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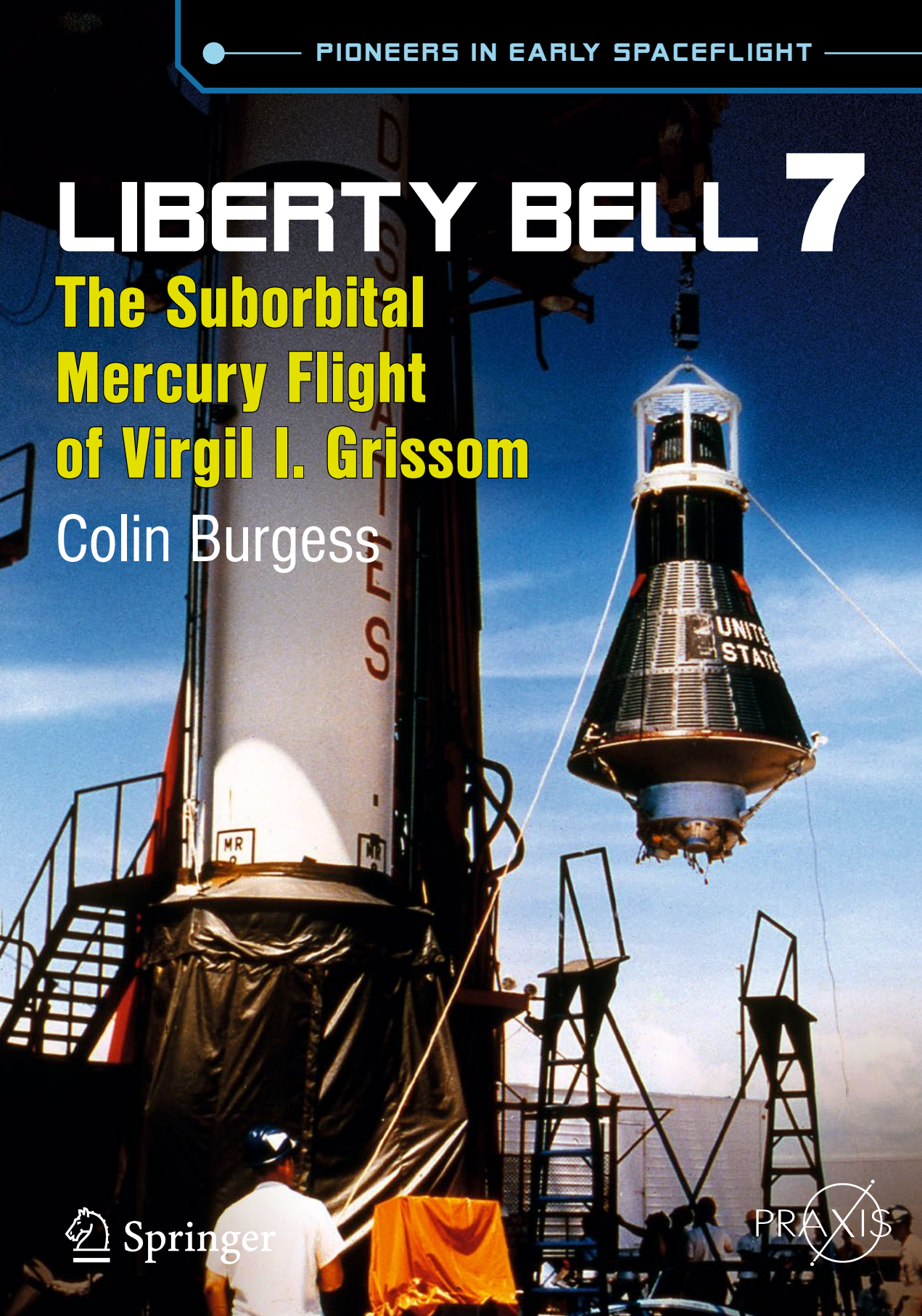
LIBERTY BELL 7

The Suborbital Mercury Flight of Virgil I. Grissom

Colin Burgess



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Liberty Bell 7

The Suborbital Mercury Flight of Virgil I. Grissom

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This book is respectfully and fondly dedicated to the memory and many extraordinary accomplishments of naval aviator and test pilot, Mercury astronaut and aquanaut Scott Carpenter (1 May 1925 – 10 October 2013), who on 24 May 1962 became the second American to fly into Earth orbit on the MA-7 mission aboard spacecraft Aurora 7.

