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ROCKET SCIENCE

*The earth is the cradle of mankind,
but one cannot stay in the cradle forever.*

(Konstantin Tsiolkovsky, 1911)

I must have seen it on TV as child. It is the image of an exploding rocket that keeps re-appearing in my mind and head since then. On January 28, 1986 the space shuttle „Challenger“ disintegrated live on CNN. All 7 crew members found there death. The incident was a national disaster in the United States leading to postponement of a scheduled State of the Union address and a dedicated national address on the disaster by US-president Ronald Reagan.

The series “Rocket Science” mounts quotes of this speech onto images of various failed attempts to shoot rockets into the orbit over the last decades. This can be seen as an highly ambiguous metaphor of progress and technology.

Rockets are so complicated and have such narrow margins for error that they require large teams of designers, engineers, workers and managers to succeed. Rocket tests resulted in inevitable failures and explosions familiar to anyone who tried to advance the science of rocketry.¹

The ideas of traveling in space by means of rockets might have lurked around for a while, but as with most contemporary technology it required the military-industrial complex to drive the development of rockets, a major foundation of which was set by the the German Nazi-military with their efforts on the infamous V weapons.

This is just one striking parallel to many of the technologies surrounding us today: Computers, the Internet, GPS, satellites, mobile communication and data crunching and data mining - most of the groundwork of which was and is built by the military-industrial complex with significant contributions during the heights of the second world war – and nowadays mainly driven by the United States.

It's also rockets that enable our contemporary communication and surveillance society by delivering the necessary infrastructure into the god-eyed orbital positions: reconnaissance, GPS, communication and imaging satellites. The initially limited civilian usage of this infrastructure was not only made possible, society grew with it, and now depends on it.

"Rocket Science", however, should not be seen as a simple critique of technology. Neither it is a praise. “Technophilia and technophobia form a diabolical pair joined together by a central untruth: that such a thing as the technical exists, [that] it would be possible, apparently, to divide between what is technical and what is not, in human existence. Well, no, in fact.” [..] “man’s relation to the world is essentially artificial,technical”²

It is always man and society (and their essential quest and struggles to pursue knowledge, power and fame) who chooses which and how technologies are used and which are developed ...

January 2015

1 Gainor, Chris (2008): To a Distant Day: The Rocket Pioneers. University of Nebraska Press

2 The Invisible Committee: Fuck Off, Google, Retrieved on January 21st, 2015 from <https://events.ccc.de/congress/2014/Fahrplan/system/attachments/2530/original/fuckoffgoogleeng.pdf>

*Du lebst auf diesem Erdplaneten
Im Zeitalter der Fernraketen.
Das Himmelschiff im Weltenraum -
Ein Friedenswerk und Menschheitstraum -
Mag das Jahrhundert einst begeistern!
Heut' heißt es ein Waffe meistern...*

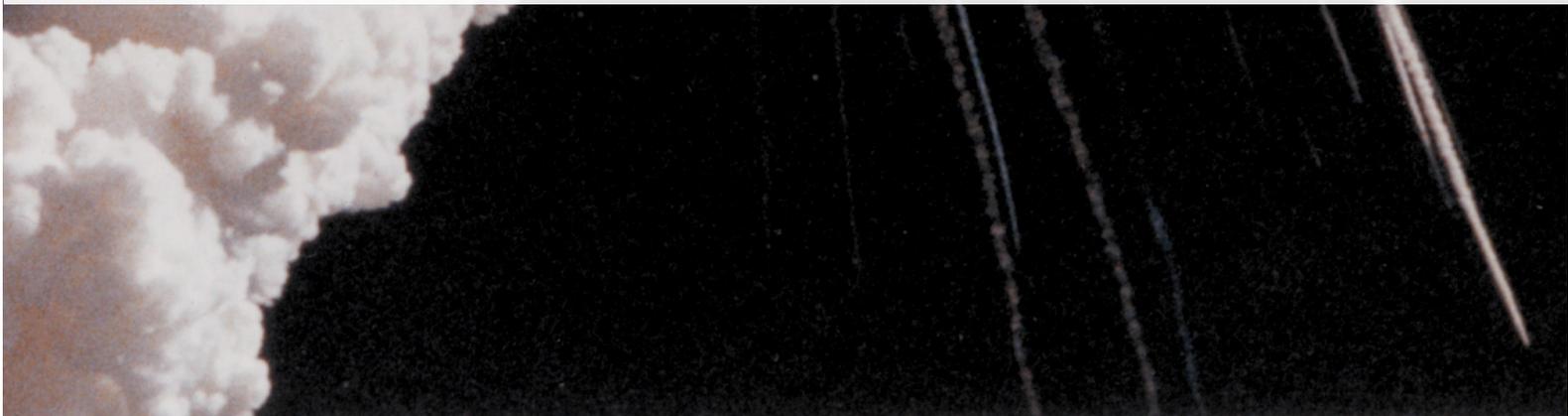
(A-4-Fibel, 1944 - Nr.1.8b)

