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# The Final Journey of the Saturn V

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# **The Final Journey of the Saturn V**



# The Final Journey of the Saturn V

Andrew R. Thomas  
and Paul N. Thomarios



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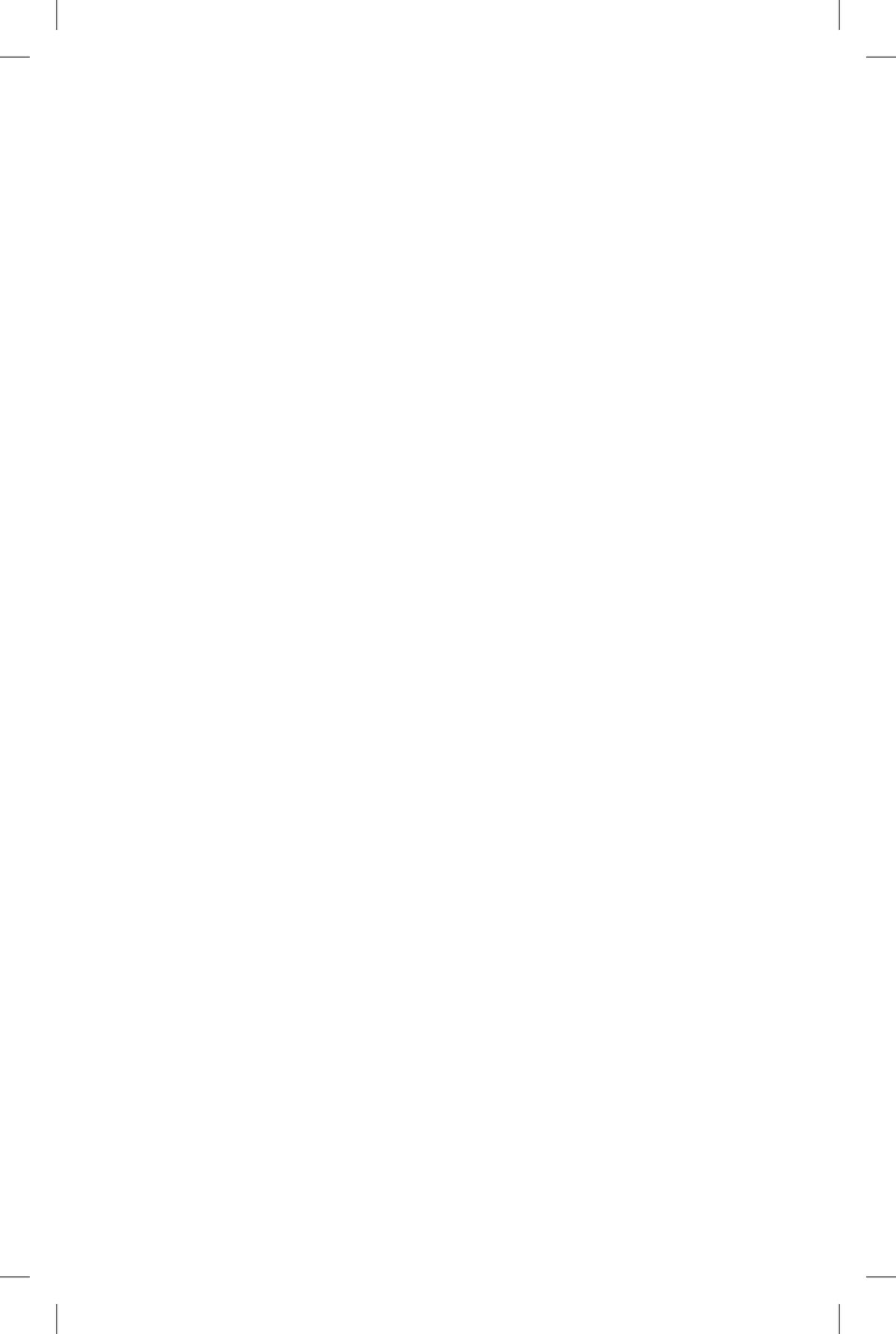
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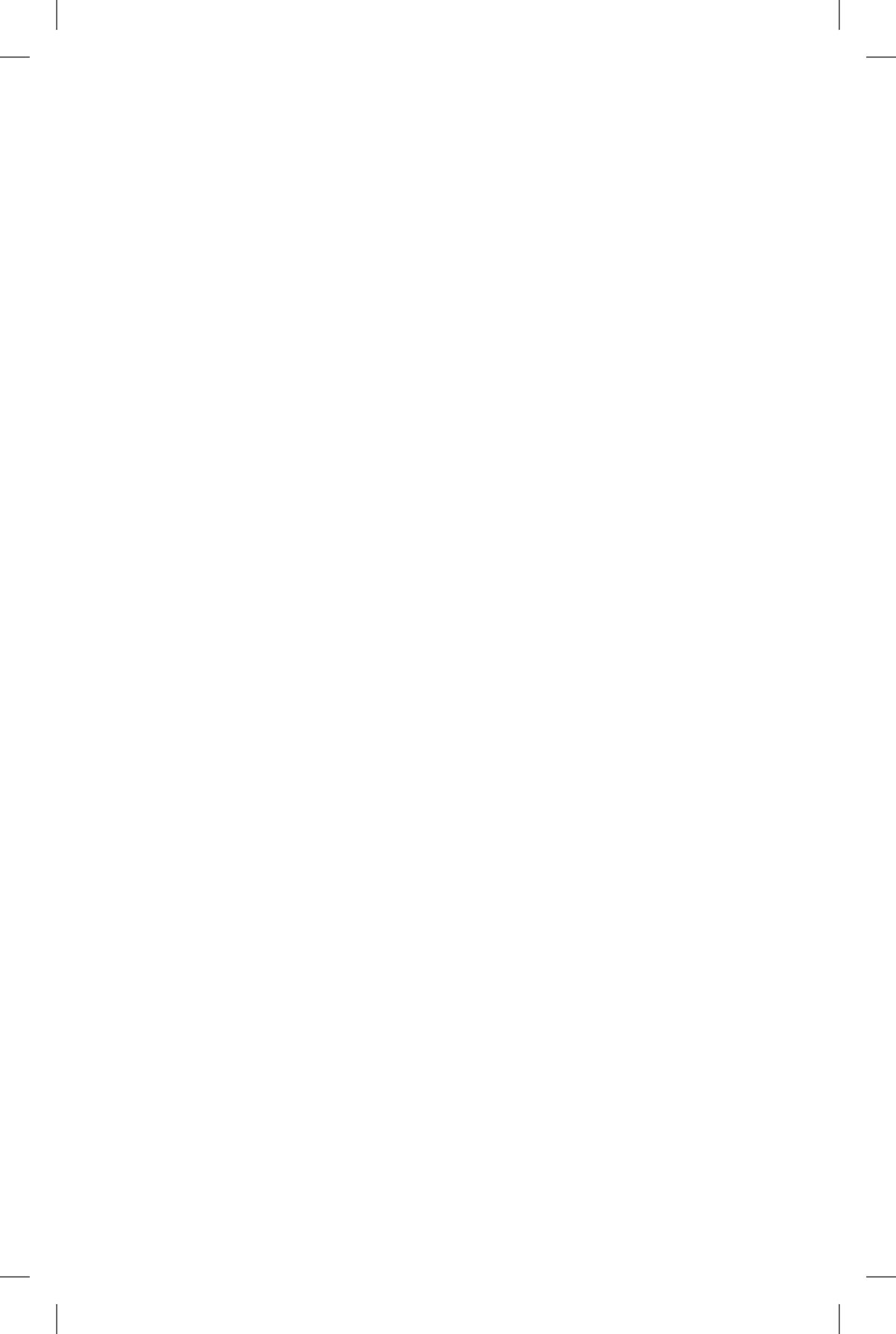
# Contents

