



Chapter 1: A chill at the Cape

NBC's Cape Canaveral correspondent retraces the Challenger tragedy

By Jay Barbree
Correspondent
NBC News

In an exclusive eight-part series, NBC News' longtime Cape Canaveral correspondent, Jay Barbree, recounts the inside story behind the 1986 destruction of the shuttle Challenger, in which seven astronauts lost their lives.

CAPE CANAVERAL, Fla. - There's cold. Then, there's *cold*. In late January 1986, a frigid weather front rolled southward out of Canada and headed straight for Florida. The rare, bone-chilling freeze gripped unsuspecting palms and palmettos, stiffened and cracked rolling groves of citrus and froze Florida's sprawling Kennedy Space Center to a slow crawl. The spaceport — making use of the latest electronic miracles and a step ahead of the cutting-edge of technology — had never felt such a chill.

During the predawn hours of Jan. 28, temperatures fell below the freezing mark. Frost appeared on car windshields, and ice fog formed above canals, swamps, lakes and salt-water lagoons. Alarmed forecasters predicted a hard freeze in the low 20s by sunrise.

Not a single tropical insect moved in the frigid stiffness. Birds accustomed to warm ocean breezes huddled in stunned groups. Fire and smoke rose from smudge pots set across Florida's citrus belt in last-ditch attempts to save the budding produce.

Along the beaches beneath the towering rocket gantries, only the sparkling white form of space shuttle Challenger appeared unconcerned about the freeze. It stood bathed in dazzling floodlights, its metal and glass and exotic alloys unfeeling of the arctic air.

The great spaceship appeared to be a monstrous ice sculpture above the framework of its launch tower.

Night vanished, and sunrise brought the first hope of warmth — and the seven astronauts — to the launch pad.

They rode the elevator up to the walkway of the service tower that led to the "White Room," the dirt-free enclosure surrounding the entry hatch to the shuttle crew cabin. The NASA television cameras showed the astronauts shivering as icy wind gripped them.

As they walked along the bridge 195 feet above the pad to their launch vehicle, the astronauts took only careful, short steps — so they wouldn't slip and fall on icy patches.

Politically correct

No one had ever seen a more "politically correct" crew. It was a public relations dream, made to order for worldwide acclaim. You simply could not ask for more: two white women, an African-American man, an Asian-American man and three white men.

Second only to the politically correct stature of the flight team was the selection of a social science teacher from one of the bastions of America itself: New Hampshire. Sharon Christa McAuliffe was

smart, experienced, courageous, had a smile big enough to adorn any magazine cover and was a brilliant selection by NASA for the coveted role of the planet's "first citizen in space."

This one woman had emerged from an enthusiastic wave of more than 11,000 applicants giving their all to become the one individual selected for NASA's acclaimed Teacher in Space Project. Her audience of well-wishers went far beyond her contemporaries and the everyday citizens who wished her well and prayed for her success. Millions of schoolchildren eagerly awaited her departure from Earth on a mountain of fire created by the shuttle's twin rockets. She would blaze her own trail in the footsteps of such giants as Neil Armstrong, John Glenn, Sally Ride, Alan Shepard and the others who had defied the odds to reach Earth's orbit and beyond.

Make no mistake about the intent: McAuliffe wasn't going into space as a scientific or engineering member of the crew. She was leaving Earth to command the attention of the world and awe-struck American schoolchildren. Having squirmed beneath congressional brickbats and attempts to slash the NASA budget, even to do away with the superbly engineered but devastatingly expensive shuttle program, NASA stoked the Teacher in Space extravaganza as the perfect response to dull the political ax held against it.

You could scrub an astronaut, cancel a mission, condemn a fleet — but you did not, in any way, shape or form mess with Apple Pie, Mom and Our Sainted Teacher.

Cloudless, perfect sky

"This is a beautiful day to fly," Cmdr. Dick Scobee said as he stopped on the walkway to the entry hatch. To Scobee, the cloudless, cold sky was perfect — conditions that experienced pilots called severe clear. It was true: On such a clear day you could see forever, and from 20 stories above ground the crew beheld a sparkling, shining string of ocean breakers in the curving surf along the cape's coastline to the south.

Smiles, grins and words of agreement followed Scobee's great pleasure with the cloudless heavens. One by one, the spacefarers donned their helmets and, with the assistance of the specialists, climbed through the hatch into the deep and wide recesses of the crew compartment.

As McAuliffe prepared to enter Challenger, a member of the close-out crew presented the teacher with a shiny red apple. It was a nice public relations touch for those watching on television, including the families of the astronauts who sat three miles distant in their VIP suite.

But in spite of the "public relations portrait" being painted, Challenger was in every respect a contained iceberg. That the presence of so much ice was a clear and present danger to the launch team was demonstrated when the countdown reached its standard 10-minute hold at T-minus nine minutes in the count. This time the call was heard loud and clear.