*The more technology advances, the more
fateful will be its impact on humanity. But if
the world's ethical standards and moral laws
fail to rise and be adhered to with the
advances of our technological revolution, we
run the distinct risk that we shall all perish.*

(Wernher von Braun)



The future doesn't belong to the
fainthearted It belongs to the brave.





That's all part of taking a chance and expanding man's horizons.





Nothing ends here.
Our hopes and our journeys continues.



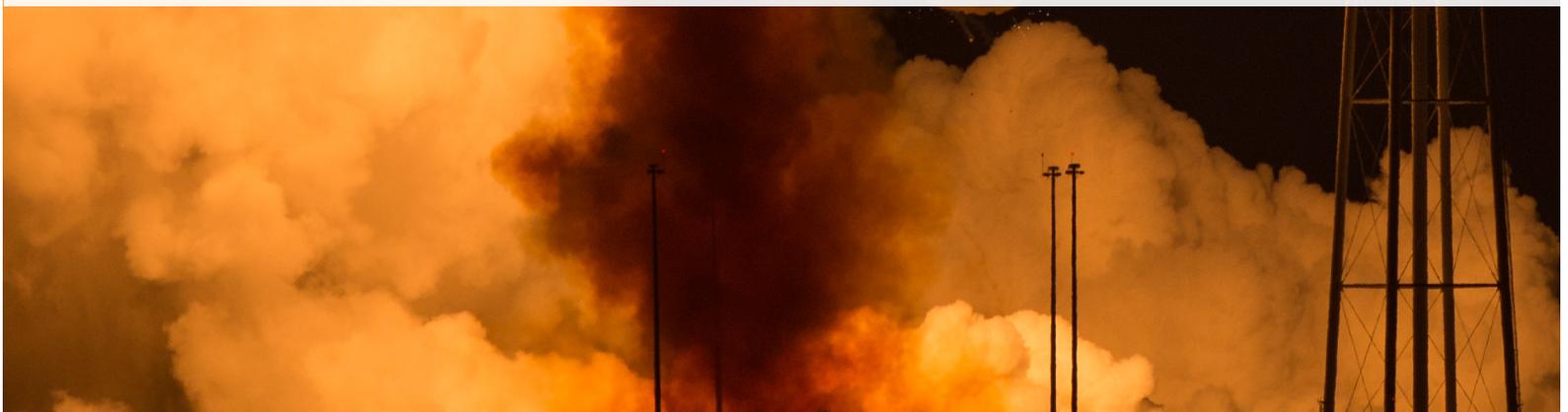


It's all part of the process of exploration and discovery.





That's the way freedom is,
and we wouldn't change it for a minute.