Godspeed, Scott Carpenter

Our civilization is no more than the sum of all the dreams that earlier ages have brought to fulfillment. And so it must always be, for if men cease to dream, if they turn their backs upon the wonder of the Universe, the story of our race will be coming to an end.

Sir Arthur C. Clarke, CBE
(16 December 1917 – 19 March 2008)

Foreword

Where to begin? There has been a tremendous amount of material generated regarding my brother Gus, from the early days of the space program through the Apollo 1 tragedy, but I will always talk to anyone who wants to talk about him. I can tell people who he was.

What I remember most of all about Gus was the thoroughness with which he approached everything he did, and this carried over into many things – even those not related to flying. But to know about Gus, it is important to also know about our parents, Dennis and Cecile. Dad worked for the Baltimore and Ohio Railroad for 47 years, as a signal maintainer. He was one of the fortunate few who had a job during the Depression. Our parents were very giving and generous people. Although they had modest means they were always very willing to share what they had with others in need. It seemed that when I was growing up there was always a relative living with us.

I was one of four children (Gus was the oldest) and we were blessed with parents who exhibited emotional stability and a sense of security. We were all born and raised in Mitchell, Indiana, and lived in the same house until we left home. That house at 715 West Grissom Avenue – it was Baker Street until it was named after Gus – is now in the process of restoration to become a museum.

We all attended Mitchell High School. Surprisingly, Gus was not an outstanding student in high school. In fact, he probably would have been classified as an underachiever. The high school principal did not endorse his application to enter Purdue University. I don't want to give you the wrong impression … he did excel in math and sciences. I guess he just didn't see the importance of those other classes.

When Gus entered high school he was 5 feet 4 inches and weighed about 100 pounds, not quite what the high school coaches were interested in for the athletic teams, but he was well coordinated and one of the most competitive people that I have ever known, and he tried harder.

Right after high school he went into the Air Force. Shortly after World War II ended he entered Purdue University where he earned a degree in engineering. He then returned to the Air Force and went on to fly 100 combat missions in Korea, became a test pilot, and joined the space program. NASA chose Alan Shepard, John Glenn and Gus as the three astronauts

who would be candidates for the first American space flight, ultimately selecting Shepard for the first flight and Gus for the second suborbital flight.

There was a tremendous amount of anxiety in the Grissom house that morning of July 21, 1961, as we all waited for the liftoff of *Liberty Bell 7*. It was quite a relief when we heard that the spacecraft had gone through reentry and had successfully landed. Of course, we later learned that the most dangerous part of the mission occurred in the water, when the hatch unexplainably blew, and Gus almost drowned. The fact that NASA selected Gus as the Command Pilot for the first Gemini flight clearly indicated that they knew that he was not responsible for the hatch prematurely opening.

As a mild extrovert, Gus could surprise you with his wit and humor, and it appeared when you least expected it. He was also a man of few words. He was once asked to speak to the workforce at Convair, a space contractor in Southern California. After a lengthy introduction, Gus got up in front of a couple of thousand workers and gave his famous, three-word speech: "Do good work."

The recovery of *Liberty Bell 7* from the ocean in 1999 exemplifies the pioneering spirit, the dedication and the resourcefulness of Gus. Standing on the dock in that hot July sun, 38 years to the day from liftoff, waiting for *Liberty Bell 7* to be hoisted from the recovery ship, I wondered what Gus would be thinking and feeling as that tiny craft came swinging over onto the dock. I know I had many emotions that were aroused, from deep sadness that Gus wasn't there to see it, to immense pride in knowing that the only craft that he had flown and lost had now come home. Just like it had been said that man could not fly in space, it had also been said that *Liberty Bell 7* was so deep it could never be recovered. Gus was always up for a challenge and I think he would have been very pleased that those who said, "It can't be done," had, again, been proven wrong.

Lowell Grissom, brother of NASA astronaut 'Gus' Grissom, photographed at Grissom Air Force Reserve Base, Indiana. (Photo: U.S. Air Force, taken by Tech. Sgt. Mark R.W. Orders-Woempner, 434th ARW Public Affairs.)

After his Gemini flight, Gus was again selected to be the Command Pilot for the first Apollo flight, leading America to the Moon. Unfortunately, a fire on the launch pad took the life of Gus, Ed White and Roger Chaffee. However, there is a general consensus that America would not have made it to the Moon in the decade of the sixties without the knowledge that was learned, and the corrections that were made as a result of that fire. There is no doubt that Gus would have stepped on the Moon had he lived.