"Hold!"

Launch control explained the delay. The standard hold in the countdown would be extended. The count would be held here at T-minus nine minutes for hours, if necessary, until the temperature rose to 40 degrees. Everyone looked at the sun, beseeched its warming rays.

But the warmth of the sun on the outside could not solve the problem of the critical O-ring seals within the solid rocket boosters. Without the direct rays of the sun, they would stay cold, hard and brittle all day. And the more brittle the O-rings, the greater the chance they could not perform their job.

The synthetic rubber O-rings' design purpose was simple enough: seal the joints so tightly they would prevent violently hot gases from escaping as spears of flame.

It was a daunting task for any piece of equipment; in the case of the shuttle, the O-rings were like a rubberized David holding back a whole battalion of Goliaths.

During several earlier shuttle missions, disaster did everything it could to crawl into the shuttle launch system and turn it into tumbling flaming wreckage. The primary O-rings on those flights suffered severe erosion from superheated gases, sometimes accompanied by lesser erosion. And the erosion had occurred after launch temperatures much higher than on this freezing Florida day — 53 degrees was the lowest launch-time temperature up to that time.

The booster engineers felt helpless. For months, they had been studying the O-ring seal problem. They knew a disaster was coming, but no one stepped forward and said, “Stop this train until it’s fixed.”

If there was a failure and a crew was ... but they didn’t want to think about that. But, now, NASA obviously was going to launch on the heels of a hard freeze.

'Welcome to space, guys!'

At about 11 a.m. ET, launch control notified the Challenger crew that it was definitely warming up outside their ship. Things were looking up. The launch team anticipated resuming the count shortly.

“All right!” came the enthusiastic response from Scobee.

At Mission Control in Houston, flight director Jay Greene polled his team for their final status report. Launch director Gene Thomas ran through his checklist items with his team in launch control in Florida. It was a familiar and critical litany of last-moment review and checks.

Every response was “Go!” Not a single call to stop.

Inside the crew cabin, Scobee and pilot Mike Smith went with precision through their final checks.

All seven astronauts locked their helmet visors in place. They rechecked their seat harnesses one final time to assure that every man and woman was strapped in securely. Scobee told his crew, “Welcome to space, guys.”

Next: 'Here we go!'

NBC News correspondent Jay Barbree has covered America's space effort from Cape Canaveral for more than 40 years. This is an updated version of a series that was first published on MSNBC.com in January 1997.

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Chapter 2: 'Here we go!'

Astronauts, onlookers cheered Challenger's launch

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CAPE CANAVERAL, Fla. - In Launch Control, NASA commentator Hugh Harris reported the countdown's final moments, his words spoken into the microphone as he watched the numbers shining brightly before him.

Green and flashing, the numbers gave him an update with each passing second of the count. A television monitor showed Challenger looming high on its icy launch pad.

But the NASA commentator wasn't that comfortable relying on electronic vision. He found himself turning often in his seat to peer at the shuttle through the huge glass window behind him, trusting his own eyes to assure that all continued smoothly toward that critical moment of engine ignition.

Hugh Harris had been the "voice of Launch Control" for most of the previous 24 shuttle flights. As chief of information for the Kennedy Space Center, he knew the drill by heart and felt comfortable with the routine to be followed.

Counting down

Last-second events kept the NASA commentator busy, providing a steady stream of information to the outside world. Through the news outlets carrying his running commentary, Harris' microphone was the public's link to the event.

"T-minus 10, nine, eight, seven, six, we have main engine start ..."

As the countdown rolled, the astronauts' families were hurried from their VIP suite to an observation deck on the roof of Launch Control.

From their rooftop location, from the press site, from the VIP stands, ignition began as a flash of coruscating fire.

Challenger came to life.

Searing orange light appeared in a swift rippling of unleashed power. This was the moment of the shuttle's savage fire birth, the light so intense it forced tears to the thousands of onlookers. Three engine bells, now lost in the controlled tornado of burning rocket fuel, cascaded their violent fire down the curving flame tubes. White clouds snapped into being as fire and water begat shrieking steam. Challenger shook, vibrating its flanks. A blizzard appeared about the huge fuel tank as thunderous vibration ejected the ice storm that had gathered on the flanks of the 15-story-tall external tank.

The main engines screamed in a hoarse bellow, waiting for the computers to sense all three engines were running properly and had built to the required liftoff thrust.

Relays clicked and the computer gave the signal to ignite and release the holding bolts of the two

giant solid rocket boosters.

To the onlookers, it appeared as if the sun fell from the sky and writhed wildly at the base of Challenger. Two enormous fire plumes snapped into existence, gushed downward, then spattered away in every direction, raging, uncontrollable.

