"All the News That's Fit to Print"

The New York Times

Late Edition
Weather: Partly cloudy and cold today, chance of snow; chance of snow tonight. Partly cloudy, cold tomorrow. Temperatures: today 27-30, tonight 13-19; yesterday 14-23. Details, page C19.

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THE SHUTTLE EXPLODES

6 IN CREW AND HIGH-SCHOOL TEACHER ARE KILLED 74 SECONDS AFTER LIFTOFF

ABC News; Agence France-Presse

Disaster Is Worst For Space Effort

By WILLIAM J. BROAD
Special to The New York Times

CAPE CANAVERAL, Fla., Jan. 28 — The space shuttle Challenger exploded in a ball of fire shortly after it left the launching pad today, and all seven astronauts on board were lost.

The worst accident in the history of the American space program, it was witnessed by thousands of spectators who watched in wonder, then horror, as the ship blew apart high in the air.

Flaming debris rained down on the Atlantic Ocean for an hour after the explosion, which occurred just after 11:39 A.M. It kept rescue teams from reaching the area where the craft would have fallen into the sea, about 18 miles offshore.

It seemed impossible that anyone could have lived through the terrific explosion 10 miles in the sky, and officials said this afternoon that there was no evidence to indicate that the five men and two women aboard the craft survived.

No Ideas Yet as to Cause

There were no clues to the cause of the accident. The space agency offered no immediate explanations, and said it was suspending all shuttle flights indefinitely while it conducted an inquiry. Officials discounted speculation that cold weather at Cape Canaveral or an accident several days ago that slightly damaged insulation on the external fuel tank might have been a factor.

Americans who had grown used to the idea of men and women soaring into space reacted with shock to the disaster, the first time United States astronauts died in flight. President Reagan canceled the State of the Union Message that had been scheduled for tonight, expressing sympathy for the families of the crew but vowing that the nation's exploration of space would continue.

Killed in the explosion were the mission commander, Francis R. (Dick) Scobee; the pilot, Comdr. Michael J. Smith of the Navy; Dr. Judith A. Resnik; Dr. Ronald E. McNair; Lieut. Col. Ellison S. Onizuka of the Air Force; Gregory B. Jarvis and Christa McAuliffe.

Mrs. McAuliffe, a high-school teacher from Concord, N.H., was to have been the first ordinary citizen in space.

After a Minute, Fire and Smoke

The Challenger lifted off flawlessly this morning, after three days of delays, for what was to be the 25th mission of the reusable shuttle fleet that was intended to make space travel commonplace. The ship rose for about a minute on a column of smoke and fire from its five engines.

Suddenly, without warning, it erupted in a ball of flame.

The shuttle was about 10 miles above the earth, in the critical seconds when the two solid-fuel rocket boosters are firing as well as the shuttle's main engines. There was some discrepancy about the exact time of the blast; the National Aeronautics and Space Administration said they lost radio contact with the craft 74 seconds into the flight, plus or minus five seconds.

Two large white streamers raced away from the blast, followed by a rain of debris that etched white contrails in the cloudless sky and then slowly

Continued on Page A5, Column 4

From the Beginning to the End

The last flight of the shuttle Challenger lasted about 74 seconds. Here is the transcript, as recorded by The New York Times, of its final moments, before and after liftoff.

PUBLIC AFFAIRS OFFICER: Coming up on the 90-second point in our countdown. Ninety seconds and counting. The 51-L Mission ready to go. . . .

T minus 10, 9, 8, 7, 6, we have main engine start, 4, 3, 2, 1. And liftoff. Liftoff of the 25th space shuttle mission and it has cleared the tower. . . .

MISSION CONTROL CENTER: Watch your roll, Challenger.

PUBLIC AFFAIRS OFFICER: Roll program confirmed. Challenger now heading down range. [Pause.] Engines beginning throttling down now at 94 percent. Normal throttle for most of flight 104 percent. Will throttle down to 65 percent shortly. Engines at 65 percent. Three engines running normally. Three good cells, three good ABU's. [Pause.] Velocity 2,257 feet per second, altitude 4.3 nautical miles, down range distance 3 nautical miles. [Pause.]

Engines throttling up, three engines now at 104 percent.

MISSION CONTROL: Challenger, go with throttle up.

FRANCIS R. SCOBEE, CHALLENGER COMMANDER: Roger, go with throttle up.

PUBLIC AFFAIRS OFFICER: One minute 15 seconds, velocity 2,900 feet per second, altitude 9 nautical miles, down range distance 7 nautical miles. [Long pause.]

Flight controllers here looking very carefully at the situation. [Pause.]

Obviously a major malfunction. We have no downlink. [Long pause.]

We have a report from the flight dynamics officer that the vehicle has exploded.

How Could It Happen? Fuel Tank Leak Feared

By MALCOLM W. BROWNE

Debris from the explosion of the shuttle Challenger was scattered so widely over the Atlantic Ocean that investigators may never recover enough of it to pin down the cause of the disaster. But suspicions quickly focused on the craft's huge external fuel tank, a potential bomb that carried more than 385,000 gallons of liquid hydrogen and more than 140,000 gallons of liquid oxygen at liftoff.

The most logical explanation is that a large leak must have occurred either in the tank itself or in the pipeline and pumping system that carried liquid hydrogen to the orbiter's three main engines.

Barbara Schwartz, a spokesman for the Johnson Space Center, acknowledged that pure liquid or gaseous hydrogen cannot burn; only if the pure hydrogen carried in the rear section of the shuttle's tank were allowed to come into contact with air, or with the liquid oxygen in the tank's nose section, could it have burned or exploded.

Potential Dangers of Hydrogen Gas

But what might have started the leak, and what could have ignited the explosion that followed?

Parallel questions, never fully answered, were raised after the fire that destroyed the German airship Hindenburg as it was landing at Lakehurst, N.J., on May 6, 1937. The shuttle Challenger, like the Hindenburg, had been releasing hydrogen gas into the air shortly before the disaster, and some of the gas might have remained aboard the craft, mixed with air and ready to detonate if exposed to the smallest spark.

Neither NASA nor Martin Marietta Aerospace, the manufacturer of the external fuel tank, would comment yesterday on possible causes of the disaster.

But the geometry of the shuttle's external fuel tank, as described by official manuals from NASA and the Rockwell International Corporation, a major shuttle contractor, suggest one potential danger point in particular: the "intertank," or midsection of the structure, which separates the liquid oxygen tank from the liquid hydrogen tank. The bulk of the hydrogen fuel is closest to the liquid oxygen at this point, and a rupture or leak in the plumbing or walls of the intertank could have flooded the two fluids together to create a gigantic bomb.

