

ESCAPE FROM EARTH

A SECRET HISTORY OF
THE SPACE ROCKET

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MACDONALD

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PREFACE

SPACE FLIGHT MAY SEEM like a transcendent theme – the stuff of soaring visions and azure skies – but its history is grounded in the dirt. This book is the unearthing.

It is a story that I've reconstructed from archives buried in obscure places. Perhaps that's why the research has so often felt like an exhumation. It's not just that the principal characters in this book are dead, which they are, but that their reputations have followed them down to the grave. This is about people who have, for the most part, been forgotten, even though their lives are central to the achievements of the twentieth century. I only found out about them through an accident of geography.

In the closing years of the twentieth century, I was conducting some doctoral fieldwork on the island of North Uist, in Scotland's Outer Hebrides. I didn't go there to study rockets but my interest in the cultural landscape made me curious about the one place on the island to which I was denied access: a hilltop called Cleatrabhal, 'hill of the ridge' in Old Norse. Its militarised summit gives a commanding view over the irregular carpet of moor and loch; there are even traces of Neolithic and Iron Age communities. But it's the Cold War infrastructure that still dominates Cleatrabhal, and it was there that I first started to dig into the story of the Space Age.

I learned that this site had been part of a rocket testing range built on the neighbouring island of South Uist in the late 1950s. The next time I was down in London, I dredged the National Archives to find declassified military files about the planning of the range. I discovered that it had been built to test a type of American rocket. And not just any rocket: the Corporal was the first guided missile authorised to carry a nuclear warhead. To my mild shame, I had never heard of it.

I wrote a few dry academic papers about missile testing and Cold War geopolitics, but the origins of this technology remained a bit hazy. I knew that the Corporal had been designed at the Jet Propulsion Laboratory and I knew, too, that JPL was at the forefront of space exploration today. But I thought it a bit odd that the key engineer behind both the rocket and the laboratory should be such a distant figure. His name was Frank J. Malina.

In 2006, I noticed a new Wikipedia article about Malina – a one-sentence entry that described him as an ‘aeronautical engineer and painter’. Ploughing through a few books and oral histories turned up more information. I read that when he was little more than a graduate student, with the help of friends whose credentials were even less impressive than his own, he developed the first US rocket to reach an extreme altitude. It’s called the WAC Corporal, the precursor to the Corporal. These days ‘rocket science’ is a cliché for complexity, a shorthand for engineering brilliance. In the 1930s, however, the opposite was the case: rocketry was so discredited that it didn’t belong anywhere near the word ‘science’. Yet it was Frank Malina, arguably more than anyone else in the United States, who made it respectable. Why then was his name absent from histories of space flight? There were rumours about his politics, and even more outlandish stories about his colleagues.

Years passed. I was invited to give a paper at the International Astronautical Congress, where by chance I ran into the astronomer Roger Malina, Frank’s son. I had no particular plans to write about his father but I was intrigued by why he wasn’t better known. Why did he walk away from practical rocketry? Why did he leave the United States? ‘You should come to our home in Paris,’ Roger suggested. ‘We have a family archive there.’

It took me a few more years – life happens; I wasn't in a hurry – but eventually I made it to the Malina house. Roger opened the gate and welcomed me through the courtyard into the home where he grew up. Tucked away off a quiet back street in Boulogne-Billancourt, the house exudes a kind of homely modernism: simple concrete lines, a quirky spiral staircase, high ceilings and low furniture. In the study was a panorama of books, photographs and paintings, preserved in a state of lifelike disorder.

In the adjacent office I scanned the shelves. Each was laden with box files of letters, drawings, photos, sketches, more letters, magazines, exhibition catalogues, receipts, so many letters. There were documents of every conceivable kind – many of them intimate rather than institutional. Love letters. Letters to his mother. There were more formal papers too: a thick correspondence with lawyers, an archive box on which was written 'Box V: Witchhunt file'. Frank's life felt so close at hand, it was as if he had just stepped out to the patisserie. On his bedside table I spotted his wristwatch, a tiny calendar clipped to the strap: November 1981.

I had only been in Paris for a few hours when I realised that what had been an idle curiosity on Cleatrabhal, then an academic interest in London's National Archives, was now something urgent and personal. Here was an extraordinary life. I didn't know the full story then, not even half of it, but I felt certain that there *was* a story.

With Roger's permission, I photographed everything I could find, page by page, and read the material back in Scotland. I filled notebooks with details of Malina's friends and colleagues. I pieced together his relationships from the letters, working out who he trusted and who he didn't. I started to find gaps: letters missing; things that didn't add up. I found Frank Malina's FBI file and blinked at some of the allegations it contained. I submitted my own Freedom of Information requests to declassify the FBI files on Malina's friends. There were thousands of pages to examine in this house, but it was only a starting point; the search took me spiralling outwards, into other circuits of association.