The giant kicked free of the launch pad, spread its flame in a visible punching blast, burning ever brighter, ever fiercer.

Challenger was in climbing free flight.

Hugh Harris' final countdown came over loudspeakers, on the radio, through the television sets. " ... four, three, two, one, and LIFTOFF! Liftoff of the twenty-fifth space shuttle mission and it has cleared the tower." In fact, his words were barely audible over the screams and shouts of thousands of excited onlookers, cries that have been the prayer beseeching success of every astronaut launched. "GO, GO! GO, GO!"

Almost at the same instant Hugh spoke those words, the shock wave from the running engines arrived at the press site and the VIP bleachers three miles distant. The deck trembled, family slammed against family on the roof observation deck. Sound crashed and rolled, tumbling and roaring across the ground and through the air, but at a speed of only 1,000 feet a second, it took 15 seconds before the roar engulfed onlookers.

Inside the crew cabin

Inside the Challenger crew cabin, the seven astronauts felt the spaceship come alive as the three main engines swiveled in a final pre-ignition check and then erupted in fire. Crew Cmdr. Dick Scobee shouted, "There they go, guys!"

"AIIII riiight!" came the shout from veteran astronaut Judy Resnik.

"Here we go!" laughed Mike Smith from the pilot's seat.

As the booster rocket lit off, Challenger leapt from the pad, the sudden acceleration pressing the astronauts back into their seats. The great ship of space thundered skyward on twin columns of fire, trailing an enormous plume of white smoke from the boosters.

The spaceplane lifted higher and higher, bending over into an invisible curving arc toward its destined point in orbit high above the earth. The flame grew longer, mystical, magical, shattering, a howling cyclone of fire longer than the length of two football fields.

Back on the roof deck of the Launch Control building, the families of the seven astronauts, spouses and children stood stunned and awed, their bones vibrating from the thunderous energy of Challenger. Sound engulfed, embraced, crushed them, a sonic juggernaut heralding a magnificent birth.

They reached out to one another, faces wet with tears, and sought each other's hands. They gripped tightly, unknowingly watching their loved ones leave this Earth.

[Next: Hints of disaster](#)

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Chapter 3: Hints of disaster

First moments of flight bring exultation, but then ... 'Uh-oh!'

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CAPE CANAVERAL, Fla. - At the moment of solid rocket ignition, something sinister happened. Barely apparent beside the opening fiery blast, a puff of black smoke spat forth from the lower joint of the right booster. Almost as quickly as it appeared, it was gone. Much later, examination of every frame of film and every inch of videotape would reveal that the smoke spewed forth from a sudden, tiny gap. It was a death warrant.

The long Florida cold had robbed the critical O-ring of its ability to flex, to expand and seal immediately. What was so necessary to be malleable was now hard, almost brittle.

When the joint of the booster rotated, it created a tiny but critical gap. But the stiffened O-ring failed to expand, failed to seal the gap.

Searing gases rammed through and rushed past the primary seal. For 2 1/2 seconds, black smoke jetted out. Then, instantly, it vanished. For within the curving flanks of the rocket, aluminum oxide particles created by the burning fuel miraculously plugged the leak in the joint before flame itself could escape.

Unaware they were now in mortal danger, the astronauts waxed enthusiastic, shouting with excitement as Challenger hammered its way higher and higher.

"Go, you mother!" Mike Smith shouted as the shuttle charged ahead, heading faster and faster into space.

"LVLH," Judy Resnik announced, reminding the two pilots of a cockpit switch change.

"Ohhhkaaaaay," Dick Scobee confirmed, grinning.

Sound and fury

Sound and fury enveloped the press site. Tables shook, the press bleachers vibrated from the punching thunder overhead. Windows rattled, floors rumbled as if in an earthquake. Outside the windows, red became orange, leaving behind a dazzling trail of golden fire. But this was expected, the familiar signature of a huge shuttle rejecting the earth.

It was a slow-motion nuclear fireball swallowing everything within reach, then howling up and away, disdainful of any attempt to hold back such power.

No matter how many of these shattering launches you had seen, no matter how many times you had felt the body-shaking impact, the shock waves rippling your clothes like sudden strong wind gusts, you never felt at ease.

You never took human rocket flight for granted. You sweated out every second of a launch, prayed it would go as planned.

Veteran space reporter Mary Bubb of the Reuters News Agency, sat with tightened fists, teeth clenched. She tilted her head slowly to keep the climbing spaceplane with its attached rockets in clear view. Unthinking, she groped for the hand of the reporter seated at her side.

Bubb had been ill for months, but she was dedicated, undaunted by her ailing body. She would never be absent for any launch; especially a shuttle. But this time was different. It was not a chill of the morning's freeze that swept her body.

"I'm afraid," she said, her voice barely audible over the battering vibrations and crackling roar. "I'm afraid for them."