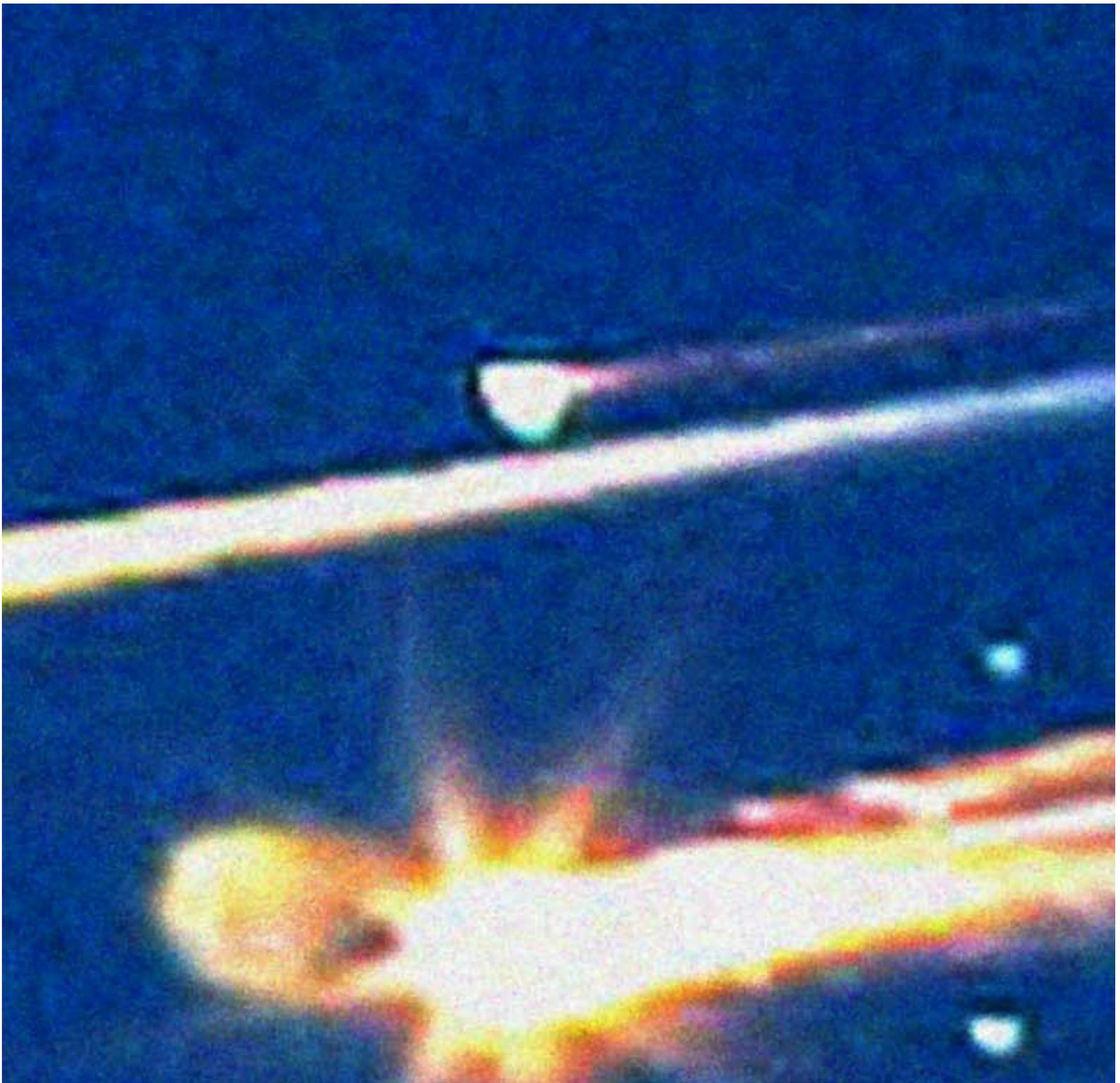


Give me a challenge and
I'll meet it with joy.





I know it is hard to understand, but sometimes painful things like this happen.



