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SPACE

DISCOVERY AND EXPLORATION

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Endsheet: The rings of Saturn as photographed by *Voyager 1*, November 1980. Radio analysis showed them to be composed of relatively low-density matter ranging in size from dust particles to house-size boulders, frosted with ice and swirling in orbit around the planet. The rings' natural brightness is due to sunlight reflecting off the ice.

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American civilian and military space programs rank among history's most complex technical achievements. They have provided us with awe-inspiring images and experiences and transformed our sense of ourselves and our planet. They have required enormous social and political commitment—billions of dollars, the contributions of government agencies, private industry, universities, and tens of thousands of people. Space is at once part of our imagination, our politics, our culture.

Yet the very complexity of space exploration has made it ripe for simplification. Public commentators and authors have viewed it variously as romantic adventure, manifest destiny, an opportunity for technical virtuosity and space "firsts," a quest for scientific knowledge, or simply as needless expenditure. Over recent years, however, authors have presented a more detailed view of our history in space. The goal of this book is to communicate some of their insights to a broader audience.

In conception, this volume has benefitted from the research of members of the National Air and Space Museum's Department of Space History and from the work of many other scholars. Their studies have helped point the way to historical questions and issues that are germane to present discussions on the future of space. More directly, the editors wish to thank the authors of the essays for their diligent, thoughtful effort and patience with editorial comments. Their work is the meat of the book. Sylvia Kraemer ably complemented this main course by writing and preparing the several sidebars that appear throughout the text.

Special thanks go to Joan Mathys, the book's picture researcher. She distilled the varied and sometimes obscure requests for images by the editors and the authors into a collection of actual photographs. Her unflagging energy and inventiveness in tracking down photographs added immeasurably to this volume. Her command over the thicket of details that accompany picture research made life easier and more manageable.

A book like this is only possible with the cooperation of repositories and individuals who have preserved photographs. In this regard, we are grateful to the National Aeronautics and Space Administration. The NASA Headquarters' History Office, the Headquarters' Broadcast and Imaging Branch in the Office of Public Affairs, and the Johnson Space Center fulfilled numerous photographic requests over a period of months rapidly and with cheerful goodwill. Thanks go to Robert Sheppard and his staff at the TRW Space and Electronic Group's Marketing Communications Department for responding to our many photographic requests in the midst of a busy schedule. We appreciate the personal effort of Robert Allen and George Honzik at Lockheed in making some exciting photographs and artwork available to us. *Air Force* magazine graciously opened its files to us. Not least, the Archives of the National Air and Space Museum skillfully facilitated our many requests for items in the museum's collections. Other individuals and institutions, too numerous to list, also have our warm thanks for their cooperation and help.

Last, we would like to thank Hugh Levin, the publisher, for offering the National Air and Space Museum the opportunity to undertake this book. His perseverance over several years kept the project alive and eventually won us over to the task. His associate David Pryor has our gratitude for helping us through the many travails of the publishing process.

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INTRODUCTION

Think of images of our venture into space. Most likely, you will remember the exploits of astronauts Scott Carpenter and the United States' first flight into space, John Glenn and *Friendship 7*, the Mercury astronauts' White House commendations from President Kennedy, the New York ticker-tape parades for returning heroes, Ed White taking the first U.S. spacewalk, Neil Armstrong walking on the moon, and more recently, the *Challenger* astronauts boarding their ill-fated craft. As a way of understanding our "giant leap for mankind," its historic grandness, its heroics, triumphs, and occasional tragedies, we have looked to the astronaut as a kind of measure.

In many ways, putting a human face on space exploration seems natural. It was—and still largely, is—the astronaut who directly encounters the strange and hostile environment of space, so different from earth, so unfriendly to human life. It is through these men and women that we feel vicariously the danger and oddity of space itself: the explosive force of rocket lift-off; the counterintuitive sensations and rhythms of weightless life in space; and the challenge to machines and pilots in reentering the thick atmosphere of Earth. Humans seem to represent by their mere presence and deeds in space the aspirations, the inventiveness, the frailty of life in the universe.

Equally important, human exploits in space seem to offer a modern analogue to the voyages of Columbus, the subsequent "discoveries" of other western European explorers, as well as the settlement of the American West. Since the early, heady days of American space flight in the Mercury and Apollo programs, our prevailing images of space exploration have tapped the rich lode of images generated by several centuries of earthly exploration. As with earlier expeditions, the venture into space directed our attention toward the explorers, their deeds, and the new and strange things they had to tell us. Journalists, government public relations specialists, and the explorers themselves helped in linking the past with the present. A focus on the explorers of space fits nicely with America's own traditions and values. Our respect for the grit and motivation of the individual supported the depiction of space as an extension of the American frontier. To explore space was simply to carry out the imperatives of our own history. New horizons, new challenges, and new knowledge awaited the next generation of intrepid pioneers. Through the marvels of modern technology, the astronauts served as popular representatives, as average citizens chosen for a special task, in which the aspirations of the many were lived out by the few. If only the technology were more democratic, like Conestoga wagons, more of us would be explorers. This image of space exploration frequently has been invoked as both motivation and justification for our space program, and still persists to the present.