Howling winds

Outside, the wind continued to howl, blowing horizontally with a speed of 84 miles per hour — some of the fiercest winds ever recorded for a shuttle ascent.

Challenger accelerated swiftly into the area of Max Q — maximum aerodynamic stress — where its great speed created shock waves from the resisting air through which it must fly. Inside the shuttle they felt the side loads, felt Challenger meeting the invisible forces.

The shuttle had flown through high winds before. "Yeah," Dick Scobee announced in recognition of the sudden shaking, "it's a little hard to see out my window."

It was a moment with far greater impact than anyone could have known, for this mission carried with it a terrible flaw.

When the side load of the winds smacked into the right booster, they struck an already-weakened rocket. The wind was physical impact. It jarred loose the aluminum oxide particles that at launch had sealed the lower joint where the O-rings had failed. Now the aluminum oxides broke up, spat away from the booster.

There was nothing left to hold back the raging fire and enormous pressure. A tongue of dazzling flame burst through the joint opening, creating a fearsome blowtorch of immense power precisely 58 seconds into the flight.

No one in the crew cabin knew what was happening.

"OK, we're throttling down," Scobee called out as he began reducing power of the main engines from 104 percent down to 94 percent, and then reduced power to 65 percent. This would safely diminish the howling thrust behind them as Challenger knifed its way through the combination of powerful shear winds and maximum aerodynamic pressure.

Then they were through and Scobee went back to full power, throttling the engines to full thrust.

"Feel the mother go!" yelled Mike Smith.

"Wooooohoooooo!" another crew member shouted, swept up in the acceleration.

"Thirty-five thousand going through one point five," Smith reported.

Seven miles high and booming past 1 1/2 times the speed of sound.

"Reading four eight six on mine," Scobee acknowledged.

Smith agreed with the routine airspeed check. "Yep, that's what I've got, too."

Fiery blowtorch

Scobee heard Mission Control report his three main engines were again running fine at full throttle. Every instrument reading of the shuttle's flight and power systems were transmitted automatically, in real time, to Houston.

Mission Control kept up its steady monitoring, telling the pilots everything was "Go!"

No one knew the fiery blowtorch far below the crew cabin was already ripping apart the right booster rocket.

The crew worked smoothly, flawlessly. "Roger, go at throttle up," reported Scobee. His steady voice amazed a world audience. For the seasoned test pilot this was to Scobee just matter-of-fact language and tone.

Suddenly a sheet of intense flame swept swiftly over Smith's window.

The pilot's seat was nearest to the disintegrating booster rocket. In whatever instant of time was available to Smith he knew something terrible was happening.

He had no more than that instant. No more than that infinitesimal moment. Just enough time to utter a single cry, "Uh-oh!"

[Next: A hellish fireball](#)

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Chapter 4: A hellish fireball

Challenger explodes while onlookers watch

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CAPE CANAVERAL, Fla. - Flames from inside the booster rocket had escaped through the failed O-ring seal and enlarged the small hole, growing into a monstrous blowtorch as they burst through the lower joint of the right booster.

The torch slashed through the lower half of the huge external fuel tank that stored the liquid hydrogen that fed the three main engines. The lower half of the tank collapsed, then the entire tank followed in swift disintegration.

The lower support strut attached to the right rocket booster broke away. The blazing rocket swiveled on its upper strut to send the nose of the booster crashing into the top of the tank, freeing liquid hydrogen and liquid oxygen fuels from the tank and booster to mix disastrously and ignite.

Where there had been only cold blue sky pierced by a bright flame atop a climbing white smoke trail, there appeared a hellish fireball. Instantly it bulged into a massive flaming monster. Metal tore jaggedly, shattered into debris that that would continue to climb, tumbling and cartwheeling through curving arcs, until gravity commanded their downward fall. Two corkscrew spears of white smoke spun twisting paths higher into the clear blue sky, the rocket boosters flaming uncontrolled, burning as if in mockery to the disaster from which they fled.

The explosion expanded in a scattering of debris, creating hundreds of burning and twisting fingers and tendrils of smoke, all seeming to try desperately to escape the terrible blast. Burning debris fluttered and whirled oceanward.

A hairline streak of red arched up and then over in a curving line. It would be long remembered. Challenger's crew vessel with its seven occupants was fleeing the flames and devastation.

In this one ghastly, terrible moment, the very air over the America's spaceport seemed to burn.

Thunder echoed and boomed earthward, sky echoes of a climbing rocket, deep rumblings from the berserk lunging of the boosters.

Beneath the ominous groans from the heavens, thin wailing cries and screams reached upward toward where Challenger died.

Inside Mission Control

Inside Mission Control near Houston, NASA Commentator Steve Nesbitt followed the flight-mission script before him. He kept up his litany of progress, reporting the main engines were now burning at their full thrust of 104 percent. He continued to read his prepared notes to match flight times and progress. He was totally unaware of what had happened to Challenger.