Suggestions that the unseasonably cold weather at

Continued on Page A4, Column 1

After the Shock, a Need to Share Grief and Loss

By SARA RIMER

The nation came together yesterday in a moment of disaster and loss. Wherever Americans were when they heard the news — at work, at school or at home — they shared their grief over the death of the seven astronauts, among them one who had captured their imaginations, Christa McAuliffe, the teacher from Concord, N.H., who was to have been the first ordinary citizen to go into space.

Shortly before noon, when the first word of the explosion came, daily events seemed to stop as people awaited the details and asked the same questions: "What happened? Are there any survivors?"

In offices, restaurants and stores, people gathered in front of television sets, mesmerized by the terrible scene of the shuttle exploding, a scene that would be replayed throughout the day and night. Children who had learned about Mrs. McAuliffe were watching in classrooms across the country.

It seemed to be one of those moments, enlarged and frozen, that people would remember and recount for the rest of their lives — what they were doing and where they were when they heard that the space shuttle Challenger had exploded. The need to reach out, to speak of disbelief and pain, was everywhere. Family members telephoned one another, friends telephoned friends.

"It was like the Kennedy thing," said John Hannan, who heard the news when his sister called him at his office, a personnel recruiting concern in Philadelphia. "Everyone was numb."

'I Felt Very Close to Her'

Florine Israel, a legal secretary at the New York Civil Liberties Union, echoed the sentiments of many who spoke of Mrs. McAuliffe not as an astronaut but as a friend. "I felt very close to her," she said. "She was ordinary people. She was a mother, a working woman. I felt like I was a part of it."

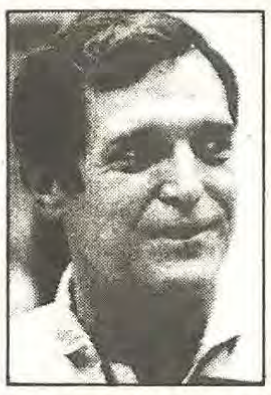
The image of the shuttle exploding flashed across 100 television sets in the electronics department of Macy's, in midtown Manhattan, where a crowd of workers from nearby offices and facto-

Continued on Page A3, Column 1

Reagan Lauds 'Heroes'

President Reagan, shaken by the explosion of the space shuttle, postponed his State of the Union Message. "We mourn seven heroes," he said in a talk broadcast from the White House after the disaster. "There will be more shuttle flights and more shuttle crews and, yes, more volunteers, more civilians, more teachers in space."

He also sought to console the nation's pupils, many of whom saw telecasts of the loss of the teacher who was to have been sent into space. Article and transcript, page A9.



Francis R. Scobee
Commander

Michael J. Smith
Pilot

Judith A. Resnik
Electrical Engineer

Ellison S. Onizuka
Engineer

Ronald E. McNair
Physicist

Gregory B. Jarvis
Electrical Engineer

Christa McAuliffe
Teacher

The Shuttle Explosion: Outlines of a Disaster

What Preceded the Instant in Which the Challenger Was Lost

How Mission Began, Grew And Met End

August 1984

President Reagan announces that to further the education of the nation's children, a teacher will be selected to ride into space. More than 11,000 teachers across the nation fill out the 11-page application for the honor. Among them is Sharon Christa McAuliffe of Concord, N.H. As the months pass, she learns that she has survived the culling process and that the Council of Chief State Officers has included her among 114 teachers granted interviews. The interviews reduce the field to 10, and then comes a battery of psychological and medical tests.

July 19, 1985

The announcement comes from Vice President Bush that Mrs. McAuliffe has been chosen. The 36-year-old teacher becomes a celebrity almost immediately with that announcement, and her life changes radically. Committed to a six-month training program punctuated by speaking engagements and other duties connected with her flight, Mrs. McAuliffe is compelled to leave the care of her two children to her husband, Steven. She plans to write a three-part "personal journal" about her adventure, covering her training experiences, the flight and her afterthoughts. The training, at the Johnson Space Flight Center in Houston and elsewhere, includes zero-gravity flights in diving planes, human centrifuges and emergency escape tactics.

Week of Jan. 19, 1986

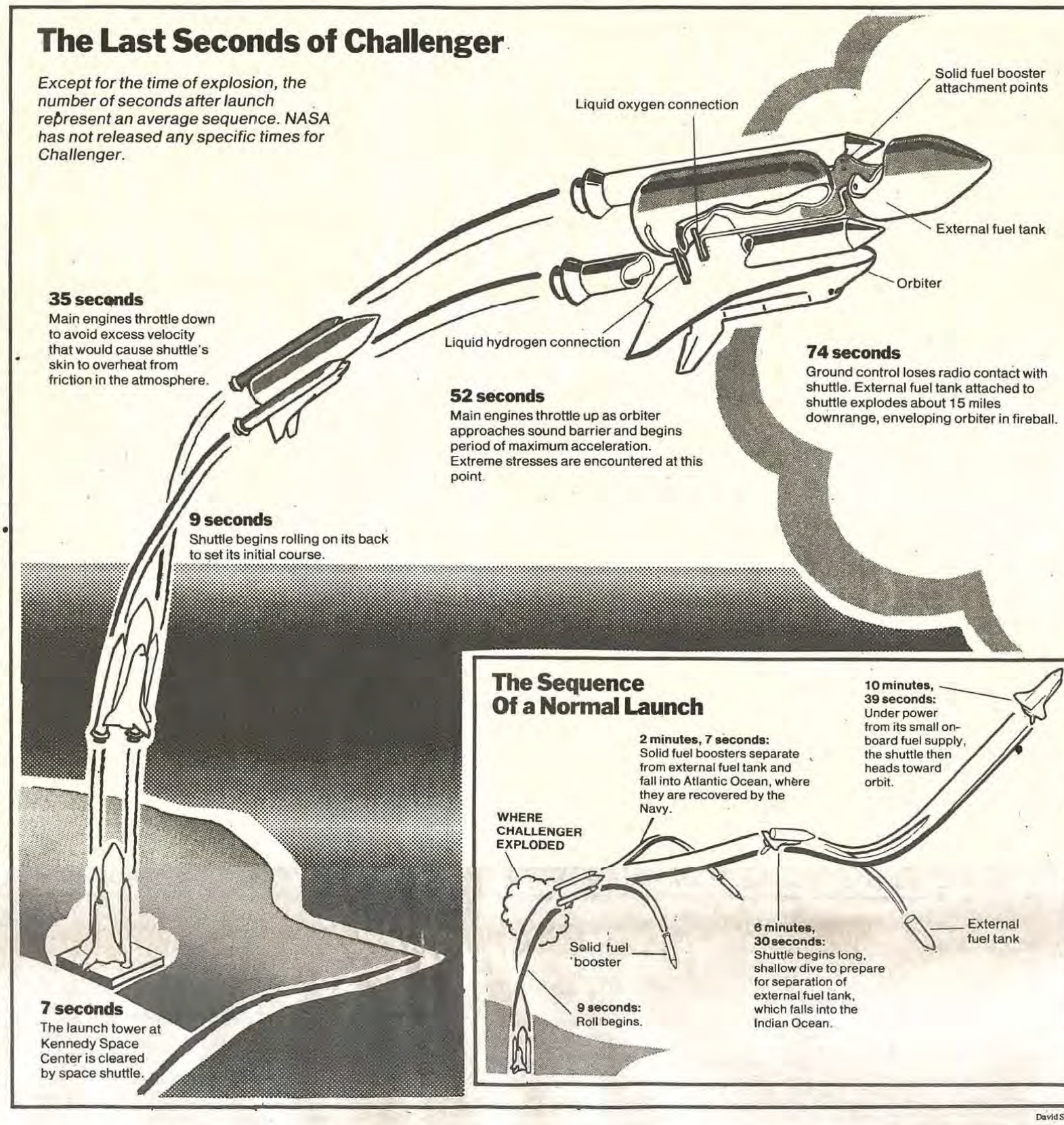
The final round of preparations begins with the arrival the crew of Shuttle Mission 51-L, including Mrs. McAuliffe, at the Kennedy Space Center in Florida. The plans call for the astronauts to launch two satellites from the shuttle's cargo bay, a $100 million one to relay spacecraft communications around the earth and a $5 million satellite to study Halley's comet. Crew members also plan to carry out several scientific experiments. Launching time is at first scheduled for Jan. 22 but is delayed three times as a result of the preceding Columbia mission. Then it is set for Saturday, Jan. 25, but it is delayed by bad weather, reset for Sunday, and delayed again. Mrs. McAuliffe spends part of the day riding a bicycle and the other crew members get permission to watch the Super Bowl before going to bed at 7 P.M. On Monday another hitch arises when a bolt in a door handle refuses to operate properly and high winds persist. After Mrs. McAuliffe and the others have waited inside the orbiter for six hours, the mission is scrubbed again.