We can honor him only if we follow in his footsteps and peacefully continue to explore space. Our future work in space is bound to include some failures. Yet Apollo 1 has taught us that we can never really fail as long as we persist in our efforts. The greatest lesson we can learn from Gus Grissom is that failure is impossible for those who refuse to abandon their goals. The most fitting tribute to Gus and his Apollo 1 crew is for us to continue doing that for which they gave their lives and to renew our dedication to their quest….REACHING FOR THE STARS!

Lowell Grissom
Mitchell, Indiana
March, 2013

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This book owes much to those who so willingly assisted in its compilation. In virtually every instance, my request for information or material to quote was met with a positive response.

Sincere thanks are therefore extended to helpers and participants Mike Andrew, John Barteluce, Bob Bell, Rick Boos, Lou Chinal, Dean Conger, Kate Doolan, Lowell Grissom, Donald Harter, Thomas Henderson, Ed Hengeveld, Roger Hiemstra, Jerry Holman (Materium Brush Beryllium and Composites), Philip Kempland, Dale Kreitner, James Lewis, H.H. (Luge) Luetjen, Dr. Robert H. Moser, Lawrence (Larry) McGlynn, Earl Mullins, Otto Preske, Eddie Pugh, Earl Robb, Jerry Roberts, Scott Sacknoff (*Quest* magazine), Ross Smith, Cameron Stark, Charles Tynan, Jr., and Charlie Walker. As well, Dianne Blick, Jim Remar and Shannon Whetzel from the Kansas Cosmosphere and Space Center were of wonderful assistance in locating and supplying rare illustrative material. Other photographs came from two sources, both of whom have – as always – helped out by providing me with clear, high-resolution images; J.L. Pickering of Retro Space Images (*www.retrospaceimages.com*), and Joachim Becker at Spacefacts (*www.spacefacts.de*). Special thanks to the man who located and salvaged the *Liberty Bell 7* spacecraft, Curt Newport, for his interest in – and much appreciated help with – this book.

One of the greatest and long-serving resources of all has been the amazing and immensely popular website, collectSPACE (*www.collectspace.com*), under the inspirational and erudite administration of Robert Pearlman. Robert, and the wonderfully eclectic, knowledgeable band of space enthusiasts who are contributors in many ways to this space website (a daily imperative) have always proved of immense and trustworthy assistance to me, and I am continually grateful to Robert for his dedication and 24/7 input into this website and to the ongoing saga of space exploration.

Keith Scala deserves special mention for contributing so readily to this book. In seeking information for this book I came across an article written by Keith for the quarterly spaceflight magazine, *Quest*. Published in the spring of 2000, his article "The Future of Liberty Bell 7" was so well constructed and written that I asked him if he would be willing to

update the article for inclusion in this book. Happily, he has done so, and I am grateful for his superb contribution.

There were also those who were involved in the editing and production of this book. Endless thanks once again to my esteemed editor for this and past books, David M. Harland. A gifted spaceflight author in his own right, he not only completed a monumental effort in both editing this book and weeding out some pesky errors, but went out of his way and job description to ensure that it went through the production process when problems arose. To a friend of so many decades, Francis French, continuing thanks for going through the draft manuscript as a final check of the facts and my often poor understanding of certain Americanese.

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If I have missed thanking anyone associated with this work, please forgive me, but kindly accept my sincere appreciation for helping me to put together this story of an extraordinary man on an amazing, pioneering space mission in an outstanding Mercury spacecraft he called *Liberty Bell 7*.

Illustrations

Front cover:
Liberty Bell 7 is raised for mating with the Redstone booster. (Photo: NASA)

Back cover:
MR-4 Mercury astronaut Virgil ('Gus') Grissom (Photo: NASA)

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Prologue

At 9:34 a.m. (Eastern Time) on 5 May 1961, the MR-3 combination of a Redstone rocket and a Mercury capsule known as *Freedom 7* lifted off its launch pad at Cape Canaveral, watched by an estimated 45 million viewers across the United States. Onboard, carrying the hopes, prayers, and adoration of a nation was NASA astronaut and Navy Cdr. Alan B. Shepard, Jr. He would successfully complete a suborbital space flight lasting 15 minutes and 22 seconds. In doing so he became the second person after Yuri Gagarin to fly into space, and the first American to achieve that feat.