"One minute and fifteen seconds, velocity two thousand nine hundred feet per second, altitude nine nautical miles, downrange distance seven nautical miles."

Nearby, a flight controller gestured frantically to him. Nesbitt turned to see where the controller was pointing with such agitation. He stopped reading, disbelief gripping him like a giant fist as he stared slack-jawed at the expanding fire cloud on the huge television monitor that adorned the walls of the control center, at the twisting smoke trails and the flotsam of burning debris raining toward the ocean.

Nesbitt slumped in his seat. He hurt as if a house had dropped on him. He sat, stunned, feeling as if his blood drained from his body.

But he was on duty. He still had his job to do. He shook off the helpless feeling, rallied his senses and keyed his microphone. "Flight controllers here are looking very carefully at the situation."

He felt helpless to explain what was really happening. He must report only what he knew for certain. "Obviously," he heard himself saying, "a major malfunction."

Nesbitt turned off his mike.

Stunned and shocked

Back at Florida's Launch Control, Hugh Harris fared no better than Steve Nesbitt. He was stunned, in shock, staring vacant-eyed through the big window behind him. Even as he searched the tumbling, burning debris and corkscrewing smoke trails for some sign the crew was still alive, the scene before him refused to penetrate his own reality, that there could be that much fury and destruction in the sky.

It was ... unbelievable. So inadequate a word! What made it all the more terrible was the tremendous personal emotion felt for the Challenger crew. They had shared with these people, an alliance of a professional and personal family. Harris sat in his emotional cocoon of shock and kept asking himself how in the name of God this could have happened.

On the roof observation deck of the Launch Control Center, in the brilliant sunlight beneath the pockmarked sky, NASA escorts were doing everything possible to move the distraught, sobbing families away from the horrifying spillage of charred debris raining downward to the ocean waters.

The children of Challenger pilot Mike Smith stood rooted to where they had been when the blast split the heavens. The horror of what had happened, was still happening, hammered at their senses.

"I want my father!" they wailed as one voice. "I want my father! He told us it was safe!" Then they lost their voices in tears and choking misery.

Inside the Associated Press trailer at the press site, veteran aerospace reporter Howard Benedict worked furiously to get out the story to the world as quickly as possible. He was dictating over the phone to the AP's New York desk. His first paragraph was already available as a news bulletin on every wire and he was into his second paragraph:

"There was no immediate indication on the fate of the crew, but it appeared that nobody could have survived that fireball in the sky."

He paused momentarily, felt the air freezing about him. "Mother of God," he whispered.

Howard Benedict was wrong.

A decade after the accident, the best evidence tells experts that Challenger's seven astronauts did

not die in the blast.

What a Presidential Commission failed to learn, what NASA's own investigations studiously ignored, what the contractors who built the shuttle knew, what no one wanted to even mention, what was too horrifying to acknowledge, was that the seven astronauts of Challenger lived from the moment of the explosion until they smashed at great speed into the sea.

Theirs was truly the longest ride down.

[Next: An eternity of descent](#)

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Chapter 5: An eternity of descent

Evidence hints that astronauts were alive during fall

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CAPE CANAVERAL, Fla. - The water was murky, swirling from surface winds, keeping divers Terry Bailey and Mike McAllister from seeing more than an arm's reach in front of them. They had been diving for days, recovering Challenger's debris, and, now, on this dive, they had only six minutes left in their tanks.

They were about 100 feet down, moving across the seafloor, when they almost bumped into what at first appeared to be a tangle of wire and metal. Nothing that unusual, nothing they hadn't seen on many dives before.

Then, they saw it. A spacesuit, full of air, legs floating toward the surface. There's someone in it, Terry Bailey thought.

No, that's not right, he admonished himself. Shuttle astronauts do not wear pressurized spacesuits during powered flight. They wear jumpsuits. They carry along two pressure suits if they should be needed for a repair spacewalk.

He turned to his partner, Mike McAllister. They just looked at each other and thought, "Jackpot." This is what we've been looking for. The crew cabin.

Low on air, the two divers made a quick inspection, marked the location with a buoy and returned to their boat to report the find.

A cabin intact

Early the next morning, the USS Preserver recovery ship put to sea. The divers began their grim task of recovering the slashed and twisted remains of Challenger's crew cabin and the remains of its seven occupants.

On first inspection, it was obvious that the shuttle Challenger's crew vessel had survived the explosion during ascent. A 2-year-long investigation into how the crew cabin, and possibly its occupants, had survived was begun.