Jan. 28

The shuttle Challenger explodes after liftoff and all seven people aboard are believed dead.

The Last Seconds of Challenger

Except for the time of explosion, the number of seconds after launch represent an average sequence. NASA has not released any specific times for Challenger.



The Sequence Of a Normal Launch

David Suter

Inside the Orbiter and Its Fuel Tank

The major payloads

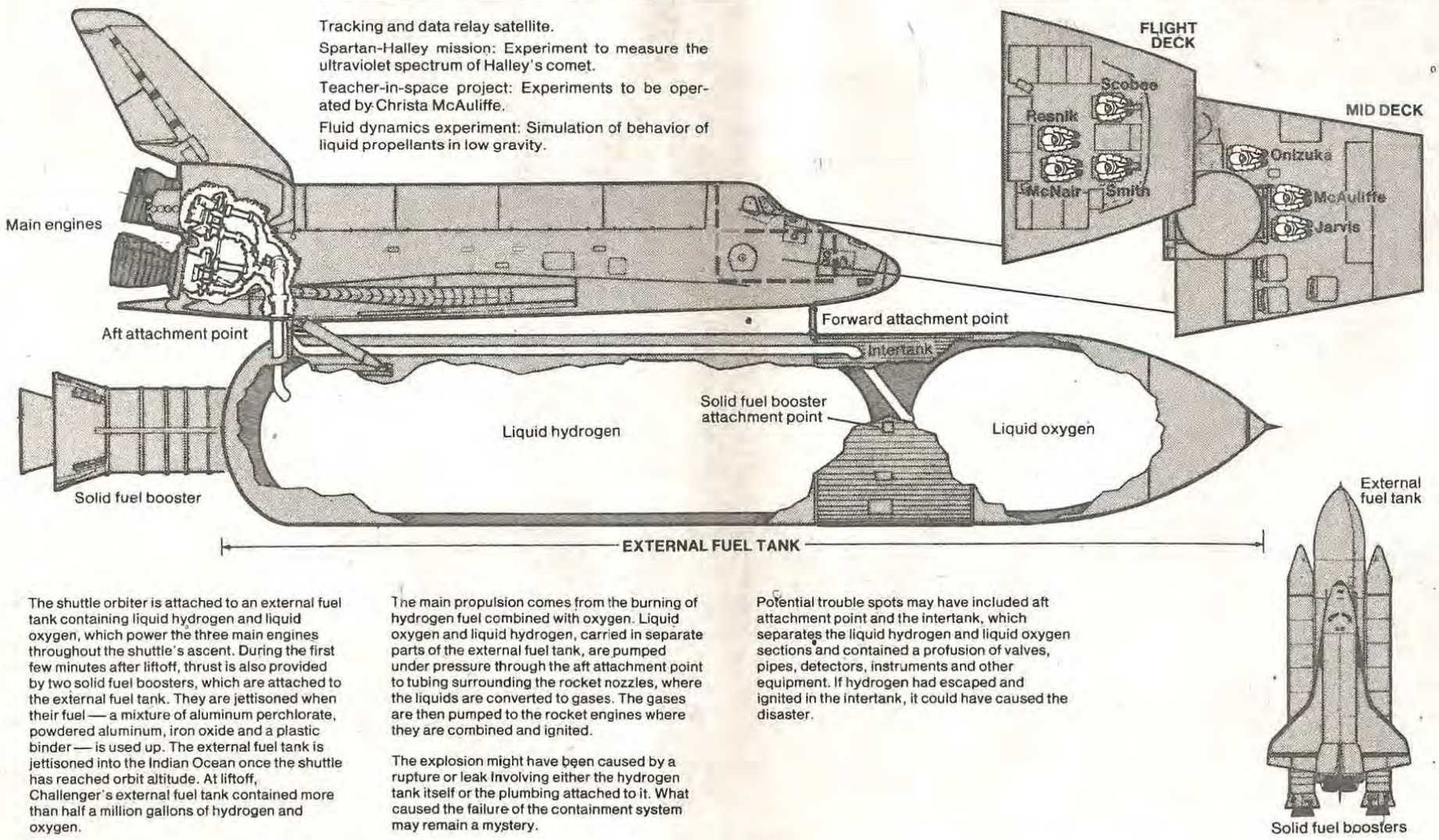
Tracking and data relay satellite.

