WORLD NEWS

Booster burnthrough caused Shuttle explosion
HOUSTON

Nasa believes that burn-
through of a solid rocket
booster caused the cata-
strophic explosion which
destroyed Challenger, killing
its crew of seven little more
than a minute into the 25th
Space Shuttle mission.
The external tank contain-
ing liquid hydrogen and liquid
oxygen exploded with such
force that, for an hour after,
recovery ships and aircraft
were prevented from entering
the impact area by debris fall-
ing from high altitude.
Mission 51L lifted off at
1138hr local time on January
28. The day was clear, but
cold, and the first 70sec of
flight appeared normal. About
50sec after launch Chal-
lenger's three main engines
were throttled back to 60 per
cent thrust as the Shuttle
experienced maximum air
pressure.
Some 15sec later the
engines were throttled up to
maximum 104 per cent power
as air pressure diminished.
Shortly before the explosion
the crew received the standard
call from mission control,
"Challenger, go at throttle
up," indicating that telemetry
reported engine performance
as normal.

At 72sec after lift-off, just
after commander Dick Scobee
made the standard reply and
the last words from Chal-
lenger, "Roger, go at throttle
up", the base of the external
tank appeared to catch fire.
The fire spread rapidly, and
the forward liquid oxygen
tank exploded, engulfing the
Shuttle in flames.

Film released by Nasa
reveals that more than lOsec
before the explosion a plume
of flame appeared near the
base of the righthand booster,
playing like a blowtorch over
the external tank. Nasa
believes that this flame
burned through the tank,
causing a liquid hydrogen
leak, the resulting fire spread-
ing forward to ignite the
highly explosive liquid oxygen
tank.

Initially the boosters
appeared to emerge unscathed
from the fireball that engulfed
Challenger, only to be deliber-
atly destroyed 30sec later by
the range safety officer, a
standard procedure which

may have robbed Nasa of
valuable evidence.
Nasa at first discounted a
possible booster failure,
saying that telemetry had
indicated "reasonably
nominal" thrust. Later anal-
ysis showed that combustion
pressure in the righthand
booster had dropped by about
10 per cent before the
explosion. The burnthrough is
thought to have occurred at
the bolted join between two
booster segments.
Attention is now focussed
on possible ice damage to the
booster while still on the
launch pad. Nasa had earlier
discouraged speculation that
ice was to blame, saying that
ice teams had inspected the
pad twice on the morning of
the launch, including just
20min before lift off, and had
reported that low risk was
involved. Shuttle was
launched without problem in
similar icing conditions in
January 1984, Nasa said.

The boosters are designed
to be recovered, refurbished,
refilled, and reused ten times.
The boosters for this mission
are reported to have been
assembled from elements
which had flown no more than

three times.
Shuttle was travelling at
2,900ft/sec, 47,000ft altitude,
seven miles downrange when
the explosion occurred. Nasa
immediately formed an
interim board of inquiry.
Teams were formed to
impound and protect data on
telemetry, trajectory, launch
pad, beach area, debris, Shut-
tle processing, astronaut
corps, main propulsion, solid
rocket boosters, and external
tank.

The seven-strong crew
comprised commander, pilot,
three mission specialists, and
two payload specialists, one of
whom was Nasa's first "citi-
zen astronaut", a US teacher.
Commander Dick Scobee,
46, was pilot on Challenger
mission 41C in April 1984
when the Solar Max satellite
was repaired in space. Pilot
Mike Smith, 40, was on his
first Shuttle mission. Mission
specialist Judy Resnik, 36,
became America's second
woman in space on Discovery
mission 41D in August 1984.
Ron McNair, 35, was on his
second Shuttle flight, having
flown on Challenger mission
41B in February 1984. Scobee,
Smith, Resnik, and McNair

EXTERNAL TANK

SOLID ROCKET BOOSTER

LOX.LH;
feed pipes
to Orbile'

were in the Orbiter cockpit.
In the mid-deck beneath
the cockpit was mission
specialist Elison Onizuka, 39,
veteran of Discovery mission
51C in January 1985. Beside
him were Shuttle newcomers
Hughes Communications
payload specialist Greg Jarvis,
39, and US teacher Christa
McAuliffe, 37, selected from
10,000 applicants to become
Nasa's first Spaceflight
Participant.
Challenger's crew were the
first US astronauts to be lost
in flight. Nineteen years
earlier, on January 27, 1967,
the three-man crew of Apollo
1 was killed when the space-
craft caught fire during a test
on the launch pad at Cape
Canaveral. The deaths of Gus
Grissom, Ed White, and
Roger Chaffee delayed the
Apollo programme for almost
two years.

Also in 1967, on April 24,i
the Soviet Soyuz 1 plummeted
to Earth when its parachute
failed and cosmonaut Vladi-'
mir Komarov became the
first space casualty. On.
June 29, 1971, cosmonauts
Georgi Dobrovolsky, Viktor
Patsayev, and Vladislav,-
Volkov died before re-entry
after a 20-day stay aboard the
Salyut 1 space station when,-*
their Soyuz 11 descent module
depressurised.

On April 5,1975, during the '
launch of Soyuz 18, the
second stage of the Soviet A-2
Launch vehicle failed to sepa-
rate completely from the core
stage, and the two-man Soyuz
capsule was hauled clear by
escape rockets to land near
the border with China. On
September 27, 1983, an A-2
booster carrying Soyuz T10
exploded on the launch pad.
Again the two-man crew was
saved when their capsule was
hauled to safety by the rocket
escape system.
Shuttle has come close to
disaster before. Discovery
mission 41D aborted on the
launch pad on June 26, 1984,
as did Challenger itself on
mission 5 IF on July 12 last
year. When mission 51F was
finally launched, on July 29,
Challenger lost one main
engine during ascent, but
safely reached orbit. These
incidents have only served to
underline the reliability and
safety of Shuttle's demanding
fail-safe systems.

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