

**NASA**

National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas



**What's happening**

A dervish of Apollo 20th anniversary activities will engulf JSC next week. Story, schedule and map on Page 11.



**A crew remembers**

The crewmen of Apollo 11 talk candidly about their mission, the past 20 years and the future. Story, photos on Page 5.

# Space News Roundup

Vol. 28

July 14, 1989

No. 28

**Lunar Landing  
20th Anniversary  
Edition**



# DIRECTOR'S MESSAGE

By AARON COHEN

I never really thought about the Moon when I was a boy growing up in San Antonio. It was always up there in the Texas night, even during the Great Depression and World War II, but I wasn't much of a dreamer. The only round object I really paid much attention to in those days was a tennis ball. I didn't wonder what the Moon was made of. I didn't wonder if men would ever go there. I didn't wonder what kinds of machines would take them there.

I was always interested in mathematics and physics, but at Thomas Jefferson High School in San Antonio it seemed the only way to apply those skills was in mechanical engineering. It wasn't until after I had graduated from college and had gone to work for RCA that my interest in aerospace began. Even then, I hadn't yet developed an interest in helping send men to the Moon. I was interested in ballistic missiles as a way of applying my math and physics to flight mechanics, trajectory analysis and guidance. That's how I became involved in the Atlas and Centaur rocket programs at General Dynamics in San Diego during the advent of the space program.

Then, suddenly in May 1961, President Kennedy set this country's sights on the Moon. I began thinking about the Moon, thinking about what an outstanding opportunity it would be to work on that project. Kennedy's vision appealed to me—exploring and exploiting space were the right things to do. I found myself working on General Dynamics' unsuccessful Apollo spacecraft proposal. When General Dynamics didn't receive the contract, I decided I had to pursue the opportunity to work on that project. That's when I left my job at General Dynamics and went to work for NASA. I still remember the elation I felt back in 1962 when I received the NASA letter inviting me to come to work at the Manned Spacecraft Center.

When I arrived, NASA and the Apollo Spacecraft Program Office were scattered across Houston in rented office buildings as Dr. Robert Gilruth was starting to put together this center. My first job was in the project office, managing the development of guidance, navigation and control hardware and software for the Apollo spacecraft. What a challenge that was! We had never left the influence of the Earth's gravity before and the equipment my group was working on was critical to the success of all lunar missions. In the process, I learned a lot from people like Gilruth, Chris Kraft and George Low.

I'll never forget when Kenny Kleinknecht and

George Low gave me the job of verifying that the Command and Service Modules could successfully complete the Apollo 8 mission that Low had conceived. I ended up writing the memo to Low saying that the vehicle was ready to make the voyage. I still have that letter, framed and hanging on my wall.

For me, Apollo 8 was probably the greatest accomplishment of the entire Apollo program. The landings were an important conclusion, but having the foresight and the will to do that mission and put the program back on track will always be the finest hour in the history of the Manned Spacecraft Center and NASA, as far as I'm concerned. That mission taught us that if we do set our goals high, we can reach them—but that we have to have a good team of motivated people willing to pay attention to detail and dedicate themselves to achieving the goal.

I guess my experiences in the Apollo program prove you don't have to be a dreamer to play a part in making great dreams come true. Each of us has a role to play, a job to do, and it's the team spirit of working toward a common goal that turns challenges into realities. For every dreamer we need to ask "why don't we?" we need many more pragmatists to ask "how do we?" We had the goal and we had the team during Apollo. And that spirit and dedication are carrying over in today's programs.

There are many who said at the time and who say now that NASA and this country made a mistake of cosmic proportions when they decided to end the Apollo lunar landing program with Apollo 17.

They say that we threw away the most powerful launch vehicle ever made. They say that we failed to take advantage of our success. They say we let go our chance to establish the first human settlement on another world.

Whether they are right or wrong is truly academic now, 20 years later. What is important is that we have not allowed ourselves to stand still or to remain earthbound and complacent. We have continued our search for knowledge and furthered our goals of exploration and exploitation of the universe.

In the manned space program, we took the remnants of that magnificent Apollo program and built the world's first space station, Skylab—a laboratory that allowed us to collect a treasure-trove of information about how humans react to long periods of microgravity, about the Earth, the Sun and the stars, and about how to conduct long-duration missions. P.J. Weitz, deputy director at JSC, can list a



host of accomplishments from his Skylab 1 mission alone.

Then, we took another Apollo spacecraft and made a gallant gesture for world peace by making the first international link-up of spacecraft in orbit. We learned to work together with our Soviet counterparts, both on the ground and in space, and set the tone for scientific cooperation that is going on to this day. Ask Vance Brand, who is about to command STS-35, about the value of his mission.

With the Apollo-Soyuz Test Project, we closed out the era of the Apollo spacecraft, and set out to begin a new era, the era of the reusable spacecraft. We used inspiration and the lessons of the Mercury, Gemini, Apollo and Skylab programs to design, test and fabricate five new space shuttles. With the exception of one mission, those shuttles have proven themselves to be remarkably reliable and resilient, carrying more than 100 men and women into space and returning them safely to the Earth. Along the way, they have deployed 30 unclassified satellites and one interplanetary probe, retrieved two stranded satellites, repaired two orbiting satellites and performed a great many experiments that have yielded important data about ourselves, the spacecraft, the Earth, the weightless environment and our Solar System. Ask any of the shuttle astronauts about the importance of our National Space Transportation System.

In the unmanned space program, we have launched nine interplanetary spacecraft since the last lunar landing, including Pioneer 11, which swept past Jupiter and Saturn before heading out toward interstellar space; Mariner 10, which flew by Venus and Mercury; Vikings 1 and 2, which landed on the surface of Mars; Voyager 1, which flew by Jupiter and Saturn before heading into interstellar space; Voyager 2, which flew by Jupiter, Saturn and Uranus

and is about to provide our first close encounter with Neptune; Pioneer Venus 1 and 2, one of which impacted on the surface of Venus and the other that is still returning images and data; and we have just used the space shuttle to launch Magellan, which will provide further information about Venus. Ask the crew of STS-30 that helped Magellan across millions of miles of space whether our robotic exploration of the Solar System is worthwhile.

Those who say we were wrong to put the brakes on the Apollo program also say that because we did, we may never again have the chance to explore and exploit the Moon.

Whether they are right or wrong in that assertion is not academic. We will prove they are wrong. Everything NASA and this country have done in space since the Apollo program is leading us toward greater accomplishments in the next century than we can imagine. We are going back to the Moon, but this time the Moon will not be our ultimate goal. This time, the Moon will be a stepping stone toward other planets and the stars, a classroom where we will learn how to live off the land of other worlds, to shelter and sustain ourselves without constant resupply from Earth, to contribute to the well-being of our home planet from across the void.

I still remember what Gene Cernan said on Dec. 3, 1972, as he took his last steps on the lunar surface and mounted the ladder to the lunar module Challenger:

"I believe history will record that America's challenge of today has forged man's destiny of tomorrow. And, as we leave the Moon at Taurus-Littrow, we leave as we came and, God willing, as we shall return, with peace and hope for all mankind."

Happy anniversary, Apollo! Your struggles and your accomplishments light our way through space, just as the beckoning Moon lights our way across a darkened ocean.

## CONTENTS

### One Small Step: Remembering Apollo 11 . . . . . 3

"Task accomplished ... July, 1969," were the words written across the screen in Mission Control as the emotions from the preceding decade of effort, hardship and dedication were released.

### The Apollo Era . . . . . 4

A pictorial history of the Apollo Program and the missions that took men to the Moon, landed them on its surface and returned them safely to Earth.

### A Crew Remembers . . . . . 5

The Apollo 11 crew—Neil Armstrong, Buzz Aldrin and Mike Collins—looks back across the gulf of time to the time they crossed the gulf of space to our nearest celestial neighbor.

### Lunar Landing Anniversary . . . . . 6

"Houston" was the first word spoken from the Moon, and for good reason. Photographs tell the story of the training and the missions as seen and felt at the Manned Spacecraft Center.

### Living in a 'Space' Community . . . . . 9

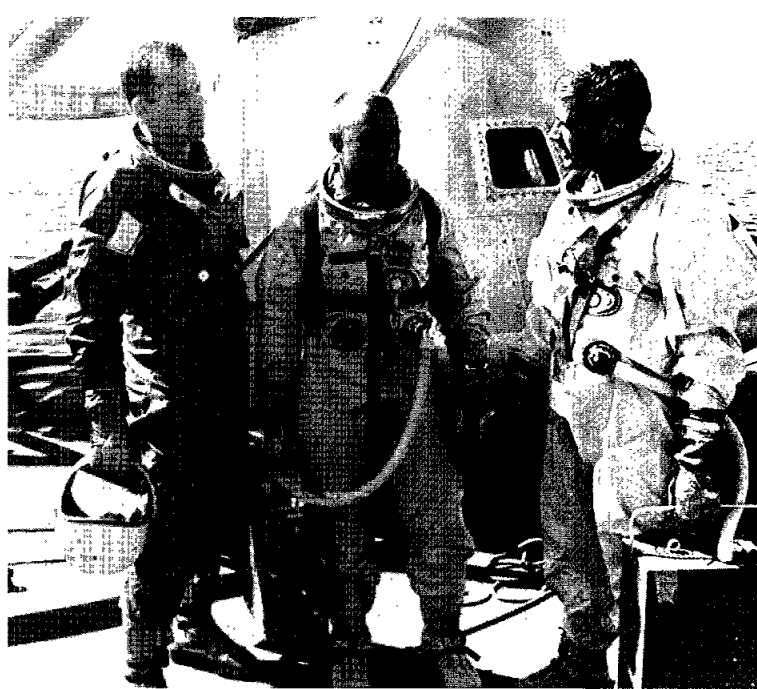
A personal recollection of how the Apollo program affected the families of the people who worked and struggled to make it happen.

### Breakthrough to the Unknown . . . . . 10

Maxime A. Faget, one of the key designers of the Mercury, Gemini and Apollo spacecraft, answers 11 questions about Apollo and America's space program.

### 20th Anniversary Celebration . . . . . 11

The coming week's meetings, lectures, parties and other activities are listed, accompanied by a locator map.



## DEDICATION

This special issue of Space News Roundup is dedicated to all the men and women who molded the Apollo Program into a success that will serve as a monument to the ingenuity and devotion of a nation not just for decades, but for centuries. It goes out to the family members who encouraged, supported, endured and rejoiced in their efforts and accomplishments.

It also honors the memory of all astronauts who died in pursuit of the goal to land men on the Moon and return them safely to Earth, including Gus Grissom, Ed White and Roger Chaffee, who lost their lives in the Apollo 204 fire on Jan. 27, 1967.

## Space News Roundup

Editor . . . . . Kelly Humphries

Associate Editor . . . Linda Copley

Graphic Artists . . . . . Julia Oppe

Jan Knight

Dave Krenek

The Roundup offers special thanks to the people of the Printing Management Branch, the Public Affairs Still Photo Library and Audio Control Room, the Photographic Branch, Distribution Operations and the JSC Mail Center, all of which performed yeoman service that made this anniversary issue possible, and who continue to make possible the weekly production of this publication.

The Space News Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday for all center employees.

## COVER

NASA commissioned Clear Lake-area artist Al Chinchar to produce this full-color painting of the Apollo 11 lunar landing for use in a poster celebrating the Apollo 20th anniversary.

# ONE SMALL STEP

By BRIAN WELCH



The scene in the Mission Operations Control Room on July 24, 1969 was flag-waving, cigar-smoking bedlam. Flight controllers were finally able to vent their pent-up emotions once Neil Armstrong, Buzz Aldrin and Mike Collins were safely aboard the aircraft carrier *Hornet* in the Pacific Ocean. The message on the large screen refers to President Kennedy's announced goal of putting men on the Moon and safely returning them to Earth by the end of the 1960s.

A vivid sense of supreme accomplishment had been thick and palpable for more than three days, and countless corks had already popped by the time the three bright parachutes came into view.

Suspended beneath the canopies, the *Columbia* was a dingy brown and black, pitted and charred at the base but intact for all it had been through. Inside were the three most celebrated people in history at that moment, Neil Armstrong, Buzz Aldrin and Mike Collins. It seemed to some at that moment that they were riding within a very tiny craft, a fragile counterpoint to the awesome, Promethean machine on which they had risen from the Earth a week before.

The first people to see the Command Module had been the 80 passengers and crew aboard a Quantas airliner who saw the fireball when *Columbia*, traveling an incredible 36,300 feet per second, came screaming into the atmosphere at 400,000 feet above the Earth. Soon after, half a billion people were watching, even some in the Soviet Union who were witnessing the first live television coverage their government had allowed of the Apollo 11 mission.