	Foreword by Gene Cernan	ix
	Acknowledgments	xiii
<b>1</b>	The Greatest Ever, Really?	3
<b>2</b>	Audacity of the Highest Order	13
<b>3</b>	The Game Changers	31
<b>4</b>	Putting It All Together	45
<b>5</b>	Magnificent Deterioration	65
<b>6</b>	Resurrection Begins	85
<b>7</b>	Bringing the Saturn V Back to Life	99
	Afterword	123



*For Alana—may you always dream great dreams.*  
Andrew R. Thomas

*For my parents, Nickitas and Stilyani; my children,  
Nickitas, Sarah, Adam, Emily; my third grade teacher  
and member of the “Mercury 13,” Jean Hixson*  
Paul N. Thomarios



## Foreword

**D**istance and time tell us how far things are apart. On December 7, 1972, I left the Earth on top of a mighty and powerful Saturn V rocket. Four days, fourteen hours, twenty-two minutes, and eleven seconds later, I landed on the moon. The distance covered in that time was almost 236,000 miles. The Saturn V that carried Ronald Evans, Harrison Schmitt, and myself was the final Apollo mission. It closed the circle on President Kennedy's audacious 1961 goal of sending a man to the moon and returning him safely to the Earth. Twelve Americans walked on the lunar surface. My footprints are the last ones there. They are testament to that moment in history when human beings actually lived on another world.

The final journey of the Saturn V rocket that is on display at Kennedy Space Center was a lot different. It covered only 1.9 miles and took more than 20 years. After the cancellation of the moon missions in the early 1970s, the rocket, which was supposed to be Apollo 18, was instead laid out in the parking lot in front of the Vehicle Assembly Building—at that time the largest structure in the world. The rocket endured Florida's harsh sun, humidity, and hurricanes—but just barely. Occasionally, a coat of paint would be slapped on to keep it presentable to the visitors on the bus tour and cover up the mold and mildew. Still, it was rotting from the inside and out.

Fortunately in 1995, under the leadership of the Smithsonian Institution, a plan was put in place to restore and preserve the rocket to its original condition, and house it in the new Apollo/Saturn V Center. Selected to do the work was Paul Thomarios—the son of Greek immigrants. In May 1996, Thomarios completed the project and the refurbished Saturn V made the journey from the parking lot to its permanent home, where it continues to dazzle more than 1.5 million visitors at Kennedy Space Center each year.

This book is ultimately a celebration of the Saturn V and the indomitable strength of the human spirit. It details in simple language the rocket's creation, birth, life, death, and resurrection, so that future

generations will never forget what was accomplished in the 1960s and '70s, when the courage, determination, intelligence, dedication, and slide rules of nearly 400,000 Americans were harnessed towards a single ambition: the greatest journey ever undertaken by humankind.

—Gene Cernan, Commander of Apollo 17



## Acknowledgments

**T**he creation of a book requires contributions from a great number of people, all of whom go out of their way to support the ideas and aspirations of the authors. Together, we'd first like to thank Thomas Bacher, our editor, who believed in this project from the outset and continued to challenge us to make it better than either one of us thought it could be. We'd also like to thank Amy Freels, Carol Slatter, and the many students at the Press who worked on the book. Bob Rogers of BRC, Inc. was vital in clarifying how the Apollo/Saturn V Center at Kennedy Space Center came into being. His company's work in making this vision a reality is testament to Bob's steadfastness and world-class creativity. Andrea Farmer at Delaware North Corporation, Wendy Schweiger at Sherwin Williams, and Professor Roy Hart-

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*Andrew R. Thomas*

I'd like to recognize the unwavering support of my mentor Tim Wilkinson in supporting my writing and academic career. My wife, Jackie, and children, Paul Bryan and Alana, were always excited as I talked endlessly about this book for years. I think my first inkling of the greatness of the Saturn V came from the Florida family vacation I took with my parents to Kennedy Space Center in 1976. Thanks Mom and Dad for this, and so much more.