Spartan-Halley mission: Experiment to measure the ultraviolet spectrum of Halley's comet.

Teacher-in-space project: Experiments to be operated by Christa McAuliffe.

Fluid dynamics experiment: Simulation of behavior of liquid propellants in low gravity.

The crew



The shuttle orbiter is attached to an external fuel tank containing liquid hydrogen and liquid oxygen, which power the three main engines throughout the shuttle's ascent. During the first few minutes after liftoff, thrust is also provided by two solid fuel boosters, which are attached to the external fuel tank. They are jettisoned when their fuel — a mixture of aluminum perchlorate, powdered aluminum, iron oxide and a plastic binder — is used up. The external fuel tank is jettisoned into the Indian Ocean once the shuttle has reached orbit altitude. At liftoff, Challenger's external fuel tank contained more than half a million gallons of hydrogen and oxygen.

The main propulsion comes from the burning of hydrogen fuel combined with oxygen. Liquid oxygen and liquid hydrogen, carried in separate parts of the external fuel tank, are pumped under pressure through the aft attachment point to tubing surrounding the rocket nozzles, where the liquids are converted to gases. The gases are then pumped to the rocket engines where they are combined and ignited.

The explosion might have been caused by a rupture or leak involving either the hydrogen tank itself or the plumbing attached to it. What caused the failure of the containment system may remain a mystery.

Potential trouble spots may have included aft attachment point and the intertank, which separates the liquid hydrogen and liquid oxygen sections and contained a profusion of valves, pipes, detectors, instruments and other equipment. If hydrogen had escaped and ignited in the intertank, it could have caused the disaster.

The Shuttle Explosion: America Watches in Horror

For the Families, the Moment of Doom

By WILLIAM E. SCHMIDT
Special to The New York Times

CAPE CANAVERAL, Fla., Jan. 28 — Bundled against the cold Florida morning, Ed and Grace Corrigan watched with pride and nervous excitement as the space shuttle Challenger, carrying their daughter, Christa McAuliffe, and six other astronauts, thundered off the launching pad here.

Then, 74 seconds into the flight, their excitement turned to disbelief, then horror. There was a puff of smoke and a muffled clap, audible in a viewing grandstand where the Corrigans and relatives of the other astronauts were sitting.

There was a moment when nobody was sure what had happened. People around them were still cheering, raising their thumbs in a signal of victory.

Then Lisa Corrigan, Mrs. McAuliffe's sister, hollered and grabbed her father's hand. Mrs. Corrigan leaned her head on the shoulder of her husband, whose sweater bore a large button with his daughter's picture.

"The craft has exploded," an official of the National Aeronautics and Space Administration told Mrs. Corrigan. She turned and repeated the message to her ashen-faced husband, as more screams and crying broke the stunned silence around them.

In a nearby building, Mrs. McAuliffe's husband, Steven, their 9-year-old son, Scott, and 6-year-old daughter, Caroline, were also watching as the spacecraft exploded, showering debris into the ocean.

The families of the astronauts were among some 2,500 guests invited by NASA to witness the lauching from an open-air grandstand about four miles from the pad. As NASA officials quickly helped them away, many here still did not know what had happened.

After it became clear that the mission had ended in disaster, some relatives spoke about it. In Beaufort, N.C., Patrick Smith, the younger brother of Michael Smith, the shuttle pilot, said, "I'll tell you exactly how I feel. I don't have any regrets about Mike doing this. "He was doing exactly what he wanted to do. There aren't too many people who've done exactly what they wanted to do with their careers. But he's done that."

In Ilion, N.Y., John Ladd, the stepfather of Gregory Jarvis, the payload specialist, said, "It's got everybody wondering just what the hell happened. We're shocked, terribly shocked. It's a disaster, a national disaster for everybody."

Mr. Ladd, who is 65, said that he and Mr. Jarvis's mother, Lucille Jarvis Ladd, known as Tele, had returned home from Cape Canaveral Sunday because she was suffering from a heart problem. "My wife was in front of the TV watching when it blew," he said. "There was no one here with her. She called my office, a woman who lives nearby came over. My wife is in very, very bad shape."

'I Just About Collapsed'

Mr. Ladd told The Albany Knickerbocker-News that Mr. Jarvis's natural father, Bruce Jarvis of Orlando, Fla., had suffered a heart attack while watching the shuttle explode at Cape Canaveral and had been taken to a nearby medical center.

At the launching site was Dr. Charles Resnik, who teaches at the Medical College of Virginia in Richmond. His sister, Dr. Judith Resnik, a Challenger crew member, was to have taken a signet ring and heart locket into space for her 5-year-old nephew, Randy, and 2-year-old niece, Becky, said Dellana O'Brien, a principal at Randy's kindergarten.

The following family members of the astronauts were also among the more than 200 people invited by the astronauts to the launching: June Scobee, wife of Francis R. Scobee, and their two children, Kathie and Richard; Jane Smith, wife of Michael J. Smith, and their children, Scott, Alison and Erin; Lorna Onizuka, wife of Ellison S. Onizuka, and their children, Janelle and Darien; Cheryl McNair, wife of Ronald E. McNair, and their children Reginald and Joy; Marvin and Betty Resnik, parents of Judith A. Resnik, and Marcia Jarvis, the wife of Gregory Jarvis.

James Scobee of Auburn, Wash., the brother of the mission commander, Francis R. (Dick) Scobee, preferred not to speak about the disaster. "We're trying to make arrangements to fly to Houston," he said, "and I know that although you have a job to do, I'd really not rather say anything."

The New York Times/Keith Meyers

FAMILY IN SHOCK: Ed and Grace Corrigan, the parents of Christa McAuliffe, and their daughter Lisa, left, watching from a special viewing area yesterday as the space shuttle took off and exploded.

Suddenly, Flash of Fear Dashes Watchers' Hopes

By HOWARD ANGIONE
Special to The New York Times

CAPE CANAVERAL, Fla., Jan. 28 — As the Challenger rose skyward, about 350 guests at a viewing area on a hill about six miles from the launching pad cheered and clapped.

Many of them, invited here to view the launching from the space center grounds, had been here Monday morning. They had driven away disappointed after waiting six hours in a cold wind only to hear that clouds and mechanical problems had postponed the launching.

But for a moment this morning it seemed that the event they had come to see was turning into a success.

The thundering of the shuttle rockets was just reaching their ears when there was a flashing burst of white and orange.

"Could something be wrong?" a woman blurted.

"This shouldn't be happening," said a young man who had viewed previous launchings.