When the splashdown finally came, it was 11:51 a.m. CDT July 24, 1969, a little more than 195 hours since the vigil had begun. As swimmers attached the flotation collar and a raft to the spacecraft, and as the helicopter began dropping biological isolation garments for the Apollo 11 crew, Moon madness hit full stride in other parts of the world.

Church bells rang along Fifth Avenue in New York. Champagne began to flow at a splashdown party in the Hayden Planetarium. Firecrackers exploded and ticker tape fell from windows in San Francisco. At MIT, where students had been demonstrating for months over the Institute's defense and aerospace work, a 10-story-tall figure, "11," was formed in a triumphant lighted window display. It was MIT, after all, that perfected the guidance system that made the flight possible.

In Wapakoneta, Ohio, Neil Armstrong's hometown, the high school band marched and played moon songs.

It was raining in Paris at the time of the splashdown, with thunder and lightning driving many people from the streets, but on the Riviera cannon boomed and the peal of church bells was heard for five minutes. Similarly, the Lutine Bell tolled twice at Lloyd's of London in that firm's traditional expression of exceptional good news.

ComSatCorp., whose management by then must have been positively giddy, announced that satellite time for worldwide coverage of Apollo 11 had broken all records, with more than 230 hours having been purchased for the broadcast of 200 programs over a nine-day period. The estimate was that some 500 million people in 40 countries on five continents had seen the mission unfold. But as wondrous as that seemed, there were some places in the world exempt from the excitement the flight generated. Four countries—China, Albania, North Korea and North Vietnam—chose not to tell their citizens of the epic journey.

Besides those four nations, one of the few other places in the world where viewers were not celebrating was on the third floor of a squat, windowless building on the grounds of the Manned Spacecraft Center in Houston. The

third floor, just like the floor below it in the Mission Operations Wing of Bldg. 30, was square, with a series of support rooms and meeting places along the outside walls. Within that square was another, a long wide hallway with high ceilings and two-foot-square floor tiles that could be lifted with suction cups for access to a maze of cable runs and wire bundles. The hallway had been thick with people and cigarette smoke earlier in the day, but by splashdown it was almost deserted.

On the interior wall of the southeast corridor, just about midway down, there were two sets of broad double doors. The doors on the left led up a set of orange-carpeted steps to a room that looked more than anything else like a small movie theater, especially with its low-level lighting. If a visitor had entered that room on that morning, just before splashdown, he would have found many of the most senior officials of the National Aeronautics and Space Administration (NASA) seated there, in a kind of VIP balcony overlooking Mission Control. In the moments before the splashdown, when *Columbia* was still hanging beneath the chutes, there had been smiles and cigars and some laughter, but the conversation was almost as subdued as the lights at that point. The adventure wasn't over yet.

If the visitor had gone back down the steps and out into the hallway, and entered the double doors on the right a few minutes before the landing, he would have come into a very long and dim entryway. The effect would have been like walking into a tunnel, with the visitor's eyes gradually becoming accustomed to the subdued lighting—always 15 foot candles or less—and the next sensation would have been one of nearly complete silence. As the noon hour approached in Houston, the job was not yet over in the Mission Operations Control Room, known to the people who worked there as the MOCR, which they pronounced "Mow-Ker."

The traditional crisp discipline of the place still reigned.

A visitor to the MOCR that morning would have emerged from the tunnel-like entryway into a large room that has seemed, to almost every visitor, to be smaller than it appears on TV despite the 16-foot-high ceiling. But it is big, nonetheless, with four long rows of consoles running parallel to one another along three tiers, so that each row of consoles is elevated about a foot above the row in front of it.

At the back of the room, in the center just in front of the Viewing Room windows, the visitor would have seen three men clustered about a console, all riveted to the data displayed before them. They were the three people who, probably more than any others, were the planners and the fixers and the doers responsible for making Apollo 11 come to pass.

Chris Kraft was seated on the right facing the front of the room. As director of flight operations, he was the man in charge of Mission Control and all who worked there, the man who

enforced the discipline and traditions of the place through a powerful mixture of vast technical knowledge and something else—an indefinable thing that radiated from him, that could best be described as presence. Kraft, the original and only flight director until the final Mercury mission, had been on the cover of *TIME* magazine back in 1965 and was universally credited with guiding the development of an entirely new field of endeavor—the flight control techniques necessary to put people in space.

On the left side of the console was an older, dignified looking man, a man who had been the hands-on godfather and spiritual mentor of this operation from the very first day. This was Robert Gilruth, the first director of the Manned Spacecraft Center and, before that, the head of the original Space Task Group which had been formed in the infancy of NASA back in 1958 to meet the challenge of Sputnik and put an American in space. He and Kraft had known one another for many years, having both worked in the 1950s for the National Advisory Committee for Aeronautics (NACA), from which NASA had been created. In those days, their interest was high-speed flight and learning new ways to study aerodynamic effects at high velocities. Kraft was one of the first people Gilruth had sought to join the Space Task Group, one of the original 35 members.

Together, Kraft and Gilruth had witnessed and been a part of an incredible 10-year odyssey. They had experienced

the extreme frustrations of the early Project Mercury days, followed by the triumphant flights of Shepard and Glenn. When the Space Task Group moved to Texas in late 1961, they had tried to bring some order out of the chaos when the manned space program was spread out among rented office buildings all over the southeast side of Houston while Brown and Root and the U.S. Corps of Engineers built the Manned Spacecraft Center. By 1964, the new center was ready to support its first flight—the Gemini IV mission—and the pace of the program became breakneck. Now it was July 1969, and the return on their investment of sweat and spirit was about to be paid in full.

Seated in the center chair was another powerful and well-liked NASA manager, a role model in many ways for the younger engineers and managers who would go on to lead the agency in later years. This was George M. Low, the manager of the Apollo Spacecraft Program, a man whose memory is venerated in Houston to this day. Low had assumed control of the program in the dark days following the launch pad fire that had killed the first Apollo crew and thrust the entire program into chaos and despair in 1967.

The deaths of Gus Grissom, Ed White and Roger Chaffee had shaken the country and had revealed widespread problems within the lunar landing program. The mood had been gloomy back then, and Gilruth had written at the time

that the probability of meeting President Kennedy's now sacred goal of reaching the Moon by 1970 was "not high." George Low, working six- and seven-day weeks and 10- to 12-hour days for more than two years, had somehow managed to put the program back on track.

It had been one of Low's inspired decisions, a little more than a year before, which many consider the pivotal event that made the first lunar landing possible before the end of the decade. At that time, in the spring of 1968, Low was confronted with a glass half full. Progress in the redesign of the Command and Service Module (CSM) following the pad fire was going better than expected, which meant that the manned Apollo 7 Earth orbital test flight of the spacecraft could probably take place on schedule in the fall. But problems with the Lunar Module (LM) were mounting and the Apollo 8 mission, intended to be another manned test in Earth orbit, this time with both the CSM and the LM, seemed certain to fall behind schedule as a result.

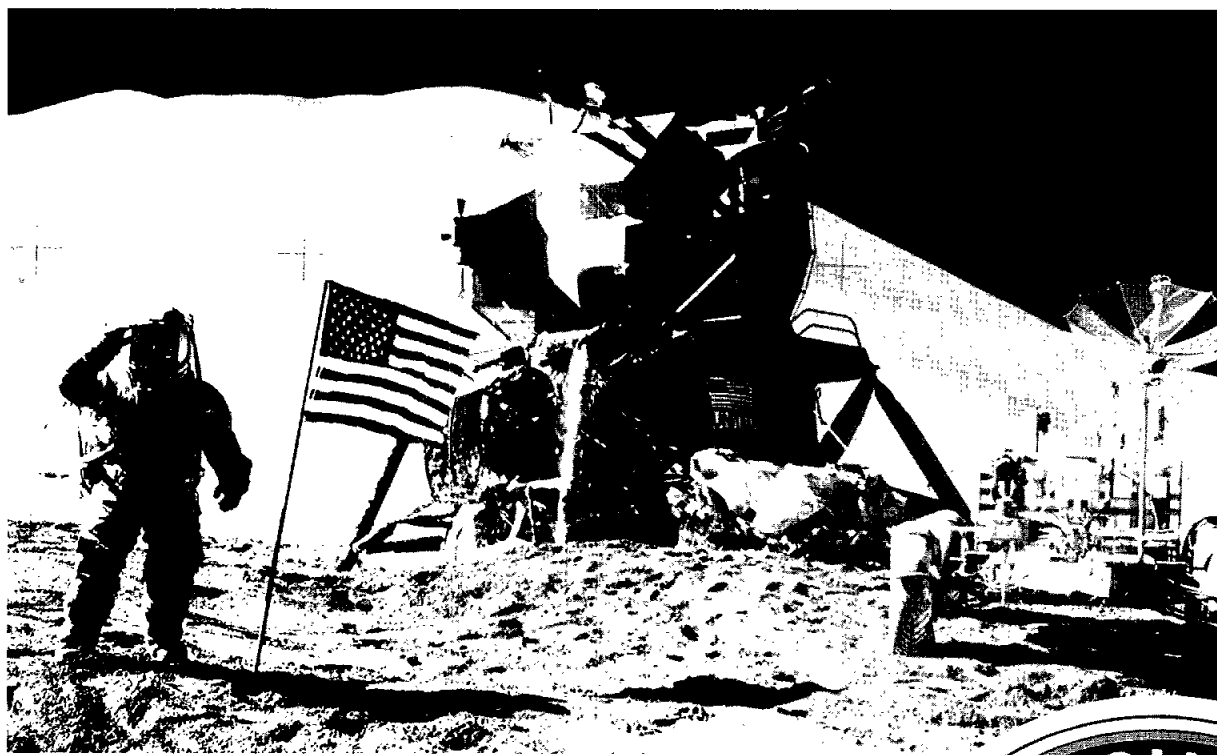
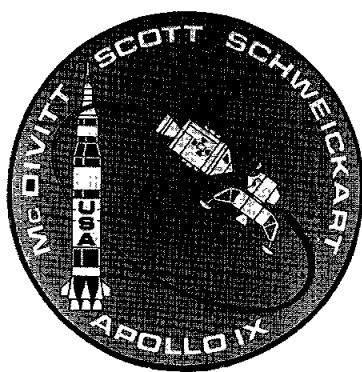
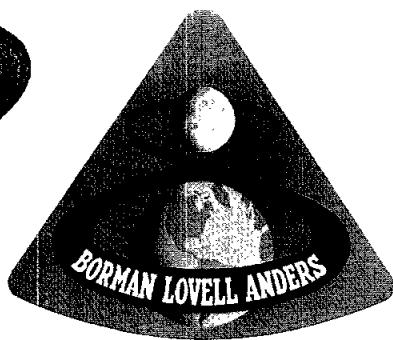
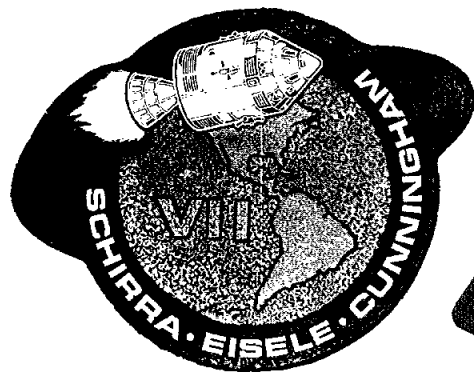
Low's proposition was bold, highly secret, startling, and elegant in its simplicity. Low proposed that they bypass the lunar module, for the time being, and press on to the Moon. Low hoped the flight of Apollo 8 could energize the program and add critical knowledge to the experience base necessary for a lunar landing. The decision to fly Apollo 8 to the Moon, in Kraft's mind, "was the boldest decision of the space program. It was the first manned launch of a Saturn V. It was the first time men had left the gravitational influence of the Earth. It was the first time we had tried to navigate with onboard systems to the Moon. It was the first time we went into orbit around another planet. It was the first time men looked down on the surface of the moon from a distance of just 60 miles. It was the first time we came out of orbit from another planet. And it was the first time we did a 36,000 foot-per-second reentry, the same as you would encounter in returning to the Earth from any planet."

In the aftermath of Apollo 8, the spectacle of reaching the Moon, of seeing the Earth rise above its horizon, seemed to elevate the program to an entirely new level. It had become An Epic Event. All of a sudden, the people who worked at the Manned Spacecraft Center and elsewhere in NASA, who had been pushing toward the goal for so many years, looked up and saw their efforts being compared to only a handful of the most pivotal developments in the history of the world. The atmosphere swirling around Apollo was electric, and the feeling carried through over the next few months as Apollo 9 checked out the Lunar Module in low Earth orbit, and as Apollo 10 went back to the Moon for a dress rehearsal of the flight to follow, complete in every way except for the landing itself.

