Echoes of Apollo

By Nick Howes

It’s not very often that a 17 year old gets to play a vital role in something so historic that almost everyone alive at the time can say exactly where they were the moment it happened. But on 20 July 1969, one such moment in human history occurred.

The landing of the Apollo 11 in the Sea of Tranquillity is one of the best documented and written about events of all time, but a little known fact is that it was the role of this 17 year old, and the small part he played, which made it possible for all of us to witness history in the making.

NASA’s ground stations in the continental United States were not able to track (due to the rotation of the Earth) their developing space programme 24 hours a day, So they had set up and worked with a series of tracking stations around the globe to receive the downlink of voice and data from the spacecraft and relay this back to mission control. These included ground stations in Madrid in Spain, Goldstone in the US, and Parkes and Honeysuckle Creek in Australia.

The famed 2000 movie ‘The Dish’ was a light-hearted farce that aimed to tell the story of how Australia played a vital role in the communications link to the Moon for the Apollo 11 landing. While the movie gained many plaudits and popular approval, some ‘facts’ from the film were highly embellished, to say the least!

For that historic landing, both the US and Australia were in view of the Moon and NASA had initially intended to give the role of receiving the signals to the Goldstone dish. The problem was that someone had some switches in the wrong position making the Goldstone signals useless and the role shifted to Australia.

Robert Brand was that 17 year old, tasked with wiring up components which allowed us to see that “Giant Leap for Mankind” and here, he speaks to *Spaceflight* magazine about that seminal moment, which led to a more than four decade long involvement in the space industry.

Q. So, how did this famed ‘tap on the shoulder’ for a 17 year old working in telecoms come about?
Simply, it seems that everyone was super busy with the preparations for the NASA switching centre that was located in Sydney, plus there had also been an incident that put an enormous load on the installation. An electrician had accidentally hooked up 240v to the 110v AC NASA equipment. It blew up NASA’s media conversion equipment and the AC system.

It was all hands to the pump. I happened to be at the site doing work experience during my college term break. Just one of those unexpected accidents of being in the right place at the right time. By the way the team managed to get a motor generator system going and secured the motor and generator to a painter plank and literally tied it down to a place in the building basement. NASA also flew out a replacement

of the blown media system. From that moment on though my life really never was the same again.

Q. 'The Dish' is widely lauded as a good fun movie, but can you highlight some of the glaring errors in it?
The producers were fanatic about getting the colours right in every part of the set – just as they were at the time. Meticulous! The story however was nothing like the truth. In fact the staff in Australia at NASA's tracking stations were Australians, unlike the staff in Madrid that were NASA staff. Australians were considered to be every bit as professional as their NASA counterparts and it was the only country staffed by non-NASA personnel.

In the movie, they ran out of diesel fuel in the generator, they lost the tracking data and they played cricket in the dish. None of these and many more parts of the movie were real. It was a fun story, pure and simple. The movie poked at the 'she'll be right' attitude of the period, but it never happened that way. The staff were consummate professionals of the highest level.

One 'fact' from the movie which was adapted related to the high winds. In the hours leading up to the Moon walk a massive dust storm did indeed hit the Parkes dish. The strain gauges were many times over the level for the dish to be stowed (pointing straight up to lower wind resistance). The staff stayed in the building right under the dish and kept it on track seriously risking their lives for the mission. The building and structure were groaning under the strain of the windstorm. I would suggest that the two astronauts on the Moon were in a much safer situation than the staff at Parkes. The massive structure could have collapsed right on top of them. Such was their dedication and commitment to the moon mission.

During the Moon walk I was back at college studying and watching unfurl on a black and white valve driven TV set with about 100 other students and lecturers. I was obviously pleased to see the fruits of my labour, but I was not afforded any special status for wiring so much of the NASA Sydney switching site. None the less it felt good that I had been a small part of the enormous team underpinning Apollo 11 and especially the success of the live TV transmission from the moon.