As the watchers looked up, they saw what they hoped was the shuttle continuing on an upward path. Below, there were bursts of flame.

A moment later an announcement from the launch center confirmed the fear that had flashed through everyone's mind: The vehicle had exploded.

A couple from Texas raised their hands to their faces and choked back tears. Their neighbor, Michael J. Smith, was the shuttle's pilot.

Children asked their parents what was happening. A mother patted her daughter reassuringly, but there was little she could say.

Others fought back tears. They from New Hampshire and they knew the husband of Christa McAuliffe, the teacher on board.

They did not want to talk about it. "Just say that friends from Steve McAuliffe's law firm were here and everybody was crying," one woman said.

Gary Barton, who said he worked at the space center and had seen other launchings, was at the viewing site to photograph the flight with a telephoto lens. He said he sensed trouble.

"Something wasn't right," he said, adding: "It's shocking, I can't believe something like this has happened."

The public affairs official at the site, Jean Rhodes, speaking over the loudspeaker, asked everyone to walk back to their cars, about a quarter mile away.

But they were not immediately allowed to drive away; officials wanted to keep roads clear for rescue vehicles. So they turned on their car radios, seeking some hope that crew members had survived.

The couple from Texas sat in their station wagon, holding hands.

Ninety minutes later, the traffic controllers gave them permission to leave and the cars, about 70 of them, silently pulled away.

Cheers Turn to Numbness as Concord High School Mourns One of Its Own

By MATTHEW L. WALD
Special to The New York Times

CONCORD, N.H., Jan. 28 — Scores of students at Concord High School were gathered in the auditorium this morning, wearing party hats and cheering and blowing into noisemakers as the space shuttle Challenger roared into the sky with a social studies teacher from the school aboard. They cheered more when they saw a flash.

Then an adult in the balcony — no one was sure who — realized that the flash was not the separation of a booster rocket, and yelled, "Shut up, everyone!" A silence descended in time for the students, teachers and administrators at the school where that teacher, Christa McAuliffe, had taught for three years to hear the announcer report, "The vehicle has exploded."

The room was still for a moment, hoping that the unexpected was impossible, that it just was not so, that "a terrible burden of tragedy," as Charles Foley, the principal, put it, had not struck. Then some of the students and some of the faculty began to cry.

Day of Sharp Disappointment

It was a day of sharp disappointment for students around the country, because this was to be the schoolchildrens' shuttle. The educational broadcasting system had planned, for the first time, to carry two lessons by Mrs. McAuliffe live from the Challenger into thousands of classrooms.

But the disappointment, and especially the confusion, were especially sharp here.

"We weren't sure what was going on," said Marsha Bailey, a sophomore, who was watching on one of the dozens of television sets installed around the school for the occasion. "I thought it was part of the staging."

Other students expressed disbelief.

"Everyone was cheering, going wild when it took off," said Alex Scott, 15 years old. "We were really psyched. Then one of my friends said, 'It blew up.' I said, 'You're kidding me.' "

Tom Tirrell, 16, a junior, could not find a place in one of the rooms with a television, so he was sitting with friends in another classroom at launching time. Word of the explosion spread almost instantly, though.

'Something I Hope I Forget Soon'

"We saw the teachers crying and stuff," he said. The explosion was "something I hope to forget soon," he said, adding, "Later it won't be as bad as now, but it'll always be on our minds."

"In the cafeteria, everyone thought it was normal, until Mr. Foley came on," said Bobbi Cotton, 15, a sophomore. Mr. quickly told all the students to return to their classrooms.

"Everyone that knew her was crying, and some of them were flipping out," said Miss Cotton. "I wish I had known her. She sounded like a sweetheart."

Reporters who had gathered inside the school before the launching were ordered out at the time of the crash, and many students and faculty rushed away from the building without speaking later on.

"It was in the back of everybody's mind," said Michael Purrington, a mathematics teacher, "but they've had so many successes. Human nature being what it is, you put aside the possibility."

Mr. Purrington, like many of the faculty, appeared shaken on a day when the school had hoped to bask in reflected glory, and balance past sorrows. "It's a sacrifice you don't really expect a person to make," he said. "It's a tragic way for 1,200 kids to find out about what life is like."

Several moments before the launching several students said that Mrs. McAuliffe, already known for bringing the outside world into the classroom, was making the space program real for them.

In the days before the launching, some students had grown bored with the frequent postponements, while others distributed hats, confetti and tiny firecrackers to drum up spirit. On Monday in the cafeteria several students did a brisk business selling $2 bumper stickers with the teacher's name, a mortarboard with a star instead of a tassel and the legend, "Reach for the stars," a phrase she sometimes used.

Students were sent home soon after the crash today, and the faculty followed. Concord High School will be closed Wednesday, while the faculty, with the help of mental health specialists from the school system and elsewhere, discuss how to help the students, and help themselves.

"This has been the kind of year that will stay with our staff, that brought them to incredible highs and lows," said Joan Lonergan, vice president of the school board.

Early in the school year, William J. Bennett, the United States Secretary of Education, came to teach, and later, President Reagan visited the city. In December a troubled junior at the high school came to class with a gun and took two students hostage; he was killed by the police in the subsequent shoot-out.

Then there was the launching, which another school board member, Robert Schweiker, called "the ultimate field trip." The school felt honored by the selection of Mrs. McAuliffe in July from among more than 11,000 applicants, to be the "first private citizen passenger in the history of space flight."

But with the explosion, Mr. Foley said, "It's like one wave rolling on top of another wave, before it breaks on shore."

Students and faculty will spend a long time trying to make sense of the event.

Special Counselor Called

"I think the impact of this kind of tragedy is going to be greater, because of the buildup," said Dr. Norman Shulman, of the Central New Hampshire community Mental Health Center, who was called to the school by officials. Students also were looking forward to lessons from space, broadcast back to the high school and schools around the country. "The grief resolution is going to be difficult," said Dr. Shulman.

Some friends were trying to draw a lesson from the disaster, among them Eileen O'Hara, Mrs. McAuliffe's replacement as a social studies teacher at the high school this year. She had spoken to Mrs. McAuliffe by telephone last night, she told other faculty members.

"There's a risk in everything you do," she said. "I think Christa knew the risks and she took them," said Miss O'Hara, as she made her way tearfully across the school parking lot. "She encouraged kids to try to grow and to get beyond anything they've done before. I think it's important for people to know, and kids to know, if things don't work, you should still try."

The New York Times/Marilynn K. Yee

MEMORIAL FOR TEACHER AND FRIEND: Students attending mass for Christa McAuliffe at St. Peter's Catholic Church in Concord, N.H.

