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Europa 1, the European Launcher Development Organisation satellite launch vehicle, a 3-stage liquid propelled rocket, set for a launch from Woomera rocket Range in South Australia in May 1966. Image: National Archives of Australia



Europa 1 rocket leaves launching pad at Woomera Rocket Range, South Australia, 9 October 1973

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An Incomplete Taxonomy of South Australia's Space Industry Towns

Elmo Keep

An ill wind whipped through Woomera on the afternoon I wandered its empty streets, in search of a single other person. The day was overcast, and a mist of rain began to fall, sideways and brittle. Later in the early evening it would turn the sky black, silent lightning tracing the distant horizon, which I watched from a roadhouse as a deluge on the tin roof deafened even the diesel trucks pulling in and out of the petrol station. Two hundred or so kilometres away, the storm was depositing snow on the Flinders Ranges with 'air arriving directly from Antarctica',[1] in a very rare weather event occurring only a handful of times in the last 70 years. Where I was, it came and ended quickly, clattering to a halt, as sun then poured down and illuminated the undersides of the shelf cloud as it moved away. Stillness disturbed by the atonal blare of a road train, I felt relieved to only have to spend one night in the cramped motel room lit by a single fluorescent bar directly over the bed. In the mess hall of the roadhouse, people seemingly long tired of each other's company sat wordlessly and picked at their dinners of truck-stop fare, while game shows played on the television behind them. At the first light of morning I would leave, and drive far and fast, away, and towards the ranges.

Off the Stuart Highway nearly 500 kilometres north from Adelaide, the village of Woomera, South Australia, is a time-frozen monument to the military-industrial complex. Missiles built here in the 1950s and 60s are erected as exhibits pointing out of the ground, including the gnarled and charred wrecks of pieces of engine that exploded on impact with the desert, now set behind wire fences adorned with plaques, including one made by Rolls-Royce. Bygone jet fighters and army vehicles sit sentry with signs warning not to pose on them. Many of the buildings are boarded up, locked shut. My footfalls echo with the gravel crunching beneath as I round corners and try the handles on doors that won't open, and push my face up against windows that reveal nothing inside. Seven thousand army personnel once lived here, where it's now home to a population of about 200 people from the Australian Defence Force. I trudge down the streets of identical housing, passing the hospital, the empty primary school, the library which is not open, and eventually I see someone else: a tourist taking a photo of a blue-painted tree.

The museum still operates, showing films on loops to the few people like me who are here on a weekday. I move sequentially through the decades of the past, passing the curiosities designed to distract and amuse and evoke the rugged myths of places like this, where fun was still to be had away from the business of the development of lethal weaponry. Once, a game of darts was played here in 1960 by the Woomera Darts League which set a then world record of 44 hours and 22 continuous minutes for a single game. Elsewhere a photo commemorates the growing of an exceptionally large radish, subsequently eaten.

Woomera was built on the lands of the Kokatha in 1947, in a joint military operation between Australia and Britain, when the United Kingdom sought for somewhere 'remote and unpopulated' to test its weapons. The United States Army would also come to establish itself here in 1957, denoted now by the continuing presence of a bowling alley in the village that had been installed by its staff. The bowling alley operates currently only on Wednesday evenings, which I had just missed, and the weekend, for which I would not be staying. A cinema screens a new release film once a month.

Britain had taken this vast part of the desert as Crown land, where 6 groups of people are the custodians of the enormous area they were displaced from, to form the Woomera Prohibited Area, which covers almost 122,200 square kilometres. At its establishment, it consumed more than 270,00 square kilometres of land — the size of all of New Zealand. It includes Maralinga Tjarutja lands, parts of the Nullarbor, stony desert and several significant salt lakes. It contains innumerable ancestral sites going back tens of thousands of years. In the postwar era, its strategic positioning to the then Allied powers as the development site for the testing and firing of long-range missiles during the Cold War saw it remain a fortified inaccessible place for 35 years, until it was opened to the public in 1982. Not until 2009 were the Maralinga lands returned.

From its inception, it was the site of vociferous sustained protest movements: against its nuclear testing, its abrogation of Aboriginal rights, its environmental devastation, its existence in sum. That its weaponry testing was fundamental to the development of bomb technology capable of the total obliteration of all life on Earth under the emergent nuclear doctrine of mutually assured destruction, galvanised the Australian anti-nuclear movement.