The NASA staff in Sydney were at odds with each other about which feed to take. The mission was so important to mankind and the pressure was on. The Honeysuckle Creek feed was there and stable and so was the Parkes feed, but the windstorm made the senior NASA controller stick with the poorer quality feed from the smaller dish.

What has never been told is that inside the sound proof room of the Sydney switching centre, the NASA staff almost came to fisticuffs to resolve which feed to use. It was resolved after Neil Armstrong's first steps on the Moon and the feed was switched to Parkes. This story was told to me about 10 years ago by one of the NASA staff involved.

Q. After Apollo 11, you went on to work on almost all of the Apollo Moon missions, which, if any was a highlight for you?

That would be Apollo 13. I was still at college for Apollo 12 and I missed supporting that mission, but I worked in support of almost every NASA mission until the Challenge disaster in 1986.

I was no longer working at the station for work experience, but I had graduated and had been appointed to a full time position at the station. Once the Apollo 13 oxygen tank exploded, everything changed. Our normal support increased from ‘critical’ to an even higher level, but we had no instructions or name for it.

Basically we had to shut down all work at the station to ensure that nothing that we did would jeopardise the links to the crippled spacecraft. Being at the heart of the NASCAM network, we heard everything that was happening without the censorship that NASA could apply to the voice transmissions released to the general public and the press.

The astronaut’s life and death fight was riveting. It was not the only life and death struggle that I would experience in my communications career but this one ended in a positive outcome unlike many I would hear at later stages. We had little to do during our working day, but listen to the radio links from the spacecraft. Although in terms of the technical aspects, we did the least of any mission, it remains the most memorable by far.

Q. You then went on to work in communications all the way through to the ESA Giotto mission to Halley’s comet, and the Voyager flybys of the outer planets, what was that like?

Giotto was my first interaction with ESA on a personal level. I had a lot to learn. I had moved away from supporting space missions and was actually stationed at another building. I had gone to work that day and had shut down an important computer system for maintenance. There was no one on duty other than myself that knew how to complete the maintenance, but in the next 15 minutes, I was to find out that politics trumps necessity.

I was told to return home and quickly pack a bag. I was headed to Parkes – a 5 hour drive. It seems I was being taken out of mothballs and thrust back into the heart of a space mission. Now I must remind you that it was a communications issue of a terrestrial nature. I only worked in comm’s in those days, but I believe that I was very good at what I did.

The finer points of new technologies and their issues were my specialty. I was one of the trouble shooters in the company when it came to things that were not clear and faults that were not obvious and thus I was pulled of a critical job to assist in the communications for a space mission in difficulty.

It turns out that for many months, the data links between Parkes and Darmstadt in Germany had been failing. Normally the data would have been sent on wideband links, but these were rare in those days and NASA was also using the Parkes dish and had used all the wideband systems for the Voyager encounter with Uranus. ESA was thus forced to use a packet switcher to combine several voice data circuits to obtain the bandwidth needed for the mission.

ESA had five voice circuits and one spare circuit for the mission. The nature of the fault was that the circuits failed and shut down one by one, narrowing the bandwidth until there were no circuits left operable.

ESA believed that they had not been getting the response that they needed and made a complaint to the Australian Government. Well it turned out that the company I worked for was owned by the Government. It seems that I was spearheading the government's response. I packed the appropriate equipment, picked up a hire car and headed to Parkes.

My arrival at the massive Parkes Radio Telescope was surreal. Just like a scene from 'The Dish'. It was 1985 and security in Australia was only brought on line as required. I went to the office building first and it was totally empty, a bit like the…*Marie Celeste*. Fresh coffee in the pot and lunch wrappers on desks. I visited a couple of other buildings and found the same.

I drove over to the dish and thumped on the one and only door. Nothing! The door had a security key pad and I noticed a pencilled set of four numbers. I keyed them in and the door clicked open. Again, no one in the building under the big 64 m (210 ft) dish.