The momentum I built up in Frank's archive was dragged by the search for FBI files. First you have to prove that the subject is dead

and provide enough information (social security number, dates of birth, death, marriage) to identify the relevant files. If any are found you then join the declassification queue; that can take five years. Released files have many of the names redacted – blacked out – so that although you have some idea of what has happened, it's difficult to know *who* it happened to. It requires endless comparisons with other files and other archives. Much of this is repetitive and boring. Now and again, I'd find a little nugget. In the spring of 2016, a new file arrived. And with a single name on a single page, mistakenly left unredacted, I found the motherlode.

The trouble with FBI files as sources is that they're only as reliable as the agents and their informants. They can be useful, but they aren't the Truth. On reading them I still needed wider evidence – letters, diaries, oral histories – to give a more nuanced picture. Foremost here were the papers and journals kept by Frank's first wife, Liljan. Even with all this material, getting the measure of this story depended on getting to know its characters; that in turn meant getting to know their children, even grandchildren. These conversations weren't always relaxed. I was asking about past membership in the US Communist Party, not the kind of talk that puts anyone at ease. But in time, unseen and often unknown sources began to emerge, sometimes dramatically changing the story: the people who remembered FBI agents sitting in cars at the bottom of their driveway; or those who recalled the suited men watching as they bought ice cream as children; the family that came home one day to find a nail driven into a door frame, preventing its tight closure. Some of these recollections cut deep.

Half a century after the moon landings, we have inherited a particular image of America's Space Age pioneers: the steely-eyed missile man facing the great unknown. In the mass of papers and testimonies piling up in my own study, I saw something else: something repressed and unspeakable, something hidden and shameful. Something secret.

This is the story of the birth of the space rocket. In the pages that follow, you'll learn how humankind first reached beyond the atmosphere of Earth to worlds beyond. But it is more than that. It's about what we will allow ourselves to know about the darker legacies of the

twentieth century, and the dangerous ideas that won't stay buried. I didn't expect this story to turn out as it did. Then again, I didn't think I'd be the one to uncover it.

PROLOGUE

THE PHONE RANG. The caller didn't identify herself; she just began speaking. At first Liljan Malina was too busy trying to absorb the information to recognise the voice. Then it clicked: this was Katja Liepmann. She could tell from the German accent. Not a close friend – their husbands had worked together at Caltech – but she knew Katja understood political danger. Katja had twice fled from the Nazis.¹ And, yes, it was definitely Katja who was saying that the FBI were on their way to the Malinas' house, that they'd be there within the hour.

Liljan snapped into alertness. It was a scenario she and her husband Frank had feared; they'd half planned for it, though neither of them quite expected it would happen like this. Katja, in a matter-of-fact tone, said that other homes were being raided even as they spoke, although she gave no clue as to how she knew that the Malinas were next. She calmly instructed Liljan to grab and destroy anything that might incriminate them.

After Liljan hung up she tried the office number at the Jet Propulsion Laboratory. No answer. She started to panic. She ran through the house from room to room scanning for books, pamphlets, fliers, magazines. There didn't seem to be much lying around, but then they'd both become a bit more careful recently. Earlier that year, in

April 1945, Frank had told her about a long train journey during which he found himself chatting to another passenger who, it turned out, worked for the FBI. 'His ideas were most discouraging,' Frank wrote; he 'said he would like Southern California if there weren't so many radical inhabitants'.² The whole episode had seemed quite funny, inconsequential.

Liljan calmed herself down and remembered the spring clean that Frank had undertaken months before. He had burned a lot of material. What was left he had placed in two cartons, which were put out of the way in the attic. Sure enough, behind some old furniture, Liljan found the cartons. It took two trips to heave them to the car, racing up and down steps two at a time, after which she carefully locked the front door of their Pasadena house.

Liljan drove towards Los Angeles – in the 1940s it was still quite separate from Pasadena – and at a quiet stretch she pulled off the road to call a friend, Saki Dikran, from a payphone. Saki's mother, Helen Blair, was part of the scene, and so was Helen's partner, Jack Frankel, an attorney to a number of beleaguered leftists. He would soon be handling Liljan and Frank's divorce. Liljan skirted LA and drove west, winding her way up to Saki's Spanish-style villa in Laurel Canyon, high in the Hollywood Hills.³ It was a steep, narrow road with houses dug right into the hillside, all steps and walls and terraces. The place was tucked back from the road and nestled in greenery. On the horizon, Italian cypress trees pointed skywards. When the car pulled in to the house, Saki was standing in the driveway. Liljan motioned to the garage. Saki opened it without a word. Once inside, Liljan spilled out everything that had happened. Saki poured her a drink and in her usual quiet way said, 'Well ... we'll simply burn the whole damned mess.' Together they collected a few leaves and twigs from the back yard and started a fire that would consume, page by page, the contents of the two cartons, until nothing but white ash remained.