After the Shock, Children's Questions and a Need to Share the Grief

Continued From Page A1

ries spent their lunch hours. "You just think of that teacher in there," said a tearful Tom Uzzo, who works for a blouse manufacturer.

Across the nation, people cried openly. "People were crying in my court," said Chief Judge Seymour Gelber of Dade County Juvenile Court in Miami. "We had become so accustomed to perfection in this space program that many simply believed it couldn't happen to us."

At Philadelphia's High School for Engineering and Science, teachers watched the liftoff in the office of the principal, Dr. Alvin I. Garblik. "Everyone was speechless," Dr. Garblik, said later. "It was such a spectacular thing. It was lifting, lifting, lifting and just went bingo — it was gone."

Flags were flown halfmast, and moments of silence were shared. The news came particularly hard at P.S. 332, an elementary school in Brooklyn. The children had learned all about Mrs. McAuliffe, an ebullient wife and mother of two who taught a class called "the American Woman" at Concord High. Thrilled that a teacher was to become the first ordinary citizen in space, Mrs. McAuliffe had become the children's heroine — "the teachernaut."

At 1 P.M., only after she was certain beyond a doubt that word of the disaster was true, Jeanette Reed-Clarke, the assistant principal at P.S. 332, announced the news over the public address system as gently as possible.

A Sixth Grader's Poem

"Sadly, I must inform you that at 11:38 the shuttle exploded, with all the crew members, including Mrs. McAuliffe, our first teachernaut," she said. She called for a moment of silence and said that radios would be tuned to news programs in all the classrooms.

"You mean, she's no longer alive?" asked several children in Toni Weinstein's sixth grade class, where they had been watching a special videotape about Mrs. McAuliffe at the moment the shuttle exploded.

In Chicago, at the Newberry Academy, a public elementary school, a sixth grader named Celina Gonzalez was moved to compose a poem eulogizing Mrs. McAuliffe — "First Teacher in Space:"

Even though I didn't know her,
I feel as if she was my friend.
So please God,
Please take good care of her and her companions.

As Bernie Bradley, 38 years old, broke the news to his fifth graders at the Newberry Academy, he was filled with memories of the day President Kennedy was assassinated. "I compared today to Nov. 22, 1963 when I was in a high school Latin class," he said. "I told them they will remember this day forever."

Sidney Davidson, an equipment manufacturer from Bedford, N.Y., was a passenger yesterday morning on Delta Air Lines Flight 766 from Fort Myers, Fla., to Atlanta. The passengers had what Mr. Davidson described as "a great view of what looked like a magnificent takeoff."

Nobody realized that anything had gone wrong, he said. But a few minutes later, the pilot made an announcement. "He said, 'We regret to inform you that there has been a malfunction in the launching, and it appears that everyone is lost.' There were gasps, and then everyone on the plane was very quiet."

Need to Talk of Accident

Again and again, people said they had begun to think of space shuttle flights as routine, almost without risk. "It had become almost commonplace," Mrs. Israel, the legal secretary, said. "It was like riding the F train."

Some people suggested that there was a lesson in the disaster. "Maybe it isn't appropriate for regular people to go into space at this time," said Susan Alexander, a representative of the Wilderness Society, who was on a visit to Washington from her home in Alaska.

At Nevada Union High School, in Grass Valley, Calif., friends and relatives called Chris Owen, a woodworking teacher who had hoped to become the first teacher in space.

"They were thankful that I'm earthbound," a shaken Mr. Owen said. "I feel like I lost someone in my family, too."

But even yesterday's explosion did not dampen his desire to visit space. "I'd go tomorrow if they'd give me a seat," he said.

Washington Watch
Monday in Business Day
The New York Times

The Shuttle Explosion: How It Happened

COMPUTER EXPERTS BAFFLED BY CRASH

Data From On-Board System Failed to Warn of Problem — Tape to Be Studied

By DAVID E. SANGER
Special to The New York Times

WASHINGTON, Jan. 28 — Computer experts were baffled today about why none of the five I.B.M. on-board computers that have aborted so many space launchings detected anything wrong with the shuttle Challenger's operation until the instant the craft exploded.

"On first glance, there were no anomalous data at all," said Steven Eames, a spokesman for the International Business Machines Corporation team at the Johnson Space Center in Houston that monitors the flow of data from the space shuttle's processors. "Nothing was unusual, and then the screen just went blank."

Until pieces of the actual wreckage can be examined, however, a stretch of magnetized computer tape, packed with thousands of instrument readings sent from the shuttle until the explosion, may prove to be the best trail available for investigators who will be studying the catastrophe.

Meanwhile, the absence of warning from the shuttle's processors and the complex network of sensors connected to them could mark a tremendous setback for the nation's computer and avionics industries.

Technology Is Cited

The combination of computer equipment and programs aboard the shuttle has long been hailed as one of American technology's greatest achievements. In recent times it has frequently been cited as evidence that enormously complex programming, like the kind that would be needed to control the Reagan Administration's proposed high-technology antimissile shield, is well within the industry's reach.

Gentry Lee, a top official of the Jet Propulsion Laboratory in Pasadena, Calif., said all that had changed. "It's the kind of thing that marks a tremendous setback for new technology of any kind," said Mr. Lee, who headed one of the first studies of the software designed for the shuttle program. "It forces the whole society to examine the margins of error we build into technology, and that will probably prove a valuable exercise."

Most confusing to experts familiar with the craft's design is that the disaster appeared to defy every computer simulation ever written for the shuttle.

"It's very, very strange," said Dr. L. John Lawrence, a NASA spokesman at the Houston space center. "In all the models, the data show a deterioration before failure. You begin to see pressures change, or temperatures, or valve failures or voltage or hydraulic changes. Things begin to happen. Here, nothing happened."

Past Problem Detected

The events also contradicted five years of experience in the space program. The only other severe failure of a Challenger component occurred in July, when a computer's response to the failure of two heat sensors led to the shutdown of engine No. 1, forcing the shuttle into a lower orbit than planned. It was the first time a manned space mission had ever lost a main engine in flight.

But in that case, as in the computer models, there was ample evidence from the sensors that something was amiss, and both the astronauts and technicians on the ground had time to respond. I.B.M. spokesmen said the entire computer system had been used in previous flights.

If the computers aboard the Challenger and its sister ships have been faulted for anything in recent years, it has been for their oversensitivity, rather than lack of precision.

Starting with the first shuttle flight in 1981, launching after launching has been delayed because one of the four primary I.B.M. AP 101 computers or a fifth backup unit failed to agree that each of thousands of components was working properly. That has triggered automatic shutdowns that sometimes proved embarrassing to NASA.

