

# No Place Like Home

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THE LATEST IMAX BLOCKBUSTER WAS FILMED BY A BUNCH OF ROOKIE CAMERA OPERATORS, BUT THEN AGAIN THEY WERE ALL HIGHLY TRAINED ASTRONAUTS LOOKING TO SHARE THEIR PRIVILEGED VIEW OF THE PLANET WE CALL HOME // written by Terry Hope

Every astronaut that's ever had the privilege to head off into space has come back enthralled and inspired by the experience. It doesn't matter how familiar you might be with the vast amount of imagery out there depicting the view looking back towards Planet Earth, nothing quite prepares you for the real thing. And when you do experience it firsthand it's a moment that changes your life, reminding you just what a beautiful home we all share and how vulnerable it can be should we not take good care of it.

With space tourism still in its infancy the fact is that most of us will never have the chance to share that same awe-inspiring experience. However, there's still

a chance to get a strong flavour of what it might be like thanks to the medium of film – specifically IMAX film. Those who have been to an IMAX cinema will already be familiar with how intense the experience can be, with a screen that extends beyond your field of view, stunning film quality and state-of-the-art sound.

The problem is that IMAX cameras, thanks to the size of the 65mm film they use, are big, cumbersome and heavy, three things that are anathema when it comes to taking something into space. The ending of the space shuttle programme, the only way to get bulkier items into space, appeared to shut the door on further productions, but the development of smaller high-

quality digital cameras has come to the rescue. The latest IMAX blockbuster – the seventh to be made in space – is *A Beautiful Planet*, which serves as a testament that it's now possible to achieve ultimate high quality without a bespoke piece of heavy-weight kit.

## // A LIGHTER ALTERNATIVE //

The film's DoP James Neihouse is not just a veteran of large-format films – he's worked on over 30 IMAX productions – but he's also had a long association with NASA. Together with director Toni Myers, James has become something of a specialist in terms of filming big movies about space, having been involved in this sector since the 1982 film *Hail Columbia!*, which

covered the launch of the first space shuttle.

Given that it was no longer feasible to work with traditional IMAX cameras it fell to James to find a good alternative. After evaluating possible replacements the decision came down in favour of the Canon EOS C300, even though the Mark I only shot in HD. This was because James liked the image – and there was also the knowledge that the 4K C500 was in the wings, which was ultimately the camera that made the journey into space.

“*A Beautiful Planet* is the first IMAX space film to be shot entirely on digital cameras,” says James. “The traditional IMAX cameras did an amazing job, but had their limitations. You could shoot three minutes



of footage on a 305m/1000ft roll and at the end of a flight you may have 30 minutes of film – ten rolls that weighed 45kg/100lb – and there would be a lot of pressure to get the shot required first time since there was not enough film for retakes.”

The C500, which was used to shoot interiors of the space station, was paired with Canon’s 15.5-47mm T2.8 cine zoom and 12mm ARRI Master Prime T1.3 lenses, a choice dictated by the somewhat cramped confines of the ISS. The camera recorded a 1080 proxy onto a CF card at the same time as outputting 4K, enabling both to be recorded.

