

SPACE SYSTEMS SYMPOSIUM (D1)
Training, Achievements, and Lessons Learned in Space Systems (5)

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THE DEVELOPMENT OF NEW TECHNOLOGIES AND MANAGERIAL COMPETENCIES FOR
LUNAR LANDING

Abstract

In 1961 NASA received a clear-cut mission – land man on the Moon before the end of the 1960s. NASA had the Mercury and Saturn programs, but the path from Mercury to Apollo to the Moon was fraught with barriers. In particular, NASA needed to develop the engineering and operational competencies necessary to accomplish the overall mission. For this, a new program and new approaches were required, and these were accomplished through the Gemini project.

As is well known, NASA achieved its mission with the successful lunar landing and return of the Apollo II astronauts. This could not have occurred had not a new, unique, focused approach to large-project management been implemented and had not a new technological direction been pursued by NASA. NASA pulled together the proper mix of people, process, and product without which the Apollo landing would have occurred years late.

What NASA accomplished with Project Gemini is instructive for those tasked with leading current and future space projects that are critical, that face seemingly impossible time constraints, and that lack an established technological base. An assessment of what was done yields markers and guideposts for future generations of programs.

First, NASA assembled a team of engineers and scientists to design, contractors to build, ground crews to implement, astronauts to fly, and leaders to manage the operation. Required traits included a balance of risk-taking and grounded knowledge to step into unknown technologies.

Second, NASA developed new management processes. It built the management structure that was ultimately adopted by Apollo, implemented the all-up testing process, and established a new process for effective agency-contractor relationships. New paths were encouraged, and failure along the way – but not in the final outcome – was understood and accepted.

Finally, working backward from mission requirements, NASA built a high-quality product, a spacecraft and launcher, and developed the supporting physical and intellectual mechanisms that allowed it to reach its objective on time and within severe budgetary constraints.

The outcome of the new approaches was ten successful crewed missions in 20 months, a feat not accomplished before or since. NASA developed the physical technologies and the human competencies required to allow man to function on orbit, to rendezvous and dock, and to physically perform in space paving the way for the lunar orbit rendezvous necessary for a successful Apollo lunar landing. How this was possible given funding and time constraints is instructive for all.