Early that evening, Liljan returned to Pasadena feeling as though she had disposed of a body. It was dark by the time she got back, and she was concerned to see the house bright against the evening sky, a light on in every room. She found Frank in his study. The posture of his slight frame was tense, his face pale and angry.

They had interrogated him in his office. Books, paper and files were strewn about the floor. It was the same in Liljan's studio, and in their bedroom. Frank's only crumb of comfort was that it was Liljan, not the FBI, who had removed the two cartons from the attic.⁴

YOU MIGHT NOT HAVE RECOGNISED his name, but Frank J. Malina is among the most important figures in twentieth-century science. His life is central to the bigger story of how humans first reached beyond the boundary of Earth, yet it has been obscured by the politics of the mid-twentieth century. In part because of a decades-long campaign of surveillance and harassment, both Malina and the pioneering rocket he created have vanished from the pages of history.

Malina was the first US rocketeer to achieve the main purpose of rocketry – high-altitude flight. Of course, building such a complex system is never the work of just one individual, but Malina was the architect of America's first successful liquid-propellant rocket, the WAC Corporal. The reclusive Clark University physicist Robert Goddard is known as an early pioneer with liquid fuel, but he never came close to the 'extreme altitudes' that were his own stated aim.⁵ Malina's WAC Corporal rocket owed no design debt to Goddard's, and it soared twenty-seven times higher. In collaboration with the self-taught chemist and occultist Jack Parsons and aerodynamicist Theodore von Kármán, Malina also helped develop solid-fuel rocketry, another mainstay of contemporary space flight. If we put aside the Nazi engineering team that built Hitler's V-2 (many of whom became born-again Americans), it was Malina's initiative and leadership that transformed early rocketry in the United States from fantasy to science.

Malina occasionally turns up as a bit-part player in other people's histories – not least those of the charismatic Parsons.⁶ But he is weirdly absent from so many accounts of the Space Age. Take, for instance, Walter A. McDougall's Pulitzer Prize-winning *The Heavens and the Earth: A Political History of the Space Age*. It is one of the most authoritative histories of space exploration and yet, across five hundred pages, it has more references to Bob Dylan than to Frank Malina.⁷ This is very strange. The institutions Malina founded have

been crucial to human achievements in space for over seventy years. His Jet Propulsion Laboratory (JPL), for instance, is now a NASA research centre with 6,000 employees that daily pushes back the frontiers of autonomous space exploration. Those amazing hi-res pictures of Martian terrain? Many are from JPL's *Curiosity* rover; by 2020 a new JPL mission will assess the habitability of the red planet. It's precisely because these institutional legacies are so enduring that *our* curiosity might usefully explore the secret struggles that were part of their genesis.

One of Frank Malina's most important contributions was a paper he published in the *Journal of Aeronautical Sciences* with his colleague Martin Summerfield. 'The Problem of Escape from the Earth by Rocket' detailed for the first time the mathematical criteria for 'multi-staged rocketry', a strategy by which a rocket achieves high altitude by dropping pieces once it has finished with them, so that it gets lighter as it ascends. Though the efficiency of rockets has since improved immeasurably, staged rocketry has remained the standard means of reaching orbit for over half a century.

But the problem of escape from Earth turned out to be as much political as mathematical. For Malina and Summerfield, it was the problem of how to make the rocket the bearer of hope rather than fear, and how their bid for the stars could be part of a progressive politics here on Earth. Closer to home, it was the problem of how to maintain a personal and professional life in the face of suspicion that reached the highest levels of America's security apparatus.

Malina didn't especially like to put a name on his politics. He thought of his views as being common sense, even 'scientific'. During the early years of his work at Caltech, he campaigned against racial segregation and raised money for the republicans in the Spanish Civil War. Some called him a radical, a socialist and a communist. These labels aren't wrong. Nevertheless, after years examining his private archive, it's clear to me that the core of his politics was anti-fascist. That was enough to put him in a difficult position.

As his rocket work became more successful in the interregnum between World War and Cold War, a refined version of his WAC Corporal was anointed as the Corporal missile, the first rocket

authorised to carry a nuclear warhead. 'Four battalions of Corporal missiles alone are equivalent in fire power to all the artillery used in World War II,' boasted President Eisenhower.⁸ The Corporal offered what US Secretary of Defence Charles Erwin Wilson memorably called 'a bigger bang for the buck'.⁹ In other words, the rocket that Malina developed as a vessel for scientific exploration became the progenitor of contemporary weapons of mass destruction. He found himself making instruments of terror that were intended to destroy the very political movement he believed in.

