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REMEMBERING CHALLENGER



“Go with throttle up...”

By WILLIAM J. BROAD, Special to the New York Times

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 had survived.

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 had 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.

The Challenger lifted off flawlessly this morning, after three days of delays, for what

was to have been 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.

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 **EXPLOSION to page 2**

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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 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 a sign 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.

Among the people watching were Mrs. McAuliffe's two children, her husband and 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 something was wrong," said Brian Ballard, the editor of The Crimson Review at Concord High School. "I felt sick to my stomach. I still feel sick to my stomach."

At an outdoor news conference held here this afternoon, Jesse W. 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.

Pending an investigation, Mr. Moore said at the news conference this afternoon, hardware, photographs, com-

puter 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.

"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, 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 panel could be appointed as soon as Wednesday by Dr. William R. Graham, the director of the space agency.

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 in three days by bad weather. The Challenger was to have launched two satellites and Mrs. McAuliffe was to have broadcast two lessons from space to millions of students around the country.

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



Official NASA photograph of Challenger crew

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, which 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.

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 procedure, 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 occurred, 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, referring to communications from the Challenger. "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 sailed 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 rescue 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..

In addition, the explosion of the huge fuel supply would have created a cloud of toxic vapors. NASA officials said tonight that the hazardous gases presented no danger to land, but the Coast Guard was advising boats and ships to avoid the area.

This morning, water froze on the shuttle service structure, 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 through the earth's atmosphere.



President Reagan addresses the nation regarding the shuttle disaster

Columbia doomed at liftoff

Shuttle Columbia breaks apart during re-entry on February 1, 2003



Simulated test results reveal fuel pod foam damaged Columbia's left wing at lift-off

By Traci Watson

A test to simulate the blow from a piece of foam insulation smashing into the left wing of the space shuttle Columbia has provided investigators with the first solid evidence that the debris could have led to the destruction of the spacecraft.

NASA engineers and members of the independent Columbia Accident Investigation Board have long suspected that the foam played a role in the Feb. 1 accident, in which all seven crewmembers died. But the evidence until now was mostly circumstantial.

In the test Thursday, investigators used a chunk of foam the same size as the piece that fell off Columbia's fuel tank and hit its left wing during its Jan. 16 liftoff. Using a giant gas-powered gun, they fired the foam into a facsimile of the shuttle's wing at the same speed and impact angle as in the incident Jan. 16.

The blow from the foam was so powerful that a seal on the front edge of the wing "lifted and pulled" toward the outbound side of the wing, board spokesman Lt. Col. Woody Woodyard said.

The displaced seal left a gap 22 inches long in the wing's front edge. The gap varied in width from the thickness of a dime to more than a quarter-inch.

Board members have said

in recent weeks that a missing seal would leave a hole big enough to allow super-heated air to enter the wing on re-entry and burn it up from the inside. Crash debris from the Columbia shows that a hole on the front of the left wing allowed heat to burn away the interior of the shuttle as it glided through the upper atmosphere toward landing.

The one central difference between this test and the actual foam strike on Columbia was the makeup of the test wing. Investigators used a fiberglass version of the panels that cover the front of the wing. The actual panels are made of a more brittle, carbon-based material that would be even more likely to be affected by the foam strike.

"Wow!" Jerry Grey, visiting professor of mechanical and aerospace engineering at Princeton University, exclaimed when told of the test. The result isn't conclusive, but it "sure is a stronger bit of evidence" that the foam is to blame, he said. "It's experimental data, which is always much better than theory."

The finding is "suggestive," said Steven Schneider, a professor of aerospace engineering at Purdue University.

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By Traci Watson and Alan Levin

WASHINGTON -- The nation's space shuttle fleet should be able to return to flight as early as January, the head of the independent panel investigating the shuttle Columbia disaster said Tuesday.

Harold Gehman, chairman of the Columbia Accident Investigation Board, indicated that the changes the board members believe are necessary can be made without extensive redesign or new technology. "I don't see any recommendations which are so difficult to accomplish that they shouldn't be able to return to flight in six to nine months," he said.

His comments mean NASA's plans to get the shuttle flying early next year are not overly optimistic. They indicate that the board won't require major changes that could take years to implement. The comments also rebut

shuttle critics, including some members of Congress, who have suggested that the shuttle is so problem-ridden that it should never again be allowed to carry people.

