The Space Shuttle Challenger Disaster

On January 28th, 1986, the United States stopped in their tracks to watch the 10th flight of the *Challenger* make its way into space. The Shuttle was named after HMS *Challenger*, a British corvette that was a command ship for the *Challenger* Expedition, a marine research expedition happening all over the globe from 1872-1876. The Space Shuttle was manufactured by Rockwell International and operated by NASA, it was initially intended to be a test article and not for space flight. Their original plan to upgrade the *Enterprise* shuttle for spaceflight would have been more expensive than the upgrades to the *Challenger.* So, the *Challenger* then made its maiden flight in April 1983 as the second Space Shuttle orbiter to enter space, following *Columbia.* After the first flight, it then flew on 85% of all space missions after that. It began flying 3 missions a year from 1983-1985, and in 1986 it took its 10th and final mission.

The *Challenger* was originally scheduled to launch July 1985 then got rescheduled twice, November 1985 and then January 26th, 1986. But that wasn't the end, and after several paperwork and technical delays, it was delayed until January 28th. The *Challenger* had 7 crew members on this mission with several of them ready to make history. One particularly was Christa McAuliffe who was going to be the first teacher in space and teach to her students via live sessions from the orbiter. Prior to the flight there had been concern of the O-ring joints in the solid rocket boosters (SRB) not closing tight enough because of the forces being generated at ignition. It was noted that combustion gases were able to erode the O-rings in the event of a flame path which would cause the joint to burst, destroying the booster and the shuttle. After several attempts of the Marshall Space Flight Center engineers notifying NASA and Morton-Thiokol of the concern of design, there was no response, and the joints were accepted for flight in 1980.

The morning of January 28th the weather was unusually cold reaching near 30° F as a high and low of 18° F the night before. The minimum temperature allowed for a launch is 39° F, meaning if they continued the temperatures are below their redline. Neither the O-Rings or the shuttle were tested and yet they were permitted for a launch in low temperatures. There were several engineers who voiced their concerns that morning about the effects of the conditions and if the joints would be properly sealed if they were colder than 54° F. The delay was then opposed by the NASA staff who were appalled that they wanted to create another delay of the launch. There had been ice accumulations all over the launch pad and equipment. With concern, the Kennedy Ice Team pointed an infrared camera at the joint on the SRB and found the temperature was at 9° F. The engineers from Morton-Thiokol continued to voice concern about the amount of ice accumulation and how if it shakes loose and hits the protection tiles it can result in damage of many things. But they were once again, told to proceed with the launch. And at 11:38 am EST, the *Challenger* was cleared to launch.

Seventy-three seconds into the flight was when everything changed. It became the first shuttle that was destroyed in a mission accident. 17% of the United States had been watching the launch and saw the destruction of the shuttle. The explosion killed all 7 crew members and began a 32-month investigation process. The booster joint had opened creating a flame that began melting structures around it and then came an explosion of the external tank due to the leaking of gas from the SRB joint. It is a day that most remember, and many have heard about. That afternoon President Ronald Reagan was supposed to deliver his State of The Union speech, but he instead spent time giving his condolences and speaking about the tragedy. The speech was listed as one of the most significant speeches in the 20th century. Three days later a memorial service was held at the Johnson Space Center. It was attended by President Reagan and his family, 6,000 NASA employees, 4,000 guests and the families of the crew.

After months of investigation, it was found that the *Challenger* explosion was in fact caused by the failure of the O-rings not properly sealing the SRB which allowed pressurized gases to eventually flame up and create an explosion. There was also a large discussion about the why the shuttle was launching in such low temperatures, knowing that it wasn't safe. The failure of both NASA and Morton-Thiokol Company by not properly responding to concerns from their engineers and flawed designs was a bad judgement call. **The accident was a prime example of what can occur when you lack the clarity of the information presented. This was a hard lesson learned publicly for an institution that prided itself on scientific advancements. This should be a reminder for people to stop and think before blowing off safety suggestions/concerns in order to get things done fast.**

Robert Boisjoly, engineer for Morton-Thiokol, left his job and became a speaker on workplace ethics. He said the decision to launch "constituted the unethical decision-making forum resulting from intense customer intimidation". In March of 1988, Morton-Thiokol was sued and agreed to pay for the manufacturing of faulty SRB's. They paid for 60% of the lawsuit which came out to be $4,641,000 and the US government paid the remainder. After this disaster NASA made some changes to how they build and do things. They made many technical changes to the shuttle and the parts they used. They also made changes to the accountability and safety culture of its company and created an educational legacy for years to come.

Resources

- https://www.space.com/18084-space-shuttle-challenger.html
- https://www.space.com/18084-space-shuttle-challenger.html
- https://www.history.com/news/how-the-challenger-disaster-changed-nasa
- https://history.nasa.gov/Biographies/challenger.html
- https://www.today.com/news/christa-mcauliffe-s-former-students-remember-challenger-disaster-t207158
- https://www.npr.org/sections/thetwo-way/2016/01/28/464744781/30-years-after-disaster-challenger-engineer-still-blames-himself

Video

- https://www.youtube.com/watch?v=AfnvFnzs91s
- https://www.youtube.com/watch?v=ILAeVAgqFV4