Now Apollo 11's mission was just about over, the *Columbia* and her crew were returning, and the sense of greatness that began with Apollo 8 was at a powerful crescendo. Up at the console in the back of the room, it is hard to imagine how, at that moment, anyone could have felt a more supreme sense of accomplishment than George Low must have experienced as *Columbia* swung beneath the chutes toward the Pacific.

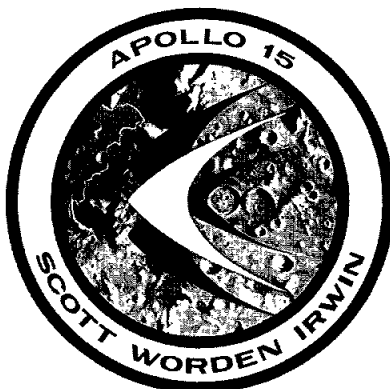
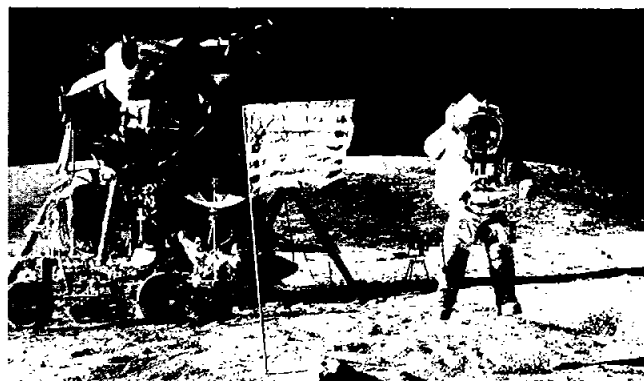
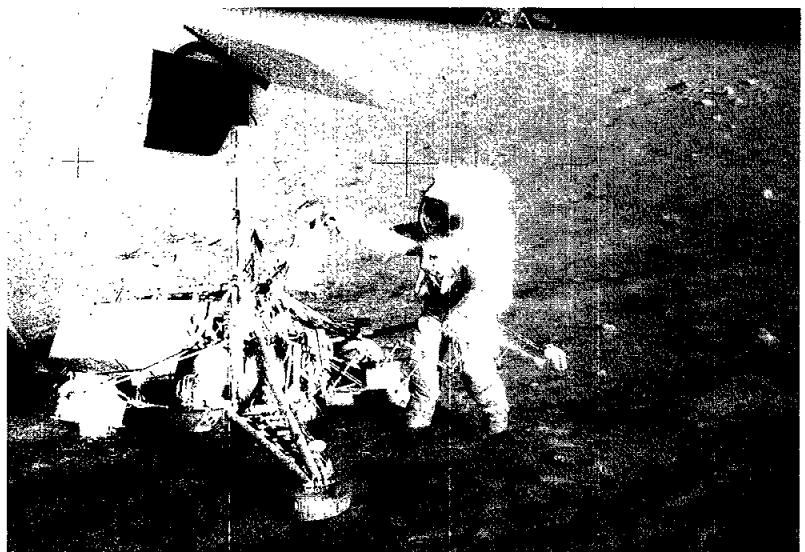
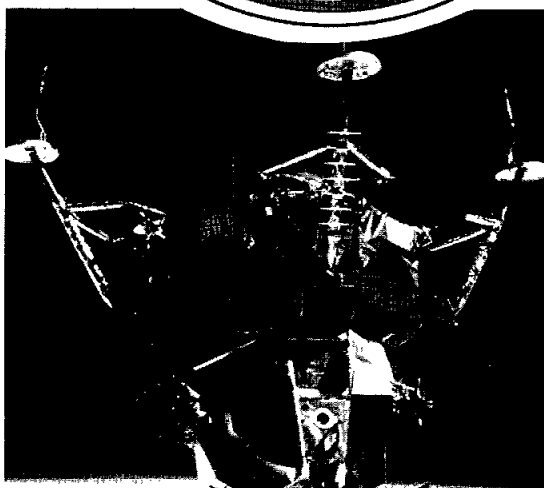
Please see APOLLO, Page 8

**Many believe Apollo was the finest hour of their careers, a golden time never to be repeated, because you can do something for the first time only once.**



# ANOTHER WORLD

Six United States spacecraft landed on the surface of the Moon between 1969 and 1972, making 12 Americans the only humans to ever set foot on another world. Clockwise from above: Apollo 12 Astronaut James B. Irwin gives a military salute beside the lunar module *Falcon*; Apollo 17 Scientist-Astronaut Harrison H. Schmitt stands beside a flag that seems to point toward Earth; glistening handcart tracks lead back to a lonely *Antares* during Apollo 14; Apollo 16 Commander John Young gives a one-sixth-gravity salute in front of *Orion*; the lunar module makes its debut on Apollo 9 with the flight of *Spider*; Apollo 12 Astronaut Charles Conrad Jr. inspects the unmanned Surveyor III as *Intrepid* sits in the background; and the returning Apollo 11 crew is greeted by their wives at Ellington Field.





# APOLLO 11: A CREW REMEMBERS

(Editor's note: The following interview was conducted May 26, 1989, at the Smithsonian Institution's Air and Space Museum in Washington, D.C. Joe Headlee, a television writer and producer for NASA during Apollo 11 and now chief of the Broadcast Audio Visual Branch at NASA Headquarters, was the interviewer.)

By JOE HEADLEE

**Headlee:** What is the most vivid memory each of you had about the mission?

**Armstrong:** Apollo 11 was filled with vivid experiences. One that comes to mind in my case is flying through the Moon's shadow and seeing the Sun eclipsed by the Moon as we approached. It's a very spectacular sight.

**Collins:** I think the thing I remember the most visually is the ascent stage of the lunar module, the ascent stage of *Eagle*, in front of my window and then in the background seeing the lunar horizon and seeing the Earth pop up above it, so that you had the horizon, the lunar module and the Earth all in a row. I think that was something that would rarely be seen again and I remember that most vividly.

**Aldrin:** I think for me the most memorable may not have been one that, at the happening, I was most aware of, but I've had occasion to challenge my memory and think back of those few seconds when Neil and I touched down. There were numerous things that we needed to do, but we also needed to announce to the world that we were there and then pause for a moment and things were quiet. We gazed out the window and it was just a magnificent view. That's the most impressive memory that I carry now, because I refer back to it so many times.

**Headlee:** What was the most personally rewarding part of the mission for each of you?

**Armstrong:** I think, perhaps, the final descent to the lunar surface was for me the highlight of the flight. It was very challenging, there were a lot of unknowns and for a pilot it was a wonderful experience.

**Collins:** There are so many things that can go wrong on a trip to the Moon and back. It's sort of a long and fragile daisy chain of events. I can remember being in the mobile quarantine facility, the little house trailer aboard the aircraft carrier after we landed in the Pacific and thinking, gee, none of them did, none of those little links broke. To me that was the amazing part, that everything worked in sum as well as it did.

**Aldrin:** I think the most rewarding part of Apollo 11 was having it be the major event which changed my life entirely and gave me and opportunity to reorder priorities and chart a course for the future, based on a new life of being a representative of the human race having done a very significant thing. It's enabled me to deal with that in a way that I feel very confident of my future and of my participation in helping shape the future of the space program.

**Headlee:** As best as you can, recall and describe how each of you felt that day in July '69 as you prepared for the launch.

**Armstrong:** Well, every launch day is a time of excitement, enthusiasm and apprehension. But I think in most circumstances, you always feel that the chances of actually lifting off are fairly distant and remote. You have to temper your enthusiasm with the realization that in fact you may be coming back in and trying to go another day.

**Collins:** I agree with Neil that it seemed to me at that time I was most interested in just getting that thing off. Above all, I did not want to recycle, to have to empty out those gigantic fuel tanks and try again a different day. I just desperately wanted to go on the 16th of July.

**Aldrin:** I think the most memorable thing that I can recall about that particular day was the opportunity while my two friends here were being put into the spacecraft to stand alone by myself out there and look at the rocket in the quietness and see the Sun come up and waves rolling in, the evidence of the millions of people watching. It was just so quiet and to realize that, indeed, such a contrast was going to take place. All the frantic activity preparing the rocket, but it was so quiet up there for me personally and in a very few moments we were going to be departing in a great roar, off for a momentous event.

**Headlee:** This next one for Neil and Buzz—what were your immediate impressions of the lunar surface when you first walked on it and touched it?

**Armstrong:** I think the impressions of the Moon

started much earlier on our approach. As you got closer and closer we could see more and more. As we got down into low orbit about the Moon, we kept getting impressions. On the final descent, we got closer and after landing—of course then we were very close, we had hours to stand there a mere 15 feet above the surface and look at pretty much everything that was available out that front window—we had a sense of the gravity, the character of the environment there. So long before we actually got out on the surface, we already had a pretty good appreciation for what the Moon was like.

**Aldrin:** I agree with Neil. There are many different moons to remember, the one we see from the Earth, the one that's en route as we were alone between the Sun, the Earth and the Moon, and as we approach the Moon, it's a different one. When you're in orbit, you look down on it and it's a rather rough, lonesome, foreboding location. Neil had a much better view during powered descent of that transition down to the surface. I think I was relieved by the ease we had in being able to maneuver around. I was impressed by the talcum powder nature of the fine surface itself. As you would look at a bootprint, it was just so smooth, like you had put your foot in talcum powder. It was a many-faceted Moon. It was a stranger to

me before the mission, but I now look back at it as somewhat of a friend, a place that I've visited.

**Headlee:** Mike, what were you able to see from your vantage point, as you circled the Moon?

**Collins:** The thing about the Moon that I thought was peculiar was that it seemed to depend on the angle of the Sun. When the Sun was almost overhead and it was noon down below, the Moon appeared to be a warm and a friendly place. On the other hand, near dawn or dusk, it became very foreboding looking. The craters cast very long shadows and the place looked distinctly unfriendly.

**Headlee:** How did you feel orbiting the Moon alone, knowing that the Earth was so far away and your two fellow astronauts were out of reach and out of sight?

**Collins:** I enjoyed being in the command module by myself. It was a happy little home. All the machinery was working properly. My concerns were not within the command module but simply that something might go wrong with

the LEM, with the lunar module, and these two guys might get stuck on the surface of the Moon.

**Headlee:** What goes through your mind when you think back to viewing the Earth as a whole from so far out in space? How did that impress you at the time?

**Armstrong:** Of course, all three of us had flown in orbit before and seen the wonders of Earth as seen from space. This was a new experience for us in seeing it from a very long distance away. It does probably change in character as you become farther away. I think you most notice that, though, at the time you leave Earth.

**Collins:** The Earth as it appears from the Moon is a very small and fragile object, and when you think about it that's not an inaccurate description. Certainly, a lot of the things that we do down here can affect the balance. The "greenhouse effect" we're noticing today, for example, the changes between a healthy atmosphere and an unhealthy atmosphere are very subtle, very fragile. You sort of get that feeling when you look at the Earth from a great distance.

**Aldrin:** When we were on the surface of the Moon, even though the Earth was only a slight, slight 24 degrees off the vertical, there was no attraction on my part to divert my attention from where we were and what we were doing to look up at it, except for the one time when we tried to take a stirring picture, or a memorable picture, and it certainly in retrospect looked awfully small. Personally, there was a time when an ironic thought sort of filtered through my mind that, here Neil and I were so far away from home, much further than people had ever been, and yet at that same time there were more thoughts, and concerns so far away on what it is we were

doing at that very moment. I thought that was very unique in the history of mankind.

**Headlee:** Are you surprised that we haven't gone back to the Moon? In retrospect, do you think landing on the Moon when we did changed the way we now view our planet?

**Armstrong:** We did go back a number of times after our departure. For a combination of reasons, that program was terminated in favor of other new initiatives. I do think there is an increasing momentum to go back to the Moon. Studies of the Moon are indicating more and more new reasons why it does make sense to go back, but I'm not in a position right now to say when we might make that next trip.

**Collins:** I'd prefer to see us go to Mars rather than go back to the Moon, unless we need the Moon as a stepping stone to Mars. It could be that in studying Mars we will discover the best way to do it is by way of a base on the Moon. If that turns out to be the case, then well and good. I see the Moon not as an end in itself, but really a stepping stone to deeper space, to Mars and the planets beyond.