Veteran astronauts Robert Crippen and Bob Overmyer, along with other top experts, sifted through every bit of tracking data. They studied all the crew cabin's systems — even the smallest, most insignificant piece of wreckage. They learned that at the instant of ignition of the main fuel tank, when a sheet of flame swept up past the window of pilot Mike Smith, there could be no question Smith knew — even in that single moment — that disaster had engulfed them. Something awful, something that had never before happened to a shuttle, was upon them like a great beast.

Mike Smith uttered his final words for history, preserved on a crew cabin recorder.

"Uh-oh!"

An ultimate epitaph.

Immediately after, all communications between the shuttle and the ground were lost. At first, many people watching the blast, and others in mission control, believed the astronauts had died instantly — a blessing in its own right.

But they were wrong.

NASA's intensive, meticulous studies of every facet of that explosion, comparing what happened to other blowups of aircraft and spacecraft, and the knowledge of the forces of the blast and the excellent shape and construction of the crew cabin, finally led some investigators to a mind-numbing conclusion.

They were alive all the way down.

Rise and fall

The explosive release of fuel that dismembered the wings and other parts of the shuttle were not that great to cause immediate death, or even serious injury to the crew. Challenger was designed to withstand a wing-loading force of 3 G's (three times gravity), with another 1.5 G safety factor built in. When the external tank exploded and separated the two solid boosters, rapid-fire events, so swift they all seemed of the same instant, took place. In a moment, all fuel was gone from the big tank.

The computers still functioned and, right on design plan, dutifully noted the lack of fuel and shut down the engines. It was a supreme exercise in futility, because by then Challenger was no longer a spacecraft.

One solid booster broke free, its huge flame a cutting torch across Challenger, separating a wing. Enormous G-loads snapped free the other wing. Challenger came apart — but the crew cabin remained essentially intact, able to sustain its occupants.

The explosive force sheared metal assemblies, but was almost precisely the force needed to separate the still-intact crew compartment from the expanding cloud of flaming debris and smoke. What the best data tell the experts is that the Challenger broke up 48,000 feet above the Atlantic. The undamaged crew compartment, impelled by the speed already achieved, soared to a peak altitude of 65,000 feet before beginning its curve earthward.

The crew cabin, reinforced aluminum, stayed solid, riding its own velocity in a great curving ballistic arc, reached the top of its curve, and then began the dive toward the ocean.

It was only when the compartment smashed, like a speeding bullet, into the sea's surface, drilling a hollow from the surface down to the ocean floor, that it crumpled into a tangled mass.

Mercifully unconscious?

But even if the crew cabin had survived intact, wouldn't the violent pitching and yawing of the cabin as it descended toward the ocean created G-forces so strong as to render the astronauts unconscious?

That may have once been believed. But that was before the investigation turned up the key piece of evidence that led to the inescapable conclusion that they were alive: On the trip down, the commander and pilot's reserved oxygen packs had been turned on by astronaut Judy Resnik, seated directly behind them. Furthermore, the pictures, which showed the cabin riding its own velocity in a ballistic arc, did not support an erratic, spinning motion. And even if there were G-forces, commander Dick Scobee was an experienced test pilot, habituated to them.

The evidence led experts to conclude the seven astronauts lived. They worked frantically to save themselves through the plummeting arc that would take them 2 minutes and 45 seconds to smash into the ocean.

That is when they died — after an eternity of descent.

Weighing the mystery

Some dispute this conclusion, and the truth is, there is no way of knowing absolutely at what moment the Challenger Seven lost their lives. But a common-sense, rational review of the evidence tell those with extensive backgrounds in flight that the seven astronauts lived all the way down.

In the face of such expert beliefs, NASA finally made this official admission: "The forces on the Orbiter (shuttle) at breakup were probably too low to cause death or serious injury to the crew but were sufficient to separate the crew compartment from the forward fuselage, cargo bay, nose cone, and forward reaction control compartment."

The official report concluded, "The cause of death of the Challenger astronauts cannot be positively determined."

"We'll probably never know," says a NASA spokesman.

But in the mind of one of the lead investigators, we do know. Three-time space shuttle commander Robert Overmyer, who died himself in a 1996 plane crash, was closest to Scobee. There no question the astronauts survived the explosion, he says.

"I not only flew with Dick Scobee, we owned a plane together, and I know Scob did everything he could to save his crew," he said after the investigation.

At first, Overmyer admitted, he thought the blast had killed his friends instantly. But, he said sadly, "It didn't."

One could see how difficult it had been for him to search through his colleagues' remains, how this soul-numbing duty had brought him the sleepless nights, the "death knell" for this tough Marine's membership in the astronaut corps.

"Scob fought for any and every edge to survive. He flew that ship without wings all the way down."

Standing in his oceanside condominium, Overmyer turned away to stare at where his friends had crashed with great speed into the sea. "They were alive," he said softly. "They were alive."

