Gavin left the Navy to join the Grumman Aircraft Corporation in Bethpage, New York.

Some of the most extraordinary responsibilities of Gavin's subsequent career at Grumman directly involved his organizational and personal associations with MIT. On May 25, 1961, inspired by the bold initiative President Kennedy announced, the Apollo Program brought Grumman, and Gavin, the opportunity

of a lifetime. It was during a decade as Vice President and LM Program Director that Gavin faced his greatest challenges in management of technological innovation, when Grumman won the NASA competition to build the lander that would deliver NASA astronauts Neil Armstrong and Buzz Aldrin to the Moon's surface on July 20, 1969. From Grumman's very first announcement through Apollo's conclusion, Gavin led the team:

> "Full authority for directing Grumman personnel assigned to the LEM [25] and for controlling the resources required to achieve LEM objectives will belong to LEM Program Director Joe Gavin, who, since his graduation from MIT, has piled up 20 years of experience in aircraft, space, and missile engineering" [26].

A major highlight of Gavin's subsequent leadership of Grumman was implementing a major F-14 contract with Iran [27]. Initiated in 1968 and flown first in December 1970, the aptly-named F-14 "Tomcat" benefitted from the critical support of Gavin's old classmate—now Vice Admiral—Tom Connolly, who sacrificed his chance for a fourth star to ensure the program's inception and later managed it from the Pentagon side [28]. In 1972, the year Gavin became president of the Grumman Corporation's aerospace subsidiary (Grumman Aerospace Corporation), the Shah of Iran wrote to the F-14 Program Coordinator in the office of the Chief of Naval Operations, stating that he wished to consider purchasing F-14s for the Imperial Iranian Air Force (IIAF) to replace its aged F-4 Phantoms [29]. An experienced pilot himself, the Shah sought to counter high-altitude Soviet overflights then violating Iranian airspace. In July 1973, in an F-14 demonstration for the Shah at Andrews Air Force Base against the rival F-15, Grumman's team stole the show with dramatic maneuvers. The Shah appeared to have made up his mind [30]. That December, Iran ordered 30 F-14s; complete with the AIM-54 Phoenix missile, of which the F-15 lacked an equivalent [31]. After Gavin became President and Chief Operating Officer of the Grumman Corporation itself in 1976, the Navy delivered the first F-14 on January 24, 1977 [32]. A total of seventy-nine were delivered out of an ultimate order of eighty.

IV. Giving Back to MIT

Gavin had an extraordinary aerospace engineering career in an extraordinary age for American aerospace achievements, the likes of which may never be rivaled. His employment coincided exactly with the Cold War era's lofty defense spending and ambitious megaprojects. Following degrees from MIT in 1942 and four years as an officer in the US Navy's Bureau of Aeronautics, Gavin spent his entire career with the Grumman Corporation, rising from design engineer in 1946

to president and Chief Operating Officer in 1976 before his retirement from leadership in 1985 and his complete departure from remaining management and consulting in 1990. To the very end of his life, Gavin remained focused on pursuing new technological horizons and helping the organizations he valued look to the future. Gavin was a life-long active alumnus of MIT, eventually serving as a member of the MIT Corporation. He attended his last MIT Corporation board meeting on October 1, 2010, driving the two hours each way alone. This was just twenty-nine days before his death at age ninety, surrounded by family members at the Applewood Retirement Community in Amherst, Massachusetts.

Gavin was an active supporter of and fundraiser for the schools he had attended. Particularly noteworthy was his lifelong association with and support for MIT, of whose Corporation he was a life member and on whose executive committee he served from 1984–1991, in addition to many visiting committees. He was also a member of the MIT Education Council and MIT's Alumni/ae Association (Vice President, Board of Directors, 1981–1983; Vice-President, 1981–1983; President, 1986–1987). Following his onetime professor and master's thesis advisor, for whom it was named, he was a member of the Charles Stark Draper Laboratory Corporation in 1981, then served on its board of directors (1982–1989). In the final years of its previous incarnation as the MIT Instrumentation Laboratory (1961–1970), it had developed the Apollo Program's GNCC systems [33]. Professor Richard "Dick" Battin, formerly director of mission development for the MIT Apollo program, stated that Gavin supported engineering education extensively at MIT, often by lecturing in Battin's seminars [34]. "He was really good with the freshmen," Battin recalled. "I didn't even have to ask" him to participate in the seminar. "He would call me up to ask to take part" [35]. In 1995, at Gavin's induction as a life member emeritus of the MIT Corporation, Carl Mueller, fellow classmate and crew team member, would attest that "his generosity and abiding concern have strengthened this institution immeasurably," describing him as "a modest gentle man whose powerful intellect and effective leadership have literally put men on the moon and returned them safely to Earth" [36].

Gavin's educational focus may hint at what he might have pursued had aerospace project management not consumed his career. Interviewed in 1968, "Mrs. Gavin thinks her husband would have made an excellent teacher if he ever decided to leave the world of space exploration. 'When you can explain to your wife why an airplane flies,' she said, 'that means you're a good teacher'" [37]. In his MIT Fiftieth Reunion yearbook Gavin concluded, "Couldn't have done it all without Dorothy's interest and support" [38].

Through these efforts, Gavin became particularly interested in the potential of Japan and China to develop advanced aerospace technologies and programs. “I think the place that we’re going to have to watch is the Japanese and the Chinese,” he told the author in 1998 [39]. At the first opportunity, through the 1996 International Astronautical Congress, he visited China. In the process of touring space facilities in Beijing, Xi’an, and Shanghai, he was impressed by the caliber of the leading young aerospace specialists whom he met. He assessed that if placed in top US programs, such as at MIT, they would perform with distinction [40].

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[37] "Reacher for the Moon: Joseph Gleason Gavin Jr.," *New York Times*, January 23, 1968, 10. The latter quotation was the newspaper's quote of the day (p. 41). Gavin's parents were very proud when advertising colleagues sent it to his father, who responded that he had married a smart wife.

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[40] Author’s discussion with former *Aviation Week & Space Technology* journalist Craig Covault, who accompanied Gavin on the trip.