



Report of the

# PRESIDENTIAL COMMISSION

*on the Space Shuttle  
Challenger Accident*



### IN MEMORIAM

*"The future is not free: the story of all human progress is one of a struggle against all odds. We learned again that this America, which Abraham Lincoln called the last, best hope of man on Earth, was built on heroism and noble sacrifice. It was built by men and women like our seven star voyagers, who answered a call beyond duty, who gave more than was expected or required and who gave it little thought of worldly reward."*

—President Ronald Reagan January 31, 1986

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Francis R. (Dick) Scobee  
*Commander*

Michael John Smith  
*Pilot*

Ellison S. Onizuka  
*Mission Specialist One*

Judith Arlene Resnik  
*Mission Specialist Two*

Ronald Erwin McNair  
*Mission Specialist Three*

S. Christa McAuliffe  
*Payload Specialist One*

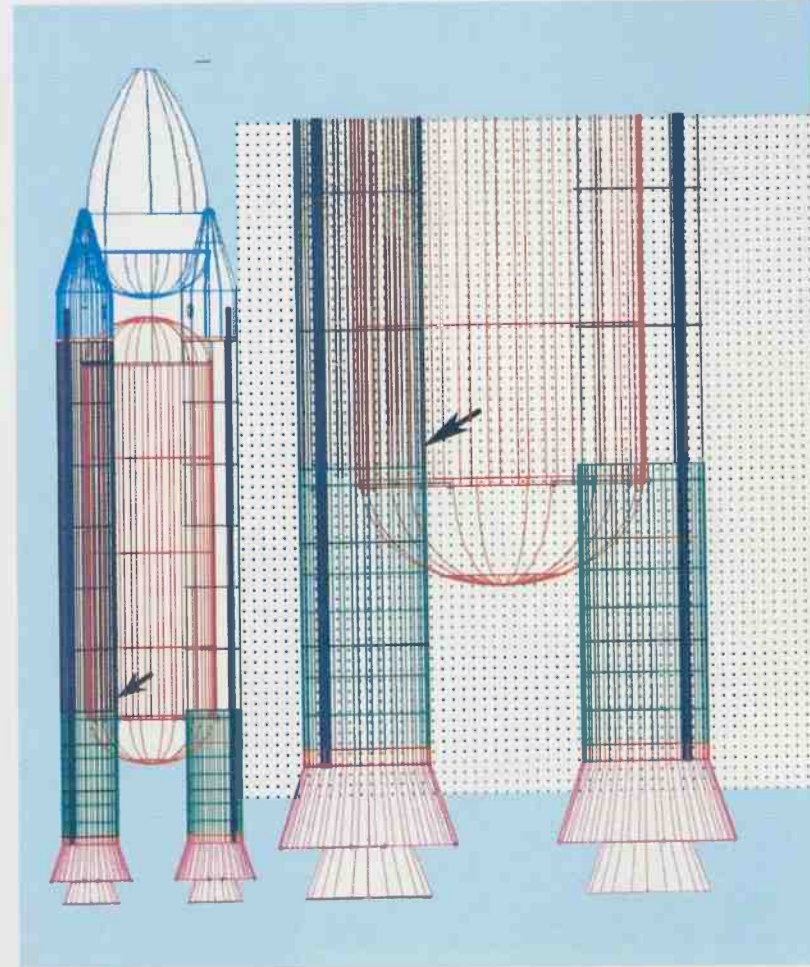
Gregory Bruce Jarvis  
*Payload Specialist Two*