[Next: Heroes from the sea](#)

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Chapter 6: Raising heroes from the sea

10-week ordeal required to reunite the Challenger 7

By Jay Barbree
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CAPE CANAVERAL, Fla. - Recovery of the heroes was a long, difficult ordeal for all involved.

The bulkhead that secured the internal air pressure of the crew decks, separate from the airlock to the cargo bay, faced the divers as a dangerous skew of wreckage that had to be removed before they could reach what remained of the bodies inside.

First to be retrieved from the watery tomb were the remains of Judy Resnik. The divers worked slowly but steadily. More and more parts of bodies went to the surface. Then, from the middeck, the remains of First-Teacher-in-Space Christa McAuliffe were carried slowly to the surface vessel. For the moment, that was all the divers could do.

The cabin wreckage was so twisted and tangled, sharp edges jutting everywhere like knife points, that the divers demanded the wreckage itself be hauled to the surface and the operation continued on deck.

The crew, the NASA teams and the astronauts overseeing the operation stood silently on the USS Preserver recovery ship as a crane lifted the wreckage from the sea. Every step possible to render respect and honor to the human remains was taken.

The salvage operations proceeded normally until the steel cables on the ocean bottom tugged at another section of Challenger's middeck. At first the weight and mass seemed too great for the hoisting system. Slowly, painfully, the cables pulled the unseen wreckage from the bottom. Then the cables drew the load to the surface. Divers in the water, and everyone on deck, froze where they were.

A blue astronaut jumpsuit bobbed to the surface, turned slowly and then disappeared again within the sea.

What seemed like minutes passed, in reality only seconds of time. Divers and sailors stood stunned as they realized what had happened. They had found — and just as quickly lost — astronaut Gregory Jarvis. Immediately the divers went deep again, beginning a frantic search for the last astronaut of Challenger, a frustrating search that would not end for another five weeks.

Reuniting the heroes

In the days following, armed forces pathologists made positive identifications of six astronauts from Challenger. The underwater search continued for the body of Gregory Jarvis.

The frustrations of failure day after day began to tell on everyone involved. No one wanted to declare "missing" someone so close to his own group, when they knew the body had every chance of being nearby.

Veteran shuttle pilots Robert Crippen and Bob Overmyer had been put in charge of the recovery of their fellow astronauts, and they would brook no interference from anyone, no matter how high

they might be in the NASA hierarchy. Or from any other source. Crippen and Overmyer had decided that when the remains were turned over to the families, there would be seven coffins beneath the American flags. There would not be six. So desperate was Crippen to bring Jarvis home with the rest of his crew that he used his own credit card to hire a local scallop boat to drag its nets across the ocean bottom. Crippen's move was a last-ditch effort in a search all but abandoned by the exhausted recovery forces.

On April 15, when the recovery teams were planning to cease the search they had carried out for months, divers were making what was scheduled to be their last attempts to gather wreckage from the ocean floor. Two hundred yards from where they had lost the blue suit, they swam within view of the lost astronaut.

The seventh crew member of Challenger was brought carefully to the surface. Ashore, finally, the Challenger Seven were reunited.

[Next: Finding fault](#)

NBC News correspondent Jay Barbree has covered America's space effort from Cape Canaveral for more than 40 years. This is an updated version of a series that was first published on MSNBC.com in January 1997.

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Chapter 7: Finding fault

Challenger fell victim to 'accident rooted in history,' commission says

By Jay Barbree
Correspondent
NBC News

CAPE CANAVERAL, Fla. - During that embittered period when divers searched for the remains of Challenger's crew and the space shuttle's wreckage, President Ronald Reagan formed a presidential commission to carry out a thorough investigation of the disaster.

After exhaustive hearings and intensive studies, the commission issued its report — a report that cited troubling lapses in judgment, expertise, communications and management. The commission labeled the Challenger tragedy "an accident rooted in history," adding that NASA had accepted terrible risks "because they got away with it last time."

The commission specified that the direct cause of the flaming explosion was a disastrous leak in the right booster rocket joint. Said leak, a rupture in the integrity of the rocket casing, failed to contain searing flames escaping from the burning rocket, leading to the ultimate explosion — a confirmation of an NBC News report that aired just two days after the astronauts died.

Commission findings were clear, beyond question, that cold weather was a major contributing factor to the disaster.

"The space shuttle's solid-rocket booster problem began with the faulty design of its joint and increased as both NASA and contractor management first failed to recognize it as a problem, then failed to fix it and finally accepted it as an acceptable flight risk," the commission wrote.

Another determination of the commission was that NASA operated its affairs under extreme pressure to launch, to maintain the greatest number of flights per year, and had stretched its capabilities beyond safety limits in scheduling 15 flights during the 12 months of 1986.