Central and Eastern European refugees from World War II were put to work to build the town, a tiny cohort of the 1.2 million UN-designated 'displaced persons' who had been rendered homeless by the wholesale

1 Saunders T, 'Snow within 35km of five Australian capitals as Antarctica blast arrives', *ABC News*, 29 August 2025, www.abc.net.au/news/2025-08-29/weather-winter-storm-snow-antarctic-blast-arrives/105708844. Accessed 23 January 2026.

bombing destruction of their cities; hard labour in unforgiving conditions that few, if any, Australian citizens were willing to do. Average day temperatures in summer can climb to 40°C. It would also come to hold, in the detention centre on its outskirts, other displaced persons fleeing unsafe homelands.

Under the Howard Government, a private contractor built the Woomera Immigration Reception and Processing Centre in 1999 for 400 people to be held in a tortuous stateless limbo. That would grow to 1,500 until its closure in 2003, after an eventual inquiry publicised its long list of human rights abuses. The site is still here, turned over to the Department of Defence, where you can drive up to its gates and look at the vast expanse of land, at which all of those people seeking asylum had also looked, for months and years on end.

Just outside the town of Woomera is its cemetery, where a disproportionately high number of babies are buried, including 23 stillbirths from between 1953 and 1968. A class action lawsuit filed in 2010 against the British Government where descendants of the affected families sought compensation was unsuccessful. A lack of medical records, abetted by the secrecy around the test range, saw the judges refuse to draw definitive links between nuclear testing and the high incidence of infant deaths.

Rarely have I felt a stronger urge to leave a place than during those hours spent at Woomera. To drive, in my freedom, to wherever I liked. To anywhere that wasn't there. Less than 24 hours is more than enough to feel weighted by its violence. To think of being sent to be stationed there now, to have been imprisoned there while seeking asylum, to have been denied access to Country, has filled me with disquiet, with shame. That night I slept badly, broken by the rattling of heavy vehicles on the road, and at one point I was jolted awake by what felt like the room itself moving. I don't know if it did, or if I'd been beset by one of those infrequent awful dreams where you feel yourself to have fallen, woken by hitting the mattress. I didn't linger in the morning to ask anyone else if there had been some kind of rocking of the vicinity overnight, or even to check out. I just left the key in the door lock and got straight into the car, peeling onto the highway and away from a place that I'm certain I will never return to in my life.

What goes up, must come down. We learn this physics lesson early. All rockets blasted into space fall back down to Earth. Or nearly all. Those which achieve escape velocity from our planet are sent into solar orbit to be trapped by the Sun's heliocentric pull around Earth for a length of time measured in millions of years. But some of those are affected by chaotic forces which see them tugged back down to our planet's orbit, as was the case of *Apollo 12*'s third-stage *Saturn V* booster rocket which left Florida in 1969. A small velocity error that slowed its path beyond the Moon to launch it into heliocentric orbit, instead left it elliptically circling between Earth and the Sun's gravity. It was recaptured by Earth in 2002, when it was briefly a second satellite, until it was flung back away and recaptured by the Sun's gravity. It will continue this way, looping around its unpredictable path until it returns to our orbit again in the mid 2040s, and then will leave again. The cycle will repeat and repeat, a piece of space junk that is difficult to track through the ever-increasing garbage heap of space debris that now encircles our planet. NASA's Orbital Debris Program Office estimates those pieces of debris to be in the hundreds of millions, including *Vanguard 1*, the long-dead satellite launched by the United States in 1958.

The majority of rocket launches which have sent satellites and robots and crewed missions into space have their booster rockets — the parts that separate from the payload (the important part, like a crew capsule or a multimillion-dollar satellite) — deliberately crashed into the ocean or to disintegrate as they burn up in our atmosphere around 60 kilometres above us. Where they are designed to fall into the ocean most often is Point Nemo, the oceanic Pole of Inaccessibility. This point in the Pacific Ocean is so far from any land (2,700 kilometres) that the closest other people to anyone at sea would be the astronauts of the International Space Station as it passes overhead. More than 260 spacecraft have been crashed into this watery satellite graveyard, so that they don't fall back to Earth at 27,000 kilometres per hour onto populated areas of land. There they rest on the sea floor at a depth below that of the *Titanic*.

There are several Poles of Inaccessibility around the world, their locations calculated by differing criteria of remoteness. There is one in Australia, in the Northern Territory, 920 kilometres from any coast. This 'middle of nowhere' — as people drawn to find them in the manner of scaling so many mountain peaks like to say — is only 30 kilometres from Papunya, on Pintupi and Luritja lands, site of the Papunya Tula Artists cooperative from where the Western Desert Art Movement began in 1971 and continues. A place where people — driven from their land, dispossessed and disenfranchised — were taken to, away from their families and forced into assimilation with White Australia under the Menzies Government in the late 1950s. A place of enormous cultural significance, it falls as so many swathes of country in Australia do, under a misapprehension that this idea of 'remoteness' only means relatively sparsely populated.

