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"Can you believe they put a man on the moon?" The Apollo Program. (3)

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LESSONS FROM THE LUNAR MODULE PROGRAM: THE DIRECTOR'S CONCLUSIONS

Abstract

The highlight of Joseph Gavin Jr's distinguished aerospace career was serving as Apollo Lunar Module (LM) Program Director from 1962-72. Gavin believed the Apollo Program "would be the biggest engineering job of history... bigger than building the pyramids or inventing the airplane and would take every ounce of ingenuity... to pull off." In it, Gavin led as many as 7,500 employees in developing the LM and ultimately building twelve operational vehicles. All met mission requirements, and those that were used "worked every time." "For the 1960s, that was the place to be, that was the program to be involved with," he later reflected. "As tough as it was, none of us would have chosen not to be there." Developing the state-of-the-art machine required multiple unprecedented innovations and maximization of reliability amid inherently imperfect testing conditions. When congratulated on the success of each LM landing, Gavin typically replied that he would not be happy until his spacecraft and its crew got off the moon. This process required three procedures in unison (the firing of explosive bolts, the severing by guillotine of wires and other connections between the descent and ascent stages, and the firing of the ascent engine). All could be tested on Earth individually, but their simultaneous action could not. Gavin drew multiple lessons from his Grumman Aerospace Corporation team and its subcontractors' experience that may be distilled into eight principles: (1) create conditions for success, (2) reliability is attainable, (3) true innovation renders cost and schedule unpredictable, (4) don't complicate things unnecessarily, (5) remove hierarchical barriers, (6) empower individuals, (7) share information, and (8) return the pilot safely to earth. Serving in top management positions subsequently returned Gavin to the naval aircraft development that remained the core of Grumman's business. He applied LM best practices, particularly improving initial construction to reduce the need for tests (per principle number two). Drawing on Gavin's original calendars, notes, and presentations, this paper will explore his lessons and explain how he envisioned them and applied them in practice in leading one of history's greatest aerospace engineering achievements.