

The Challenger disaster

As we lived it at the Madrid Tracking Station, Spain

It was April 12th 1981. NASA was about to initiate a new era in space transportation. It was kind of an aircraft adhered to a big liquid propellant tank and two solid rocket boosters all of which would be recovered and most of which would be reused.

This first flight was considered as a “Dress Rehearsal”. A demonstration of the capabilities of this new endeavor. The Space Shuttle was the Columbia and the flight denomination was STS-1.

The whole tracking network was in a “critical support status” and everything, from operations training to equipment maintenance, had been prepared to the maximum possible

Madrid was a “Launch hold criteria Station”, which meant that were we not ready for whatever the reason, the launch would be scrubbed. And thus, during the previous two years, we had been getting ready doing operations simulations and performing equipment readiness tests to the maximum extent possible.

The Naval Station Rota, at Cadiz, was also a “Launch hold criteria Station” as the Shuttle could land in there in case of an abort.



STS 1 Launch

After the Columbia had cleared the launch pad, the tracking station at Merritt Island, the first to acquire contact with the ship, had a failure and signal was lost. The whole network stopped breathing.....but there was no problem as in a very short time the station at Bermuda, in the Atlantic, would pick up the signal. But, as Murphy would have said, <...if anything can go wrong...>, the system responsible for relaying information of distance and velocity at Bermuda failed, and left Houston with no knowledge of whether the craft was in the proper trajectory to attain orbit.

After Bermuda lost the signal, there was a communications blackout of a few minutes until the ship could be picked up by Madrid, and Houston and the whole network were expectant as to the reports from our station.

Everything worked out fine, Madrid acquired the signal at the right moment and in the predicted spatial position and Houston breathed again and so did we. Our success was crucial in that the decision to push to orbit or abort depended on the information relayed from our tracking.

With the subsequent trouble free launches, the stress gave way and we finally relaxed until that become almost like a routine.

And then STS 51-L came. It was the twenty fifth launch of a Shuttle and Challenger's tenth. It was launched from Complex 39-B at the Kennedy Space Center in Florida at 16:38 GMT on January 28th, 1986.

Everything seemed normal but...73 seconds after liftoff, the vehicle experienced a catastrophic structural failure that determined the loss of the ship and its crew.



Challenger (STS 51-L) launch

Meanwhile, we in Madrid were unaware of what had happened.

All our equipment and operations personnel were ready, our antenna was looking to the predicted acquisition horizon point and we were all waiting for the downlink signal.

But something was not right; the thunderous silence of the voice lines did not predict good news.

We began worrying and decided to ask Houston.

Houston's laconic answer <...We have a major contingency...> left us speechless. Almost at the same time, station workers that were not involved in the tracking operations and were watching the launch on TV came into the operations room and informed us of the tragedy.

The crew that lost their lives in this accident was composed by the commander Francis R. Scobee, the pilot Michael J. Smith, the mission specialists Ellison S. Onizuka, Judith A. Resnik and Ronald E. McNair and the payload specialists Gregory B. Jarvis and the first civil crew member in a NASA flight S. Christa McAuliffe.

In Madrid, we felt we had lost some close relatives as that was how we considered the astronauts that flew in the missions we participated in.

What had happened? President Ronald Reagan immediately assigned a commission to investigate the causes of the failure.

The “Rogers Commission” was composed by William P. Rogers as president, Neil Armstrong as vice-president, and David Acheson, Eugene Covert, Richard Feynman, Robert Hotz, Donald Kutyna, Sally Ride, Robert Rummel, Joseph Sutter, Arthur Walker, Albert Wheelon, and Chuck Yeager. Their analysis determined that the accident was caused by the failure of an O-ring in one of the solid rocket boosters and by the decision making system at NASA.

Important factors that contributed to the accident:

1. Our image of Florida is that of an idyllic paradise with beautiful beaches and modern infrastructures where the Sun is always shining and everything is perfect, but it is also a frequent route for hurricanes and, in winter, temperature goes below freezing during the night and it even snows every now and then.
2. The solid rocket boosters, manufactured by Morton Thiokol, were composed of seven steel cylinder sections. Six of these sections were assembled at the factory in pairs using an asbestos-silica compound and the resulting four segments were shipped to Florida for assembly at the Vehicle Assembly Building (VAB). These remaining four segments were put together using two rubber O-rings each, a primary and a secondary.
3. The launch was originally programmed for January 22nd but had been postponed several times for different reasons and during all these days, the vehicle had been in the launch pad suffering the weather conditions. Local humidity coated everything with water droplets that froze at night and melted again during day time.



The disaster



The crew

4. On launch day, ambient temperature was 3° C below zero.

5. Experts from Morton Thiokol tried to convince launch control to delay the countdown due to the low temperatures.

6. The security margin had been placed at 12° C but NASA decided to go ahead with the launch sequence due to the continuous delays they had had in this mission.

Due to these drastic and aggressive changes in atmospheric conditions plus the vibrations, the dynamic tensions and the heat of the launch, produced a crack in one of the rubber O-rings on the stern of the starboard rocket.

Extremely hot gas started to come out of the crack and as it was highly pressurized, it acted much as a flame-thrower, hitting directly onto one of the fittings of the booster to the rest of the ship until it gave way.

The booster started lurching and hit, and severely damaged, the main tank. This, in turn, originated more flames while, at the same time, the booster and the rest of the ship were pulling in different directions. The aerodynamic tensions were so intense that it all ended into a structural failure.

The cockpit was built by using reinforced aluminum and thus, it was an especially solid structure. It separated in one piece from the rest of the ship and followed a ballistic trajectory. The acceleration during separation was calculated to be up to 20 g, but it soon came down to 4 g.

The recovery procedures were immediately put into effect and several parts of the vehicle were found deep into the ocean after a long search. The cockpit was among these parts.

It was subject to a deep analysis that indicated that, probably, at least three of the crew members had survived the initial breakdown as three of the emergency air kits had been used.

The usage corresponded to two minutes and forty five seconds which was the calculated time for the cockpit to reach the ocean surface.

May be, they didn't survive the impact on the sea which was calculated at 333 km/h.

This mission had unusual media coverage due to the presence, as part of the crew, of Christa McAuliffe, first civil in space, professor and member of Project Teacher in Space.

Obviously, all Shuttle operations were suspended during a period of thirty two months while the problems of the solid rocket boosters, that were the cause of this tragedy, were corrected.

The bonds between segments at the VAB were modified and the O-rings were increased to three for future launches. NASA also received nine recommendations regarding their decision making scheme.

A week later, USA President, Ronald Reagan, gave a national address on the disaster from the Oval Office of the White House and finished it with these words <...We will never forget them, nor the last time we saw them, this morning, as they prepared for their journey and waved goodbye and 'slipped the surly bonds of Earth' to 'touch the face of God....>

Three days later at a memorial service at JSC he stated <...Sometimes, when we reach for the stars, we fall short. But we must pick ourselves up again and press on despite the pain...>

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