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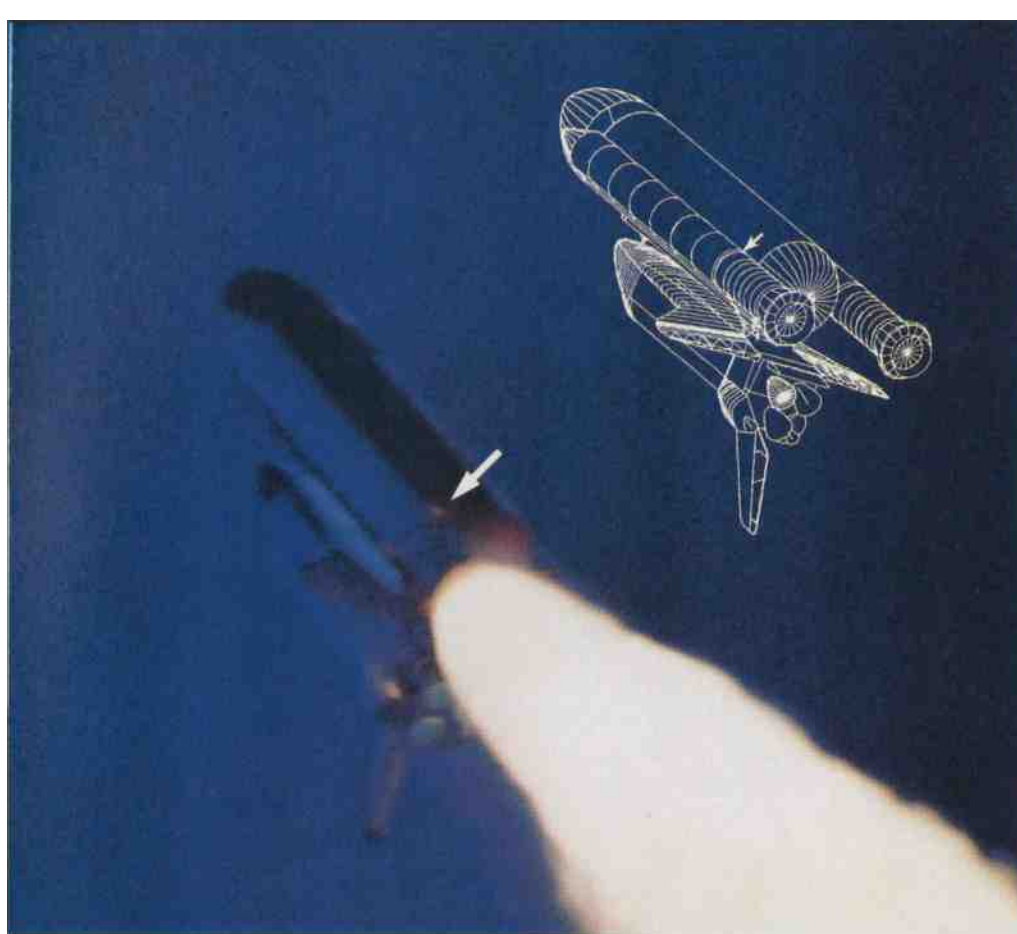




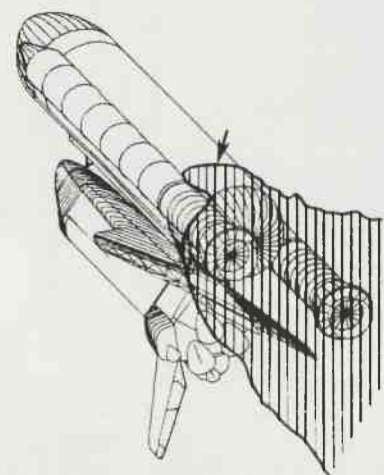
Multiple smoke puffs are visible in the photo above (arrows). They began at .836 seconds and continued through 2.500 seconds, occurring about 4 times a second. Upward motion of the vehicle caused the smoke to drift downward and blur into a single cloud. Smoke source is shown in the computer generated drawing (far right).



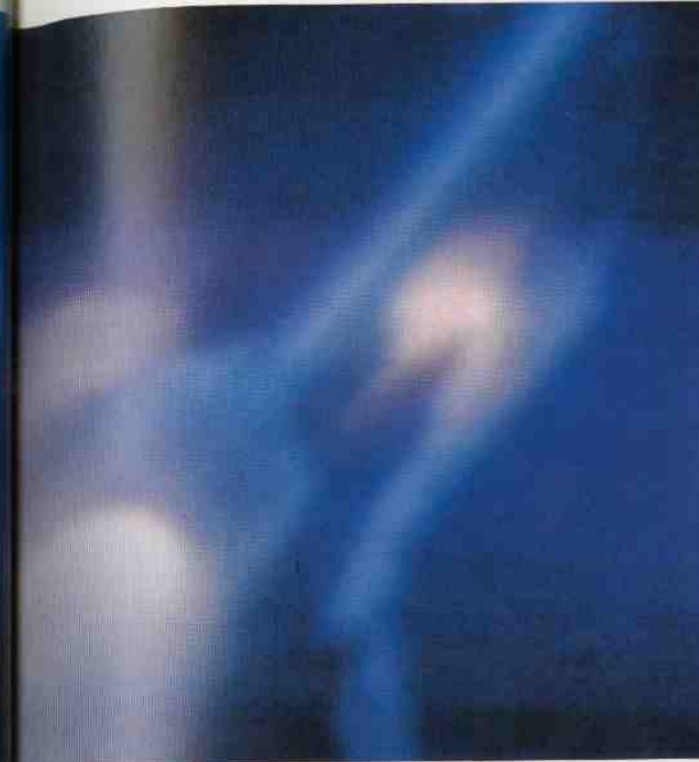




At 58.788 seconds, the first flicker of flame appeared. Barely visible above, it grew into a large plume and began to impinge on the External Tank at about 60 seconds. Flame is pinpointed in the computer drawing between the right booster and the tank, as in the case of earlier smoke puffs. At far right (arrow), vapor is seen escaping from the apparently breached External Tank.