*Paul N. Thomarios*

I'd like to thank all those that helped during the project, Carol Cavanaugh (NASA-KSC), Larry Mauk (NASA-KSC), Frank Winter (NSAM), Alan A. Needell (NSAM), Al Bachmeier (NSAM), Scott Wirz (NSAM), Bayne Rector (NSAM), Dallas Finch (Sherwin-Williams), and all the others that contributed time/efforts; my parents that taught me "never to quit;" and, my dedicated employees, who believe in me.

There are two photographs in my office of the “Wonder Women” in my life. One is of my mother. The other is of Jean Hixson—my third grade teacher during 1957. Miss Hixson was born in 1922 in Hoopston, Illinois, the “Sweet Corn Capital of the World.” At the age of 16, she persuaded her parents—her father was an insurance agent, not a risk-taking profession—to let her start flying lessons. At 18, she earned her private pilot’s license. America entered World War II the following year.

In 1943, Miss Hixson joined the WASPs (Women Air Force Service Pilots). Her first duty assignment was at Douglas Air Force Base in Arizona, where she towed targets for live gunnery practice, ferried aircraft domestically and overseas, and trained pilots. Later, she flew B-25 bombers over the desert at night to test their navigation systems. After the war, she took a job as a flight instructor in Akron. In her off hours, she attended the University of Akron and earned a Master’s Degree in Elementary and Secondary Education.

Early in my third-grade school year, we had a substitute teacher. My classmates and I thought Miss Hixson might be sick or something even worse. The next day, the principal proudly announced to us that Miss Hixson had just become the second woman in history to break the sound barrier.

That same year, the world was turned upside down when the Soviet Union put Sputnik into space. Miss Hixson took us outside to see the shiny man-made object as it orbited overhead. Her passion for aviation and her continual insistence that the country’s success was a result of America’s spirit and determination were contagious. I still clearly

## My Story

Paul N. Thomarios

remember Miss Hixson's lessons on how Americans could do anything once they put their minds to it.

In 1959, Hixson won a National Education Association award as "a teacher who had made outstanding use of travel and aviation experience in her classroom." Also that year, Miss Hixson was chosen to be one of America's "Mercury 13," a group of seven men and six women who had qualified for and completed astronaut training. Unfortunately, due to a later NASA decision to use only test pilots, a male-only club, Miss Hixson and her colleagues never got a chance to go into space. Miss Hixson taught in the Akron public schools for another twenty years, winning countless teaching awards and touching the lives of her students. Miss Hixson launched me forward and taught me lessons I've never lost.

# Chapter 1

## *The Greatest Ever, Really?*

Intitum didium facti (The start is half the deed).  
—Roman dictum

**A**djectives don't cost much. Watch a game or an awards show and count how many times superlatives are used—a hall-of-fame catch, a song for the ages, or a legendary performance. As the saying goes, "Talk is cheap." With the advent of blogs and other instant means of communication, talk is everywhere and nonstop. The here and now supersedes the historical record.

Does our hyperbole about current achievements blind us to real greatness? In some situations, the answer is a very resounding "yes." While comparing

achievement from generation to generation is like asking if beauty is in the eye of the beholder, some achievements stand the test of time. Technological magnificence can be illustrated by the Great Wall of China, the Egyptian pyramids, the printing press, and the personal computer. All were significant innovations that altered culture and civilization.

Not long ago in the span of human existence, the United States built and launched the Saturn V rocket. The Saturn V was, and still is, the largest object to leave the surface of the Earth. At 363 feet in height, or over 30 stories tall, the rocket weighed 6.3 million pounds, about the weight of 1,600 automobiles or 50 Boeing 747s. In 2010, the Saturn V was taller than any building in Alaska, Delaware, Idaho, Kansas, Maine, Mississippi, Montana, New Hampshire, New Mexico, North Dakota, South Carolina, South Dakota, Vermont, West Virginia, and Wyoming.