**Aldrin:** I look back on those days now of landing on the Moon, and I try to put myself in the position of the historians off into the future that look back and see that it was an international challenge and response that prompted the president to chart a course for this nation to go there. But getting to some specifics, almost exactly six years to the day after we left the Earth to go to the Moon and land, we launched a mission that in essence gave the Soviets the ability to say that they are equal to us technically. Then we proceeded in the next six years not to fly even one human in space. I think it is going to be inconceivable when future historians see what a tremendous capability was put together by one nation and set aside. I hope that we don't do that in the future. I feel that as humans extend outward, it should be in a gradual, continuous self-sustaining way and I suspect that it will involve visiting the Moon simultaneously, or with our growing visits of humans to Mars. I agree with Mike that the nation needs a strong goal, strong objective and Mars is a much clearer one to use as our compelling, drawing force into the future.

**Headlee:** How do you feel about that Neil, going to Mars? Do you think that should be the next manned space exploration?

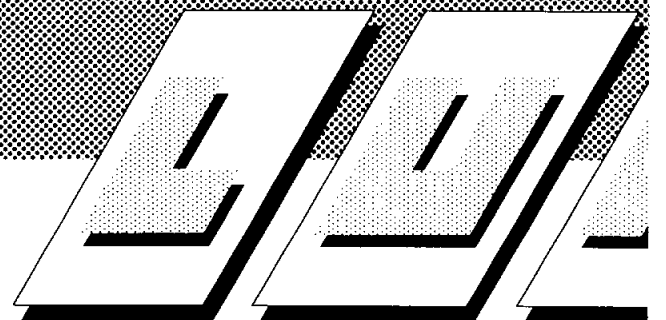
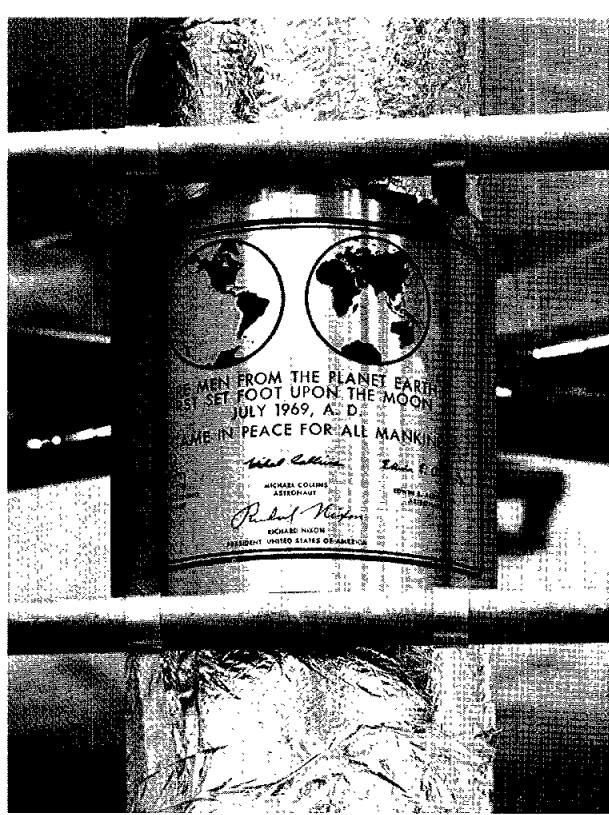
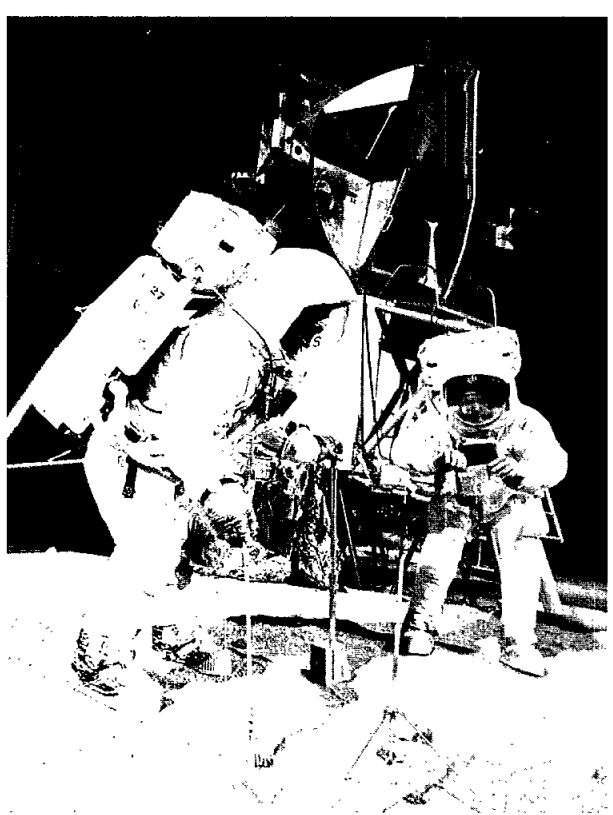
**Armstrong:** There can be some very attractive cases made for going to Mars. Some of the various approaches to doing that, both manned and with unmanned machines, seem to be very persuasive.

**Headlee:** Neil, on the 10th anniversary of your flight in 1979, you issued a statement calling for a national commitment to establish a permanently manned space station. Are you surprised that we still don't have such a facility?

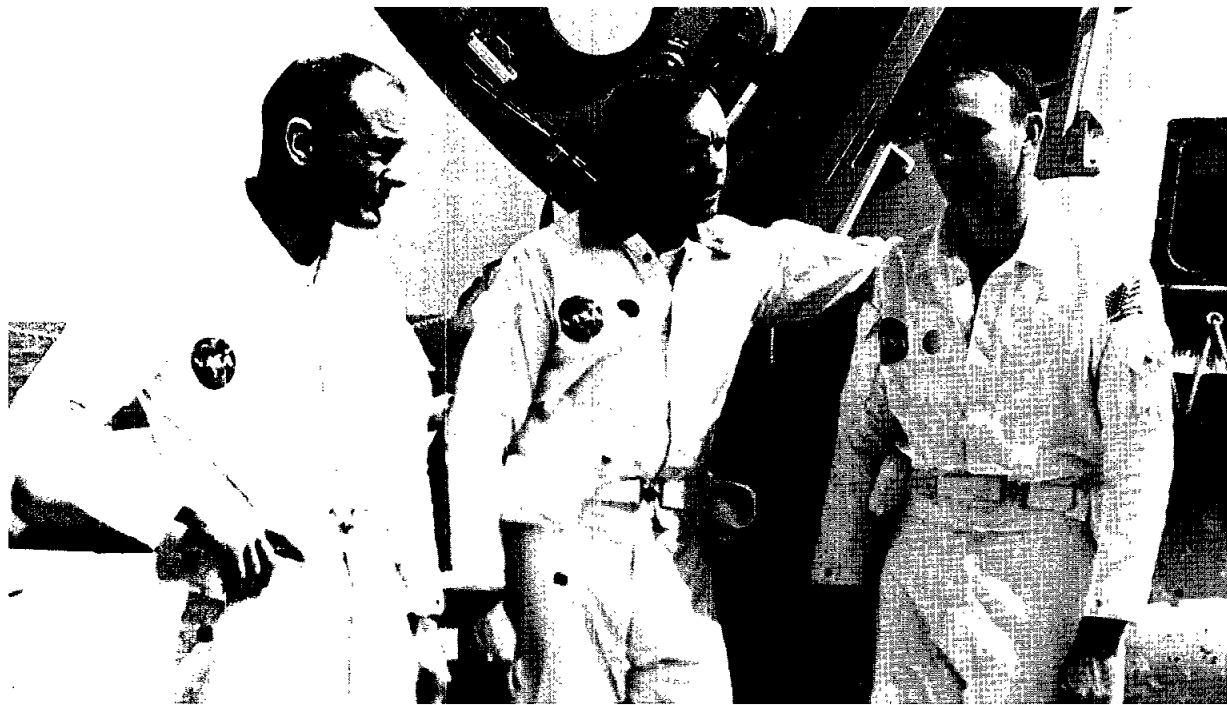
**Armstrong:** I'm not surprised. I would have preferred that we would have already had a permanent presence in space. However, it takes 10 years or so to accomplish any big project these days and I understand that now, Please see **CREW**, Page 8

**“It was a many faceted Moon. It was a stranger to me before the mission, but I now look back at it as somewhat of a friend, a place that I've visited.”**

**—BUZZ ALDRIN**

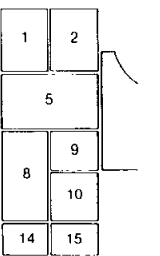


L A N I



## "WE WILL SUPPO

1. Apollo 11 astronauts Buzz Aldrin, left, and Neil Armstrong simulate the use of lunar tools during a training exercise in Bldg. 9 on April 22, 1969.
2. A close-up of the stainless steel plaque attached to the lunar module *Eagle's* landing gear reveals America's intent in making the voyage "in peace for all mankind."
3. After a successful mission, Apollo 11 Command Module Pilot Mike Collins is greeted by his wife, Patricia, through the glass of the quarantine trailer at Ellington Field.
4. A 70-millimeter tracking camera mounted on an Air Force plane flying at 40,000 feet took this photo as the Saturn V's S-1C stage separated 2 minutes, 40 seconds into the Apollo 11 mission on July 16, 1969.
5. Aldrin, Armstrong and Collins relax on the deck of the NASA Motor Vess Retriever before participating in water egress training in the Gulf of Mexico. In the background is the Apollo Boilerplate 1102 used in the exercise.
6. A close-up view of one of man's first footprints in lunar soil, taken July 20, 1969.
7. Neil Armstrong, center, is greeted by friends in the crew reception area of the Lunar Receiving Laboratory following his release from quarantine. Obscure by Armstrong is Dr. Robert Gilruth, and behind him is Deke Slayton, director of Space Flight Crew Operations.
8. A steely-eyed Slayton monitors activities in the Mission Operations Control Room (MOCR) during the Apollo 11 mission. To his left are astronauts Ron Evar and Bill Anders.
9. A trio of relieved flight directors and their boss, flags and cigars in hand celebrate the safe return of the Apollo 11 crew. From left are Clifford Charlesworth, Glynn Lunney, Gene Kranz and Christopher C. Kraft Jr.
10. Apollo 15 astronauts Jim Irwin, left, and Dave Scott make a trainin



# 20<sup>th</sup> ANNIVERSARY

# WARR

## I N G



### T YOU ANYTIME."

3	4
7	
11	12
	13
16	17

run in the Arizona desert using a mock-up of the lunar rover. The vehicle was first used on the moon in the summer of 1971.

11. A sign attached to Kraft's console in the MOCR during the Apollo 15 mission refers to the grandiose productions of filmmaker Cecil B. de Mille.

12. Kraft, Apollo Spacecraft Program Manager George M. Low and Manned Spacecraft Center Director Dr. Robert Gilruth monitor mission progress in the MOCR.

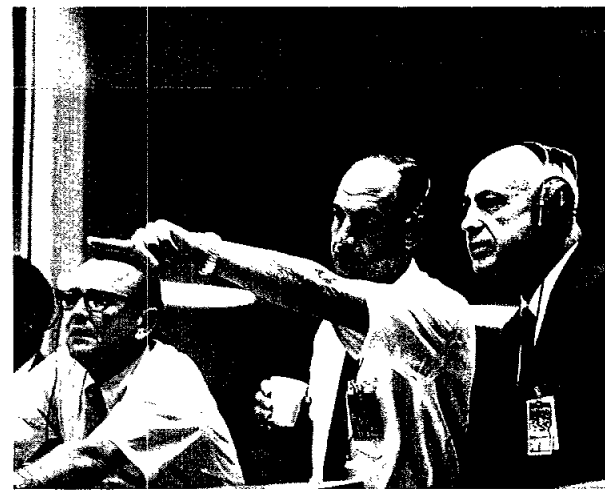
13. Astronauts Charlie Duke, center, and John Young, right, inspect three large rocks from Apollo 16 Sample Collection Station No. 7 in May 1972. Looking on are Dr. Friederich Horz, lower left, of the Geology Branch, Dr. Pat Butler Jr. of the Laboratory Operations Branch, left background, and Dr. James Head of Bellcomm Inc.

14. The crippled Apollo 13 Service Module is photographed from the departing Command Module. Astronauts James Lovell, John Swigert and Fred Haise were on the last leg of their journey home after circling the Moon in a Lunar Module lifeboat. An explosion early in the mission had left the crew with insufficient oxygen to operate the Command Module or make the planned lunar landing.

