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On top of this was the door. So nervous were the engineers who designed the door about the possibility of rupture in the hostile vacuum of space that it had to be bolted shut with 12 bolts. The door was also so heavy that White and the other astronauts – all superfit specimens of manhood – actually used it to practise their shoulder presses.

It had never been made for rapid egress and nobody at NASA had ever even considered the possibility of a fire on the launch pad.

Bolted inside a steel capsule in such an atmosphere Grissom, Chaffee and White never stood a chance. When they slipped into their canvas webbing chairs at 1pm local time that fateful January day they were already climbing inside their own communal coffin.

The disaster paralysed NASA and the burgeoning American space industry. All work on the Apollo program was halted while the cause of the fire was determined and steps taken to prevent a repetition. There was little time though because John F Kennedy had mandated that America must land a man on the moon – and return him safely to Earth – by 1970, less than three years away.

In Grissom's case there was a terrible irony in the circumstances of his death. Only five years before, in the summer of 1962, he had become the second American to fly into space aboard the Mercury-Redstone spacecraft Liberty Bell 7. On landing in the ocean the capsule's door had blown off and Grissom had nearly drowned. Grissom's nemesis was ever to be the door to his spacecraft.

In the end neither NASA nor North American Aviation – the capsule's designers – were really to blame. Both were simply responding to a culture which mandated that things got done in the shortest time possible and as a result short cuts were taken. And by a twist of fate, this week also sees two other, more recent NASA anniversaries where the same culture of haste again resulted in tragedy.

On January 28, 1986, the space shuttle *Challenger* exploded 73 seconds after launch killing all seven astronauts in board, including the school teacher Christa McAuliffe.

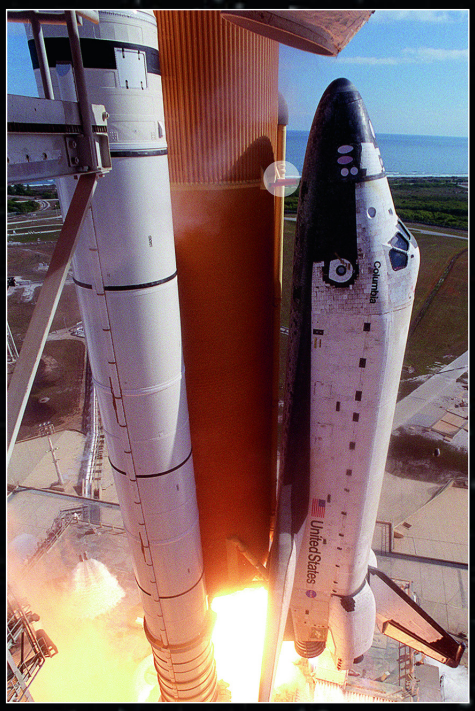
The causes and consequences of this tragedy were disconcertingly similar to that of the Apollo 1 fire almost 20 years before.

The Rogers Inquiry traced the source of the launch failure (explosion is not a word that is welcome within the NASA lexicon) to the failure of a single 'O' ring that joined two segments of the solid rocket booster (SRB) together.

Such 'O' rings worked just fine in all conditions except low temperature and NASA managers had taken the decision to launch that cold January morning against the advice of a least some of the Morton Thiokol engineers who manufactured and maintained the boosters.

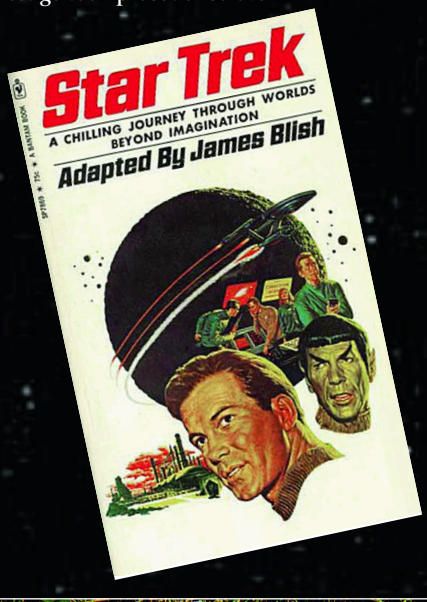
Unlike the shuttle's liquid-fuelled main engines once the SRB's were ignited there was no way to shut them down. The seven *Challenger* astronauts were effectively dead before they even left the ground.

The Rogers Inquiry included some of the heaviest hitters in the American space and science community. Neil Armstrong – the first man to walk on the moon - was on it, as was Charles 'Chuck' Yeager, the first man to break the sound barrier and original bearer of Tom Wolfe's iconic 'Right Stuff'.



Also on the panel was Richard Feynman, arguably the greatest physicist of his time. Armstrong and Yeager were old hands with NASA procedures and may have understood – although certainly never condoned – the labyrinthine workings of that monolithic organisation.

Feynman was incandescent at what he identified as a culture of mismanagement at the heart of NASA where schedules and prestige took precedence over



science and safety. It was Feynman who demonstrated most graphically what must have happened that fateful day.

At the press conference where the Rogers Inquiry announced their findings Feynman took an 'O' ring at room temperature and twisted it to show its superb flexibility under the right conditions. Then he dipped it into a glass of iced water and repeated the experiment. The 'O' ring was as rigid as cold candle wax.

There was no denying it – the immediate cause of the Challenger disaster was clear and the reasons behind it were too. NASA should have waited for warmer weather before launching but took a risk to stay on schedule – and lost. Feynman was scathing. "Reality must take precedence over public relations, for nature cannot be fooled," he said.

The shuttle fleet was grounded while the issues were addressed and resolved, delaying for years the launch of satellites and the development of the International Space Station.

And then there is the final tragedy. Ten years ago, on February 1, 2003, NASA's very first space shuttle, the venerable *Columbia*, broke up over Texas on approach into Cape Canaveral having been damaged at launch by a piece of frozen insulation that hit a wing.

NASA's own safety regulations identified very clearly the risks of debris strikes from the external fuel tank cladding, but repeatedly NASA had launched shuttles having failed to address it. Once again safety concerns were subordinate to the operational requirements of a system that was repeatedly advertised as being as routine as taking a bus – but wasn't.

A year after the Columbia tragedy, in January 2004, President Bush finally announced that the ailing Space Shuttle fleet would be retired and replaced.

At the present time a new generation of American space vehicles which will carry between four and six astronauts into orbit is on the drawing board at NASA. It will be a titanic endeavour because not only will these new spacecraft serve the International Space Station, they will also be the vehicles that will take humans back to the Moon and thence to Mars, by NASA's reckoning, by 2030.

This year, as NASA commemorates three of the worst moments in its history, it is appropriate that Oxford residents also commemorate the writer who penned stories about the success of humanity's future in space in close to the dreaming spires.

Blish, who died in 1975, knew that we live in an overcrowded and abused world, and that sooner rather than later we will have to contemplate the first steps in our species' next journey – the colonisation of the planets.

■ *dr Richard Corfield's new book, Architects of Eternity: The New Science of Fossils, is available now on the Kindle from Amazon. he also writes under the pen name Jack Shipley, and his first novel, a science thriller called Dark Site, will be published this summer*