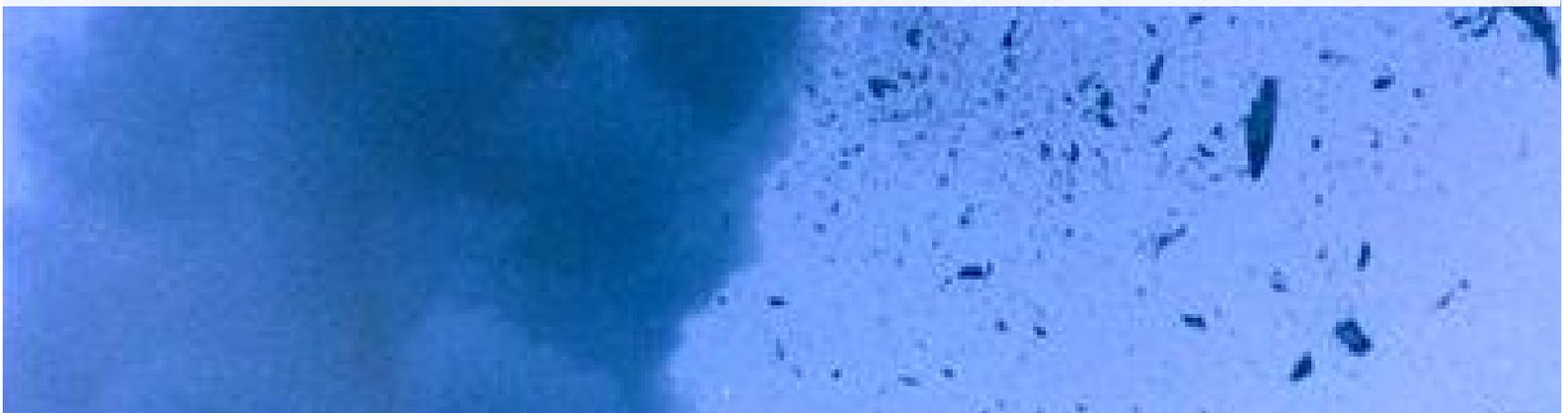
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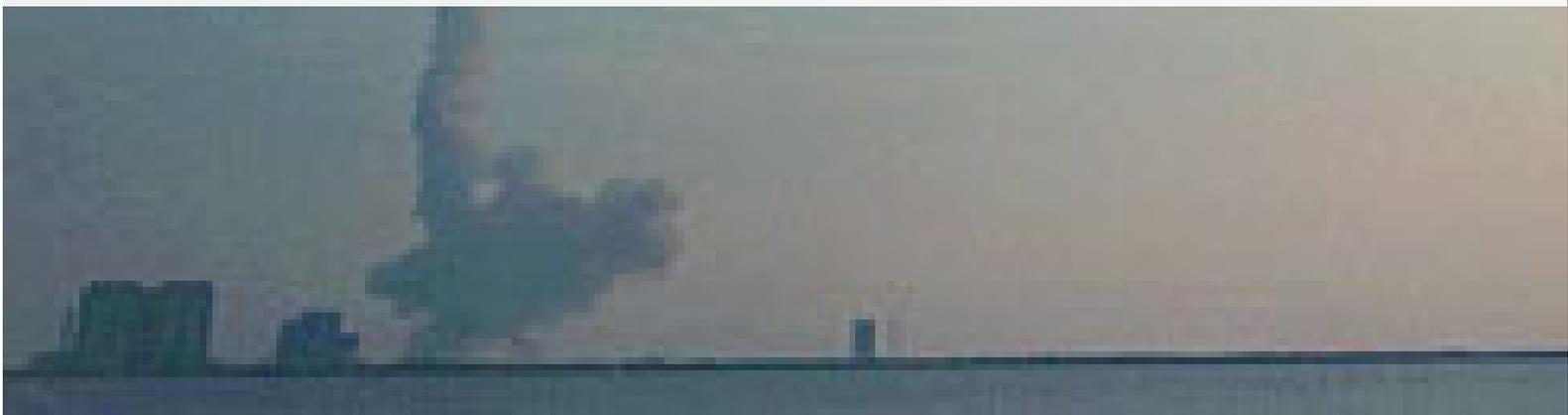