Dependent on Processors

At the same time, space officials say they have little choice but to depend on the processors, because human pilots could never keep track of the thousands of bits of information that stream from the shuttle's sensors.

As a result, the computers have virtually complete control of the flight, which is why they will be a centerpiece of the disaster investigation.

In the industry's terminology, the shuttle's processors are a "redundant," or "fault tolerant," system, each programmed to do exactly the same thing at exactly the same time, like soldiers marching in formation. Thus, if they disagree, a "vote" is staged and the out-of-step machine is ignored. Much the same redundancy is used for the sensors.

"If anything, the system is overly conservative," said Algirdas Avizienis, a professor of computer science at the University of California at Los Angeles who has worked extensively on fault-tolerant systems for the space program. "False alarms are not unusual, and that has been a headache from the beginning."

Immediately after the explosion today, flight controllers in Houston played back the telemetry record. "We found nothing at all," said Dr. Lawrence.

But Mr. Eames, the I.B.M. spokesman, said a full examination of the tape would take some time. "We're talking weeks," he said, before it is all sorted out.

Most experts seemed to agree yesterday that the computers themselves would not ultimately be found at fault.

The Last Moments

Associated Press

The story of the destruction of the Challenger told in plumes of smoke and water vapor high above Earth. The two streams starting in the upper right of the second picture from the top, and curving around in the others, are believed to be the solid fuel booster rockets,

Shuttle Explodes, Killing All 7 Aboard

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headed toward the cold waters of the nearby Atlantic.

The eerie beauty of the orange fireball and billowing white trails against the blue confused many onlookers, many of whom did not at first seem aware that the aerial display was an indication that something had gone terribly wrong.

There were few sobs, moans or shouts among the thousands of tourists, reporters and space agency officials gathered on an unusually cold Florida day to celebrate the liftoff, just a stunned silence as they began to realize that the Challenger had vanished from the sky.

Among the people watching were Mrs. McAuliffe's two children, her husband, her parents, and hundreds of students, teachers, and friends from Concord.

"Things started flying around and spinning around and I heard some oh's and ah's, and at that moment I knew somethng was wrong," said Brian Ballard, the editor of The Crimson Review at Concord High School

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Ships Searching the Area

At an outdoor news conference held here this afternoon, Jesse Moore, the head of the shuttle program at NASA, said:

"I regret to report that, based on very preliminary searches of the ocean where the Challenger impacted this morning, these searches have not revealed any evidence that the crew of Challenger survived." Behind him, in the distance, the American flag waved at half-staff.

Coast Guard ships were in the area of impact tonight and planned to stay all night, with airplanes set to comb the area at first light for debris that could provide clues to the catastrophe. Some material from the shattered craft was reported to be washing ashore on Florida beaches tonight, mostly the small heat-shielding tiles that protect the shuttle as it passes through the earth's atmosphere.

Films of the explosion showed a parachute drifting toward the sea, apparently one that would have lowered one of the huge reusable booster rockets after its fuel was spent.

Pending an investigation, Mr. Moore said at the news conference this afternoon, hardware, photographs, computer tapes, ground support equipment, and notes taken by members of the launching team would be impounded.

The three days of delays and a tight annual launching schedule did not force a premature launching, Mr. Moore said in answer to a reporter's question.

'Flight Safety a Top Priority'

"There was no pressure to get this particular launch up," he said. "We have always maintained that flight safety was a top priority in the program."

Several hours after the accident, Mr. Moore announced the appointment of an interim review team, which was assigned to preserve and identify flight data from the mission, pending the appointment of a formal investigating committee.

The members of the interim panel are Richard G. Smith, the director of the Kennedy Space Center; Arnold Aldridge, the manager of the National Space Transportation System, Johnson Space Center; William Lucas, director of the Marshall Space Flight Center; Walt Williams, a NASA consultant, and James C. Harrington, the director of Spacelab, who will serve as executive secretary.

A NASA spokesman said a formal review panel could be appointed as soon as Wednesday by Dr. William R. Graham, the diretor of the space agency.

All American manned space launchings were stopped for 21 months after the worst previous American space accident, in January 1967, when three Apollo astronauts were killed in a fire as they sat in a space capsule on the launching pad.

'Hope We Go Today'

This year's schedule was to have been the most ambitious in the history of the shuttle program, with 15 flights planned. For the Challenger, the workhorse of the nation's shuttle fleet, this was to have been the 10th mission.

Today's launching had been delayed three times over as many days by bad weather. The Challegner was to have launched two satellites and Mrs. McAullife was to have broadcast two lessons from space to millions of students around the coutnry.

All day long, well after the explosion, the large mission clocks scattered about the Kennedy Space Center continued to run, ticking off the minutes and seconds of a flight that had long ago ended.

Long before liftoff this morning, skies over the Kennedy Space Center were clear and cold, reporters and tourists shivering in leather gloves, knit hats and down coats as temperatures hovered in the low 20's.

Icicles formed as ground equipment sprayed water on the launching pad, a precaution against fire.

At 9:07 A.M., after the astronauts were seated in the shuttle, wearing gloves because the interior was so cold, ground controllers broke into a round of applause as the shuttle's door, whose handle caused problems yesterday, uwhich was closed.

"Good morning, Christa, hope we go today," said ground control as the New Hampshire schoolteacher settled into the spaceplane.

"Good morning," she replied, "I hope so, too." Those are her last known words.

The liftoff, originally scheduled for 9:38 A.M., was delayed two hours by problems on the ground caused first by a failed fire-protection device and then by ice on the shuttle's ground support structure.

The launching was the first from pad 39-B, which had recently undergone a $150 million overhaul. It had last been used for a manned launcing in the 1970's.

'Go With Throttle Up'

Just before liftoff, Challenger's external fuel tank held 500,000 gallons of liquid hydrogen and oxygen, which are kept separate because they are highly volatile when mixed. The fuel is used in the shuttle's three main engines.

At 11:38 A.M. the shuttle rose gracefully off the launching pad, heading into the sky. The shuttle's main engines, after being cut back slightly just after liftoff, a normal proceedure, were pushed ahead to full power as the shuttle approached maximum dynamic pressure when it broke through the sound barrier.

"Challenger, go with throttle up," said James D. Wetherbee of mission control in Houston at about 11:39 A.M.

"Roger," replied the commander, Mr. Scobee, "go with throttle up."

Those were the last words to be heard on the ground from the winged spaceplane and her crew of seven.