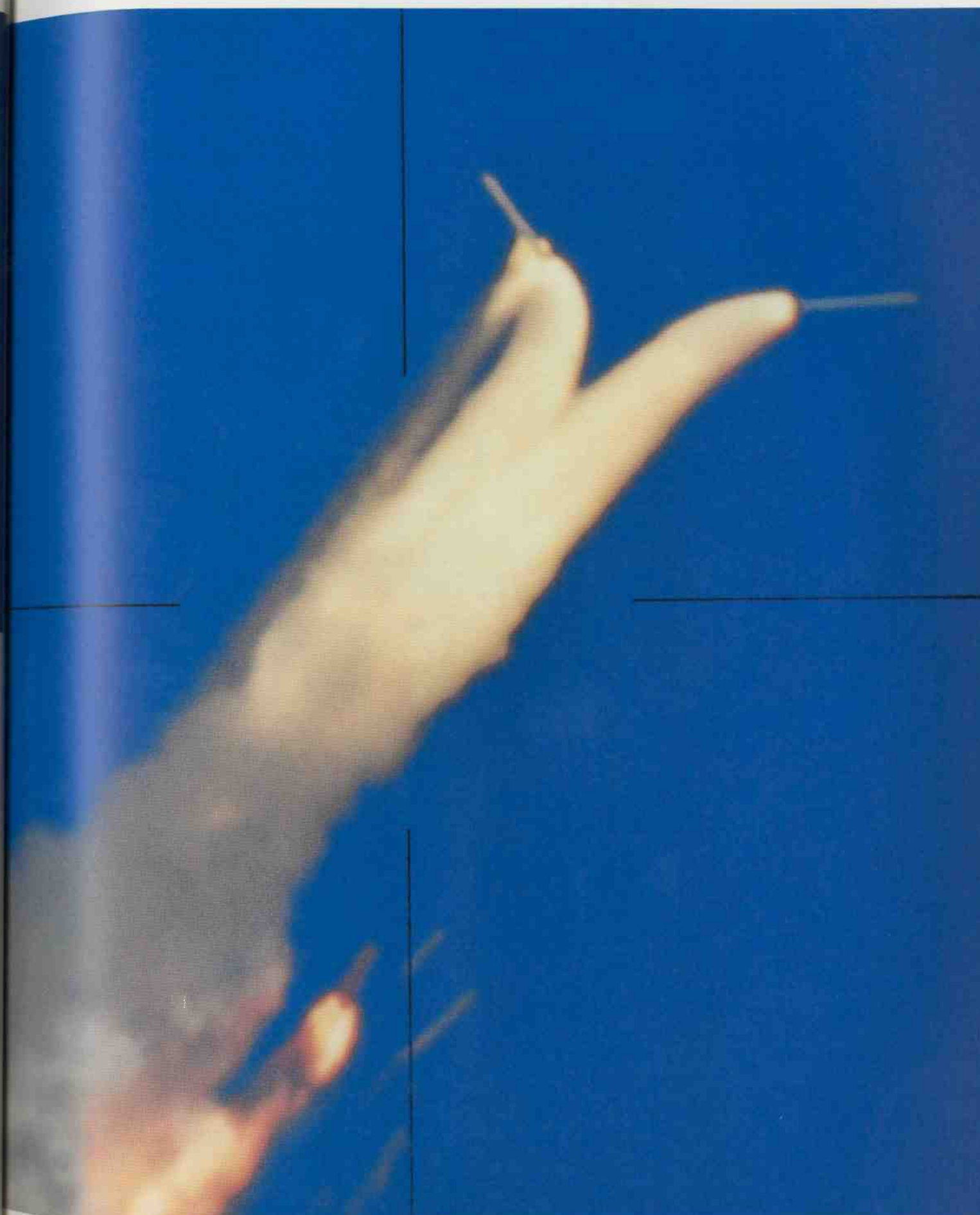
Camera views indicate the beginning of rupture of the liquid hydrogen and liquid oxygen tanks within the External Tank. A small flash (arrows above) intensified rapidly, then diminished. A second flash,

attributed to rupture of the liquid oxygen tank, occurred above the booster/tank forward attachment (below left) and grew in milliseconds to the maximum size indicated in the computer drawing.

