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John F. Kennedy Space Center

We will remember Columbia

Kennedy Space Center workers and space program followers around the world were watching for the return home of Columbia and the STS-107 crew during the clear morning of Feb. 1.

The astronauts' families and others had gathered along the Space Shuttle Landing Facility runway to hear the twin sonic booms and see the fast approaching orbiter.

Columbia was scheduled to land at 9:16 a.m. As that time came and passed, everyone continued to wait, wondering when the orbiter would appear.

Then the realization that Columbia wasn't coming back began to dawn on those who were waiting.

The Mission Control Center at Johnson Space Center broadcast the message that Columbia had been lost. The public was warned to be careful of any debris that fell to Earth because it could be covered in toxic chemicals.

Soon the nation and the world would be in shock over the loss of



The Space Shuttle Columbia, at left, lifts off Jan. 16 beginning Mission STS-107. Above are flowers, messages and photos guests left at the Kennedy Space Center Visitor Complex in a memorial to the Columbia astronauts, who lost their lives Feb. 1 during the orbiter's reentry.

Columbia and the beloved crew the ship carried: NASA astronauts Rick Husband, William McCool, Michael Anderson, David Brown, Kalpana Chawla, Laurel Clark, and Israeli astronaut Ilan Ramon.

"Coming from many backgrounds and countries of birth, these seven joined hands with each

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"Coming from many backgrounds and countries of birth, these seven joined hands with each of us to undertake the most challenging task in the history of human kind – exploring space."

ROY BRIDGES JR.
KENNEDY SPACE CENTER DIRECTOR

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Columbia astronauts gave their all

The STS-107 astronauts vanished with Columbia the morning of Feb. 1, but they live on in our memories.

A husband and father of two, the determined Commander Rick Husband realized his dreams of becoming an astronaut after four attempts: "From the time I was about four years old, I wanted to be an astronaut. It was just so incredibly adventurous and exciting to me."

However, the devoted Christian was most proud of his personal treasures.

"The most enjoyable part of my

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STS-107 crew members: Seated (from left) are Rick Husband, mission commander; Kalpana Chawla, mission specialist; and William C. McCool, pilot. Standing (from left) are David Brown and Laurel Clark, both mission specialists; Michael Anderson, payload commander; and Ilan Ramon, payload specialist representing the Israeli Space Agency.

President George W. Bush comforts nation

EDITOR'S NOTE: President George W. Bush addressed the nation Feb. 1 on the loss of Space Shuttle Columbia and its astronaut crew just hours earlier.

My fellow Americans, this day has brought terrible news and great sadness to our country.

At 9 a.m. this morning, Mission Control in Houston lost contact with our Space Shuttle Columbia.

A short time later, debris was seen falling from the skies above Texas.

The Columbia is lost; there are no survivors.

On board was a crew of seven: Col. Rick Husband; Lt. Col. Michael Anderson; Comm. Laurel

Clark; Capt. David Brown; Comm. William McCool; Dr. Kalpana Chawla; and Ilan Ramon, a colonel in the Israeli Air Force.

These men and women assumed great risk in the service to all humanity.

In an age when space flight has come to seem almost routine, it is easy to overlook the dangers of travel by rocket, and the difficulties of navigating the fierce outer atmosphere of the Earth.

These astronauts knew the dangers, and they faced them willingly, knowing they had a high and noble purpose in life.

Because of their courage and daring and idealism, we will miss them all the more.

All Americans today are thinking, as well, of the families of these men and women who have been given this sudden shock and grief.

You're not alone. Our entire nation grieves with you. And those you loved will always have the respect and gratitude of this country.

The cause in which they died will continue.

Mankind is led into the darkness beyond our world by the inspiration of discovery and the longing to understand. Our journey into space will go on.

In the skies today we saw destruction and tragedy. Yet farther than we can see there is

comfort and hope.

In the words of the prophet Isaiah, "Lift your eyes and look to the heavens. Who created all these?"

"He who brings out the starry hosts one by one and calls them each by name. Because of His great power and mighty strength, not one of them is missing."

The same Creator who names the stars also knows the names of the seven souls we mourn today.

The crew of the shuttle Columbia did not return safely to Earth; yet we can pray that all are safely home.

May God bless the grieving families, and may God continue to bless America.

Sean O'Keefe shares his condolences

EDITOR'S NOTE: NASA Administrator Sean O'Keefe made a statement following the Columbia accident Feb 1.

