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Allegations of "sudden acceleration" led to public relations crises for Audi and the development of the automatic shift lock.

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Vancouver Second Narrows Bridge collapse, British Columbia (1958) **191**

The failure of temporary construction support caused the collapse of bridge spans.

King's Bridge failure, Melbourne, Australia (1962) **196**

"Brittle fracture" of supporting girders attributed to poor material quality and inadequate welding techniques caused the failure of a single-span section of a steel bridge.

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The country's worst bridge disaster spurred research into the metallurgical properties of high-stress steel and halted use of some experimental cable designs.

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Molasses spill, Boston, Massachusetts (1919) **246**

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Ferrybridge cooling towers collapse, Pontefract, England (1965) **267**

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Collapse of a space frame roof caused by a lack of bracing of top chord truss members.

Cooling tower collapse, Willow Island, West Virginia (1978) **289**

A cooling power plant tower collapsed as it was being built when construction loads were placed on concrete that had not been allowed to reach adequate strength.

Kemper Arena roof collapse, Kansas City, Missouri (1979) **295**

Roof of award-winning arena collapsed when fatigued bolts failed during a rainstorm.

***Alexander Kielland* oil-drilling rig collapse, North Sea (1980)** **301**

Faulty welding was responsible for a crack in one of the legs supporting an offshore oil-drilling rig; the crack led to the collapse of the leg and the fatal capsizing of the rig.

MGM Grand Hotel fire, Las Vegas, Nevada (1980) **307**

Second most deadly hotel fire in United States history led to a nationwide revaluation of fire codes.

Harbour Cay condominium collapse, Cocoa Beach, Florida (1981) **313**

A five-story concrete residential building collapsed during construction owing to a combination of design errors and construction problems.

Hyatt Regency Hotel walkways collapse, Kansas City, Missouri (1981) **317**

The collapse of two suspended walkways caused by a simple design change resulted in the worst structural failure to date in the United States.

Ocean Ranger oil-drilling rig sinking, North Atlantic (1982) **326**

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L'Ambiance Plaza collapse, Bridgeport, Connecticut (1987) **332**

An apartment building collapsed during lift-slab construction, probably caused by an inadequate design for connecting the floor slabs to the column-mounted lifting mechanisms.

Chemical and Environmental Disasters

Ecological disaster, Sudbury, Ontario (1883 to present) **340**

The area around Sudbury, Ontario has been deforested by emissions from years of nickel and copper open roast smelting.

Cadmium poisoning, Toyama, Japan (1912-1955) **345**

Mining runoffs containing toxic cadmium collected in drinking and irrigation water and poisoned Japanese villagers, causing degenerative Itai-Itai disease.

DDT insecticide contamination (1939 to present) **350**

Contamination of the ecological system resulting from the use of DDT has exposed the potential destructiveness of pesticides.

Love Canal toxic waste contamination, Niagara Falls, New York (1942-1953) **354**

A Niagara Falls, New York, neighborhood, built on top of a toxic waste dump, had to be abandoned in 1980 after it was determined to be a threat to public health.

Hanford radioactive waste reservation, Washington State (1944-1988) **361**

Dumping of radioactive waste from a plutonium-producing reservation has contaminated the environment along the Columbia River.

Mercury poisoning, Minamata Bay, Japan (1955 to present) **367**

Industrial pollution caused often fatal Minamata disease among local residents, leading to legal action against the firm immediately responsible and the local and federal governments.

Agent Orange contamination, Vietnam (1961-1971) **372**

Use of the defoliant Agent Orange during the Vietnam War caused debilitating medical problems among both the Vietnamese population and American military personnel.

Dioxin contamination, Times Beach, Missouri (1971) **379**

A Missouri town had to be evacuated after the town was contaminated by the deadly chemical compound, dioxin.

Methylmercury seed poisoning, Iraq (1971-1972) **385**

Human consumption of seed grain treated with fungicide and intended only for planting resulted in nervous system damage and death to many individuals.

Chemical plant explosion, Flixborough, England (1974) **391**

Sudden and devastating explosion at a British cyclohexane processing plant prompted a reevaluation across Europe of chemical plant safety.

Dioxin contamination, near Seveso, Italy (1976) **397**

Worker errors and an unanticipated chemical reaction led to the release of a highly poisonous cloud of dioxin and widespread contamination.

Toxic vapor leak, Bhopal, India (1984) **403**

A toxic vapor leak resulted in massive loss of life and widespread injury.

Toxic vapor leak, Institute, West Virginia (1985) **411**

An explosive failure of a temporary storage tank containing an aldicarb oxime mixture caused a toxic vapor leak at a chemical plant, injuring one hundred and thirty-five people.

Austin Dam failure, Austin, Pennsylvania (1911) **420**

Failure of a poorly constructed concrete dam founded on unsuitable bedrock caused a destructive and fatal flood, followed by an explosion of gas lines and a devastating fire, in the industrial town of Austin, Pennsylvania.

St. Francis Dam failure, San Francisquito Canyon, California (1928) **426**

Failure of a dam constructed over a defective foundation killed hundreds and attested to the importance of thorough geological investigations of dam sites and state supervision of local waterway projects.

Malpasset Dam failure, Fréjus, France (1959) **431**

Failure of the rock foundation caused the collapse of a thin-walled concrete arch dam.

Vaiont Dam landslide disaster, near Longarone, Italy (1963) **435**

A huge mass of rock and mud rushed into the reservoir behind the Vaiont Dam, forcing a wall of water over the dam and onto villages in the valley below and causing thousands of deaths.

