

Gateway to heaven

From the lowlands of Cape Canaveral in Florida, **Wilson da Silva** watches the final flight of a space legend.



HUMANITY HAS a beachhead to the stars, this is it: Cape Canaveral. This sandy promontory, jutting out into the Atlantic from a barrier island on the midway point of Florida's eastern coast, is the site of most of the manned space launches in human history.

Inhabited for more than 12,000 years, and the scene of some of the first encounters between Europeans and Native Americans, it's often hot and humid, a lowland speckled with marshy lagoons in every direction. Often sunny year-round, it's also prone to sudden thunderstorms and lightning.

To the north is the Canaveral National Seashore, a national park of pristine beaches and sand dunes that are sanctuary to an abundance of wildlife, from dolphins and manatees to giant sea turtles. It's a spawning ground for saltwater fish and alligators swim the rivers and lagoons. It is from this sub-tropical setting that more than 880 passengers have been lofted into the cold of space.

As long as I can remember, I've wanted to come here to see a manned launch. And ever since staying up as a child to watch live pictures on TV of the first space shuttle heave into the sky in April 1981, I've wanted – most of all – to see a shuttle launch.

So here I was, 30 years later, as the bold – and at times tragic – era of the shuttle draws to a close, and with the last three remaining orbiters facing retirement, finally ready to see my first manned launch, and my first shuttle takeoff. I'd come to see the farewell flight of *Discovery*, the most travelled and successful of them all.

Discovery was the third shuttle to join the fleet, and made her maiden voyage in August 1984 – when Ronald Reagan was in the White House, Bob Hawke in his first term as prime minister, sprinter Carl Lewis had just won four gold medals at the Los Angeles Olympics, apartheid reigned in South Africa and Prince's *Purple Rain* was top of the charts.

The actual spacecraft is even older: construction began in August 1979, based on designs proposed a decade earlier. In fact, the whole fleet's tailor-made onboard avionics computer had 424 kilobytes of magnetic core memory, could process 400,000 instructions per second, had no hard drive, and loaded software from magnetic tape. Upgrades in 1990 boosted memory capacity to about 1 megabyte and processor speed to 1.2 million instructions per second.

Considering how often the space shuttle is billed as the most complex vehicle >>



>> ever built, and its decades-long poster child status for everything futuristic, it's amazing just how much of a technological relic it is. My iPhone has more memory than the avionics!

But it was the first civilian craft to use a computerised fly-by-wire digital flight control system, with no mechanical or hydraulic links between the pilot's joystick and the control surfaces or thrusters – the kind we take for granted on modern airplanes. It did not burn out its heat shield on re-entry, and it was the first reusable spacecraft.

SINCE ITS MAIDEN flight, *Discovery* has completed 39 missions, making it the most successful in NASA's fleet. It benefited from lessons learned in the construction and testing of its sister craft, which is why it weighs some 3,000 kg less than the first shuttle, *Columbia*.

Unofficially, it's considered 'the lucky shuttle': after the disasters that destroyed *Challenger* at takeoff in 1986 and *Columbia* on re-entry in 2003 (its two sisters from the original fleet of three), *Discovery* was twice chosen to restart the shuttle program.

And she has indeed had a colourful run: launching the Hubble Space Telescope, flying the first female shuttle pilot, Eileen Collins (who also became the first female shuttle commander, also aboard *Discovery*). It was the first – and the last – shuttle to dock with *Mir*, Russia's space station, put Australia's first communications satellite,

Almost 4.8 km to the northeast, I could see the orange external tank and just make out the white livery of *Discovery*. The beast was awakening.

Aussat 1, into orbit, twice repaired Hubble, and was first shuttle to dock with the International Space Station. It flew the highest altitude, and carried the oldest human into space: John Glenn, who was 77 and a U.S. Senator at the time and who had made his name as the first American to orbit the Earth in 1962.

"It's just amazing what this vehicle can do," astronaut Eric Boe, the pilot for *Discovery's* final flight, told a news conference. "It can launch like a rocket, go into orbit, change into a spacecraft and then land as a hypersonic airplane. What's amazing is just how well she sails. It's an honour and privilege for all of us to get the chance to fly on her final voyage."



The Crawler-Transporter moves away after delivering *Discovery* to the launch pad for the last time.

THE DRIVE TO the launch site is a collage of multi-lane highways and abundant elephant grass interspersed with rivers and lagoons and, of course, bridges and causeways. It's not hard to believe that there are almost 7,800 lakes and 19,000 km of waterways in Florida.

More surprising is the unending banality of crass Americana: multi-coloured signs

atop tall towers are everywhere, advertising Dennys, Jack in the Box, Burger King, TGI Friday's, U-Haul – along with a plethora of makeshift signs hollering daily specials in large magnetic letters.