The following are his comments pertaining to the fallen astronauts and their families.

... I was here this morning with the families of the astronauts and their friends.

It started out as a pretty happy morning, as we awaited the landing of STS-107. We had highly anticipated their return because we couldn't wait to congratulate them for their extraordinary performance and their excellent effort on this very important science mission.

They dedicated their lives to pushing scientific challenges for all of us here on Earth.

They dedicated themselves to that objective and did it with a



happy heart, willingly and with great enthusiasm.

The loss of this valued crew is something we will never be able to get over.

We have assured the families that we will do everything, everything we can possibly do to guarantee that we work our way through this horrific tragedy.

We ask the members of the media to honor that too.

Please respect their privacy and please understand the tragedy that they are going through at this time. We will help the media assure that this will be the case as well.

We trust the prayers of the Nation will be with them and with their families.

A more courageous group of people you could not have hoped to know – an extraordinary group of astronauts who gave their lives-

and the families of these crew members.

They knew exactly the risks. And never, ever did we want to see a circumstance in which this could happen.

We diligently dedicate ourselves every single day to assuring these things don't occur. And when they do we have to act responsibly, accountably and that is exactly what we will do.

A statement from the families of Columbia

On January 16th, we saw our loved ones launch into a brilliant, cloud-free sky. Their hearts were full of enthusiasm, pride in country, faith in their God, and a willingness to accept risk in the pursuit of knowledge – knowledge that might improve the quality of life for all mankind. Columbia's 16-day mission of scientific discovery was a great success, cut short by mere minutes – yet it will live on forever in our memories. We want to thank the NASA family and people from around the world for their incredible outpouring of love and support. Although we grieve deeply, as do the families of Apollo 1 and Challenger before us, the bold exploration of space must go on. Once the root cause of this tragedy is found and corrected, the legacy of Columbia must carry on – for the benefit of our children and yours.

Apollo 1, Challenger and Columbia

Crews will never be forgotten

The employees at Kennedy Space Center have experienced painful emotions following the tragedies that have struck the space program.

The Apollo 204 fire took the lives of three astronauts during a test at Launch Complex 34 on Jan. 27, 1967. Nineteen years passed before disaster struck again as Space Shuttle Challenger exploded in plain sight of KSC on Jan. 28, 1986. Then Feb. 1 seventeen years later, again, the unthinkable: Seven explorers, returning home from a successful science mission vanished, seemingly into thin air.

Angelo Taiani, a NASA retiree and volunteer escort for Public Affairs, recalls that the Apollo fire was debilitating because many employees got to know the astronauts. He even had occasion to talk to Gus Grissom himself.

"I saw the capsule while it was being dismantled in the Operations and Checkout Building. The whole inside was completely black and charred," he said

Taiani was on the Vehicle Assembly Building roof with press photographers when Columbia was due home. The weather was somewhat hazy, and the photographers were grumbling that it was the worst weather for any landing at KSC, that they would not be able to see the orbiter come in because of the haze. But shock set in following a radio message that transmissions from the orbiter had stopped over Texas, and they should return to the press site.

Memories of Challenger are still painful for Barry Grinter, a senior electrical engineer with United Space Alliance.

"Back then," he recalled, "we were working in the VAB doing testing on the solid rocket booster forward and aft skirts. Since we were close by, we'd watch the orbiters being raised and lowered into the high bays to be mated with their boosters and external tanks. Since we lived with them, we felt very close to the orbiters."

After the initial shock, he



Three groups of astronauts have a special place in the hearts of Kennedy Space Center workers and others across the globe. Their heroism as space explorers will never be forgotten. At left, the Columbia astronauts pose in the white room at the launch pad before the STS-107 mission. Kneeling in front are (left to right) Payload Specialist Ilan Ramon, Pilot William "Willie" McCool and Mission Specialist David Brown. Standing in back are (left to right) Payload Commander Michael Anderson, Mission Specialist Kalpana Chawla, Commander Rick Husband and Mission Specialist Laurel Clark. Below left, pictured in the white room about 17 years before, are Challenger (from left) Payload Specialists Christa Corrigan McAuliffe and Gregory Jarvis, Mission Specialist Judith Resnick, Commander Francis "Dick" Scobee, Mission Specialist Ronald McNair, Pilot Michael Smith and Mission Specialist Ellison Onizuka. Below right are Apollo I astronauts (from left) Virgil "Gus" Grissom, Edward White II and Roger Chaffee.



observed that uncertainty sets in.