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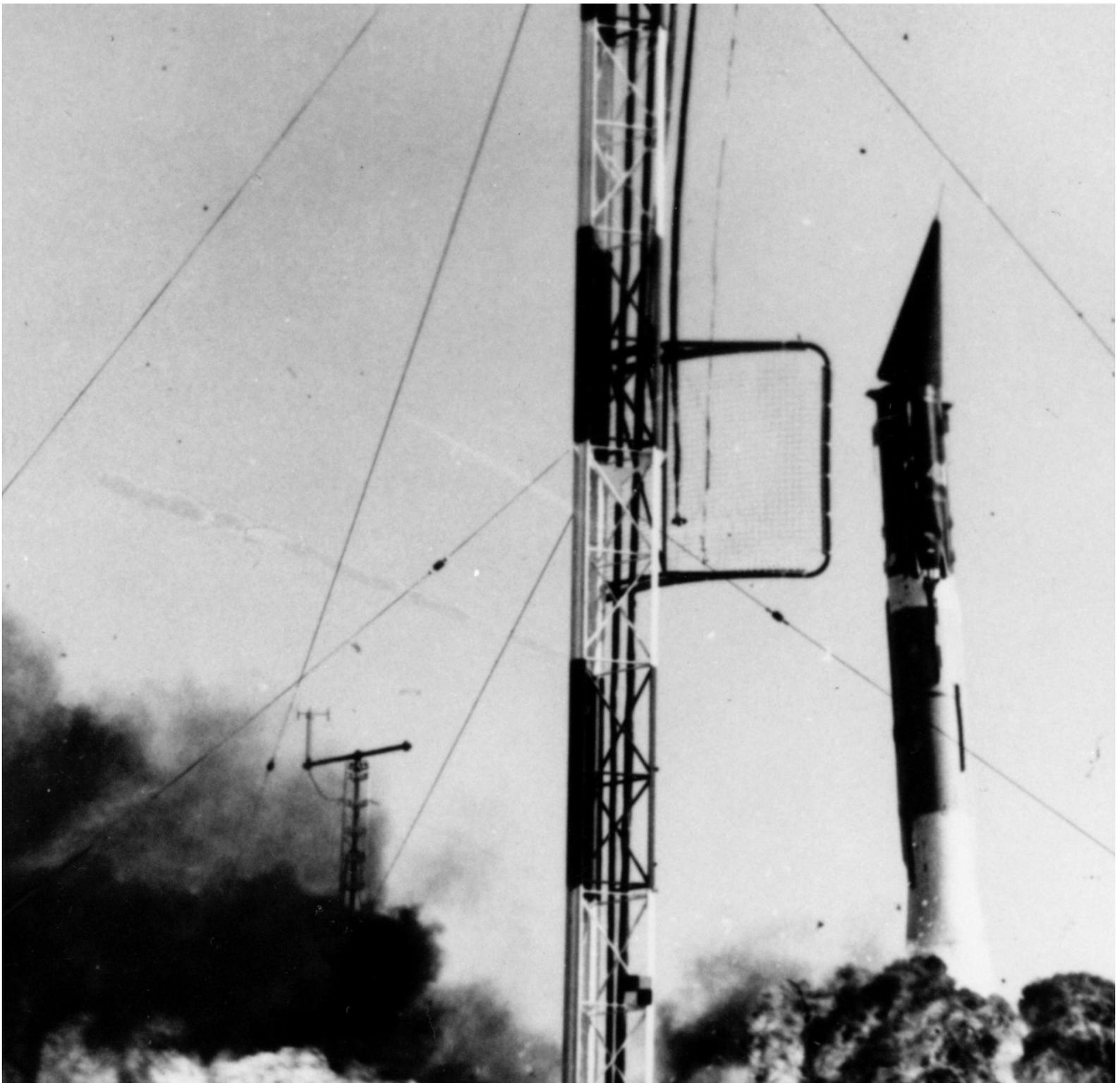
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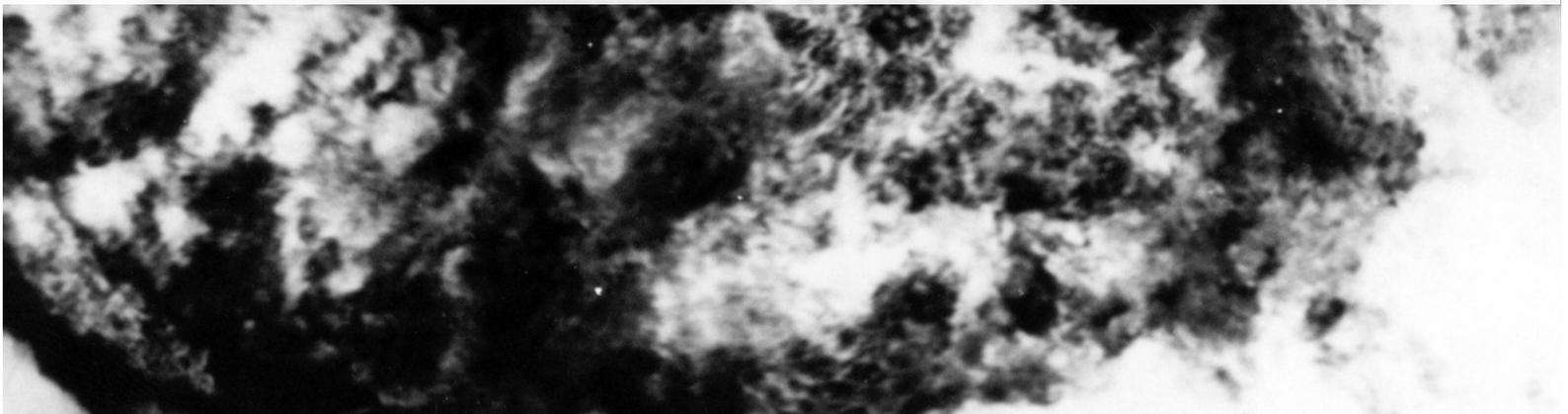