AROUND THE TIME that Malina's WAC Corporal was soaring into the upper atmosphere, another group of rocketeers were settling into a new life in America. Wernher von Braun, Arthur Rudolph and Walter Dornberger had been the driving forces behind the V-2 that terrorised London and Antwerp in the final year of World War II. Their rocket wasn't much of a killing machine: the 3,000 or so British victims can be contrasted with the 43,000 that died in the German Blitz four years earlier. The real horrors of the V-2 were located at the production sites rather than at the targets. An assembly line, latterly housed in deep tunnels of the Mittelwerk factory on the outskirts of Nordhausen, used prisoners from the Mittelbau-Dora concentration camp, drawn from among Jews, Roma and Sinti, as well as French resistance fighters. Even the more conservative estimate puts the number of deaths at Mittelbau-Dora at around 20,000, of which about half can be attributed to V-2 production.¹⁰ Words cannot describe the suffering.¹¹ Yet this was the reality of fascism. It's what Malina and his friends were fighting while von Braun was trying not to notice the executions of enslaved prisoners who were deemed a threat to output or quality.¹²

Wernher von Braun, whose smiling face would personify the Space Age to millions of Disney viewers, was not what you'd call a career Nazi. He was happy to work with whoever could propel his engineering ambitions, including the SS. Eventually, as the Third Reich disintegrated, he and his colleagues would seek a new sponsor. There was only one state that really fitted the bill. As another German engineer put it, 'we despise the French; we are mortally afraid of the

Soviets; we do not believe that the British can afford us, so that leaves the Americans'.¹³

Under the auspices of 'Operation Paperclip', 1,600 German engineers, including von Braun, Dornberger and Rudolph, transferred to the United States, many with laundered war records. Wernher von Braun wasn't the worst; he was not among the architects of Nazi death. But while the extent of his culpability for war crimes was never tested in court, survivor accounts indicate he wasn't above dishing out a bit of his own personal brutality.¹⁴ When he got to America, he would still use anti-Semitic slurs for his military minder, Arno J. Mayer, later a Princeton historian.¹⁵ Even with all this political baggage, von Braun had nothing like the difficulty in the US that Frank Malina encountered. Then again, Hitler's Boy Wonder had the advantage that he was a fervent anti-communist.¹⁶

Perhaps this comparison of Malina and von Braun is a little too neat. It will become clear that this book isn't about caricaturing heroes and villains of the Space Age. Still, we lose a great deal if don't attend to the Cold War political circumstances that have allowed von Braun's story to prosper while the legacies of Frank Malina have been obscured.

Here's one example. In 1958, when the United States launched its first satellite, a beaming Wernher von Braun was pictured at JPL holding aloft the successful Explorer 1. We might have expected Malina to share the limelight, not only as JPL's founder, but as the proponent of an earlier satellite that the US chose not to fund. Then again, he received no plaudits when, back in February 1949, his WAC Corporal reached the record altitude of 244 miles as the second stage on top of a captured V-2 – the so-called BUMPER WAC Corporal. Though it lasted just 390 seconds, that flight completed a voyage as remarkable in its own way as those of Columbus, Magellan and Cook. It was the first human object to reach into extraterrestrial space as it was then understood, and the first vehicle to achieve hypersonic flight (Mach 5).¹⁷ 'If those who publicise such matters had not been asleep in our country,' Malina later complained, then 'a reasonable claim could have been made ... that the Bumper WAC project opened up the Space Age well before the *Sputnik*.'¹⁸ But when Explorer 1 orbited

the Earth, the US had rescinded Malina's passport and FBI agents sat in a car outside his house. By the time their interest in him finally waned, humans would be walking on the moon.

THIS IS THE STORY of how Malina and a close circle of friends pursued two strains of twentieth-century optimism: space flight and socialism. These were connected in remarkable ways, not least in that the purposes of both movements became corrupted, and many of their advocates were persecuted and forgotten. If this has been a largely hidden story, the responsibility for its concealment lies as much with the radical rocketeers as with the US space and security establishment. It has taken time for the truth to emerge from the fabric of finely woven secrets, accusations, denials and evasions.

At the dark heart of the Red Scare lay a straightforward question – 'the question that we have for so long been worried about', as Malina once put it.¹⁹ Malina avoided it where he could, but he could not escape it forever. In 1958, he faced it directly on Form DSP-II, which he was completing in the hope that the US might eventually return his passport. It was the question that made the full rights of citizenship dependent on one's political thought being acceptable to the government – a question that negated any kind of achievement, no matter how far out of this world.

'Have you ever been a member of the Communist Party?'

Lest this question seem open, Form DSP-II followed it up with a binary instruction: '(WRITE YES OR NO)'.¹⁹

Malina filled the box with his clear capitals: 'NOT TO MY KNOWLEDGE'.²⁰

The evasion in these four words is at the core of Malina's adult life, of how his life has been elided from the history of the twentieth century, and of what, finally, we can know about our escape from Earth.