"On everyone's minds are thoughts of layoffs and downtime. The feelings of guilt can be overwhelming when you realize that you are worrying about your job when someone has just died."

Frank Kiep, an administrative services supervisor for Indyne, Inc., said printing services are in high demand after an accident. He recalls that security was so tight after the Apollo fire they were locked down in the VAB while they were working but that after the Challenger accident, a lockdown was not required.

Kiep planned to watch Columbia land while he was fishing. He learned of the accident when his wife called him by cell phone.

"I felt disbelief," he said. "The thing that struck me when I first heard the news was that I didn't know their names, and I felt bad about that. I wanted to know their names."

Jane Kleinschmidt, executive assistant to Center Director Roy Bridges, relocated to KSC following the Apollo fire.

When Challenger launched, she was working for JoAnn Morgan in Payloads Projects. Seeing it with her own eyes, the event had an deep impact on Kleinschmidt.

"The STS-107 mission was very different because I was much more involved and had escorted guests to view the launch. I had even met Commander Rick Husband who was very personable and genuine," she said. "Even though I had hoped to never go through this kind of tragedy again, the prayers of support we have received have really helped get us through these last few days. I think this tragedy has drawn the NASA family closer together."

Bill Gary, a NASA facility manager for the O&C Building where the crew quarters are located, has watched the astronauts come and go as they prepare for their missions. He mused, "After Challenger, you never want to believe that it will happen again, but it almost goes with the territory. Each person who is accepted into the astronaut program knows that on any given mission lives may be

lost, but the opportunity to fly into space and to be a part of space history, and all that goes with it, outweighs any fears. Realistically, the chances of being killed in a car accident are greater than being killed on a space flight."

Center Director Roy Bridges, a former astronaut and retired U.S. Air Force Major General, rallied the troops Feb. 3, with words of encouragement: "The night that we lost the Challenger, I gathered my family around me, and we hugged each other and cried together over the loss of our friends, and I recall saying that I intended to be on the next crew to return to space. That wasn't to be, but I have in some way been involved in almost every mission since. I believe in what we are doing and know that the risks are worth it. I firmly believe that each of the seven aboard Columbia made their choice and would make it again for all the right reasons. We are a people who live to explore. Thank God that we have people who are willing to take those risks. Where would we be without them?"

KSC and the world



Employees listen to the Columbia crew memorial held at KSC Space Shuttle Landing Facility Feb. 7.

Employee Assistance Program counselors here to help workers

Workers at Kennedy Space Center are urged to call the Employee Assistance Program hotline if they need help dealing with the Columbia tragedy.

Because each person copes with such tragedy in a unique way, some workers will find it especially helpful to talk to a trained counselor, said Dr. David Tipton, chief, Aerospace Medicine and Occupational Health Branch in the Spaceport Services Directorate.

Specially trained area counselors are available.

Center Director Roy Bridges Jr. urged workers not to suffer alone with survivor's guilt.

"This guilt is something that can depress us and rob us of the focus we all need to get back to flying again," he said. "It is human to feel this way, but we must fight it. We have counselors available to help you deal with the natural human emotions of grief and the accompanying guilt that we may have in some way done something or thought something that we shouldn't have. I urge you to take advantage of this help. With expert help and some time we can recover."

KSC employees who believe they could benefit from counseling should call the EAP hotline at 867-7398 to receive contact information for counseling.

Following the Columbia tragedy Feb. 1, people across the world began sending condolences to the astronaut families and the NASA centers, including Kennedy Space Center.

Many space program workers were individually contacted by family and friends who wanted to show their support.

The public began to spontaneously create memorials to the fallen astronauts in various locations, including the Astronaut Memorial



At top, Kennedy Space Center managers and workers and community members listen to the Columbia crew memorial at Space Shuttle Landing Facility Feb. 7. Above, speakers for the event included, from left, NASA Associate Deputy Administrator James Jennings, Florida Governor Jeb Bush, NASA Administrator Sean O'Keefe, Columbia's first pilot Robert Crippen, astronaut Jim Halsell, and members of the clergy.

Space Mirror at the KSC Visitor Complex and the entryway to Johnson Space Center.