Baldwin Hills Dam failure, Los Angeles, California (1963) **442**

Subsidence of land beneath an earthfill dam caused the dam to leak and, within hours, to fail, releasing water into the suburbs downstream and causing five deaths and massive property damage.

Teton Dam collapse, Upper Snake River Valley, Idaho (1976) **449**

The collapse of a dam built on fractured, water-permeable volcanic rock inundated an agricultural valley and killed eleven people.

Stava Dam failure, Stava, Italy (1985) **454**

Dam failure in Italy drew attention to national policy issues: conflicting responsibility for dam safety among government agencies, inadequate regulatory enforcement, and the need for environmental laws.

Diethylstilbestrol (DES) (1940s-1970s) **462**

Diethylstilbestrol, a synthetic estrogen, can cause cancer and reproductive abnormalities in individuals whose mothers used the drug.

Thalidomide (1950s-1960s) **468**

Widespread use of an improperly tested drug led to the birth of thousands of malformed babies, half of whom died within weeks of birth.

Silicone-gel implants (1960s-1990s) **475**

Silicone-gel breast implants leak or rupture, causing inflammation, fever, arthritis, scleroderma (a hardening of the skin), and other health problems.

Dalkon Shield (1970s-1980s) **481**

An intrauterine birth control device is fatal for some women and causes spontaneous abortions, internal injuries, infertility, and birth defects.

Nuclear Plants

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A failure in the cooling system caused an explosion at a nuclear waste storage site.

Windscale reactor complex fire, England (1957) **493**

World's first major commercial nuclear power plant disaster at Great Britain's facility for making plutonium.

SL-1 experimental reactor explosion, Idaho (1961) **499**

One of the United States' first experimental nuclear reactors exploded as a result of a combination of mechanical failures and operator error.

Browns Ferry power plant fire, Decatur, Alabama (1975) **505**

Fire in the electrical system of a nuclear power plant resulted in the most serious commercial nuclear power accident up to that time.

Three Mile Island accident, Middletown, Pennsylvania (1979) **510**

The worst accident in the history of American commercial nuclear power generation caused a partial meltdown of the reactor core.

Radioactive waste spill, Tsuruga, Japan (1981) **518**

Due to human error, nearly four thousand gallons of radioactive wastes escaped from a nuclear power plant in Japan.

Ginna power plant radioactive release, Ontario, New York (1982) **523**

Failure of a pipe in a nuclear power plant caused shutdown of the reactor and release of radioactive gas to the atmosphere.

Chernobyl accident, Ukraine (1986) **529**

The world's worst nuclear power plant disaster occurred when human errors led to a dangerous heat and steam buildup, triggering two enormous explosions.

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***Andrea Doria-Stockholm* collision, off Massachusetts (1956)** **552**

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Amoco *Cadiz* oil spill, off France (1978) **558**

An oil tanker ran onto rocks off the coast of France after its steering system failed.

Exxon *Valdez* oil spill, Prince William Sound, Alaska (1989) **563**

An oil tanker ran aground in Prince William Sound, Alaska, resulting in a catastrophic oil spill.

Nike missile explosions, Leonardo, New Jersey (1958) **572**

Spacecraft

Explosion of seven ground-to-air Nike missiles during installation of new safety and arming mechanisms resulted in ten casualties.

Rocket fire, Former Soviet Union (1960) **576**

Unexpected ignition of the fourth stage section of a rocket undergoing repairs after a failed launch attempt killed a Soviet Field Marshal.

***Apollo 1* capsule fire, Cape Canaveral, Florida (1967)** **580**

Deaths of three astronauts during a ground test due to a flash fire evidently set off by a wiring malfunction exposed need for higher design, manufacturing, and safety standards at NASA.

Soyuz 1 spacecraft reentry crash, Orenburg, Russia (1967) **586**

Fatal crash due to spacecraft's landing parachutes becoming entangled after flight and reentry control failure sent the Soviet manned space program into decline at a crucial phase of the "space race."

Apollo 13 oxygen tank rupture (1970) **591**

Explosion in service module oxygen tank, forcing three-man crew to abandon their mission and use lunar module as an emergency "lifeboat," led to cutbacks in the Apollo program.

Soyuz 11 reentry disaster (1971) **598**

Death of three Soviet cosmonauts during reentry due to cabin seal malfunction represented a significant technical setback for the Soyuz manned spacecraft program.

Skylab meteoroid shield failure (1973) **603**

Loss of the NASA orbiting space laboratory's meteoroid shield and one solar array was caused by failure to account for aerodynamic loads during launch.

Challenger explosion (1986) **609**

An explosion shortly after launch caused by faulty solid rocket booster seals destroyed the shuttle and killed its crew of seven, forcing a retrenchment of NASA's shuttle program.

Submarines

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Mechanical failure in the operating gear of an air intake valve occurred during an underwater dive, allowing the aft part of the vessel to fill with water and sink the submarine.

Thetis sinking, Liverpool Bay, England (1939) **626**

Sinking of British submarine, set off by human error, led to design improvements and recognition of need for sophisticated rescue procedures.

Thresher sinking, Atlantic Ocean (1963) **631**

A nuclear submarine plunged beneath its "crush depth" and sank, killing all 129 crew members.

Scorpion sinking, Atlantic Ocean (1968) **638**

Unexplained sinking of submarine gave impetus to development of deep-sea rescue and search submersibles and raised concerns about safety of powering submarines with nuclear reactors.

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