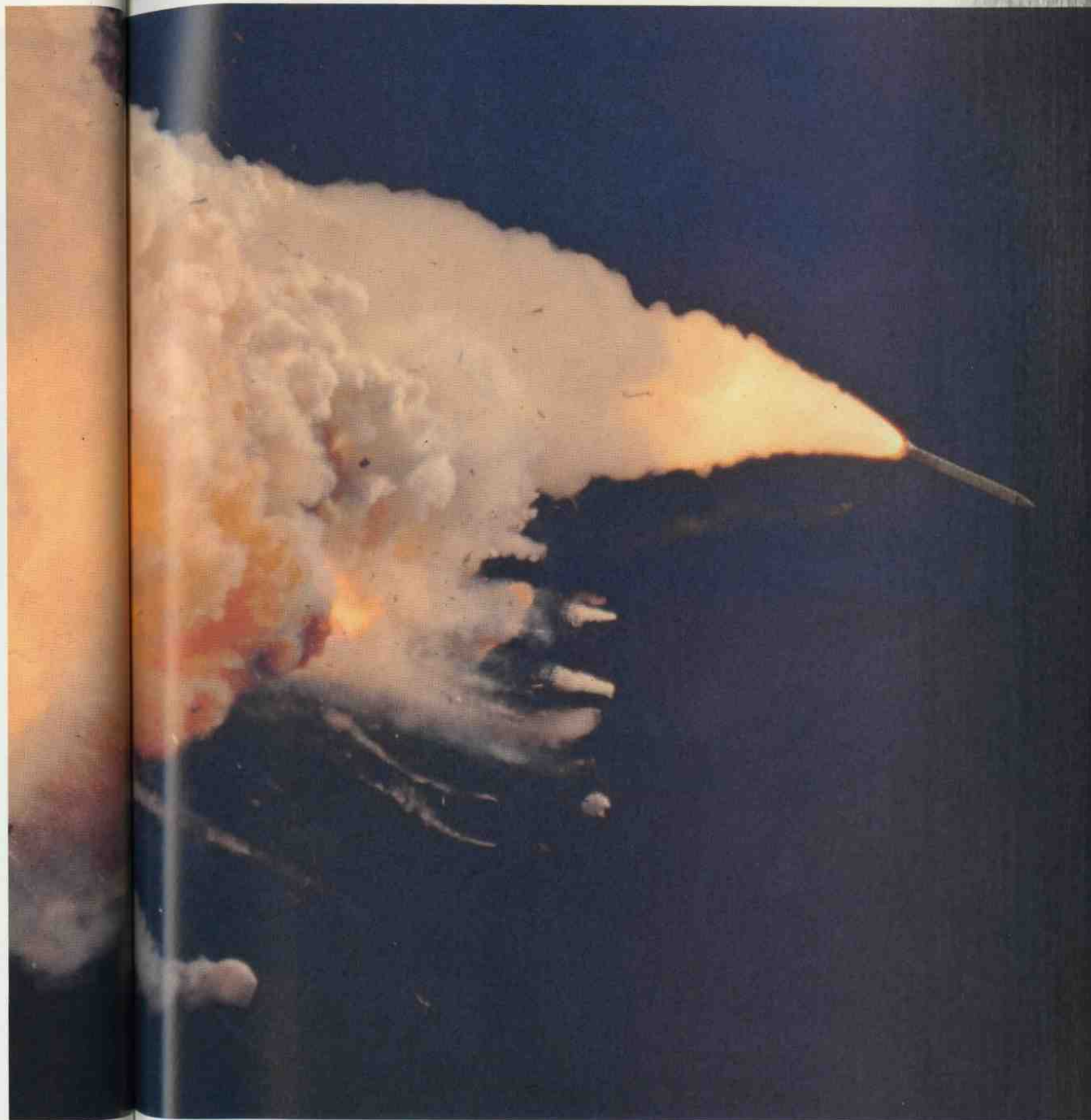




Structural breakup of the vehicle began at approximately 73 seconds. Fire spread very rapidly. Above, a bright flash (arrow) is evident near the nose of the Orbiter, suggesting spillage and ignition of the spacecraft's reaction control system propellants. At left, the two Solid Rocket Boosters thrust away from the fire, crisscrossing to form a "V." The right booster—identifiable by its failure plume—now to the left of its counterpart. At right, the boosters diverge farther; the External Tank wreckage is obscured by smoke and vapor. The Orbiter engines still firing, is visible at bottom center.







At about 76 seconds, unidentifiable fragments of the Shuttle vehicle can be seen tumbling against a background of fire, smoke and vaporized propellants from the External Tank (left). In the photo at right, the left booster (far right)

soars away, still thrusting. The reddish-brown cloud envelops the disintegrating Orbiter. The color is characteristic of the nitrogen tetroxide oxidizer in the Orbiter Reaction Control System propellant.





Hurling out of the fireball at 78 seconds (left) are the Orbiter's left wing (top arrow), the main engines (center arrow) and the forward fuselage (bottom arrow). In the photo below, it plunges Earthward, trailed by smoking fragments of Challenger.







A The upper photos show, from left to right, the left side of the Orbiter (unburned), the right lower and upper rudder speed brake (both burn damaged) and left upper speed brake (unburned), confirmation that the fire was on the right side of the Shuttle stack. The lower photos show the range safety destruct charges in the External Tank. These charges were exonerated when they were recovered intact and undetonated.



B



C



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