I'd arrived the night before in Orlando, the nearest international airport, and driven to my motel in Titusville, a sizeable town just across the Indian River from the Kennedy Space Centre. Having breakfast at a diner that morning, I watched the morning news shows excitedly discussing the last flight of *Discovery*, with a live cross to reporters at Cape Canaveral, in between weather forecasts and live traffic updates.

Although only a short drive away, I hadn't factored in that 40,000 people

had descended on the region – known as the Space Coast – to see this historic last hurrah. Despite leaving with plenty of time, I was immediately caught in a massive traffic jam that stretched across the causeway and into the outskirts of Titusville. And this was almost seven hours before the scheduled launch. On the radio, I heard that at 10.30 am, the last parking spots in the premier viewing areas around the cape had already been snapped up.

More than six weeks earlier, I'd applied for a press pass to see the takeoff from the Launch Complex 39 Press Site, where journalists and camera crews have been covering manned flights since Apollo 8 in 1968. But getting there required peeling back four layers of security, and validating my documentation at various buildings before I could pick up my site access and press passes. With all three approaches across the river clogged with slow-moving cars, it took some time – and patience.

With my passes in hand, I barrelled down the road toward the Vehicle Assembly Building, reputedly the fourth largest building in the world by volume: 160 m high and enclosing 3.7 million m³. Originally built to allow the vertical assembly of the Saturn V rocket that took men to the Moon, it's now where the shuttle orbiter – the 'spaceplane'

component – is mated with the massive orange-coloured external fuel tank and the two solid rocket boosters.

The whole assembly sits atop a mobile launch platform that is moved slowly to the launch pad 5.6 km away on a Crawler-Transporter: gigantic self-powered land vehicles that can move 7,900 tonnes at a top speed of 1.6 km/h. Built for US\$14 million in the 1960s, there are two of them, and each have two control cabins at either end and require a team of nearly

My stomach fluttered, and I found myself watching open-mouthed.

30 engineers, technicians and drivers to operate the vehicle on its six-hour journey.

LAUNCH PAD 39A is where shuttles fly from, part of a launch complex built for the Apollo program. Its sister 39B was deactivated in 2007, and *Discovery* was the last to use it; NASA is now offering the pad and facilities to private companies for the commercial space market.

By the time I reached the press site, engineers had begun loading the shuttle's external tank with about 2 million litres of cryogenic propellants. The orbiter's onboard fuel cells, inertial instruments and communications had been activated. Almost 4.8 km to the northeast, I could see the orange external tank and just make out the white livery of *Discovery*. The beast was awakening.

Soon, the six astronauts would begin making their way to the pad. I took a vantage point near the iconic digital countdown clock, which is not just big – it's mammoth. A little worse for wear, it uses large, old-school incandescent light bulbs to shape its numbers. Behind it, there's a long series of lakes, coves and creeks between the elevated mound where media facilities are located, and the launch pad. More than 200 people were already on the site, and the foreshore was festooned with camera tripods.

The News Centre, as the area is known, has several buildings: a 100-seat auditorium for press conferences, 15 site support offices, common workspace for journalists and two libraries. Major outlets such as CBS, NBC, CNN and Reuters had their own prefab shacks. The main press room has six large LCD screens with direct feeds from

various sites: the gantry leading into the orbiter, weather and radar maps, and multiple angles of the launch pad.

In the hours that followed, the astronauts entered the orbiter in their bright orange spacesuits and strapped in, their helmets by their sides, and began a long list of verbal checks with Launch Control at the Kennedy Space Centre and Mission Control at the Johnson Space Centre in Houston. Technicians in white overalls, baseball caps and head-mounted radios closed the hatch, checked seals for leaks and went through seemingly hundreds of detailed crosschecks.

DISCOVERY WAS NAMED after two historic vessels of the past: one used by 17th century English navigator Henry Hudson to explore Canada's Hudson Bay and search for a northwest passage from the Atlantic to India; and one by British explorer James Cook in the 1770s in voyages in the South Pacific, leading to the discovery of the Hawaiian Islands.

"We're wrapping up the space shuttle program," astronaut Steve Lindsey, commander of *Discovery's* last mission – known as STS-133 – told reporters before takeoff. "Besides the excitement of completing the International Space Station and all the things we do, I hope people get a sense of the history of what the shuttle is and what we've done and what's ending. Because they'll probably never see anything like it flying again."

And Cape Canaveral has been where all of the journeys began. Since 1961 there have been 165 manned launches here – from the nearby Cape Canaveral Air Force Station where the pioneering Mercury and Gemini capsules were launched, to the Kennedy Space Centre, built for the Apollo missions.

Since they first lit up the skies in 1981, space shuttles have been the workhorse of human spaceflight, taking more than 800 passengers into space. The most diligent of them has been *Discovery*, which in 39 missions has spent a cumulative 365 days in space and travelled more than 238 million km orbiting the planet.



Barrelling down the spaceport access road after clearing security.