This romantic view of exploration leaves unexamined many of the interesting features and themes that shaped our space program. Parallels to previous exploration may be identified, but they do not reveal the "why" and "how" of our move beyond the atmosphere. The historical circumstances which inaugurated the space age were dramatically different

from those that launched Columbus or encouraged the settlement of the American West. The technologies that make space exploration possible are not accessible to the average citizen or even a large corporation, but require the massive resources and organizing powers of the federal government. While space exploration drew some of its values from a rich historical heritage, it took its characteristics and principal motivations from the particulars of the present: the Cold War, the rise of big government, American capitalism, and the heightened role of science and technology in modern life.

Not surprisingly, our dramatic achievements in space have reinforced the popular, romantic view of history. In the short span of a few years, space exploration has shifted our perspective on the human condition, from Earth as a discontinuous patchwork of regions and states to Earth as a home we all share. Seeing Earth from space, as a small part of the cosmos, has been a historic event. This event and other familiar accomplishments of the space program rightly capture our imagination. They convey the momentous transition from earth dwellers to space explorers. In romanticizing the end results of space exploration, however, we obscure the events and circumstances that led to our first steps into space. Our very desire to make the once unimaginable human forays into space comprehensible has stripped the story of its complexity and connections to the fabric of modern American life. We need to understand some of the rich history of space if we are to appreciate the why and how of present and future exploration.

It is the goal of this book to address some of the basic questions of American space history. How does this history compare to previous eras of exploration? Why was the space program initiated when it was? How did the U.S. space program develop? In pursuing these questions, our intention is not to provide exhaustive answers, but to point the reader toward a more varied picture of how our venture in space has intersected with American government, politics, business, and science.

These spheres of our national life gave our space exploration a uniquely American character. Space exploration may have roots in popular values and aspirations, but it took extraordinary circumstances to bring it into being. Our jarring Cold War confrontation with the Soviet Union provided the basic ingredient—the massive mobilization of scientific and technological resources in government, industry, and academia. Our political traditions set the formula: the federal government provided policy, organization, and money while our system of private enterprise provided the tools and knowledge. The productive engines of private industry and the expertise of universities built the technologies necessary for space. Space exploration was not only a triumph of lone individuals but also of bureaucracies, institutions, and a political system. To understand space exploration, you must also understand the powerful institutional, political, and cultural dynamics of the Cold War that made possible the achievements we know so well.

The most commonly cited marker for the inauguration of the space age is the launch of the Soviet Union's *Sputnik* satellite on October 4, 1957. *Sputnik* was a resounding salvo in the ongoing Cold War, begun soon after World War II, between the United States and the Soviet Union. Above all, *Sputnik* was a political act. The first man-made object in the heavens was not for exploration. Rather it was a statement that the Soviets possessed strong and reliable rockets, rockets that could reach American soil with nuclear warheads. And it was a statement that Soviet technology, and by implication their political system, was worthy of emu-

lation by the world's developing countries. Space would be, in part, a symbolic arena for demonstrating the superiority of one political system over another.

The U.S. space program emerged from this burning crucible of Cold War, taking shape from the values and circumstances of the postwar period. But the origin of U.S. interest in space did not date from *Sputnik*. As soon as World War II ended, the military services, particularly the Air Force, began to explore the feasibility of rockets and satellites. *Sputnik* only helped to catalyze and redirect substantial efforts already underway.

The military and political ramifications of space molded and defined the U.S. space program. By the very early 1960s, the U.S. had three distinct space programs, each contributing to the military and political challenges of the Cold War: a civilian space program centered around the National Aeronautics and Space Administration responsible for the Mercury, Gemini, and Apollo manned programs and for scientific research; a military space program, primarily implemented by the Air Force, designed to exploit the potential for combat in space; and a highly secret reconnaissance program run by the Central Intelligence Agency and the Air Force organized to gather intelligence information from space on the Soviet Union and its allies. While NASA easily received the most press coverage in the years to follow, all of these programs constituted the U.S. response to *Sputnik*. In fact, for most of the years since *Sputnik*, the military and intelligence programs combined have had larger budgets than NASA.

All of the accomplishments we most readily associate with the space program—landing on the moon, sending scientific probes to all but one planet in our solar system, and achieving nearly routine human flights into orbit via the space shuttle—need to be seen in this larger frame of reference. So do the many military and intelligence space projects of which we know so little. Our most well-known triumphs, and those shrouded in secrecy, were one part of an extensive response to the USSR, rooted in the overriding importance of national security in American politics. All of these accomplishments were made possible by the distinctive way in which America got things done during the Cold War—blending federal government interests with those of industry and academia. As for the triumphs that were visible, we presented them as part of a continuing saga of western and American exploration. Try as we might, the heavens could not be separated from the earth.

A remarkable breadth of American experience has contributed to space exploration and our view of it, but with the end of the Cold War, a new period of exploration and work is at hand. To understand the place of human exploration, scientific inquiry, and the role of the military for the years ahead, we must reflect on our brief legacy in space. The story can not be encompassed only by romantic conceptions or by leaving in shadows the military's part. Past is prologue. A clear-eyed understanding of the history of space is one step in making the informed choices of the future.

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