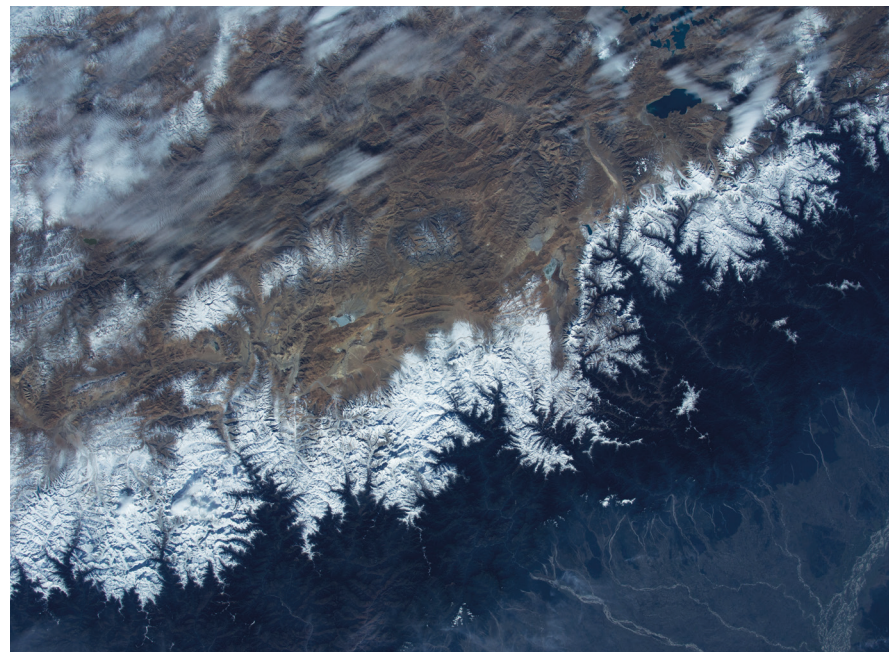
## “The aspect ratio of the full-frame still sensor at 1.5:1 closely matched IMAX cameras.”

While James felt the C500 was well suited to the crucial task of recording day-to-day life on board the ISS, he needed extra clarity for the images looking back towards Earth, and for these he turned to the full-frame 4K-capable Canon EOS-1D C DSLR, used in combination with Canon’s 14mm T3.1 and 24mm T1.5 cine prime lenses, to achieve time-lapse shots of the planet.

“Almost all shots of Earth in the film were produced using this camera,” says James. “Basically what you’re seeing is a ‘hyper-lapse’ of the Earth as it’s moving by at 17,500mph/28,163kmh. There were two advantages to this approach: firstly, the aspect ratio of the full-frame still sensor at 1.5:1 closely matched IMAX cameras, enabling 5K resolution. Secondly this approach meant it would also be possible to use longer shutter speeds to expose for night scenes.

“We wondered what this hyper-lapse material would look like on the IMAX screen, but first tests weren’t successful. The fix we eventually came up with was to interpolate the in-between frames, converting the low-frame-rate timelapse to 24 frames-per-second, and this footage was perfect.”

There were, naturally, further hurdles to jump through before everything was ready to go. For example, everything that’s going into space needs to be put through a rigorous series of tests by NASA to ensure it couldn’t possibly be toxic to



the flight crew. The CF cards, codex solid-state drives and the Onboard S+ recorder had to be tested for radiation susceptibility, as they’d be bombarded with a year’s worth of radiation in about three seconds. The results were all clear, and James and his crew were confident the data would survive low Earth orbit.

Then it was a case of training the astronauts who were due to use the filming equipment in space. James jokes about being the only DoP that had to teach his first unit how to shoot, but then again he wasn’t working with the usual contingent of novices. “You really can’t beat astronauts for students,” he says. “They are some of the fastest learners on (or off) the planet.”

And the process is a two-way street. “So far I’ve trained about 140-150 astronauts in filmmaking techniques,” says James, “and I learned a lot in return. This meant we had a good understanding of what was possible, and were able to send them up there with a shopping list of the things we wanted them to shoot. These included things like exercising, holiday celebrations, new crew arrivals and daily routines that show what living in space is like. There were also Earth targets, which were the main theme of the film; about 150 specific locations on the globe were on the list.”

### // A HELPING HAND //

One of the key resources on *A Beautiful Planet* was retired astronaut Marsha Ivins, who filmed several times in space during the five missions she flew. “I was fortunate enough to have IMAX manifested as a payload on three of my shuttle flights,” she says, “and I was assigned to operate the camera on each of those missions. Each of these films had a slightly different theme and during training Toni Myers and Graeme Ferguson, the writers and directors, would explain what story they were trying to tell, and then James trained us regarding how to capture those scenes. Toni told us that ultimately we were the directors and that if we saw something important that wasn’t on our list of things to cover – which included an alien knocking on our window – then we should go ahead and shoot it!”