Memorials books and banners were signed to honor the astronauts. Girls attending the Sally Ride Science Festival in Orlando Feb. 2, for example, filled a banner full of signatures.

Various churches and other organizations across the nation held memorials for the Columbia crew.

A memorial was held at Johnson Space Center

Feb. 4 and the Washington National Cathedral Feb. 6.

KSC held its memorial service the morning of Feb. 7 at the Space Shuttle Landing Facility. Taking part in the service were NASA Administrator Sean O'Keefe, former KSC Director Robert Crippen, astronaut Jim Halsell, Florida Governor Jeb Bush, several KSC employees, area clergymen and members of Patrick Air Force Base.

Crippen said, "The grief in the hearts of the

World grieves



Kennedy Space Center Director Roy Bridges and Deputy Director James Kennedy Feb. 3 place a wreath in front of the Astronauts Memorial Space Mirror at the KSC Visitor Complex.



President George W. Bush speaks at the Columbia memorial held at Johnson Space Center Feb. 4



Angelo Taiani, a NASA retiree was escorting photographers on the Vehicle Assembly Building roof waiting for Columbia's return Feb. 1.



The Columbia crew memorial service held at Kennedy Space Center. From left to right: Deputy Administrator for Institutions and Asset Management, Columbia's first pilot and former KSC Director



Employees react at the Columbia memorial held at KSC.



Guests at the KSC Visitor Complex sign a Columbia memorial book.



On the top of the mound where the NASA News Center is located, NBC television news anchor Tom Brokaw gets ready to give a report on the loss of Columbia.

At right and below, students attending the Sally Ride Science Festival in Orlando sign a banner in memory of the Columbia astronauts. The Feb. 2 festival drew girls from the Central Florida area to learn more about science and math careers.



crew's families and the entire NASA family, which includes all of our contractor community, which supports the Agency, is very heavy. Still, this crew lived lives that deserve our celebration. Yes, they were cut short, but these brave men and women lived their lives to the fullest doing much more in their time here on Earth than many can imagine.

"Words at a time like this seem weak. They don't fully communicate the depth of our

feelings. The NASA family speaks much clearer with actions. The action that is being taken to find the cause of the accident, correct it and continue the crew's journey of discovery in space is the grandest tribute that we can pay to them. I'm certain that is what they would have wanted."

The KSC service concluded with a "Missing Man Formation Fly Over" by NASA T-38 jet aircraft.



Investigation teams search for answers

NASA Administrator Sean O'Keefe announced a Mishap Interagency Investigation Board would provide an independent review of events and activities leading to the loss of the seven astronauts on board Space Shuttle Columbia Feb. 2, the day after the Columbia accident.

All members of the panel, according to O'Keefe, are "Safety and Mission Assurance related officials in other departments of the Federal government, from the Air Force, the Navy, the Department of Transportation, and across the federal expanse."

The board is headquartered at Barksdale Air Force Base in Louisiana, close to the East Texas area where the bulk of Columbia's debris has been found. The debris is to be reassembled for analysis at Kennedy Space Center.

Chairing the panel is U.S. Navy Adm. Harold W. Gehman Jr. The admiral co-chaired the independent commission that investigated the attack on the U.S.S. Cole in Aden, Yemen, in October 2000 and once served as commander-in-chief of U.S. Joint Forces Command.

Senior NASA leaders who are members of the board include G. Scott Hubbard, director, NASA



A Kennedy Space Center team works to support the investigation.

Ames Research Center, Moffett Field, Calif.; Bryan D. O'Connor, NASA associate administrator and former astronaut, Office of Safety and Mission Assurance, Headquarters; and Theron Bradley Jr., NASA chief engineer, NASA Headquarters, Washington. O'Connor will serve as ex-officio member. Bradley will serve as executive secretary.

O'Keefe said Feb. 6 that other board members would be added if need be to provide further expertise and independence.

Under the umbrella of the Mishap Interagency Investigative Board, there are more than 20 investigatory teams working on the various aspects of the Columbia accident. There is a Mishap Investigative Team based in Houston, at the Johnson Space Center, comprising representatives

from the Federal Emergency Management Agency (FEMA), the Environmental Protection Agency (EPA), Federal Bureau of Investigation, Department of Homeland Security, teams of propulsion system experts from Marshall Space Flight Center.