Finally someone turned up and found me sitting in the 'drivers' seat of one of the country's great icons. They were shocked as much as I was. It turned out that the entire staff was at the one building I did not visit (the visitor's quarters). They were there for a function. Security was immediately upgraded.

I set up my equipment to check the various systems and circuits. It was a huge task and the results were startling, but not the news ESA wanted to hear. I had worked 36 hours straight, had eight hours off and then worked another 24 hours before releasing my findings.

There were issues and telco staff were flown in to rectify the minor problems, but the circuits were stable. The bad news for ESA was that I had tested their packet switcher with a circuit simulator and loop backs and I had witnessed their packet switcher fail. Like any good Australian, I simply told them what I had found. It appears that diplomacy and politics was not part of my electronics education.

ESA was not impressed. It was pointed out to me later, that days after ESA making a huge diplomatic scene, I had just told them that they did not know what they were doing. Now I was rather junior in the chain of command but radio and communications was in my blood and I knew my stuff. I returned to Sydney and a week later I was partnered with a senior engineer and sent back to Parkes. It seems that no one in the company understood the finer points of my report and there was a debrief required by ESA.

The engineer was out of his depth and I had to go over the story carefully so that it could be relayed at the meeting since I was too junior to attend. He often came out of the meeting with more questions and then disappear back inside. ESA had thoroughly tested a lot of their equipment since my visit and had even updated the drivers for their reel to reel tape backup – another problem that I had spotted.

Finally, it was reported by my senior engineer that ESA had requested my attendance at Parkes for the Giotto flyby of Halleys comet. I also attended a few other critical milestones prior to the event and of course my senior engineer came with me just in case I again breached a political protocol. The encounter was amazing.

Why the fuss over the circuits since they had the backup tapes? As I was told; it was all about the TV coverage of the flyby. If that failed, then the whole mission would be seen as a failure. The general public's opinion counted in the ESA dominated flights to Halley's comet.

The Soviet Union launched two spacecraft, Japan also launched two and the USA redirected a spacecraft. The ESA design shield was the only shield good enough to protect their craft from destruction at close quarters, but it did take damage.

I was also present for NASA's Uranus flyby a short time later and then a couple of years later I was back again for Voyager's Neptune pass. It was a grand end to my comms career with space. At least for some time.

Q. You're now involved quite heavily in your own missions, building not only high altitude balloon projects, but also small satellites. How did this come about?

In 2009 I was approached by a staff group from my old company. They had received a message from Pat Barthelow from the US. Pat is a HAM radio operator and loves Moon Bounce. He proposed that we get a dish in the US to talk via bouncing signals off the moon and back to Australia. It was to be a commemorative event for the Apollo 11 40th anniversary.

The staff group called the Overseas Telecommunications Verterans Association felt it was out of their set of abilities and handed the opportunity to me in case I had a way forward. As it turned out Parkes was not in a position to contribute, but we managed to make the event a huge success with dishes all over the world taking part.

This included the old Ororal Valley NASA dish now located in Tasmania and operated by the University of Tasmania. The event also broke records with low data bounced off the Moon and received successfully in the Netherlands. The transmit power at the feed point in Tasmania (was) 3mW – about 1/1,000th the power of a bright LED flashlight. In 2010 we also ran the event and this time Pat was given the monstrous Aricebo dish. We have not run another event of this type since, but it did mark my return to space and not just in communications – also engineering.

The balloons? That was initially an inspirational hobby to get my son Jason involved in science. He was nine years old at the time and we looked around for a group launching balloons into the stratosphere. The groups all thought it was too hard. Well those that know me well know that this is a red flag to me. Jason and I researched balloon flights and we joined a few Facebook groups to help with some balloon flights and finally we launched our own.