And so, safe enough to launch rockets from.

The twinning in the public mind of space exploration and awe at human endeavor is one of the most successful public relations campaigns in history. To have bolted onto what was explicitly an exercise in military expansion a narrative of the manifest destiny birthright to explore the stars, was an inspired piece of storytelling that still occupies enormous room in the cultural imagination today. In 1959, the United States developed detailed plans to build a permanent military outpost on the Moon — Project Horizon. This modest proposal from the Army Ballistic Missile Agency envisioned a manned surveillance station on the Moon, to be able to spy on America's enemies from the ultimate vantage point. This idea is what sparked the space race against the Soviet Union to send the first crewed mission into orbit, and not an intrepid quest for adventure and the inspirational stories of ingenuity told to achieve it. Space as sold as 'the new frontier' has always meant the ultimate place from which to achieve military supremacy.



In 1960, NASA established the Island Lagoon Tracking Station at Woomera. It allowed for the deep space tracking required to keep constant contact with the Apollo missions from sites around the world. In 1967, WRESAT, the Weapons Research Establishment Satellite, was launched from Woomera, which marked another historic moment in Australian space launch technology. It became the first satellite outside the United States and Soviet Union to be launched from a nation's territory. Its short battery life saw it orbit the planet for 5 days, gathering solar and weather data on the upper atmosphere. This data was then used by the United States to predict the impact of ultraviolet and X-rays on spacecraft and warheads re-entering the atmosphere. WRESAT then came back down to Earth and burnt up over the Atlantic to the west of Ireland. It was sent up on a US *Redstone* rocket, which crashed in the Simpson Desert on Eastern Arrernte, Lower Southern Arrernte and Wanggamala lands, and was not found until 1989, having landed some 350 kilometres south-east of Alice Springs. It is one of the pieces of rocketry on display now in Woomera.

This is what Woomera was primarily built for — for weapons. Between 1957 and the end of the 1980s, more than 500 rockets were launched here, making only Cape Canaveral a more prolific launch site. Rockets launched from there in Florida all fell into the ocean. Rockets launched at Woomera instead scattered their debris across the entire length of earth of the test range — as far as the Northern Territory. The majority of this debris has never been recovered. It has fallen on ancestral lands and significant cultural heritage sites.

There are still live-fire sites within the Woomera Range Complex. A crashed Saab RBS 70 short-range anti-aircraft missile was discovered by Kokatha brothers Andrew and Robert Starkey in 2021, near the cultural heritage site of Lake Hart, on their Country within the test range. The Department of Defence did not remove the missile for one year after the Starkeys reported it, as it was unclear if or not it contained a live round of ammunition; all civilians were banned from going near it. Eventually it was cleared, found not to be live, and finally removed from its crash site. A human rights complaint filed by the Starkeys to the Organisation for Economic Co-operation and Development (OECD) did not see the issue of any fines or penalties for the damage this fallen missile caused in denying access to Country, only directing Saab as the manufacturer to update its human rights due diligence, in a finding in which the OECD directly linked Saab to a human rights violation. While Saab made the rocket, it was fired by the Australian Defence Force in training exercises that send missiles wherever they land on the test range.

Launching satellites into space is a lucrative business for the few who succeed at it. As the proliferation of devices connected to satellite technologies continues to balloon — from our phones to GPS mapping systems, providing the internet connections that enable every facet of modern life — the commercial space launch market has grown to be worth more than US$10 billion in 2025, with predictions for that to reach more than US$35 billion in the next 10 years. To service this market, spaceports have opened around the world to compete for contracts to send satellites into orbit on behalf of communications corporations and national defence contractors.

In the Special Economic Zone at Duqm, in Oman, is the Etlaq Spaceport. Its location near the equator allows for launches from the site to take advantage of the slingshot effect, where the Earth's rotation is fastest, and launches need less fuel to achieve escape velocity by exploiting the forces of the planet. Being near to the coast allows its launch debris to fall into the ocean. Oman has signed memorandums of understanding with partners in the United States, Spain, the United Kingdom, Taiwan and New Zealand to launch research missions into low Earth orbit.