The recovery part of the investigation is under the direction of FEMA. The EPA deployed hazardous material teams to collect debris, mobilized Airborne Spectral Photo-Imaging of Environmental Contaminants Technology aircraft to help locate debris using infrared sensors to detect hazardous chemicals, and deployed the Trace atmospheric Gas Analyzer Unit to provide mobile analytical support.

A Rapid Response Team from KSC includes 80-plus engineers. Working with the EPA, the

Kennedy response team is helping to photograph and collect debris as well as analyze the pieces. Mike Leinbach, launch director, is leading the KSC teams.

A Management Recovery Team at KSC is coordinating KSC technical support and assets to the Mishap Investigation Team in Barksdale, La., and providing support for the Recovery teams in Los Angeles, Texas, New Mexico, Arizona and California.

In addition, the team is following up on local leads pertaining to potential debris in the KSC area. Mike Wetmore, director of Shuttle Processing, is handling the KSC support to the teams.

The internal investigation is being processed and managed by Gehman's investigative board, which will ultimately make recommendations based on the findings.

"We have no timetable, but we have two main responsibilities here," Gehman said. "One is to future astronauts, who need to know we've done everything possible to make it safe for them to fly. The other is to the three people currently in orbit on the International Space Station, who need to have the Shuttle program fly as soon as possible."

COLUMBIA ...

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of us to undertake the most challenging task in the history of human kind – exploring space," KSC Director Roy Bridges told workers Feb. 3.

Soon after the accident, NASA Administrator Sean O'Keefe and Associate Administrator for Space Flight Bill Readdy addressed the nation about the disaster, offering condolences to the astronaut families and detailing steps being taken to find the cause of the orbiter breakup. That afternoon President George W. Bush spoke words of comfort to the nation.

Then NASA began a series of press briefings with Space Shuttle Program Manager Ron Dittemore, Chief Flight Director Milt Heflin and others to express concern for the families of the fallen astronauts and to thoroughly discuss investigations into what caused Columbia to break up during its reentry. The possibility of terrorism was quickly dismissed. The NASA press conferences detailed the collection of Columbia over a debris field stretching over several states, primarily Texas and Louisiana.

Across the nation churches and other

organizations began to hold a series of memorials for the Columbia crew, including the Feb. 6 memorial held at the Washington National Cathedral. NASA held a memorial at Johnson Space Center Feb. 4. Other centers held memorials, including KSC on Feb. 7.

Condolences from across the world poured into the NASA space centers, to space program workers and to the astronaut families grieving over the loss of the astronauts.

Bridges addressed the KSC workforce Feb. 3: "... let me share with you the comments of our administrator as he boarded his plane to fly back to D.C. after a grueling and tragic day here at KSC on Saturday. He said to pass on to you that he felt very fortunate that he was at KSC when this happened. Every one responded professionally and expertly to deal with the situation as we had planned and trained. ... Thank all of you who were on duty that day for all you did to help me, Bill Readdy, Sean, and the crew families deal with this tragedy in an appropriate way. It was a painful and difficult day, but your actions helped us immeasurably and brought great credit to this Agency and our Nation."



The STS-107 crew exits the O&C Jan. 16: In front are Pilot William "Willie" McCool (left) and Commander Rick Husband (right). Following in the second row are Mission Specialists Kalpana Chawla (left) and Laurel Clark; in the rear are Payload Specialist Ilan Ramon, Payload Commander Michael Anderson and Mission Specialist David Brown.

Columbia reentry timeline

January 31, 4:39 p.m. EST Blue Team crew members Pilot William McCool, Mission Specialist David Brown and Mission Specialist Michael Anderson, were awakened by the song "Silver Inches" by Enya. The song was a general request. During the afternoon and evening, Friday, the Blue Team crew members stowed supplies and gear and went about the normal routine of preparing for return.

Feb. 1, 1:35 a.m. EST Red Team crew members Commander Rick Husband, Mission Specialist Kalpana Chawla, Mission Specialist Laurel Clark and Payload Specialist Ilan Ramon were awakened by the song "Scotland the Brave" sung by The Blackwatch and the Band of 51 Highland Brigade. It was a request by Mission Specialist, Laurel Clark.

During the early morning hours the seven-member crew of STS-107 prepared for the scheduled Shuttle landing at Kennedy Space Center. They stowed supplies and gear, checked instrumentation and sensors, and aided each other in donning their launch and entry suits. Prior to **8:00 a.m. EST** Commander Rick Husband and Pilot William McCool configured orbiter settings to prepare for the scheduled deorbit burn maneuver.