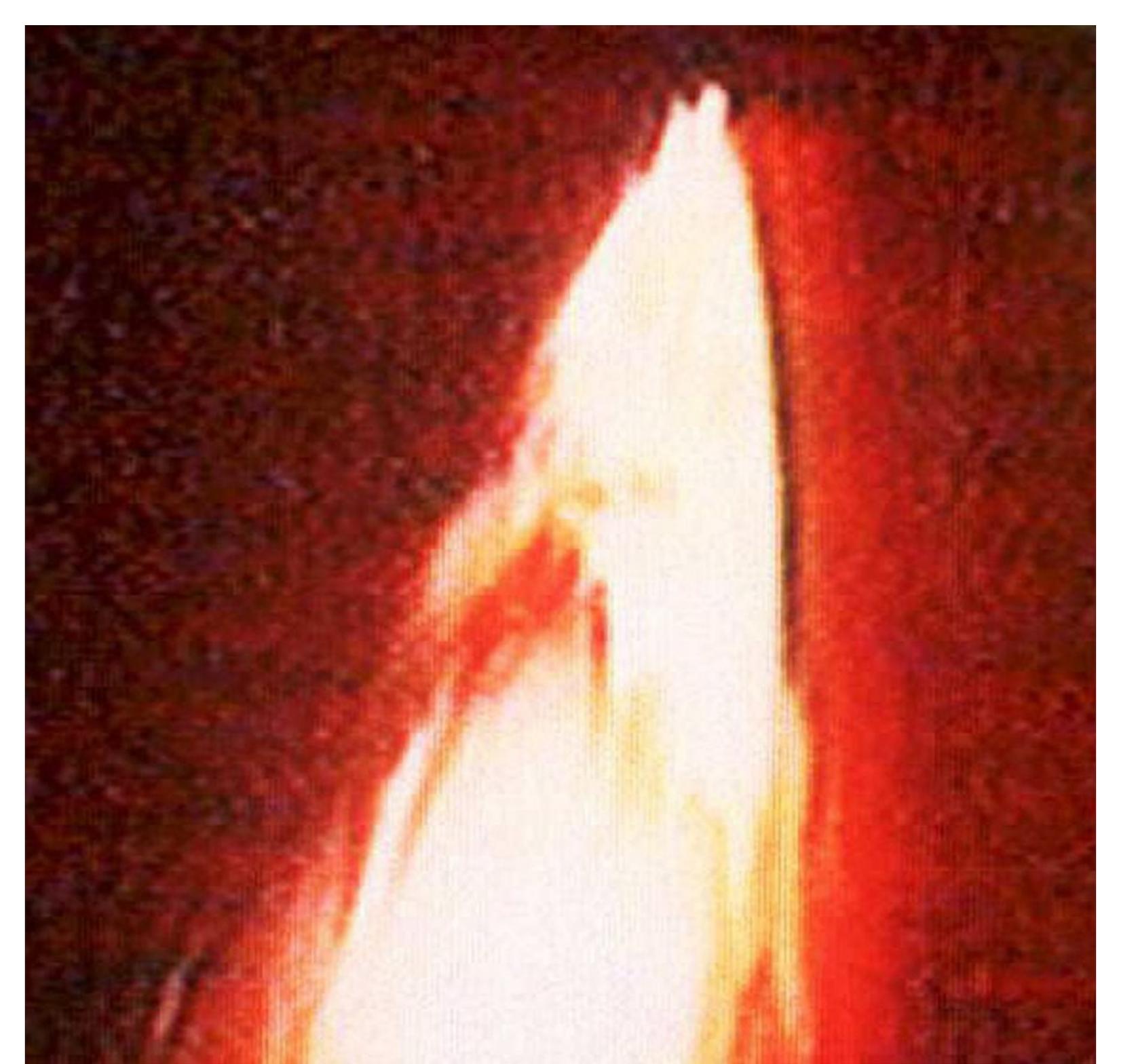
It's all part of the process of exploration and discovery.





I know it is hard to understand, but sometimes painful things like this happen.





The future doesn't belong to the
fainthearted It belongs to the brave.





We learned something today. We won't make this mistake again. We'll correct it.



Images / Incidents

1 Space Shuttle Challenger Disaster (Jan 28, 1986)
NASA / Kennedy Space Center.

On January 28, 1986, the Space Shuttle Challenger (mission STS-51-L) and her seven-member crew were lost when a ruptured O-ring in the right Solid Rocket Booster caused an explosion soon after launch. This photograph, taken a few seconds after the accident, shows the Space Shuttle Main Engines and Solid Rocket Booster exhaust plumes entwined around a ball of gas from the External Tank. Because shuttle launches had become almost routine after twenty-four successful missions, those watching the shuttle launch in person and on television found the sight of the explosion especially shocking and difficult to believe until NASA confirmed the accident.
https://en.wikipedia.org/wiki/Space_Shuttle_Challenger_disaster
Image from NASA: https://en.wikipedia.org/wiki/File:Challenger_explosion.jpg

2 Space Shuttle Challenger Disaster, (Jan 28, 1986)
Destruction of the Space Shuttle Challenger. At about 76 seconds, fragments of the Orbiter can be seen tumbling against a background of fire, smoke and vaporized propellants from the External Tank. The left Solid Rocket Booster (SRB) flies rampant, still thrusting. The reddish-brown cloud envelops the disintegrating Orbiter. The color is indicative of the nitrogen tetroxide oxidizer propellant in the Orbiter Reaction Control System.
https://en.wikipedia.org/wiki/Space_Shuttle_Challenger_disaster
Image from NASA: https://en.wikipedia.org/wiki/File:Challenger_breakup.jpg