Such a swift return to space would ease worries about the fate of the \$100 billion International Space Station and the two astronauts aboard. They currently have but one way to get back to Earth: the cramped Russian Soyuz spacecraft.

The shuttle had been the main vehicle to carry supplies, replacement crews and additional parts to complete the station. After the loss Feb. 1 of Columbia, which killed all seven aboard, the space station's crew was reduced from three to two. It has relied on whatever supplies can be carried by the Soyuz and small, unmanned Russian cargo ships.

The accident investigation board already has revealed some of the changes it plans

to recommend in a final report later this summer:

Better attachment of the foam insulation to the shuttle's external fuel tank. A chunk of foam broke from the tank and bashed into the shuttle's wing as Columbia took off Jan. 16.

A shuttle exterior less vulnerable to damage from flying debris. Investigators suspect the foam cracked open Columbia's wing, allowing hot gases to melt the shuttle's interior.

Techniques for inspecting the shuttle after takeoff and repairing it in space.

NASA officials have mentioned dates ranging from mid-December to early spring for the first flight after the Columbia accident. Those dates seemed hasty next to the 21-month gap between the Challenger explosion and NASA's subsequent return to flight.

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The crew of Space Shuttle Columbia

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Schneider noted that a missing seal could create exactly the kind of heat flow that led to Columbia's disintegration.

Investigators must do foam-impact tests on the actual carbon panels used on the shuttle to make a strong case, he said.

Investigators plan to start such tests during the first or second week of June. They decided to fire foam at fiber-

glass panels as practice for tests on the carbon panels. Very few carbon panels exist. They take 18 months to make and cost \$ 800,00 each.

The fiberglass panel comes from a test space shuttle, named Enterprise, which wasn't built to fly in space. But it did make a number of test flights.

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Columbia space shuttle at re-entry

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Shuttle Endeavour seconds before liftoff

football pitch.

The astronauts will also replace a defective gyroscope, one of four keeping the space station on an even keel, and install an exterior stowage platform.

Astronauts will venture out of the ISS on three spacewalks to complete assembly and repair tasks.



Teacher taken to space on shuttle Endeavour

CAPE CANAVERAL: NASA's space shuttle Endeavour blasted off yesterday, sending the first teacher into space 21 years after the Challenger explosion tragically took the life of another pioneering teacher.

Teacher-turned-astronaut Barbara Morgan, 55, has become the star of the second shuttle mission to the International Space Station (ISS) this year, which has otherwise been marked by embarrassing stories of drunken and love-crazed astronauts.

Her chance to fly into space finally came with Endeavour's launch yesterday evening from the Kennedy Space Centre in Cape Canaveral.

The booster rockets separated about two minutes after the shuttle lifted off, and Endeavour was hurtling toward space at a speed of 24,000km/h, a NASA official said.

"Class is in session," a NASA mission control spokesman said after the external

fuel tank separated from the shuttle and the

Endeavour entered its preliminary orbit less than nine minutes into the flight.

"A launch operation doesn't get any better than this, it can't,"

NASA administrator Mike Griffin said afterwards.

The shuttle is to reach the orbiting ISS tomorrow morning.

First Lady Laura Bush, a former teacher herself, called Morgan yesterday to offer congratulations from "one schoolteacher to another".

Morgan had trained alongside fellow teacher Christa McAuliffe in the 1980s as a backup for the Challenger shuttle mission.

But on January 28, 1986, Challenger exploded and broke up 73 seconds after blast-off, killing all seven aboard, and delaying for two decades Morgan's own aspirations to join the elite astronaut corps.

"Christa was, is and always

will be our 'teacher in space', our first teacher to fly" in a shuttle, Morgan said in an interview released by NASA.

"She truly knew what this was all about -- not just bringing the world to her classroom, but also helping ... to show the world what teachers do," she said.

After the Challenger disaster, Morgan went back to teaching and then rejoined the astronaut corps in 1998.

Once in space, she will operate robotic arms on the ISS and the shuttle to unload and install new equipment and supplies on the space station.

Endeavour is taking seven astronauts on an 11-day mission to continue the expansion of the ISS, an orbiting laboratory that NASA considers a key part of its space exploration ambitions.

The mission will carry a truss section about the size of a small car to extend the space station to a length of 108m, about the size of a

*In memory of those who perished
aboard
Challenger & Columbia*