8:00 a.m. EST Commander Rick Husband commenced with Columbia's deorbit burn maneuver. This maneuver sets the orbiter in the proper position for reentry into Earth's atmosphere.

8:15 a.m. EST The deorbit burn commenced. Columbia was over the Indian Ocean.

8:17:38 a.m. EST The deorbit burn ended. Columbia was over the Indian Ocean.

8:52 a.m. EST Mission Control noted three left main gear brake line temperature sensors showed an unusual rise in the left wheel well area.

8:53 a.m. EST A fourth left brake line strut actuator temperature sensor showed a 30-40 degree rise in temperature over a five-minute period.

8:55 a.m. EST A fifth left brake line main gear sensor showed a sharp rise in temperature.

8:57 a.m. EST Left wing temperature sensors failed. No further data were being received on the ground.

8:59 a.m. EST Just before communication was lost with Columbia, there was evidence of drag on the aerosurfaces of the left wing, causing two out of four yaw steering jets in that area of the Shuttle to fire for 1.5 seconds to counteract the increased drag.

The last words heard before Mission Control in Houston lost communication were said by Commander Rick Husband. It was "Roger" in response to Mission Control's request to perform a check of certain control readings.

9:00 a.m. EST Mission Control lost communication with Columbia and continued to monitor for a response from the crew. Then followed the realization that Columbia and her crew of seven had been lost.

Columbia's reentry stopped short

Weather at Kennedy Space Center's Shuttle Landing Facility was near perfect Feb. 1 as an overnight fog burned away in the morning light.

Having wrapped up 16 days of groundbreaking science work on STS-107, Columbia's crew members began preparations a few minutes before 4 a.m. for landing. During the next four and a half hours until the deorbit burn, the payload bay doors were closed for re-entry, the flight control software known as OPS 3 was configured for the upcoming burn, and the crew members donned their orange flight and entry suits and took their seats.

From his console in the Mission Control Center in Houston, CAPCOM Charlie Hobaugh cheerfully notified the crew that they had been given the "go" for the deorbit burn.

Shortly after 8 a.m., Columbia was maneuvered to the proper deorbit burn attitude – a tailfirst orientation facing into the direction of travel. Just a few minutes later, at 8:15 a.m., the Orbital Maneuvering System engines fired for nearly three minutes, just enough of a deorbit burn to slow Columbia's

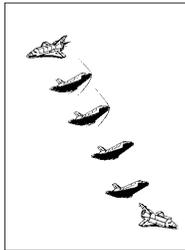
speed down from orbital velocity and begin its descent back to Earth.

It typically takes an orbiter 25 to 30 minutes from the deorbit burn to descend low enough to begin feeling the effects of Earth's atmosphere.

Columbia followed that standard and reached that point, called Entry Interface, about 28 minutes after deorbit burn.

Like all returning orbiters, Columbia was oriented with its wings level and its nose tilted upward at an angle of about 40 degrees from horizontal. This orientation allows the thermal tiles that blanket the orbiter's underbelly to absorb the bulk of the heat generated by re-entry.

A program of four steep banks, called roll maneuvers, help slow down the orbiter during the entry phase. The orbiter flies in a lengthened "S" pattern, starting with a roll to the left or right side and then completing a series of three roll "reversals" in which the orbiter rolls back and forth to



balance out the banks.

Columbia began its roll program on schedule about ten minutes before 9 a.m.

Columbia's intended flight path took it across California and the American southwest, across Texas and Louisiana, and along

the coast of the Gulf of Mexico as it approached KSC. As it glided through the upper reaches of the sky over Calif., however, Columbia's landing suddenly departed from the norm.

At 8:52 a.m., a series of abnormally high temperature readings began to appear in rapid succession in the area of the left main landing gear wheel well. Minutes later, sensors indicated an increase in left tire pressure.

Meanwhile, temperatures on Columbia's fuselage above the left wing rose 60 degrees during five minutes. Shortly thereafter, all left wing temperature sensors failed "off-scale low."

As telemetry received in Mission Control began to indicate an increased drag on Columbia's left

side, the orbiter's flight control system tried to correct the movement by rolling back to the right.

Then at 8:59 a.m., with only slightly more than 16 minutes remaining until landing, communications were lost with Columbia.