Two months later a second American astronaut would be seated aboard another spacecraft, ready to fly a similar mission to that of Shepard in order to consolidate the technical data and crucial physiological information gained from that mission. Apart from modifications to this particular Mercury capsule – as recommended by Shepard following his flight – and a far less crowded flight schedule, this second proving flight would follow basically the same test pattern as that *Freedom 7*.

Within those two months between the flights, however, much was happening in regard to America's human space endeavor. Shepard's flight had truly ignited a nation's interest in space flight, and it was now time to capitalize on the success and projected future of NASA's space program, which one day might lead to a human presence on the Moon.

Famously, in his second State of the Union message on 25 May 1961, just 20 days after Shepard's history-making flight, President John F. Kennedy reported to Congress regarding the space program. "With the advice of the Vice President, who is Chairman of the National Space Council," he began, "we have examined where we [the United States] are strong and where we are not … Now is the time to take longer strides – time for a great new American enterprise – time for this Nation to take a clearly leading role in space achievement which in many ways may hold the key to our future on Earth."

In his speech, Kennedy set forth the concept of an accelerated space program based on the long-range national goals of landing a man on the Moon and returning him safely to the Earth; the early development of the Rover nuclear rocket; speeding up the use of Earth satellites for worldwide communications; and providing "at the earliest possible time a

satellite system for worldwide weather observation." An additional $549 million in funding was also requested for NASA over the new administration's March budget requests.

At a crowded press conference held following the President's call to Congress, NASA Administrator James E. Webb pointed out to media representatives that the long-range and difficult task of landing a man on the Moon before the end of the decade offered the United States an undeniable chance to overtake and even beat the Soviet Union to this important goal. On 7 June, during an address at George Washington University, a fired-up Webb also stated that the exploration of space was an important part of man's "driving, relentless, insatiable search for new knowledge."

Kennedy's eloquent and challenging speech on 25 May had literally hinged on the success of Alan Shepard's flight less than three weeks earlier, but now he was faced with some serious questions: would Congress embrace and not only agree to what he proposed, but supply the enormous necessary funding? The answer to both questions ultimately rested on the persuasive powers of NASA's highly competitive administrator, who confidently felt the pursuit of funding for the agency's programs was achievable. He had been keeping recent stock of political winds, and realized that Congress – like the rest of the nation – had been swept up in the euphoria and the opportunities offered by human space exploration, and was in what he called "a runaway mood."

Webb's challenge was to come up with the agency's budget forecast figure for placing an American on the Moon by the end of the decade. According to NASA's General Counsel Paul Dembling, the initial projections from Webb's advisors and accountants came in at $10 billion. Dembling was there when Webb scrutinized the numbers. "He said, 'Come on guys, you're doing this on the basis that everything's going to work every time, every place, no matter what you do.' So they came back with a figure of $13 billion."

Once again Webb studied the numbers long and hard before making his way up to Capitol Hill bearing that figure. But when he spoke to the politicians he brazenly stated that the program could cost upwards of $20 billion, and that's what he was requesting. He had applied the old maxim of asking for too much – in this case a whopping $7 billion above the figure his analysts had arrived at – knowing that the enthusiasm of Congress for the space program might soon begin to wane. Webb was right; his ploy worked. He got approval for the money, which would ultimately prove to be very close to the mark by the time the first humans landed on the Moon.

On 22 June, NASA's Deputy Administrator Hugh Dryden sent a letter to Robert S. Kerr, Chairman of the Senate Committee on Aeronautical and Space Sciences, dealing with the broad scientific and technological gains to be achieved in landing a man on the Moon and returning him to the Earth. Dr. Dryden pointed out that this difficult goal "has the highly important role of accelerating the development of space science and technology, motivating the scientists and engineers who are engaged in this effort to move forward with urgency, and integrating their efforts in a way that cannot be accomplished by a disconnected series of research investigations in several fields. It is important to realize, however, that the real values and purposes are not in the mere accomplishment of man setting foot on the Moon but rather in the great cooperative national effort in the development of science and technology which is stimulated by this goal."

Furthermore, Dryden pointed out that "the billions of dollars required in this effort are not spent on the Moon; they are spent in the factories, workshops, and laboratories of our

people for salaries, for new materials, and supplies, which in turn represent income for others … The national enterprise involved in the goal of manned lunar landing and return within this decade is an activity of critical impact on the future of this Nation as an industrial and military power, and as a leader of a free world."

Two days after Dr. Dryden's letter to Robert Kerr, President Kennedy assigned Vice President Lyndon B. Johnson the task of unifying the nation's communications satellite programs, stressing urgency and the "highest priority" for the public interest.