In fairness, and once again proof of the old saw that every coin has two sides, what the commission did not say was that deep fault went right up to the hallowed halls of Congress. The penny-pinching Congress had refused NASA bequests to design and build a spaceplane-and-booster combination far superior to what ended up taking to the heavens. NASA had asked for funds for a much more expensive, but much more reliable and safer, solid-rocket booster. A solid rocket made up of one long stage, rather than segments stacked up one atop the other.

By its own track record in funding, Congress shared in the blame for the Challenger disaster. Its decisions also resulted in billions of dollars in tax funding that added up to far more than a superior rocket would have cost in the first place. And that does not include the priceless, long hiatus of space flight exploration and research when the entire shuttle fleet was grounded — and the pricey, more than \$2 billion cost of building Challenger's replacement, Endeavour.

Those kinds of worries didn't end with the Challenger investigation. Just ask veteran shuttle astronaut Robert Crippen, who headed the investigation for the Astronaut Office.

The talented astronaut/manager was appointed center director of NASA's Kennedy Space Center shuttle launch site. But in 1995, when the congressional budget ax began chopping away at the

core of the space shuttles' needed workforce, he was first out the door. Other space agency veterans followed in his footsteps as the downsizing continued.

Conclusion: Beyond the tragedy

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Chapter 8: Beyond the tragedy

Changing of the guard left NASA unprepared in '80s; could history repeat?

COMMENTARY

By Jay Barbree

Correspondent

NBC News

CAPE CANAVERAL, Fla. - The why of the Challenger disaster lies in the thoughts and perceptions of those in charge, in their willingness to be nudged and persuaded by such factors as their "public image" with the taxpayers.

On the eve of the Challenger accident, the "movers and shakers" of the space shuttle program were concerned not only with how the taxpayers might react to continued delays that had been plaguing their launch schedule, but more to the point, how Congress was viewing the situation. The public could get disgusted with the constant delays, but Congress could cut the fiscal jugular.

In the weeks before Challenger, the agency's image had taken a pounding on the streets, in the coffee shops and in newspaper editorial columns; on Capitol Hill, the heat had elevated to a sound thrashing by congressional leaders against the NASA team. After all, the record spoke in loud and damning terms. There had been one accursed delay after another plaguing NASA's commitment to fly 15 shuttle missions in 1986. And the agency's promise to the congressional purse-keepers that they'd soon launch 52 shuttle missions a year was so far-fetched that many considered it to be humorous.

NASA was doing a splendid job of falling flat on its collective face. The glory days of walking on the moon were in the distant and rapidly receding past.

Former NASA leaders had faced disasters and cliffhangers. They'd lived through the Apollo 1 fire on its launch pad that took the lives of three bright, wonderful astronauts. They'd performed miracles when Apollo 13 blew out its ribs and mechanical intestines 200,000 miles from Earth on its way to the moon. They came within a gnat's whisker of dying. But the bullet missed, right? The crew did come home.

If the unseasoned management team awaiting Challenger's launch had some of that experience, they'd know that Alice might have stumbled through the Looking Glass without a scratch, but reality was a terrific taskmaster. The old team would have said, "The hell with 'image'! Scrub! And don't set up the launch until you've got all your ducks in a row!"

The team that had brought the first shuttles to their launch pads had been hardened through the ages of aeronautical development and the pain of too many friends and test pilots burned and crushed in disaster. They knew when to say "STOP!"

But the newcomers, with their gleaming NASA ID badges and shiny lapel pins, were shouting to Congress that "If you just give us the money, we could pop off a shuttle once every week!"

Money wasn't the answer, and it never had been.

The problem was that the old pros, the boys who knew what was what and how to deal with reality, had developed wrinkles and stooped shoulders and poor vision, ailing stomachs and creaky

joints. They'd been pushed out the door to make room for the "management of the '80s."

NASA had thrown away experience for "smooth-talking, Washington-polished slicks" that measured high on everyone's political yardstick.

It wasn't that this new management group didn't try, or that they didn't care. Of course they did. But you don't expect your mechanic to fly your airliner, or the doorman to your doctor's office building to carve through your intestines to fix ails you. You get the best experienced professionals to do the job.

The professionals were gone, and not even the sounds of hard leather heels tapping the long corridors could be heard any more. What, then, could their replacements do?

For one, they simply didn't know what it was like to take off their coats, push back their hats, and with tools in hand and experience between the ears, march out to the launch pad to fix a balky rocket. It was that simple.

They were simply not "hands on" managers. Their academic records may have been glowing, but they often lacked actual knowledge and experience.

For the future, we can only hope that during the hundreds of hours of tricky and risky spacewalks needed to raise the International Space Station in orbit, history does not repeat itself.

There is one thing on our side this time. As suggested in the aftermath of the Challenger disaster, experienced astronauts have been placed in senior management positions. These hands-on astronauts have the final say over whether a launch is a go.

But are the steps that are being taken enough?

Only time will tell.

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