Beginning in 2019, SpaceX effectively took over the town of Boca Chica, South Texas, to establish a company town it renamed Starbase. Almost all of its residents are SpaceX employees, along with the mayor and the entire council. This has given control over zoning, permitting and everything else needed for launches to take place on its spaceport over to SpaceX, without opposition. Before this, Boca Chica was a tiny beachside county of a few dozen people, an unincorporated town, which meant it had no government. It was home mostly to retirees and other people drawn to remoteness and a low cost of living. SpaceX over time bought out almost all the local residents to build its spaceport for rocket launches and now has power over access to its beach. The town borders 2 national parks, and significant nature refuges, which are home to endangered sea turtles, and is in the direct migratory paths of several bird species, including falcons and plovers.

In April 2023, a SpaceX *Starship* rocket exploded over Boca Chica, and was deliberately destroyed after 4 minutes into an aborted launch. The force was so extreme that it blew the concrete-and-steel launch pad into dust, scattering chunks the size of washing machines into the air. Its debris field covered more than 1.5 square kilometres, including a pulverised concrete cloud which drifted over a nearby town.

The space industry likes to point out that catastrophic losses of these kinds of 'mature' rocket technologies are rare, and cite the statistic that 'less than 1%' will fail on launch. But new satellite rocket technologies, like those being tested at launch facilities across the world, suffer what NASA estimates as a nearly 40% failure rate on their first attempt.[2] This is the inherent risk of launching masses of metal powered by jet fuel at forces that can be simulated with software, but can be wildly unpredictable in the conditions of the actual earth from which they will be sent, on hope as much as enterprise.

In South Australia, there are 2 spaceports operated by a local satellite industry concern, Southern Launch: one at Whalers Way on the Eyre Peninsula; and one at Koonibba, just outside of the coastal town of Ceduna, where thick greens give way to red earthen bushland and turquoise ocean — what tourism has branded the Seafood Frontier. In North Queensland is a launch facility near the town of Bowen, in the Abbot Point State Development Area, run by Gilmour Space Technologies. Both companies draw on funding from a mix of private investment and government sources keen to bolster Australia's defence capabilities through building these facilities on Australian land.

Southern Launch's Whalers Way launch site will send its debris into the Great Australian Bight as it attempts to send rockets into orbit. The site at Koonibba sends satellites into sub-orbit, which means its payload is flung into space and its launch rocket falls back down to Earth. The Koonibba test range covers 41,000 square kilometres, in an area that includes Crown land, national parkland and the traditional lands of the Far West Coast Aboriginal people under Native Title, comprising 6 cultural groups stretching to the Western Australian border. The launch facilities themselves are on land leased from the Koonibba Community Aboriginal Corporation, where the community is employed at launch events in an arrangement that brings a steady income stream. Permissions for Southern Launch to retrieve any debris that falls downrange into the Far West Coast Aboriginal lands were secured through compliance with the South Australian *Aboriginal Heritage Act* protections for cultural sites. All retrieval crews must be accompanied by cultural monitor Elders to minimise disturbance to land.

To say that these installations draw strong and conflicting sentiments from a broad cross-section of people affected within their vicinity is a vast understatement. Community consultation was met with many of the same full-throated objections that had come to surround Woomera decades earlier, and which come predicated on their imposition on land, including: on environmental grounds and the threats posed to local ecosystems; on grounds of access to cultural sites; on the grounds that where rocket debris lands — even when it is obligated to be immediately removed — can be hundreds of kilometres from where it was launched. And on the flat objection to any kind of technology connected with the military to be allowed to be built at all. That there is no getting around this underpinning of rocket and satellite technologies: even missions of purely scientific merit — like those undertaken by pharmaceutical companies who want to test the ability for certain protein crystals to form in the atmosphere that cannot be formed on Earth, with the view to developing new kinds of drug treatments — are riding on the back of weapons technology. The first rocket launch at Koonibba was carrying an electronic warfare tracking satellite made by Asension, a former Australian Defence Force contractor. Lloyd Damp, the CEO of Southern Launch, spoke in Federal Parliament during a 2021 inquiry into developing Australia's space industry about the need for Australia to not spend its defence budget on launches made overseas, but to bring that investment and infrastructure onto our own shores, so that the assets are Australian-owned and operated, and less vulnerable to foreign interference. This is their strategic value to our military, who was in attendance at the inquiry along with several private exploration corporations. The government was persuaded.

When I visited Koonibba, Southern Launch had sent a documentary crew to produce a short film about the company's work in the town of just under 150 people. The crew were filled with earnest optimism about what positive impact the projects would have for the local community employed at launch events, and of the scientific breakthroughs to come from sending proteins to be studied in space. They generously welcomed me to follow them around the launch pad, to the town, to introduce me to its residents who hosted us on Country, to eat roasted oysters from a fire. They told me quintessentially Australian stories of times when wildlife imperilled the launch of hundreds of thousands of dollars' worth of technology, when an emu ran onto the live launch pad and had to be chased off by a drone. I loved their easy company, even as I didn't want to puncture anyone's optimism by telling them that next I was going to Woomera, to see Australia's true space technology history for myself.