A further two days along, on 26 June, James Webb spoke for NASA in an interview in the *U.S. News and World Report*, stating that "the kind of overall space effort that President Kennedy has recommended … will put us there [on the Moon] first." This achievement, he said, costing "probably toward the $20 billion level … will be most valuable in other parts of our economy."

The first salvos in the Space Race to the Moon had been fired. The commitment was there; the money to carry out the activities promised by the President had been made available, and the ambitious plans and goals for American space missions had the overwhelming support of the American people. Certainly the Soviet Union had shot a man into orbit, but the flight of *Freedom 7* with Alan Shepard onboard had enthralled and galvanized a nation. Even though many doubted that the President's stated goal of a man on the Moon could be achieved by the end of the decade, the will to do so was there, while the scientific and technological know-how was in place. The push to the Moon would continue.

To paraphrase the words of Alan Shepard, the first 'baby step' of his brief suborbital flight had amply demonstrated what was required of NASA and the nation's astronauts, and now it was time for America to step up to the plate. There was incredible appeal and an outstanding challenge attached to the task that lay before them.

And so, on 21 July 1961, another of the nation's finest test pilots lined up for his chance at becoming one of NASA's renowned "star voyagers." Strapped snugly into his contour couch aboard a spacecraft he had patriotically named *Liberty Bell 7*, U.S. Air Force Capt. Virgil Ivan ('Gus') Grissom was fully trained and ready to follow in Shepard's pioneering footsteps in order to help to set America on a steady course to the Moon.

1

Creating a Mercury capsule

On Sunday, 16 July 1939, noted scientist Albert Einstein famously sent a letter to President Franklin D. Roosevelt, urging him to explore nuclear weaponry and, as a result, established the United States on the road to the creation of the first atomic weapons ever used to devastating effect in a military conflict.

That very same day an industrial giant was also created when the McDonnell Aircraft Corporation was founded by James Smith McDonnell. Based in St. Louis, Missouri with a startup work force of just thirteen, including McDonnell, it eventually became a leading American aerospace company best known for developing and building some of the finest and most potent fighter jets ever to take to the skies, including the legendary and long-serving F4 Phantom. To those early workers, the McDonnell Aircraft Corporation became more simply known to them by the acronym MAC, and its founder – understandably, and fondly – as Mr. Mac.

Many years later, when McDonnell Douglas merged with the Boeing Company, a new advertising motto was adopted: "Forever New Frontiers." Those three words not only envisaged an exciting future in aviation, but reflected back most appropriately to the glory days of the McDonnell organization.

WITH EYES TO THE FUTURE

James McDonnell was someone always looking to the formidable challenges presented by the new frontier of space, as related by former MAC employee Hulen H. ('Luge') Luetjen.

C. Burgess, *Liberty Bell 7: The Suborbital Mercury Flight of Virgil I. Grissom*, Springer Praxis Books,
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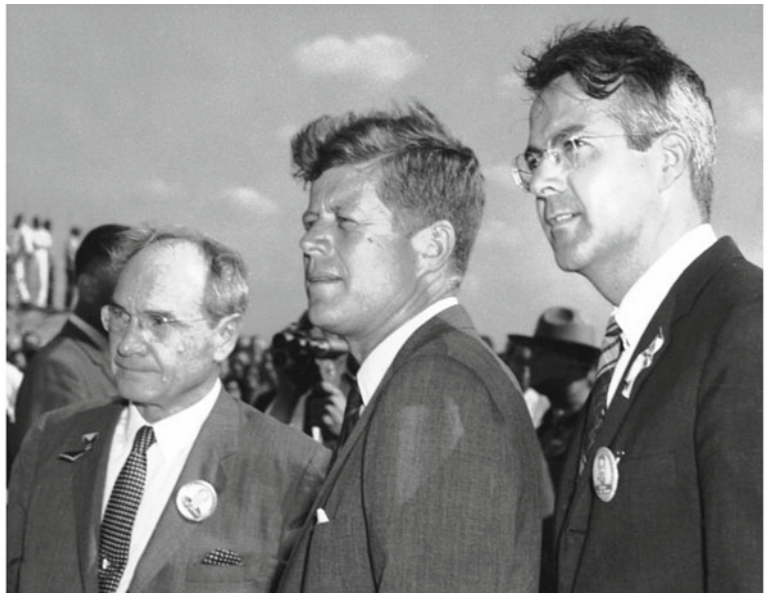