15. Apollo 8 Commander Frank Borman participates in a training exercise in the Apollo Mission Simulator in Bldg. 5.

16. A group of "shiek" Apollo astronauts poses on the Washington state desert during survival training in August 1967. From left are Charlie Duke, Ken Mattingly, survival trainer Army Col. Chester Bohart, and Jack Swigert.

17. Eight astronauts and flight controllers monitor console activity in the MOCR during the trouble-plagued Apollo 13 flight. Seated, from left, are Guidance Officer Raymond Teague, Astronauts Tony England, Joe Engle, Gene Cernan, Ron Evans, and Flight Director M.P. Frank. The photo was taken after the lunar landing had been cancelled and the crew was on its way home from the Moon.



# RY SNAPSHOTS

# APOLLO

Continued from Page 3

Back down on the main floor of the MOCR, just off the entryway, the visitor by this time might have noticed that all the people in the room were wearing little plastic headsets on one ear. The headsets came in several varieties, but all included one ear jack for hearing and one microphone, at the end of a long slender tube, for talking. Without a headset on, the MOCR was as quiet as a tomb, save for the occasional airy sounding "SHU-THUNK" which heralded the arrival of a message-bearing cannister, at 25-feet-per-second, in one of the pneumatic tube stations.

Had the visitor donned a headset and plugged into one of the consoles, the room would instantly have come alive. Each of the flight controllers in the room, representing about 10 major disciplines of responsibility, had at his disposal as many as 40 separate audio channels, or loops. You could listen to them one at a time, or all at once. For sanity's sake, most controllers tended to have the two most important channels, known as the flight director loop and the air-to-ground loop, punched up on their keysets, along with one or two loops on which they coordinated with other colleagues in other support rooms.

The flight director loop was used by the man who sat at the console in the center of the room, the man who, though he might be outranked by Kraft, Gilruth and Low, and by all the senior officials in the viewing room, was always the unquestioned boss in the MOCR.

The air-to-ground loop, which was always released live to the media and the public, was the channel that carried all conversations between the MOCR and the astronauts. And by tradition, the person who served as the capsule communicator, or CAPCOM, in Mission Control was always an astronaut.

The three managers and all the others in the MOCR were concentrating now on the displays at their consoles and on the five large screens in front of the room, on which almost any manner of data could be rear-projected, from the display of telemetry data now coming from *Columbia*, to the TV picture of the white and orange parachutes and the spacecraft descending toward the water.

Every seat in the room was taken that day, and many people who had been working on other shifts had come in to sit quietly on little ledges behind each console, just to be a part of the experience. Most of them were surprisingly young, many in their 20s, but that was by design. Kraft was aware of the pressure and tension of the jobs in this room; he knew that everything done from here which affected a crew in flight was for all the marbles, every time. It was considered a game for the young.

The controllers were bright and eager, almost all had basic engineering degrees or military flight operations experience, and outside the MOCR they would have been seen in the world of 1969 as hopelessly square, with wide ties and checked pants and close-cropped hair. The typical experience many remember was total absorption in the job. Some will tell you they remember looking up one morning in 1973, when Apollo had ended, and realized they had missed the 1960s altogether. The convulsions

and change that swept America in the '60s scarcely penetrated their consciousness. There wasn't time to pay attention to anything other than training, reading flight plans, boning up on how various spacecraft systems worked and all the other things necessary to be certified to fly one of the MOCR consoles.

The dedication many felt was single-minded, almost total, as illustrated by the story people still tell about John Llewellyn, a driven man who worked the Retro Console on some of the missions and was known as "Super Retro." Llewellyn arrived at Bldg. 30 during one of the flights to begin his shift in the MOCR and couldn't find a parking place, a chronic problem to this day. Rather than be late for the shift handover, he simply drove his car up on the sidewalk near the front door, parked and went to work.

That sense of purpose was a common thread throughout the workforce supporting Apollo, and for the flight controllers it was also a kind of self-defense mechanism. The stakes were that high. A classic example of the pressure they endured is the experience Steve Bales had during the now legendary shift when the White Team came on duty July 20, 1969 for the lunar landing phase.

The team had been so named by another of the dynamic and legendary personalities of the time, a General Patton kind of guy by the

name of Gene Kranz. Before Gemini and Apollo, U.S. manned space flights had lasted only a few hours. There had been no need for handing over responsibility between shifts of flight controllers. But the last Mercury mission, Gordon Cooper's flight, was scheduled to last 35 hours and Kraft would need some relief. He chose John Hodge to lead the second team, and for reasons of identity and esprit, named the teams Red Flight and Blue Flight. Later, when Kranz became the third flight director, he was more than happy to complete the patriotic pattern.

Bales was the Guidance Officer, or "Guido," for White Flight, 26 years old and responsible for the systems aboard the *Eagle* that told it where it should be going and how well it was getting there. The controllers on the White Team had practiced this phase over and over for months, coping with every problem the training people could think of.

When it came time to do the landing for real, the computers he monitored aboard the *Eagle* were, as the descent progressed, becoming overtaxed by the information they had to process. This caused a master alarm to go off in the cabin of the LM, an unsettling experience for everyone, but especially for Armstrong and Aldrin, who were now a little more than a mile above the surface. It was

Bales' job to analyze the source of the alarm, determine if the cause was something they could live with or whether it required some special action. One of those actions was to abort the landing.

Kranz, on the flight director loop, used the crisp language of the MOCR to ask Bales for an answer. Bales, who remembered just such a situation from one of the training exercises, believed there was no serious problem in the computer, that they should continue. He told Kranz Guido was "Go." A few moments later came another alarm, similar to the first, but by now the situation was much more critical.

*Eagle* was now just a few thousand feet above the surface, the fuel usage was higher than planned, and both Armstrong and Aldrin were having one hell of a time in the LM, between looking for a suitable landing spot and coping with the alarms. They asked for a reading from Mission Control on the second alarm.

It was one of those moments in the MOCR, for Kranz and Bales, when time stands still and a great many things pass before the mind's eye. The *Eagle* was now in terminal descent. From this point on the computers would be carefully monitoring fuel use, and if they weren't satisfied that all was well, they would automatically fire the ascent stage engine, splitting *Eagle* in half and sending Armstrong and Aldrin back toward the altitude where Collins and *Columbia* were waiting. Near the very end of the descent, the crew would enter an area known, not very cheerily, as "the dead zone." If for some reason they lost the ability to hover above the surface, if they ran out of fuel or the descent stage engine simply failed, there was every likelihood the LM would simply fall and crash, whether the ascent stage engine was firing or not.

For Bales, the decision was a little like staring into the abyss. If he told Kranz and the crew to ignore the alarm, how certain could he be that his analysis was right? What if there really was something going on in the computers? Was he absolutely certain? But if he responded to the uncertainty, and told Kranz to abort the landing, he would also be telling Kraft, Gilruth, Low, Paine, and everyone else between them and God that, well, he was terribly sorry but they were just going to have to forget about the landing today. Maybe some other time. In either case, if he made the wrong call, the ramifications were enormous.

For Kranz, the concerns were similar, but he alone had a more global responsibility. For months, people like Kraft and Gilruth and Low had been protecting him and his people from the extreme pressures that can come from within a large government agency trying to accomplish A Truly Epic Event in full view of the world. All of NASA's senior managers had stayed out of their hair, and the operations teams had been allowed to develop plans and procedures and a whole host of critical flight techniques without suffering the kind of second guessing and carping one might have expected.

But as the man in charge of the landing, he had received one, and only one, strict admonition down the chain of command from Tom Paine. If for any reason he felt the landing might not be a success, he was told, he should abort. A crash on the Moon would have been more than just a terrible accident, it would have meant more than the loss of two brave men. If *Eagle* crashed, and the answer to why it crashed was lying in the wreckage, there would be no way, by definition, to ever assure anyone that the problem had been fixed and that another landing attempt

Please see **APOLLO**, Page 9



**FROM DREAM TO REALITY**—Above: President John F. Kennedy accepts a model of the Apollo Command Module from Dr. Robert R. Gilruth, then director of the Manned Spacecraft Center, in September 1962. Vice President Lyndon B. Johnson and then-NASA Administrator James Webb are looking on. Below: Neil Armstrong and Buzz Aldrin deploy the United States flag in the Sea of Tranquility only seven years later. Armstrong is standing at the flag's staff as Aldrin holds the flag. The photo was taken from film shot by the 16 millimeter data acquisition camera mounted on the Lunar Module.



# CREW

Continued from Page 5

perhaps, we'll have *Freedom* up in the middle of the '90s and I hope that's true.

**Headlee:** Regarding the personal effects of you being the first men on the Moon, what advice would you give to astronauts who may potentially be the first ones to go to Mars?

**Armstrong:** I would advise them not to take my advice. It's a rapidly changing world, advancing technology evolves at a rapid pace. The things that my experience would dictate are three decades old and probably not applicable today. I am encouraged that there are so many people asking those questions, which seems to assure me that our future has a great deal of promise.

**Collins:** I think a Martian astronaut would probably be better off studying the voyages of Vasco de Gama or Louis and Clark rather than he would listening to three people who spent only eight days out on the road. Round trip for a Mars mission is going to be in the vicinity of two and a half years and that's close in relation to those of the early explorers.

**Aldrin:** I think Mike's right. A trip to Mars is going to be a very long and involved and major segment of a person's life. I don't know

that our advice would be that pertinent to anyone at this time.

**Headlee:** What was it like to live and work inside the Command and Service Modules during that eight-day mission?

**Armstrong:** People who come here to this museum and look at *Columbia* are most often struck by that small size, which from their perspective is understandable. From our point of view, our command module was a wonderful improvement over our previous spacecraft, which was really cramped. We enjoyed the luxury of a big-volume machine.

**Collins:** I thought we had amazingly good accommodations. We had hot and cold water, the food was even edible. All in all, it was a nicely packaged small enclosure and we could comfortably have stayed there far in excess of eight days.

**Aldrin:** I think it was a treat. It certainly was a major step up, it was a marvel of technology. We had the company of two enjoyable people to keep us occupied. Things occasionally would get to drag a little bit, but thanks to experiences we had previously in flight, we saw to it there were adequate windows and quite a few of them to look out. I think that's a very key thing in the future to provide good outside visibility.

**Headlee:** Neil and Buzz, during the lunar descent, your on-board computer became overburdened and flashed a warning. Moments later, the descent fuel situation became critical. What happened in each case and how did you respond to that?

**Armstrong:** I think Buzz would be able to

comment more accurately on the travails of arguing with our computer while I argued with the fuel gauge. However, we in our simulations were accustomed to having a large number of these kinds of difficulties and we had, in fact, simulated landing with very small amounts of fuel left. So I didn't feel that this was an oppressive situation. Not that we weren't concerned about it, we certainly were because they were serious matters, but they were felt to be within our ability to make proper judgments.

**Aldrin:** Some simulations had indicated in missions beforehand that the ground controllers needed to know a little bit more about some alarms. The senior director had directed that a number of people do some research on it. So it was not perhaps as much a surprise to them maybe as it was to us. I had not been involved in a particular simulation some computer alarms like that had come up. I think the major concern we had was we felt we needed confirmation as soon as possible from the ground and the computer alarms did interrupt what both of us were doing, which was a systematic survey for myself of the inside of the cockpit and Neil was concentrating his attention outside. As soon as a computer alarm would go off and display something, he'd have to stop looking outside where he should be looking to see what was happening and then we'd have to get a response from the ground as to what the nature of that was, clear the display and be able to proceed on. So it became a bit of an interruption. I think follow-on crews benefited tremend-

ously by our coming marginally close in fuel and I'm sure they had much greater incentive to land with a more significant margin.

**Headlee:** Neil, please talk about your famous statement when you first stepped on the Moon. When did you compose those thoughts?

**Armstrong:** Actually, I didn't worry about it until after landing, because I guess in my own view we didn't have that good a chance of completing a successful landing. But I did think about it between the time of landing and the time when we actually exited the spacecraft.

**Headlee:** Can you describe your feelings when you raised the flag on the lunar surface for the first time? Was that a moment of patriotic pride for you?

**Armstrong:** I think it certainly was. There was a lot of discussion before we went about how we represented all of mankind, that the plaque that we left on the surface of the Moon indicated that here men from the planet Earth first set foot upon the Moon and we came in peace for all mankind. But I think all of us were, with varying degrees of some service to our country that had been a major investment in our life, were most aware that this was a national response to an international challenge of our capabilities in engineering and technical prowess by the Soviets. And we were, in retrospect, responding and charting a course that was a national response. Because of the major event that took

Please see **CREW**, Page 11





The McKenzie family in 1969.