The author Wilson da Silva with the countdown clock.



The media line up in the press site for images of *Discovery's* final launch.



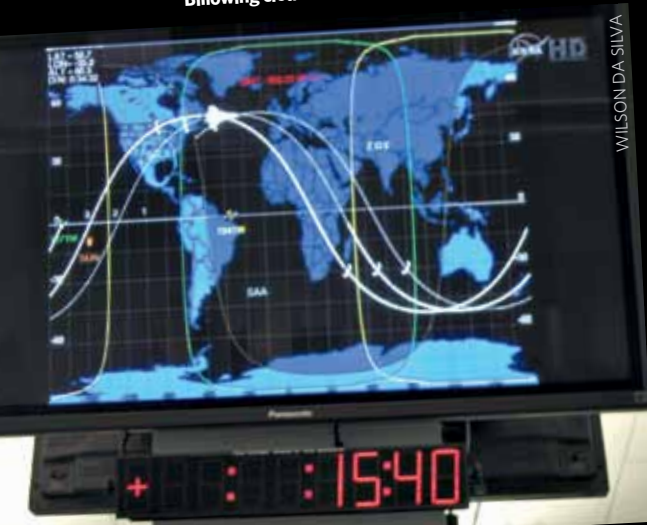
Journalists inside the News Centre wait for the launch.



Reporters and photographers watch on as *Discovery* burns into the sky.



Billowing clouds of steam lie in the wake of the shuttle.



A computer screen shows the shuttle's path 15 minutes after takeoff.

TAKEOFF WAS SCHEDULED for 4.50pm, but with nine minutes to launch, the clock suddenly froze. The Air Force's range safety computer – which monitors data from sensors dotted along the coastline – indicated a problem, and put the launch in doubt. *Discovery* had a razor-thin three-minute launch window before the attempt had to be abandoned for the following day, and tension mounted as NASA engineers scrambled to determine the cause. Taking a gamble, they restarted the clock in the hope the Air Force would uncover a false alarm and the launch could proceed.

But as no word came, the countdown was again stopped at the T-minus five-minute mark. There it held. Finally, with time running out, NASA engineers received a call saying the glitch was resolved, and resumed the countdown. At exactly 4.53:24 pm – with just three seconds to spare – *Discovery* blasted off.

When the engines ignited, there was a blinding flash and the whole structure began edging upwards. At first it seemed to gently hover above the launch pad. This was an illusion; it was actually rapidly accelerating, and within a split second,

And the sound. It's hard to describe: a resonant thundering that quickly overwhelms the cheering and rapid-fire camera shutters going off around you.

was punching through the air, riding an eye-searing waterfall of white-hot flame as it tore into the clear blue sky.

I'd waited for decades to see it, and had watched countless shuttle launches on TV. And still, my mind found it hard to accept what I was seeing. A building 19 storeys high was rising effortlessly into the air, trailed by billowing clouds of superheated steam that raced away in all directions. The plume of flame spewing from the solid rocket boosters was incredibly bright – almost like looking at the Sun. Nothing had prepared me for that.

And the sound. It's hard to describe: a rumbling growl so low it reaches into your stomach, with a resonant thundering of pops and bangs that quickly overwhelms the cheering, whooping and rapid-fire camera shutters going off around you. There is a moment – 50 or



The NASA astronauts of the final *Discovery* flight, from the right: commander Steve Lindsey, pilot Eric Boe, Steve Bowen, Alvin Drew, Michael Barratt and Nicole Stott.

so seconds in – when the sound is so overwhelming, seemingly on top of you, and silence descends on the crowd.

My pulse was racing and I found myself watching open-mouthed. It did not close again until the shuttle had, two minutes into the flight, ditched its twin solid rocket boosters 48.7 km above us. Curling clouds of steam marked its trajectory, and the orbiter – its engines now burning fuel from the attached external tank – was a tiny white speck in the deep blue sky that, eventually, vanished. My senses told me something very large and very powerful had growled to life nearby, done something incredible, and all I could do was stare after it, transfixed.

It had been a remarkable show. *Discovery* was on its way, and its engines would continue firing for another six minutes before the tank was drained and fell away, to burn up on re-entry. It would loop the Earth several times over the next two days, working its way through complicated orbital dynamics, before gently docking with the International Space Station.

"The shuttle program... has given us a lot ... and it has taught us what is needed for the routine access to space," Andy Thomas, the Australian-born NASA astronaut who flew aboard *Discovery* in three of his five flights, told me in an email. "But that has come at a significant cost, both financial and human.

"We now recognise that the shuttle technology, while brilliant in what it can do, is very fragile, costly to maintain and unforgiving to mistakes. So it is time to retire it and move on." ❏

Wilson da Silva, the editor-in-chief of *Cosmos*, is waiting for his own taste of space aboard Virgin Galactic in 2012.