3 Delta 3914 carrying a GOES-G weather satellite (May 3, 1986)
GOES G ends in a fiery explosion as the Cape Canaveral Range Safety Officer destroys Delta Launch Vehicle 178 after 91 seconds.
<http://www.photolib.noaa.gov/htmls/spac0243.htm>
https://en.wikipedia.org/wiki/Delta_3000
Image from NOAA Photo Library:
https://en.wikipedia.org/wiki/File:GOES_G_ends_Spac0243.jpg

4 Antares Rocket carrying an Orb-3 Cygnus spacecraft (Oct 28, 2014)
The Orbital Sciences Corporation Antares rocket, with the Cygnus spacecraft onboard suffers a catastrophic anomaly moments after launch from the Mid-Atlantic Regional Spaceport Pad 0A, Tuesday, Oct. 28, 2014, at NASA's Wallops Flight Facility in Virginia. The Cygnus spacecraft was filled with about 5,000 pounds of supplies slated for the International Space Station, including science experiments, experiment hardware, spare parts, and crew provisions.
<http://www.spaceflightinsider.com/missions/iss/orbital-sciences-antares-rocket-explodes-less-minute-flight/>
https://en.wikipedia.org/wiki/Antares_%28rocket%29
Image from NASA/Joel Kowsky:
https://commons.wikimedia.org/wiki/File:Antares_Orb-3_launch_failure_%28201410280011HQ%29.jpg

5 Antares Rocket carrying an Orb-3 Cygnus spacecraft (Oct 28, 2014)
The mission carrying Cygnus CRS Orb-3 failed catastrophically six seconds after liftoff from Mid-Atlantic Regional Spaceport at Wallops Flight Facility, Virginia. The flight termination system was activated just before the rocket hit the ground, but an explosion and fire destroyed the vehicle and cargo.
https://en.wikipedia.org/wiki/Antares_%28rocket%29
Image from NASA/Joel Kowsky:
https://en.wikipedia.org/wiki/File:Antares_Orb-3_launch_failure_%28201410280009HQ%29.jpg

6 Titan 34D-9 carrying a KH-9 reconnaissance satellite (April 18, 1986)
A Titan 34D rocket carrying the last KH-9 Hexagon reconnaissance satellite with a Pearl Ruby piggyback subsatellite explodes shortly after liftoff from SLC-4E, Vandenberg Air Force Base, CA. The only ever operational KH-9 to be destroyed.
https://en.wikipedia.org/wiki/Titan_34D
Image from: <http://nationcreation.wikia.com/wiki/File:Titan-34D-explosion1986.jpg>

7 VSS Enterprise crash (October 31, 2014)
The VSS Enterprise, a SpaceShipTwo experimental spaceflight test vehicle built by Scaled Composites for the commercial spaceflight company Virgin Galactic suffered a catastrophic in-flight breakup and crashed in the Mojave Desert, California, United States while performing a test flight. According to the NTSB briefing, SpaceShipTwo dropped from the mother ship and fired its new hybrid rocket engine normally. About eleven seconds later, the space plane violently broke apart, substantially giving the appearance of an explosion, and creating a 35-mile (56 km) long debris field. Witnesses reported seeing a parachute before the aircraft crashed. The co-pilot was killed in the crash, whereas the pilot survived with serious injuries. The carrier aircraft, VMS Eve, landed safely
https://en.wikipedia.org/wiki/VSS_Enterprise_crash
Image from: <http://trekmovie.com/2014/10/31/virgin-galactic-vss-enterprise-crashes-during-test-1-pilot-killed/>

8 Space Shuttle Columbia Disaster (February 1, 2003)
The Space Shuttle Columbia disintegrated over Texas and Louisiana as it reentered Earth's atmosphere, killing all seven crew members.
https://en.wikipedia.org/wiki/Space_Shuttle_Columbia_disaster

9 Proton-M carrying three GLONASS satellite (July 2, 2013)
A Proton-M/DM-03 carrying three GLONASS satellites failed shortly after liftoff. The booster began pitching left and right along the vertical axis within a few seconds of launch. Attempts by the onboard guidance computer to correct the flight trajectory failed and ended up putting it into an unrecoverable pitchover. The upper stages and payload were stripped off 24 seconds after launch due to the forces experienced followed by the first stage breaking apart and erupting in flames. Impact with the ground occurred 30 seconds after liftoff.
<https://en.wikipedia.org/wiki/Proton-M>