As the 20th anniversary of man's landing on the Moon approaches, much consideration has been given to the values of space exploration and the effects on mankind's lifestyle. Those who have worked together to achieve, perhaps the most significant scientific step in human history, certainly the most costly achievement in the United States' history, now take time to stop and celebrate and reflect on their accomplishment as a group who reached for a goal and kept reaching.

In parallel fashion the support group around the NASA/contractor employees—the families, friends, churches, schools, businesses—can reflect on how life has been, living in a community with space exploration as its primary goal. As the wife of one of NASA's engineers who came to Houston in the summer of 1963 to begin working at the new space center, I've lived through many exciting, traumatic, saddened, thrilling, and happy days as a support person to the "space" community.

As a rare native to the Harris County area—I was born in Goose Creek—it was with real joy that I encouraged my husband to seek a position with NASA's Manned Spacecraft Center (MSC) while we lived in El Paso. He was at the time working as a civil servant for the U.S. Army at the White Sands Missile Range. When he obtained the position to come to Houston, the now-flourishing community on the shores of Clear Lake was still mostly prairie. All of the engineering work was being done around the Telephone Road/Gulfgate area in Houston.

We bought a home within walking distance of MSC, the Rich Building on Telephone Road, that President John F. Kennedy and Vice President Lyndon B. Johnson visited back in 1962. I just happened to have been visiting my parents in Houston when that event took place. As my mother,

Blanche Foster, was principal of Cornelius Elementary at the time, she took her entire school out to witness the arrival of the famous men. The children stood waving little United States flags. Little did we know then that one year later, that wonderful president would be dead.

When Joe started at MSC, he was assigned to work with the Apollo Spacecraft Program Office. He and his companions at work began immediately making many out of town trips all over the country to various contractors' establishments. As a 25-year-old mother of one 2-year-old son and another baby on the way, I experienced many sleepless nights waiting for the phone to ring to go to Hobby Airport and pick up my traveling husband. After our first daughter was born in 1964 and the second one was born in 1966, the kids began calling the airport—where Daddy goes to work. Invariably, whenever Joe was out of town, something would break at home. I remember once the door knob came off the back door, the washing machine quit and the dog got hit all in one week while he was away. Engineers always want to fix things first themselves, so Joe would always say to wait until he got home. I usually did, but my patience would wear thin whenever his repairs consisted mostly of chewing gum and hay wire.

Fortunately for us, we had family nearby to provide emotional support for those nerve-racking times when Daddy had to be away from home. He was away in Downey, Calif., visiting North American Aviation, when we first heard of the president's assassination. I'll never forget I was at a laundromat—the washer was broken—with James, our 2-year-old, when a man rushed in and said the president and governor have been shot. Joe was given the news while in the meeting at North American Aviation. The meeting was disbanded immediately after the news broke.

Park Place Baptist Church on Broadway in Houston was a real blessing to many MSC families. It was there that many of us first came to share common experiences as well as seek spiritual support for some trying times. It was shortly after the birth of our third child, in 1967 that the Apollo 1 tragedy occurred. Joe was at the Grumman facility on Long Island, N.Y., supporting test and checkout of Lunar Module No. 1 when he got the news. He was immediately sent to Cape Canaveral to participate in the investigation of the voice and data tapes from the spacecraft when the fire occurred. Although that was a trying time for us—Joe was away for about two and one half months on the case—the most devastating experience to the whole community was the *Challenger* explosion in 1986. I had never seen the hurt before in the faces of NASA employees as I did then. It truly took months of grief for that hurt to subside.

As the Apollo missions gained success, times were exciting. Color television was just coming into fruition. We wanted a set. Of course, Joe decided to put a Heath Kit together. He built a huge cabinet on weekends, painting it right inside the family room, as I struggled to keep the kids out of the mess. Far be it from me to know that we would be able to watch man's first view of the Earth from the Moon on that very set due to Daddy's expertise at work. Joe received one of his most treasured awards for participating in the development of the color television system used on Apollo 10.

As the space center developed and the beautiful buildings and surroundings of the Clear Lake area were established, it became a real joy to share the Johnson Space Center, as it had become known, with many visitors and newcomers to the area. The ducks in the reflection ponds outside Bldg. 1 were the kids' favorite on the tours. Mission Control,

# LIVING IN A 'SPACE' COMMUNITY

By VIRGINIA F. MCKENZIE

the Visitors' Center, and walks around the outside displays remain highlights for special guests.

In the fall of 1972, with our children all in elementary school, we decided to put me back in the education career I had begun as a bride in El Paso. The Clear Creek Independent School District hired me as a fourth grade teacher at League City Elementary. We moved to a lovely home in Wedgewood Village, now a part of Friendswood. Surely the neighbors and friends we have grown to know and love since living here have provided a wonderful support network.

It has been a privilege to be a part of the schools, both as a parent and as an educator. All three of our children graduated from Clear Creek High School. What fun to teach at Ed White Elementary in El Lago and actually teach some of the astronauts' kids in fifth grade classes. Then as the community grew and new schools opened, I helped open Green Elementary as a fifth grade teacher. On several occasions we enjoyed field trips with our classes to JSC and relished the opportunities afforded as we had the "experts" as guest speakers for numerous science classes.

Pleasant memories float by as we think of all the leaders; every president of our time, many congressmen, and foreign dignitaries, who have visited JSC as well as the welcome home arrivals of the space crews. Those occasions gave opportunities for the citizens, especially the school children, to participate in flag waving, music making, and cheering. The parades down NASA Road 1 beside McWhirter Elementary, Webster Primary and Webster Intermediate Schools where our children attended stand out in these memories, as do the ceremonies at Ellington and in the JSC auditorium.

How grateful we are to have been a part of the science fairs, ball games,

concerts, and especially the worship services. God, indeed, has richly blessed the "space" community. We must recognize and hold fast to the faith that He will continue to guide and direct us in those endeavors for which we strive. Watching the actual physical growth of the area has been exciting—the improvements of streets and roads, parks, Frankie Carter Randolph, the Challenger 7, Armand Bayou Nature Center, Baybrook Mall, churches, the establishment of our present home church, Heritage Park Baptist, the opening of UH/CLC where I obtained a master's degree in 1975, and most recently the new Clear Brook High School.

As we've witnessed our own children's growth from infancy to adulthood, realizing all of the joys and agonies of their progression, so too we have seen the growth of the space community. Certainly as a parent never quits dreaming and hoping for the brightest future for their young adult, we also look toward a bright future with many possibilities available for the American space program. We can but imagine what may be ahead as a wonderful future for NASA.

As we cherish the photos on our walls of our children and their accomplishments, we look with a lump in the throat at the mementoes of many awards JSC has given. How proud I am today to be called the wife of a JSC employee as well as a citizen supporter of our "space community!"

*Virginia F. McKenzie is the wife of Joe McKenzie, an electronics engineer in the Tracking and Communications Division, and a member of the Apollo Spacecraft Program Office Reunion Committee that planned this month's reunion. Virginia is presently employed as an Educational Diagnostician with Pasadena I.S.D.*

## APOLLO

Continued from Page 8

could be mounted. It would have been the whole ball game, the end of the program, and the U.S. might not try again for years.

The seconds ticked by, the *Eagle* was below 3,000 feet. Bales consulted the guidance experts in his support room. The consensus was to continue. "We're go, Flight," he told Kranz on the loop. Twenty years later, Kranz remembers the moment vividly. He believes the tone of Bales' voice on the loop, sure and confident, was what tipped the scales toward continuing with the mission. "Okay, we're go," he told everyone.

From that point on, there was little to do but hang on and wait as, 240,000 miles away, Armstrong steered the fragile craft toward a landing spot. He was now flying manually, because the spot they had been aiming for, once they neared it, was too rocky in his judgement. So he steered the *Eagle* past that point, fuel quantity now approaching critical margins, while Aldrin called out the altitude and rate of descent. At 40 feet above the surface of the Moon,

Armstrong had found a site and they were now committed. "Forty feet,

down two and a half," the people of Earth heard Aldrin say, "Picking up some dust." A few seconds more, and then both astronauts felt a gentle thump and saw the round status light on the control panel come on, the blue one with white letters which said, "LUNAR CONTACT."

As they scrambled to throw switches and "safe" the vehicle, there was at first no call from *Eagle* to Mission Control. CAPCOM Charlie Duke felt the agony like everyone else in the room. "We copy you down, *Eagle*," he said.

Armstrong responded, "Houston, Tranquility Base here. The *Eagle* has landed."

What followed over the next day was history of the first order, something everyone knew at the time would be remembered for the ages.

Now the three men were returning "safely to the Earth," as Kennedy had instructed, and it was almost — but not quite— over. At splash-down, the people in MOCR could hear cheers and applause from the viewing room, but both safety and tradition dictated that the controllers themselves could not celebrate, could not savor the moment, until the astronauts were safely back aboard the carrier. Even the traditional end-of-mission cigars had to wait.

By this time, the crew had donned the protective garments (although there was some considerable debate as to what and whom the garments were able to protect) and were ready

to leave their cramped and somewhat gamey spacecraft after more than 8 days of isolation from Earth. Armstrong was the first to disembark, followed by Aldrin and Collins. After being doused with an iodine solution, another protective measure against the possibility of Moon germs, they were hoisted aboard a helicopter and flown to the *Hornet*.

Even then, the flight controllers waited before celebrating. "No cigars being lit up here yet," said the Public Affairs Office commentator, who sat in the MOCR and was known to the outside world as the voice of Mission Control. "We're waiting until the crew is on the carrier. A few cigars are being wetted in anticipation of the match, but we don't see any lit yet." All over the world, people were going bonkers, cannons were shooting off and church bells were ringing, but the flight controllers remained stoic.

Finally, when the three astronauts were safely aboard the *Hornet*, the doors to Mission Control were opened and all of the people from the other two work shifts and all the staff support rooms poured into the place. Everyone, it seemed, had an American flag in one hand and a huge stogie in the other. On the central display screen, a new projection appeared, with large blue letters in script against a black background and a drawing of the American flag planted on the surface of the Moon.

The blue script letters on the central screen in Mission Control formed the words to a now

familiar quote, 30 words long, which by 1969 had achieved the status within NASA of something akin to the Holy Grail. It was a sentence from a speech President Kennedy had delivered to Congress in May 1961, the same sentence that had brought a lot of NASA people out of their chairs back then and had caused at least one engineer to turn to another and say, "Great. Now how in the hell are we gonna do that?"

The sentence read, "I believe that this nation should commit itself to undertaking the goal, before this decade is out, of landing a man on the Moon and returning him safely to Earth." As the quote appeared on the central screen in Mission Control that day, another large screen immediately to the right lit up with the mission emblem of Apollo 11, three feet across, and above that were written the words: "Task Accomplished ... July, 1969."

The MOCR was awash in triumph by then, and the emotions which were given full reign at that moment are still resonant today, still able to raise a goose bump or a few misty eyes among the veterans of Project Apollo. Many believe Apollo was the finest hour of their careers, a golden time never to be repeated, because you can do something for the first time only once.

"Apollo was like an intoxicating wine," Kraft would later say, "and certainly the last of the vintage."

# BREAKTHROUGH to the UNKNOWN

**'Max, we're going to go back there one day.  
And when we do they're going to find out it's tough.'**

Dr. Maxime A. Faget's contributions to the space program are extensive, and he is well respected throughout the space community as a key designer and manager throughout this country's space development. During his 35 years with the National Advisory Committee on Aeronautics (NACA) and then NASA, he conceived, proposed and patented the one-man spacecraft used in Project Mercury from which the Gemini and Apollo spacecraft were derived and served in a variety of important engineering and managerial positions. He is currently chief executive officer of Space Industries Inc., actively involved in the design and development of the Industrial Space Facility as a man-tended orbiting laboratory.



By R. Scott Satterwhite

**Satterwhite:** You were one of the original 35 people in the Space Task Group that came from Langley, Va., to Houston to form the nucleus of the Manned Spacecraft Center. What was it like at NASA in those early days?

**Faget:** Those were very frothy days for NASA. There were a great number of opportunities out there in space. Many things had never been done before. The whole concept of penetrating space was legitimized when it was funded and supported by the government. We were in a space race with the Russians, and it was clear they had the lead, so any good suggestion was taken very seriously. NASA quickly divided into two camps: manned versus unmanned space flight. There was a rivalry there, but it was very open. Almost anything was fair game. Any new idea was welcome. Also, as we planned lunar fly-bys to pick landing sites, the general feeling among pilots was, "don't tell me about those pictures, I want to see it with my eyeballs before I land there."