It was very successful and Jason was so motivated that he got his amateur radio license (HAM) at age nine. Since then we have launched 18 balloons into the stratosphere and recovered all 18 payloads. The last two flights were in Croatia and these were as part of Team Stellar – these were part of a competition for Croatian Students. They built the experiments and we flew them to an altitude of over 30 km (19 miles). We had to keep them within the very tight borders of the country and to make sure that we did not land in one of the many land mine fields scattered over the country. Swamps, forests hills and mountains were also new challenges.

We will soon be launching Zero Pressure Balloons for heavy commercial payloads. It is a growing business with commercial opportunities, including taking test components for spacecraft to the edge of space.

Q. You are returning to the Moon as part of a Google Lunar X Prize project, can you tell us what this is, and who else is involved.
Team Stellar had spotted my work on building a deep space network and I joined the team 18 months ago. We are working on some fantastic projects aside from landing on the Moon for the Google Lunar X Prize (GLXP). Stellar is a serious business with a long term objective. Personally I do not believe that any team with just the GLXP in their sights will be successful in reaching the Moon.

Any group needs the full support and structure of a company to achieve the necessary milestones to make a lunar landing a reality. I have watched Stellar grow and evolve and the members have ideas worth taking further. Stellar is going to be a force to be reckoned with in the space sector. My son Jason, now 12 years old, is also involved as the Australian Student Representative for Stellar. He was essential in launching balloons in Croatia, while I head up the Communications, tracking and Data Division for Stellar.

Q. You're aiming to secure purchase of your own large radio antenna, what is this, and why do you feel the need to have this facility?
It has been a long term goal of my company, PlusComms. It now looks like we will only need a dish in the US to complete the network as things are progressing here in Australia with a 30 m (98 ft) dish. There is a real need for more dishes for deep space work and using older infrastructure that has another 30 year life-expectancy is a good way to go. The Parkes Radio Telescope is now 50 years old and will have another 50 years of service as far as the mechanics are concerned.

Q. Australia has always been seen as being at the cutting edge of radio telescope technology, with projects like the SKA for example, being the most recent. Do you see this continuing and what can be done to encourage the younger generation to get in to radio astronomy and communications?
Yes, Australia will remain at the forefront of radio astronomy and given the vast southern skies, there is a real need to explore areas that are not being observed by others. As for getting into comms and radio astronomy, if you create the jobs, the rest is history. Inspiring students to take on these fields is very simple. Get them doing things in space or at least 'up'.

When my son was nine I decided to send a payload aloft and recover the experiments and equipment. The result was UpLift-1. We are now at UpLift 19. The

previous 18 flights have all been launched and recovered – 100%. We even were sent to Croatia to manage the last two flights with student payloads for Team Stellar. Both were successful. My son is now telling everyone that he will become an aerospace engineer. He is 12 years old. He will try to break the sound barrier with a radio controlled model aircraft in the next 12 months. He is well and truly inspired.

Afterthoughts from Nick Howes:

One of the great sayings in life is that you have to be ‘at the right place at the right time’. For a school age student, to be asked to play a part in the first Moon landing must surely rank as one of the greatest examples of this in history. How it then led Robert to his pathway through multiple Apollo missions, all the way through to the greatest robotic mission in history, in Voyager 2, is the stuff of legend. Robert worked hard at college to be that person, and that hard work truly paid off.

However, when you meet Robert, you find someone who knows he was blessed with great fortune, and the pride he shows in encouraging his own children, and the youth of today in being a part of the new era of space flight is infectious and inspiring. I first met Robert in person while he was chatting to none other than Buzz Aldrin, at a conference in Tucson in 2012. He’s someone you instantly click with, and a great ambassador, not only to Australia, but to anyone interested in space.

His passion for space flight and space history has crossed many boundaries. From art, through to images, showing the Moon in a way few will ever have seen it, to the development and flight of his own satellites, and balloon projects. Robert is never ‘not busy’, but also, this non-stop, can-do attitude should serve as a message to everyone that you can achieve great things through hard work, and a little luck. I for one, can’t wait to see what the future holds for this brilliant entrepreneur.