The rocket created the loudest sound made by human hands, other than the cacophony generated by a nuclear explosion. The only natural sound on record to exceed the decibel level of the Saturn V engines was the fall of the Great Siberian Meteorite in 1883. Small earthquakes, as high as 4.6 on the Richter scale, were registered across North America when the first Saturn V launched from Florida in November 1967.

The five rocket engines of the Saturn V's first stage were the most powerful ever built. The combination

of the rocket's weight and gravity's resistance required 7.7 million pounds of force to launch the rocket and its payload into orbit. By comparison, getting a jumbo jet into the air requires only 200,000 pounds of thrust.

To house the Saturn V, NASA built the Vehicle Assembly Building (VAB) at Kennedy Space Center, which remains one of the world's larger buildings, covering almost eight acres. The VAB's four mammoth doors, 456 feet in height, are the largest ever made. The VAB had to be constructed in three stages and is large enough to hold up to four complete Saturn Vs at one time. Yankee Stadium or the Rose Bowl could fit on the VAB's roof. The structure is rumored to have its own unique weather patterns.

NASA and its corporate partners built fifteen Saturn V rockets. Thirteen went into space. Twelve were used in the Apollo missions, ten of which carried astronauts and six of which took men to the moon. The last Saturn V to fly was used for the Skylab program in May 1973. Remarkably, every Saturn V launch was successful. Two missions suffered in-flight problems including engine cutoffs, but these were overcome, resulting in successful outcomes. The flawless launch record of the Saturn V stands without parallel in the history of human flight.

The Saturn V was the outcome of a pledge—President John F. Kennedy's pledge to conquer space by sending a human to the moon and returning him safely to Earth. At Rice University in Houston, Texas

on September 12, 1962, Kennedy shared his dream with an audience of fifty thousand people.

The greater our knowledge increases, the greater our ignorance unfolds. Despite the striking fact that most of the scientists that the world has ever known are alive and working today, despite the fact that this Nation's own scientific manpower is doubling every 12 years in a rate of growth more than three times that of our population as a whole, despite that, the vast stretches of the unknown and the unanswered and the unfinished still far outstrip our collective comprehension. . . . No man can fully grasp how far and how fast we have come, but condense, if you will, the 50,000 years of man's recorded history in a time span of but a half-century. Stated in these terms, we know very little about the first 40 years, except at the end of them advanced man had learned to use the skins of animals to cover them. Then about 10 years ago, under this standard, man emerged from his caves to construct other kinds of shelter. Only five years ago man learned to write and use a cart with wheels. Christianity began less than two years ago. The printing press came this year, and then less than two months ago, during this whole 50-year span of human history, the steam engine provided a new source of power. . . . Newton explored the meaning of gravity. Last month electric lights and telephones and automobiles and airplanes became available. Only last week did we develop penicillin and television and nuclear power, and

now if America's new spacecraft succeeds in reaching Venus, we will have literally reached the stars before midnight tonight. This is a breathtaking pace, and such a pace cannot help but create new ills as it dispels old, new ignorance, new problems, new dangers. Surely the opening vistas of space promise high costs and hardships, as well as high reward.<sup>1</sup>

The early sixties were a heyday of hope. Technology was bringing changes to society at a record pace. A new generation was listening to the beats of rock-n-roll. Vaccines were eradicating diseases like polio. Satellites were being launched into space. In the early years of the decade, Americans could have "a meal in a minute," "live better electrically," and "fly the friendly skies." JFK was convinced that the history of the United States was one of continual achievement and that "man, in his quest for knowledge and progress, is determined and cannot be deterred."<sup>2</sup>

JFK's voice was full of optimism, bursting with adventure. It was time to mount a great quest, an awesome challenge.