**Satterwhite:** What were your thoughts and feelings during the early Apollo missions?

**Faget:** Once Kennedy made a clear mandate to land man on the Moon, it became extremely exciting throughout the ranks. It meant that the whole

American industrial sector would be mobilized to get this thing done. We were asked what it would cost and we said something like \$10 billion. James Webb tripled it. Nobody had any idea what it would cost. Now we spend a helluva lot more time getting cost estimates. I can't say they are any more accurate, but we sure put a lot more effort into it.

**Satterwhite:** How did you plan for technology breakthroughs and then integrate them into the project?

**Faget:** Our biggest problem in the Apollo program was not the breakthroughs; it was the unknown. We didn't know whether we were going to land on gravel, boulders, dust or hard-packed surface, and the scientific community was absolutely no help. We also had great disagreement among the planetologists. They all had very good imaginations, but none of them had any facts to go on. We had to design the lunar module long before we knew what the surface looked like. The lunar module was fairly well designed before we had the first close up pictures of the Moon. We had a program called Ranger which would take pictures and transmit them back to Earth while diving down at the Moon and the last frame was just hundreds of feet from the surface.

And then it went crashing into the Moon. So what you saw was a pretty small part of the total Moon when you looked at those pictures.

**Satterwhite:** How well did the early designs hold up?

**Faget:** Well, we had a little bit of luck when we did get better pictures, we could see that what we had designed would do the job. If the moon had turned out much different than what we had guessed, we would have had to redesign the landing gear. One of the things that bothered us just as much as the unknown about the lunar surface was the radiation of the lunar environment. There we had some very renowned scientists telling us that the radiation levels could be extremely high and the biggest concern was protecting the astronauts' eyes. I remember we designed a face shield to protect the eyes that was an inch and half thick to absorb the radiation. When we actually got some probes up and started measuring the radiation, it turned out to be lower than we expected.

The other thing we struggled with was getting reliable propulsion systems. We started out planning about 500 feet a second for mid-course corrections. Then by the time we signed the contract with North American to build it, our estimates were down to 300 feet per second. On the last flight, we used about two feet per

second on the way out and one and a half feet per second on the way back. Of course, that meant that the extra propulsion could be used to carry more equipment to the Moon and to bring back more soil and rocks.

**Satterwhite:** How did you feel personally when Neil Armstrong stepped onto the Moon?

**Faget:** I was most concerned about hazards and other things. In order for Apollo to get into lunar orbit, it had to make a firing on the dark side of the Moon, where we were out of communication. That was always a lot of fun. The vehicle would go into blackout and it was several minutes before it came out. It would fire the service module engine and when it came out of blackout we would announce that the firing was made successfully. Those were very anxious moments for me. Of course, there was a great deal of anxiety when they departed from the lunar surface.

So those were more thrilling moments than when Armstrong stepped onto the Moon. In retrospect that was the best thing, but at the time I was not near as moved as I was when they made a safe landing on the Moon. The whole landing was very tense. They used nearly all the landing propellant maneuvering for the landing position. We almost had to abort the landing. We always had the ascent stage standing by in case we didn't have enough propellant to land. I guess that was the most thrilling time of the whole mission. Especially when they said: "Houston, Tranquility Base here. The Eagle has landed."

**Satterwhite:** So how does it feel now to have made such a contribution to mankind?

**Faget:** I think of it as a national accomplishment rather than a contribution. It was an accomplishment of the species to be able to get free of the planet's gravity. I look at the Moon quite often and think about the six landing stages and thousands of footprints up there. Sometimes when Dr. Gilruth and I are out at night for one reason or another, and the Moon's up, he says, "Max, we're going to go back there one day. And when we do they're going to find out it's tough." And he's right.

**Satterwhite:** Do you think we might have forgotten already how tough it really was?

**Faget:** I think we've forgotten how to take chances. Everyone seems so damn worried about getting egg on their face. I'm not talking about taking chances with life, I'm talking

about taking chances about making the wrong guesses. You're going to have some accidents, you've got to plan on winning. I think the next time when we try to get to the Moon we'll find it's an extremely expensive proposition. Unless the system once again gets a lot more flexible and nimble.

**Satterwhite:** So do you see a possibility for manned space flight being a self-supporting industry?

**Faget:** Yes, but the cost has got to come down. We've gotten more sophisticated in our thinking and in our ability to make systems that have greater capabilities but there hasn't been any significant progress in the cost of space operations. The Russians have made great strides in reducing costs. The current space race is not one of who has the greatest technological muscle, it is one of trying to exploit space. The winners are going to be those spacefaring nations which can control and reduce the cost. We have to make things a lot cheaper and take advantage of them or we have just broken down the barriers for other people to exploit space.

**Satterwhite:** So what should we do in the future to take advantage of the opportunities that were opened up throughout the Apollo program?

**Faget:** The whole business of decision making that goes on between concept and getting started has got to be streamlined because there is such a tremendous amount of money wasted in that area. Government regulations must be changed to create a more efficient environment. They will continue to create great wastes of money until someone has the wisdom to get rid of it.

**Satterwhite:** What needs to happen for space to move forward and where should we go with space?

**Faget:** We need low-cost transportation to orbit. This will be based on low cost rocketry technology, which we currently don't have. We put a lot of money into studying launch vehicles but put very little money into studying rocket engines and no money to reduce the cost of rocketry. Until we get engines that don't cost much to produce and operate, we never will have a low-cost transportation system. We end up with engines that are built like a Swiss watch when we ought to end up with engines that are built like a Mack diesel. We need a work horse instead of a Le Mans, but people don't want to spend money on such mundane things. But the whole world would profit greatly if we could reduce the cost to space. Also, a lot of thought ought to be given as to why the Shuttle is still so expensive to operate.

**Satterwhite:** Assuming cost to orbit goes down, then what should we do?

**Faget:** We should exploit space. I really think that an orbiting space station serviced by the Space Transportation System that wouldn't cost much would be a great success. In research, as a recreation area, and a platform for journalists and exploration. Just create the environment and people will find ways to make it meaningful and profitable if access is cheap.

**R.** Scott Satterwhite is a flight software specialist for IBM and chairman of the American Institute of Aeronautics and Astronautics Young Member Committee. In observance of the Apollo 20th Anniversary, the committee has published a booklet entitled "Spirit of Apollo: A Collection of Reflective Interviews." The above Maxime Faget interview is one of more than a dozen contained in the booklet. Complimentary copies will be given to those who attend the NASA/AIAA/Spaceweek Banquet on July 21. More copies are available for a nominal fee; to place orders, write Satterwhite at 3700 Bay Area Blvd. MC 6026A, Houston, 77058.



# APOLLO 20th ANNIVERSARY ACTIVITIES

By Linda Copley

A massive celebration will commemorate the 20th anniversary of the first manned lunar landing the week of July 15-23 in the Clear Lake community.

Houston and the Clear Lake area's Spaceweek activities, which traditionally mark the week of the July 20 lunar landing anniversary observance, will include this year a series of technical briefings, panel discussions, and entertainment events at JSC and in the surrounding communities.

A series of technical briefings and panel discussions by Apollo-era veterans and NASA experts, open to the public, free-of-charge, will be held in JSC's Teague auditorium throughout the week.

The discussions will deal with what we knew and learned about the Moon, how the landing sites were selected, what we would hope to learn through future visits and how decisions were made and missions were planned.

In a step back in time, an Apollo-era "splashdown" party for current and former NASA employees and contractors, their spouses and guests, is scheduled at the Gilruth Recreation Center from 4:30-8:30 p.m., on Thursday, July 20. JSC expects as many as 5,000 to attend the evening's festivities.

An event open to the public and free to all will be the lighted boat flotilla and fireworks display named "A Thousand Points of Light." Planned by the Eagle Twenty Group, a non-profit organization of local Clear Lake businessmen, the event will assemble 1,000 boats on Clear Lake for the parade. At 3:17 p.m. CDT July 20, the exact time of the landing on the moon 20 years ago, the fleet of boats will unfurl and fly American flags. At precisely 9:56 p.m. CDT the boats will turn on their lights to commemorate the exact time Neil Armstrong first set foot on the surface of the Moon. A fireworks display over the lake will follow.

On Friday, July 21, a gala black-tie anniversary banquet honoring NASA and the Apollo program, with remarks by Walter Cronkite, will take

place at 7 p.m. in the Imperial Ballroom at the Hyatt Regency Hotel in downtown Houston. The banquet is sponsored by the American Institute of Aeronautics and Astronautics (AIAA) and the Spaceweek National Committee.

A public open house at JSC on Saturday, July 22 and Sunday, July 23 will kickoff with a parade and rally on JSC grounds Saturday morning. Throughout the entire weekend, from 8 a.m. to 5 p.m., facilities not usually open to the public, as well as special exhibits including a T-38 astronaut training aircraft and a lunar landing training vehicle, will be available for viewing. Buildings open to the public this weekend will include Bldgs. 2, 3, 5, 7A, 9A, 9B, 14, 16, 29, 30 (with a special Apollo 11 program displayed on the Flight Control Room Screens), 31A, and 32. Twentieth anniversary cachets will be given out, free of charge, to all visitors throughout the JSC open house weekend. A special U.S. post office branch will be set up in the visitors center to cancel the postage on the cachets both Saturday and Sunday.

The Lunar and Planetary Institute will hold its first open house in 10 years, featuring special tours and exhibits, from 10 a.m. to 6 p.m. on July 22.

Boeing will offer guided tours by appointment of its equipment processing facilities at 1045 Gemini, Monday, July 17 through Friday, July 21, from 2 until 3 p.m. daily. Contact Julia Sorrels, 280-2023 for reservations.

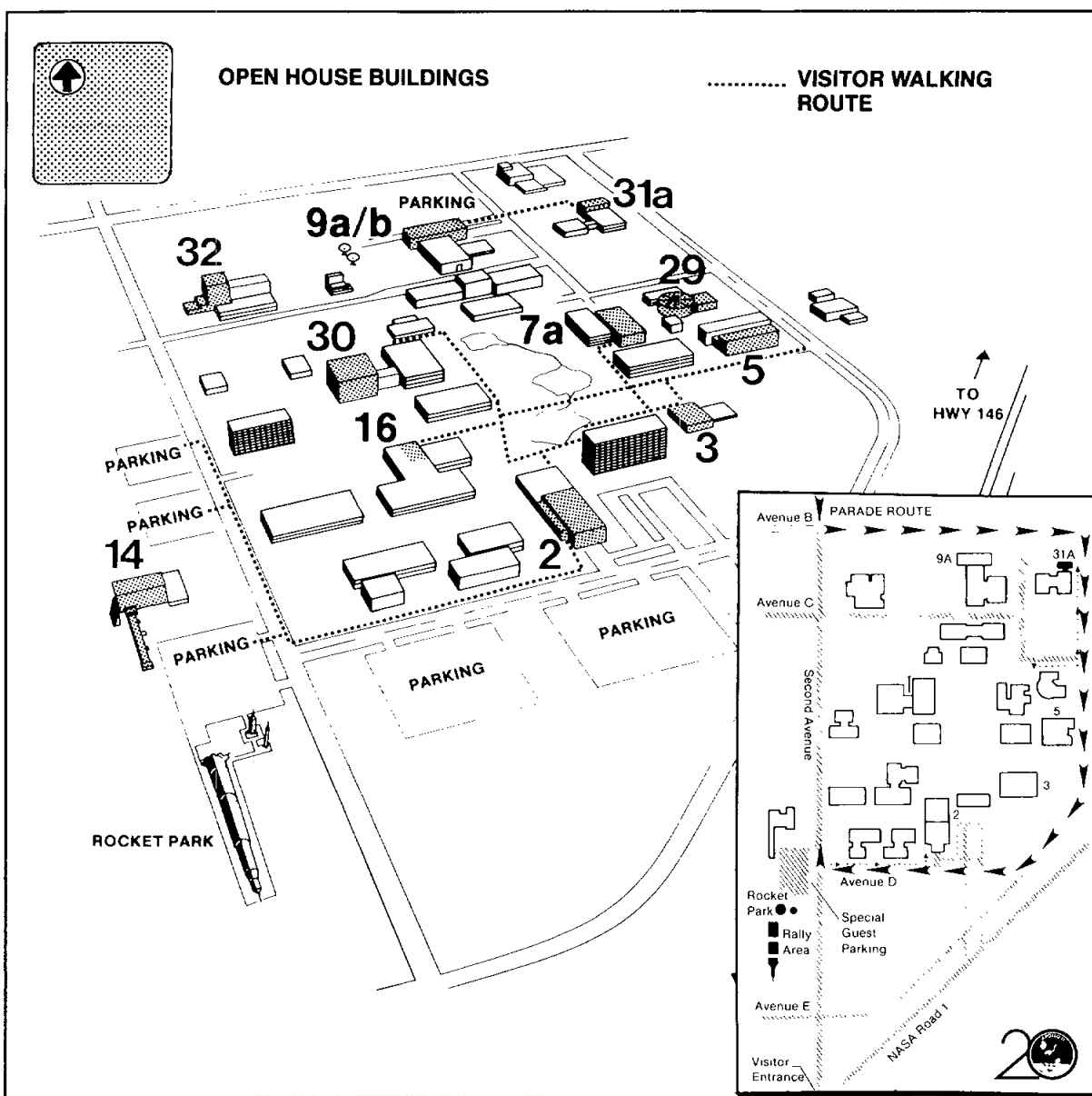
A detailed list of the events and contacts includes:

## SATURDAY

July 15—9 a.m., Aerospace and Air Exhibit, Ellington Field, sponsored by the Civil Air Patrol; 8 p.m., Lunar Rendezvous 5K Space Race and 2 Mile Fun Walk, Gilruth; \$10 entry fee, contact Len Topolski, 333-5576.