The vehicle and crew had been unable to overcome the problem it encountered upon reentry, a problem that is under investigation.

"There is some... missing link contributing to this event," said Ron Dittmore, Space Shuttle program manager.

Had Columbia's landing continued as flawlessly as it began, Commander Rick Husband would have taken over manual control of the vehicle as it dropped below the speed of sound. A "heading alignment cylinder," an imaginary circle at the end of the runway, would have guided Husband toward the runway's centerline. Pilot Willie McCool would have deployed the landing gear. Columbia, America's flagship space Shuttle, would have glided to her 28th landing.

Instead Columbia was traveling at Mach 18 at an altitude of 207,135 feet as it broke up over the skies of Central West Texas.

CREW ...

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life has been my time with my family," said Husband, who was born in Amarillo, Texas.

A young girl weaving around on her bike gazing skyward at air-planes, forming dreams and goals – we all know idealistic children like this and Kulpana Chawla was one of them. When remembering her aerospace engineering fascination beginnings, the STS-107 mission specialist recalled a day from her small hometown Karnal, India.

Her striving for perfection will undoubtedly motivate future trailblazers as her heroes did for her: "During my life, I've been inspired by explorers ... the perseverance and incredible courage with which they carried it out."

Payload Commander Michael Anderson, who along with his wife and children considered Spokane, Wash., home, was a selfless civil servant: "We train and try to prepare for the things that may go wrong to do the best we can. But, there's always that unknown. And I guess it's that unknown that I don't like. But, the benefits for what we can do on orbit, the science that we do and the benefits we gain from exploring space are well worth the risk," he said.

Mission Specialist David Brown, born in Arlington, Va., treasured the uniqueness of his extended mission, but reflected on the joys of his Earthly life: "The best advice I have heard since I came to the Astronaut Office was something I



heard John Glenn say. He said, 'When you get up there, you need to make sure you look out the window.' When you look out the window, you're not looking at the stars or the Moon. You're looking at the Earth. And, invariably people say that they think about people. And, they invariably say they think about the people they care about. So, I think the best advice I've gotten is to make sure you really appreciate how wonderful an experience it is."

Pilot and father William "Willie" McCool was also thrilled to participate in a longer mission and



The STS-107 crew share a humorous moment on Launch Pad 39A during Terminal Countdown Demonstration Test activities Dec 19. From left are Commander Rick Husband, Payload Specialist Ilan Ramon (the first Israeli astronaut), Pilot William "Willie" McCool, Mission Specialists Laurel Clark and David Brown; in the foreground (back to camera) is Payload Commander Michael Anderson. At left are photos of the crew during training and on orbit.

understood the mission's international reach: "I feel blessed to have an extended-duration spaceflight from the standpoint of just having more opportunities to absorb the whole experience," said McCool, who was born in San Diego, Calif. "The whole mission seems to be borderless in a way. ... I'm just pleased that we have the opportunity to share what we're doing with folks around the world."

Mission Specialist Laurel Salton Clark reminded the nation: "Some things are only capable of being done in space. Examples of that are looking at our Earth from that far away, and understanding the entire processes of storms and weather patterns, and oceans, and coastlines – the best way to understand that all is from that vantage point."

A wife and mother, Clark hoped to inspire the young people who, unbeknownst to her, will continue her work.

A lineage of heroes comprises Israeli astronaut and father Ilan Ramon's family tree and clearly that trend didn't skip his generation: "I think it's very, very peculiar to be the first Israeli up in space. Especially because of my background. But my background is kind of a symbol of a lot of other Israelis' background. My mother is a Holocaust survivor. My father fought for the independence of Israel, not so long ago. I was born in Israel and I'm kind of the proof for them, and for the whole Israeli people that whatever we fought for and we've been going through."

STS-107 exemplified the importance of international cooperation and science, but perhaps the greatest footprint the mission left on our hearts is that we all are vulnerable to losing loved ones and grieve equally. Remembering them is the best tribute we can offer for their ultimate sacrifice.



Special issue

This special issue of "Spaceport News" is dedicated by the Kennedy Space Center family to the memory of the Columbia astronauts and astronauts lost in the Challenger and Apollo 1 accidents. The world has benefited and will continue to benefit because of these heroic astronauts' determination to fulfill NASA's mission of space exploration.



John F. Kennedy Space Center
Spaceport News

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