The exploration of space will go ahead, whether we join in it or not, and it is one of the great adventures of all time, and no nation which expects to be the leader of other nations can expect to stay behind in the race for space. Those who came before us made certain that this country rode the first waves of the industrial revolutions, the first waves of modern invention, and the first wave of nuclear power, and

this generation does not intend to founder in the backwash of the coming age of space. We mean to be a part of it—we mean to lead it. . . . Yet the vows of this Nation can only be fulfilled if we in this Nation are first, and, therefore, we intend to be first. In short, our leadership in science and in industry, our hopes for peace and security, our obligations to ourselves as well as others, all require us to make this effort, to solve these mysteries, to solve them for the good of all men, and to become the world's leading space-faring nation. We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people. For space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war.<sup>3</sup>

Kennedy wished to discourage the naysayers and timid. The United States was a country of doers. Given a goal, American ingenuity would win out.

But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas? We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that

goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.<sup>4</sup>

The stage was set for a giant leap for mankind. Questions, however, still remained. Ambitions filled with promises were as prevalent as northern fields covered with winter snow, but uncertainties were everywhere. In 1960, two commercial passenger planes had crashed over New York City in the worst aviation disaster of the era, and Kennedy wanted the country to go to the moon? In 1961, a Sabena flight crashed in Belgium, killing all passengers, including the entire eighteen-member US Figure Skating Team, and Kennedy was aiming for the moon? Thirty-four passengers were killed on a flight to Miami. A crash near Richmond, Virginia killed forty-eight passengers. A crash near Montego Bay took thirty-seven lives.

In spite of the problems related to getting from one point to the other on the surface of the planet, Kennedy was firm in his conviction.

But if I were to say, my fellow citizens, that we shall send to the moon, 240,000 miles away from the control station in Houston, a giant rocket more than 300 feet tall, the length of this football field, made of new metal alloys, some of which have not yet been invented, capable of standing heat and stresses several times more than have ever been experi-

enced, fitted together with a precision better than the finest watch, carrying all the equipment needed for propulsion, guidance, control, communications, food and survival, on an untried mission, to an unknown celestial body, and then return it safely to earth, re-entering the atmosphere at speeds of over 25,000 miles per hour, causing heat about half that of the temperature of the sun and do all this, and do it right, and do it first before this decade is out—then we must be bold. However, I think we're going to do it, and I think that we must pay what needs to be paid. And this will be done in the decade of the sixties.<sup>5</sup>

Resolute? Yes. Momentous? Undoubtedly. Possible? As Kennedy put it, “Many years ago the great British explorer George Mallory, who was to die on Mount Everest, was asked why did he want to climb it. He said, ‘Because it is there.’ Well, space is there, and we’re going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there. And, therefore, as we set sail we ask God’s blessing on the most hazardous and dangerous and *greatest* adventure on which man has ever embarked.”<sup>6</sup>

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1. President John F. Kennedy, “Speech to Rice University on the Space Effort”, September 12, 1962.

2. Ibid.

3. Ibid.

4. Ibid.

5. Ibid.

6. Ibid.

The Roman historian Plutarch observed that any glory we might possess ultimately belongs to our ancestors. I am the product of all the people who have come before me. First and foremost are my parents.

Like so many Americans, my parents were immigrants. Their story is the history of our great nation—suffering, sacrifice, and hard work. When success came, the fruit was very sweet.

The immigrant odyssey is daunting. Imagine leaving everything behind to start anew in a foreign land. Even though current rhetoric about America as a “melting pot” has devolved into saving ourselves by putting up fences, Richard Herman, coauthor of *Immigrant, Inc.*, understands why the influx of peoples to the United States is vital to this country. “[I]mmigrants are more likely to start a business, invent something, earn an advanced degree, and have intimate knowledge of global markets than “native-born” Americans.” Perhaps we all need to travel a little more.

Before becoming immigrants, my parents were refugees, lived under Nazi-occupation, and became refugees again. Nobody gave them anything and almost every promise ever made to them was broken. Remarkably, my parents were never bitter or critical of the hand that life dealt them. They rarely, if ever, complained.

Their goal was to build a better life with determination, know-how, extra hours, and improvement. All my parents wanted was a chance. They had learned how to survive under adverse conditions. America gave them their chance and they took it.

## My Story

Paul N. Thomarios