## MONDAY

July 17: 11 a.m.-2 p.m., Speakers program, Teague Auditorium: The



Moon Before Apollo—concepts about the origin, evolution, and composition of the Moon, and unmanned precursor missions (Orbiter, Ranger, Surveyor); 1 p.m., "Return to the Moon Simulation," Challenger Center for Space Science Education, contact Lisa Turner, 488-6481, for information; 2-3 p.m., Boeing flight processing facility guided public tours, Monday-Friday, July 17-21 (contact Julia Sorrels, 280-2023, for reservations).

## TUESDAY

July 18: 11 a.m.-2 p.m., Speakers program, Teague Auditorium: Planning the Apollo Missions—mission operations, communications, guidance, software, propulsion, thermal protection and landing dynamics discussed by key project engineers; 3-4:45 p.m., jazz ensemble, "Something Different," live musical entertainment, Teague auditorium; 5 - 6:30 p.m., Apollo 11 movies, Teague auditorium; 6:30 - 9 p.m., Mission Operations Directorate Lunar Landing Party, Gilruth Recreation Center, dinner and dancing, music by "Contra-Band," attendance by invitation only; Landing and Recovery hospitality suite open, King's Inn, 1301 NASA Rd. 1.

## WEDNESDAY

July 19: 11 a.m.-2 p.m., Speakers

program, Teague auditorium: Apollo Scientific Results—program summary from the perspective of Apollo flight directors; 7 p.m., Apollo Recovery Reunion, all Navy personnel who participated in recovery operations are invited, kick-off at the Kings Inn, NASA Road 1. Contact Charles Fillet, 333-3919.

## THURSDAY

July 20: 9 a.m., Recovery Seminar, Gilruth Rec. Center, Rm. 217. 11 a.m., - 2 p.m., Speakers program, Teague auditorium: Apollo Scientific Results—leading lunar and planetary scientists from the Apollo era discuss mission preparation, scientific results and plans for future exploration; 4:30-8:30 p.m. "Splashdown" party, Gilruth, contact Cathy Lamb, x30580; 9 p.m., "1,000 Points of Light" community-sponsored lighted boat display, fireworks and laser light show on Clear Lake, contact John McLeaish, Rm. 106, Nassau Bay Hyatt, 333-2022.

## FRIDAY

July 21: 9-11 a.m., Healthcare Symposium, Teague auditorium, forum held by members of local hospitals to discuss medical spinoff exhibits from space technology.

Three health units will be open to the public for medical screenings, free of charge; medical spinoff exhibits will be displayed in the west corridor of the Visitor Center; 11 a.m.-2 p.m., Speakers program, Teague auditorium: The Moon As Seen By Apollo Astronauts; 7 p.m., Gala Anniversary Banquet: dinner and dancing at the Hyatt Regency Imperial Ballroom, remarks by Walter Cronkite, black tie, contact Ava Lundsford, 283-7312.

## SATURDAY

July 22: 8 a.m.-5 p.m., JSC Open House; 9:30-11:30 a.m., JSC Homecoming Parade begins at Gilruth through JSC, ending in Rocket Park; 11:30 a.m.-noon, JSC Homecoming Rally, Rocket Park, contact Celeste Wilson, 282-1820; model rocket launch (time yet to be determined), Rocket Park; 4-7 p.m., Apollo Spacecraft Program Office Reunion, Gilruth, contact Patsy Hall, x30824; 10 a.m.-6 p.m., Lunar and Planetary Institute open house, contact Beth Williams, 486-2157.

## SUNDAY

July 23: 9 a.m.-4 p.m., JSC Open House.

# CREW

Continued from Page 8

place as a result of the teamwork we had between government, academia and industry, I certainly felt that the American flag is what belonged there. It was characteristic of previous explorations to plant a symbol upon arriving at a new shore and it indeed was a philosophical moment of achievement. It was also a technical challenge as we found that the flag didn't exactly perform as we put it together. It didn't stick in the ground the way we thought it would, there was no breeze to wave it so we had to artificially create a little breeze.

**Headlee:** It seems we're now finding out that our environmental problems tend to impact the entire Earth. Could you sense how fragile the Earth was 20 years ago?

**Armstrong:** It so happened that environmental awareness increased during the same period of history that space travel evolved. There have been various efforts to correlate

those two events. The views from space have given all of humanity an increased appreciation and awareness of the planet.

**Collins:** Yes, somehow the Earth does appear fragile from space. Part of it is simply it's so small. It's about the size of your thumbnail if you hold your arm out at full length. It is absolutely spherical. Atmosphere is not apparent. It shines, it bounces the sunlight very well. So you have this very small, very shiny spherical object and somehow it just appears to me extremely fragile. That would be the one most fundamental quality it projects, one of fragility, I don't know why, but it does.

**Aldrin:** I think it's nice to imagine that voyagers going out to land on another object would reflect back during the mission on how fragile the Earth was. But, to be honest with you, I was particularly concerned about what we were doing. There was a narrow corridor of that fragile body in the atmosphere that we had to aim for and that would enable us to get back. I think after the fact, reflecting back, certainly technology and the advanced nature of society in using resources has caused us to become more sensitive or concerned about our environment because we're using materials, resources that tend to damage that. But I think the advancement of technology as evidenced by the space program holds with it also the keys to better monitoring. Also, it

may be that space provides the means of alternate energy sources, at least projecting energy from space back to the Earth. The advancing technology as evidenced by the space program is evidence of our cause of concern about the atmosphere but it also is our approach to the answers and the solution to our environmental problems.

**Headlee:** What have we learned about the Moon as the result of the soil and rock samples returned by yours and the other Apollo crews?

**Collins:** To me, the important thing was that we learned that human beings can operate successfully on the surface of another planet. We don't have to stay here on Earth. We have a choice of where we want to go and stay, either here on Earth, or on the Moon, or beyond the Moon on a place like Mars. I think that was for me the fundamental lesson of Apollo. We can operate successfully in places other than the surface of the Earth.

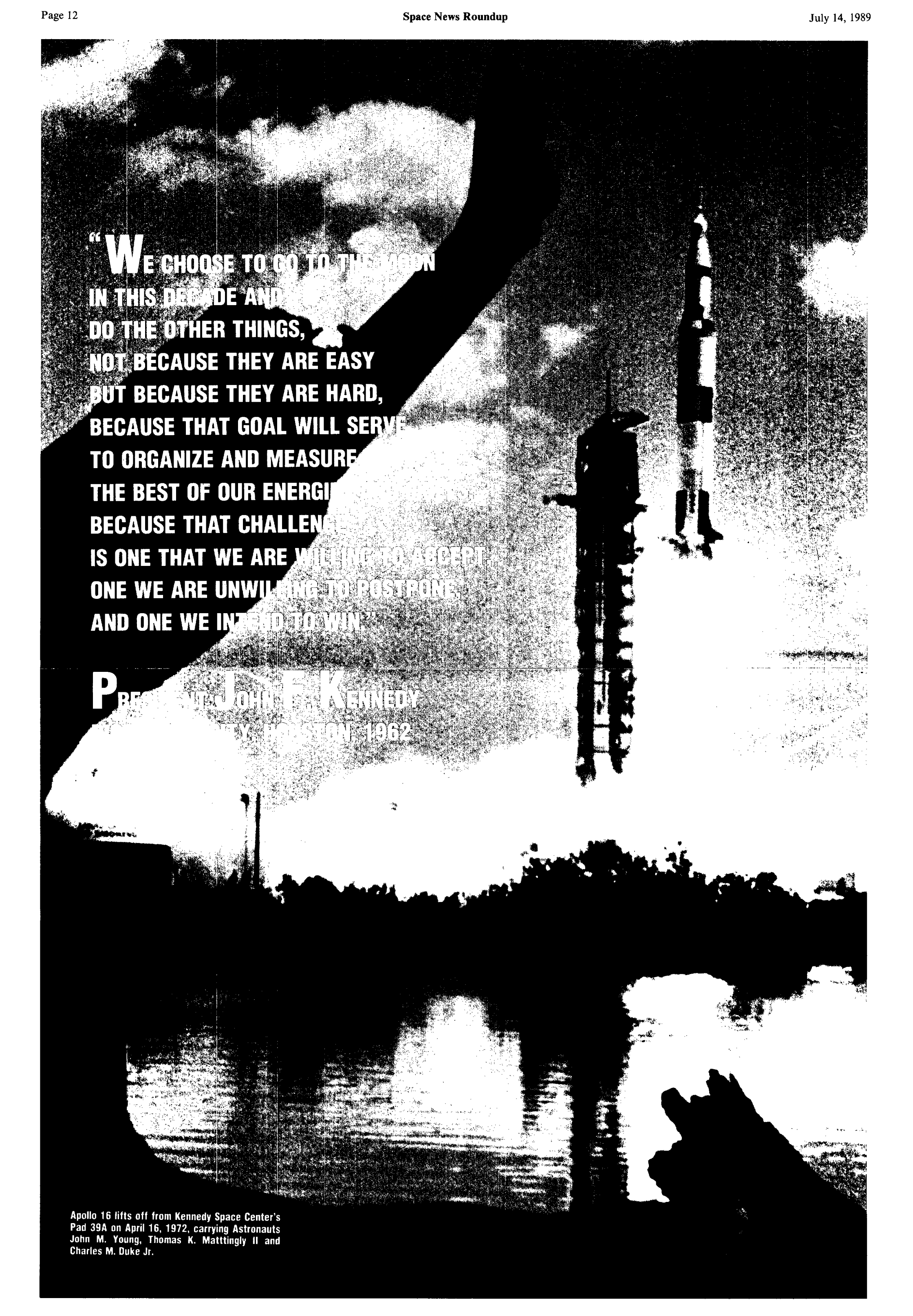
**Aldrin:** It gave us ways of looking at other planets in the universe and gave us a better perspective of how to look back on our own planet and to make judgments as to its origin and some of the dangers it might face in the future. The Moon has many contrasts. It's not a live, tectonic body. It's a very dead object created by combinations of vulcanism and meteorite impact. Rather than answering many questions I think it raised many more

questions.

**Headlee:** One final question. What advice do you have for young people who might be interested in a space career, whether as an astronaut, a scientist, an engineer, an administrator or whatever?

**Collins:** I'm very reluctant to advise young people as to what to study. The requirements for space travel keep changing. They might want a test pilot one day, a physicist next, a medical doctor the following Tuesday. I think what is important is that children do well in whatever field they choose. I think excellence is the key to it and excellence is a lot more important than excellence in a particular field.

**Aldrin:** Space and its frontiers certainly are new and challenging and because they're new and challenging they're also uncertain. I think anyone aspiring that as a career field has to be equipped with a lot of patience and the ability to cope with things not turning out exactly as they may have perceived. Those of us who have been in the space program are now out doing wide varieties of different things. I'm not sure being a crew member particularly prepares one to do anything all that well except to be a little bit better versed in how to respond to questions when they're asked. There's a lot of uncertainty with what may happen and you have to be satisfied with your lot in life.



**“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  
BECAUSE THAT CHALLENGE  
IS ONE THAT WE ARE WILLING TO ACCEPT,  
ONE WE ARE UNWILING TO POSTPONE,  
AND ONE WE INTEND TO WIN.”**

**P**RESIDENT **JOHN F. KENNEDY**  
HOUSTON, TEXAS, 1962

Apollo 16 lifts off from Kennedy Space Center's Pad 39A on April 16, 1972, carrying Astronauts John M. Young, Thomas K. Mattingly II and Charles M. Duke Jr.