The idea of scientific exploration being only for the common good had clearly cast over them its very long shadow. They were a little nervous, maybe professionally envious, as on that day Gilmour Space Technologies was launching its Eris rocket in Queensland, the first orbital launch vehicle ever built in Australia. It would achieve lift-off, hover awkwardly sideways over the launch pad for 14 seconds as it lost propulsion, and then crash back to the ground, exploding on impact.

The day I left Woomera I drove the Stuart Highway to Port Augusta and then across a plain at the base of the Flinders Ranges, along a narrow 2-lane road with a speed limit of 100 kilometres per hour. The mountains seemed to never get any closer, their dominance of the landscape warping perspective until I came right to their foot, grey-green with tree cover. I arrived in the early afternoon at a campground to find only one bag of firewood remained to be purchased, which would not do on a night that would dip below zero degrees, this being much closer to where the snow had landed on the ranges.

At the check-in I'm reminded that there is no wi-fi out here, no coverage, so I'm given a paper map of the walking trail that I set off along, that winds through a dry creek bed, passing nobody else. I walk and walk with the sun setting, around the bends lined with gums, over and under fallen boughs as I make note of the branches that I will carry back out with me and chop by the fire to feed it over the hours I sit by myself in a deep quiet. Each step along the 2 kilometres of trail I can feel is taking me further from where I've just been. I slough off the psychic grime of Woomera, watching flocks of galahs careening and laughing as I feel my feet hitting the ground and the weight of the 2 large branches of gum that I am dragging behind me.

By the fire I revel in knowing that no-one can reach me here. Having isolation forced on you and choosing solitude are not the same. Still I take out my phone, to turn the app to the sky that maps the universe above me. It lays its augmented reality over data collected from GPS satellites and it will work without connection.

You can point it down towards the earth and see the stars and celestial objects on the other side of the planet's sky. You can choose to view the Milky Way in ultraviolet light. You can choose to look only into deep space. You can tap on or off the layer that shows you

2 Jacklin SA, 'Small-Satellite Mission Failure Rates', *NASA*, March 2019, ntrs.nasa.gov/api/citations/20190002705/downloads/20190002705.pdf. Accessed 23 January 2026.

meteor showers. You can track rocket bodies and space junk objects in real time. You can see only in microwaves or radio waves or X-rays. You can shift the light pollution density to account for if you are standing in a city, or out here, far from the LED glow of any skyscrapers. You can be lost in it for hours, as it makes what you can see with the naked eye look almost boring by comparison.

Briefly I see that I have connected to the internet. The tiny icon of a satellite pops up in the place of the service bar. It is the Starlink array passing overhead. It reminds me of a story I'd read about how the signals sent by the satellite arrays have caused interference in the Radio Quiet Zone in Western Australia, where radio telescopes are listening to deep space for traces of the earliest universe. The remoteness of the location of the Inyarrimanha Ilgari Bundara/CSIRO Murchison Radio-astronomy Observatory was meant to secure the path of its telescopes to take images of the distant past not possible anywhere else on Earth. But of the 73 million images taken, 30% showed interference from the leakage of satellite noise from Starlink, rendering them useless.

Messages from home begin to ding on the screen. I don't open them. I turn off the phone and turn the embers in the fire. I look up at the embarrassment of stars that I will likely never see from this exact vantage point again. I go back to playing pretend that there is anywhere left on this planet now where we can be alone.



A rudimentary road at Woomera Rocket Range, South Australia, 1967



Defence - Central rocket range area, Woomera, South Australia, 1964. Image: National Archives of Australia

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Item ID 32000865



Woomera - Range ‘E’ - rocket in flight ‘sea slug’, black and white negative, cellulose acetate, preservation material. 13 April 1956. Image: National Archives of Australia

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Item ID 30451468



Control room of the astronaut tracking station established at Muchea, WA, 30 miles north of the capital city of Perth, as part of the US Project Mercury (Man-into-Space). Federal Department of Supply’s Weapons Research Establishment, 1961. Image: National Archives of Australia

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Item ID 20306732



85ft Deep space tracking station at the Woomera Rocket Range, SA, photograph, 4x5in, colour transparency, preservation material.,1963. Image: National Archives of Australia

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