In September 1962 President John F. Kennedy visited the McDonnell Aircraft plant in St. Louis. He is flanked in this photo by James S. McDonnell (left) and Sanford N. McDonnell, who became chairman of McDonnell Douglas following the death of his uncle in 1980. (Photo: St. Louis Post-Dispatch staff photographer)

"Mr. Mac had noted, with passionate interest, what had thus far been done in the space arena and announced that in addition to being the world's number one producer of fighter aircraft … McDonnell would also become the world's number one producer of spacecraft – manned spacecraft. He correctly foresaw manned orbital vehicles as being 'just around the corner.'"[1]

In making a commencement speech to engineering graduates at the Missouri School of Mines and Metallurgy on 26 May 1957, some five months before the Soviet Union launched the first *Sputnik* satellite into orbit, McDonnell thoughtfully outlined his expectations for the future of space travel, even giving the students a speculative timetable. Like many others, even though he may have believed that human flight was 'just around the corner,' he did not foresee the explosion of interest in human space flight that *Sputnik* would usher in soon after, and he spoke about the possibility of manned spacecraft orbiting the Earth by 1990. He further predicted that a further 20 years would elapse before there would be a human-tended flight to land on the Moon and return, in about 2010. McDonnell did, however, speak about the escalating threats associated with Cold War tensions, sharing his belief that the United States should instead "wage peace" through the development of dual-use technologies.

"When a chemical rocket motor is developed for a missile, here is a means of propulsion that may be applied in whole or in part to a space vehicle," he told the graduates. "And, when ways are found for a fighter pilot to survive high gravitational pulls at hypersonic speeds, this will help some future space pilot survive blastoff in a Moon-bound rocket."[2] With this futuristic vision firmly entrenched in his mind, McDonnell had even awarded it the code name of Project 7969.

Early in 1958, following the successful launch and orbiting of the Soviet *Sputnik* and the massively unsettling impact this achievement had on the American psyche, McDonnell was more eager than ever to explore the possibilities associated with space travel. A substantial start was made when he established a new department similar to the company's previously established Advanced Design Department (Aircraft), to be headed by L. Michael Weeks, a native of Iowa who had been working on Project 7969 since 1956. Weeks had begun his career teaching mathematics at Iowa State University for three dollars a day before receiving his bachelor's degree in civil engineering at the university in 1943. He had then gone to work with McDonnell Aircraft in St. Louis, eventually rising to the position of chief engineer. In his time with McDonnell he enjoyed key roles in Projects Mercury and Gemini and would also work on Project Apollo and the Space Shuttle. He was later involved with Rockwell International's National Aerospace Plane (X-30) and the Orbital Sciences Corporation's X-34 before retiring after a career spanning 56 years.

The charter for Weeks's department was highly innovative; it was charged with designing a spacecraft capable of carrying a person through launch and into Earth orbit; sustaining that person in space; safely reentering the atmosphere; landing in the ocean, and remaining afloat until the vehicle could be retrieved.

"Ray Pepping, previously Aircraft Chief of Dynamics, became Weeks's assistant," Luetjen recalled, "and John Yardley was named Project Engineer reporting to Weeks and Pepping."[3]

John F. Yardley was a veteran of World War II who had completed his undergraduate education in aeronautical engineering, also at Iowa State University. After receiving his master's degree from Washington University he began his professional career as a stress analyst with McDonnell in 1946. Like Weeks, he would enjoy a long and distinguished career in space flight program development with McDonnell, apart from the years 1974 to 1981, when he joined NASA as the agency's associate administrator in charge of manned space flight. He then rejoined what was by then McDonnell Douglas, serving from 1988 as senior vice president of the merged company.

In March 1958, 'Luge' Luetjen was assigned as Supervisor of Technical Integration under John Yardley. "We knew that studies in many disciplines (aerodynamics, thermodynamics, propulsion, structures, electronics, electrical, design, etc.) would be required," he observed, "and it was my job to keep all of the disciplines 'headed down the same path' and 'singing from the same sheet of music.' As I recall, about 50 to 60

A later photograph of John Yardley. (Photo: Washington University)

full-time people were assigned to the department in short order, with another 20 or so available to be used on a part-time basis as required. Those assigned were the very top people in the various disciplines. What Mr. Mac wanted, Mr. Mac got! Now all we had to do was produce."[4]

Ultimately, James McDonnell's concept of dual-use technology would play a significant role in his company being awarded a contract to build America's first spacecraft; one intended for human space travel and Earth orbit.