Image from: <http://rt.com/news/proton-m-rocket-takeoff-crash-514/>
(<http://rt.com/files/news/1f/9e/a0/00/50proton-m-rocket-takeoff-crash.jpg>)

10 Ariane 5 rocket explosion (June 4, 1996)
Ariane 5's first test flight (Ariane 5 Flight 501) launched by the European Space Agency failed with the rocket self-destructing 37 seconds after launch because of a malfunction in the control software. A data conversion from 64-bit floating point value to 16-bit signed integer value to be stored in a variable representing horizontal bias caused a processor trap (operand error) because the floating point value was too large to be represented by a 16-bit signed integer.
https://en.wikipedia.org/wiki/Ariane_5
Image from: http://www.rvs.uni-bielefeld.de/lectures/TechInf/TI2/download/ariane_pics.html

11 Titan 34D-9 carrying a KH-9 satellite (April 18, 1986)
An attempted launch of a KH-9 photo reconnaissance satellite ended catastrophically as the right solid rocket booster exploded only eight seconds into the flight, destroying the entire vehicle and showering SLC4E with debris and toxic propellant. Debris rained onto SLC-4E, badly damaging the launch complex in the process and starting numerous small fires, some of which burned for up to two days.
https://en.wikipedia.org/wiki/Titan_34D
Image from: <http://forum.nasaspaceflight.com/index.php?topic=8005.0>

12 Delta II (Jan, 17 1997)
A Delta II rocket carrying a first Block IIR Global Positioning Satellite GPS IIF-1, exploded 13 seconds after launch when a damaged SRM casing ruptured and triggered the vehicle's flight termination system. No one was injured, and the launch pad itself was not seriously impacted, though several cars were destroyed and a few buildings were damaged.
https://en.wikipedia.org/wiki/Delta_II
https://en.wikipedia.org/wiki/GPS_IIR-1
Image from: <http://www.nasaspaceflight.com/2011/09/live-ula-deltaii-launch-grail-spacecraft-to-moon/>

13 Titan IV A-20 Rocket Explosion (August 12, 1998)
The launch of a classified Navy ELINT satellite from Cape Canaveral failed around 40 seconds into the flight. An electrical failure caused the Titan to suddenly pitch downward, the resulting aerodynamic stress causing one of the SRMs to separate. The onboard destruct system automatically triggered, blowing the launch vehicle to pieces in a spectacular explosion.
https://en.wikipedia.org/wiki/Titan_IV
Image from USAF

14 Delta II (Jan, 17 1997)
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Image from: <http://www.nasaspaceflight.com/2011/09/live-ula-deltaii-launch-grail-spacecraft-to-moon/>

15 Vanguard TV3 rocket explosion (December 6, 1957)
Vanguard TV3 was the first attempt of the United States to launch a satellite into orbit around the Earth. At its launch attempt at Cape Canaveral, the booster ignited and began to rise; but about two seconds after liftoff, after rising about four feet (1.2 m), the rocket lost thrust and began to fall back to the launch pad. As it settled the fuel tanks ruptured and exploded, destroying the rocket and severely damaging the launch pad. The Vanguard satellite was thrown clear and landed on the ground a short distance away with its transmitters still sending out a beacon signal. The satellite was damaged, however, and could not be reused. Newspapers in the United States, published prominent headlines and articles noting the failure including plays on the name of the Russian satellite, Sputnik, such as "Flopnik", "Kaputnik", "Oopsnik", "Stayputnik".
https://en.wikipedia.org/wiki/Vanguard_TV3
Image from NASA:
https://commons.wikimedia.org/wiki/File:Vanguard_rocket_explodes.jpg

16 Long March 2E rocket, carrying the Apstar 2 telecoms satellite (Jan 15, 1995)
Long March 2E rocket blew up shortly after launch from the Xichang space centre. Windshear led to the collapse of the payload fairing, however on this occasion, the rocket exploded. Debris fell on a nearby village killing a number of residents.
https://en.wikipedia.org/wiki/Long_March_2E
Image from: <http://www.wired.co.uk/news/archive/2013-07/01/china-space-programme>

17 Long March 3B rocket, carrying Intelsat 708 satellite (Feb 14, 1996)
During its maiden flight the rocket suffered a guidance failure two seconds into the flight and crashed into a village near the launch site in an enormous explosion, destroying much of it and killing at least six people. Outside estimates suggest that anywhere between 200 to 500 people might have been killed.
https://en.wikipedia.org/wiki/Long_March_3B
https://en.wikipedia.org/wiki/Intelsat_708

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