As the explosion occured, Stephen A. Nesbitt of Mission Control in Houston, apparently looking at his notes and not the explosion on his television monitor, noted that the shuttle's velocity was "2,900 feet per second, altitude 9 nautical miles, downrange distance 7 nautical miles."

That is a speed of about 1,977 miles an hour, a height of about 10 statute miles, and a distance down range of about 8 miles.

The first official word of the disaster came from Mr. Nesbitt of Mission Control, who reported "a major malfunction." He added that communications with the ship had failed 1 minute 14 seconds into the flight.

"We have no downlink," he said. "We have a report from the flight dynamics officer that the vehicle has exploded."

His voice cracked. "The flight director confirms that," he continued. "We're checking with the recovery forces to see what can be done at this point."

In the sky above the Kennedy Space Center, the shuttle's two solid-fuel rocket boosters went sailing off into the distance.

The explosion, later viewed in slow-motion televised replays taken by cameras equipped with telescopic lenses, showed what appeared to be the start of a small fire at the base of the huge external fuel tank, followed by the quick separation of the solid rockets. A huge fireball then engulfed the shuttle as the external tank exploded.

At the news conference, Mr. Moore would not speculate on the cause of the disaster.

The estimated point of impact for debris was 18 to 20 miles off the Florida coast, according to space agency officials.

"The search and resuce teams were delayed getting into the area because of debris continuing to fall from very high altitudes, for almost an hour after ascent," said Mr. Nesbitt of Mission Control in Houston.

Speaking at 1 P.M. in Florida, Lieut. Col. Robert W. Nicholson Jr., a spokesman for the rescue operation, which is run by the Defense Department, said range safety radars near the Kennedy Space Center detected debris falling for nearly an hour after the explosion. "Anything that went into the area would have been endangered," he said in an interview.

'Not a Good Ditcher'

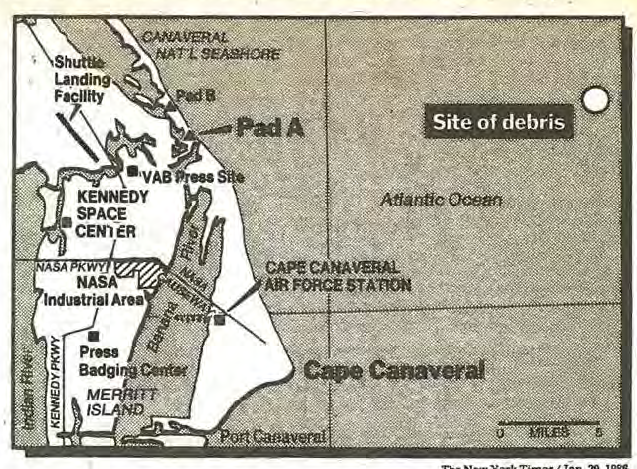
In an interview last year, Tommy Holloway, the chief of the flight director office at the Johnson Space Center in Houston, talked about the possibility of a shuttle crash at sea.

"This airplane is not a good ditcher," he said. "It will float O.K. if it doesn't break apart, and we have hatches we can blow off the top. But the orbiter lands fast, at 190 knots. You come in and stop in 100 yards so so. You decelerate like gangbusters, and anything in the payload bay comes forward. We don't expect a very good day if if comes to that."

On board Challenger was the world's largest privately owned communication satellite, the $100 million Tracking and Data Relay Satellite, which with with its rocket boosters weighed 37,636 pounds.

This morning, water froze on the shuttle service structure. It is used for firefighting equipment and for emergency showers that technicians would use if they were exposed to fuel. The takeoff was delayed because space agency officials feared that during the first critical seconds of launching, icicles might fly off the service structure and damage the delicate heat-resistant tiles on the shuttle, which are crucial for the vehicle's re-entry though the earth's atmosphere.

The Challenger, as it sat on the pad, was about 30 feet at its closest point from the fixed-service structure, close enough to present a threat during the vibrations at launch if the ice had not been not removed.



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Search for survivors was centered 30 miles southeast of Cape Canaveral.

Search by Air and Sea Yields No Sign of the Shuttle Crew

By DUDLEY CLENDINEN
Special to The New York Times

CAPE CANAVERAL, Fla., Jan. 28 — As night fell along the Atlantic coast and debris began to wash up on the shore, the United States Coast Guard pulled back the 13 aircraft that had been searching today for the remains of the space shuttle Challenger and its crew of seven. They returned to base with no human effects found, and prepared to resume the search Wednesday.

"We have not recovered any," Col. John N. Shults of the Air Force, who is coordinating military resources for the search, said tonight. Jesse Moore, the NASA administrator for space flight, said at a news conference earlier in the day that the search "has not produced any evidence that the crew survived."

But beyond the doubts about the crew's survival were questions about the likelihood of their remains being found. "I don't know," Colonel Shults said. "I have no idea what we're going to find. We're still in the preliminary search."

The search by air and by a small surface fleet of seven Navy, Coast Guard and National Aeronautics and Space Administration ships could not begin until pieces of the wreckage shot into the atmosphere by the explosion stopped raining from the sky, nearly an hour after the shuttle's destruction.

Some Wreckage Found

The searchers did recover some material from the space mission in the first hours of the rescue effort today, but the amount and kind of wreckage salvaged was not made known. Mr. Moore said that all material recovered would be impounded as part of the NASA effort to determine what had ignited the explosion that destroyed Challenger.

"I know that they have brought some pieces back, but I have not heard what the dimensions are," Colonel Shults said. "I understand that it's on its way back in. We'll turn it over to NASA, and they'll lock it up."

Lieut. Col. Robert Nicholson of the Air Force, a Defense Department spokesman, said that "some tiles have been washed up on the beach."

"Some have been carried to us by citizens," he said. "We're recommending that any citizens who find anything call law enforcement."

Colonel Nicholson and others issued a plea for citizens to turn over anything they found, and to stay away from the search area offshore. "We really need every bit," he said. "There are no souvenirs. We need it for the investigation. The intention is to gather every piece and take it to one central location and lay it out."

Ships Continue Search

The Challenger, its rockets and fuel weighed 4.5 million pounds at liftoff. Tonight, the surface ships continued to search an area 60 miles wide — from the coastline of Melbourne north to New Smyrna Beach — and 120 miles out to sea.

Officials here estimated that the floor of the Atlantic in the search area lay 70 to 200 feet down. The search thus far has been conducted by sight, officials here said. Representatives from the office of the Navy Superintendent of Salvage were expected here Wednesday to help plan the underwater aspects of the search, and the aircraft were to resume sweeping the ocean surface at daylight Wednesday.