**TOP** The astronauts on the ISS were trained to use the digital Canon cameras to achieve the required shots.

**CENTER LEFT** Everyday scenes around the ISS were all part of the footage produced by the astronauts.

**CENTER RIGHT** The Earth from above yielded extraordinary images.

**BOTTOM** James Neillhouse had the task of training the ISS astronauts to use the C500, but they were quick learners.





**ABOVE AND BELOW LEFT** The spectacular Aurora is something that conventional film-based IMAX cameras could never have captured.

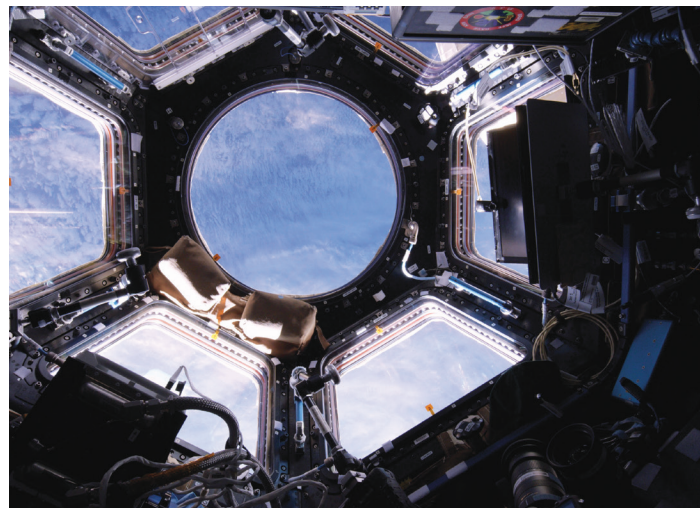
**BELOW RIGHT** Everyday scenes around the ISS were all part of the footage produced by the astronauts.

Marsha had a number of roles during the making of the film, acting as the IMAX interface with the NASA teams during the certification, manifesting and integration of the hardware prior to flight. This meant supporting local meetings and approval boards at the Johnson Space Center in Houston, helping write the procedures, assisting James during training, and interfacing with the mission support teams and the crew before and during the missions. The images from the EOS-1D C and the HD proxy files

from the C500 were downlinked with all the other on-board ISS imagery, while the full 4K imagery from the C500, recorded onto hard drives on a separate codex recorder, were returned on the SpaceX Dragon resupply vehicle when it made deliveries to the ISS. However, the process became derailed when the SpaceX was grounded, and the IMAX team ended up with 4K video data on hard drives with no obvious way to get it back to Earth.

“My job was to figure out how to get this data downlinked through a process not done before during orbit, get it approved, write the procedure

## “We figured out how to get this data downlinked through a process not done before during orbit”



and then sit in Houston’s mission control back room while we transferred 1.5TB of data to a laptop to be downlinked,” says Marsha. “It ended up being a very convoluted procedure that involved James and I heading out to the codex facility in Los Angeles to figure out just how to tackle things. They gave us a procedure – involving dozens of keystrokes and entries of long numbers – to transfer the data from a codex drive to the hard drive of the laptop. We set up a number of download sessions with the ISS, each one lasting about six hours, and each time we moved about 145GB of data onto the laptop where it took its

## “Shooting in a digital format was a game changer and enabled higher ISOs”

place in the downlink queue. We did these sessions twice a week until we’d transferred and downlinked all of the on-board codex hard drive files.”

Shooting in a digital format was a game changer and enabled higher ISOs to be used – with film the maximum ISO was 500 – and this in turn allowed such things as auroras, lightning, moonlit Earth scenes and night city lights to be captured in a way never seen before on an IMAX screen. “The other advantage of digital cameras was the ability to reshoot a scene,” says Marsha. “The crew would shoot a scene, downlink it and we then recommended other exposures, adjusted framing and, if necessary, had them reshoot the scene. This feedback loop allowed Toni, as the director, the ability to get exactly what she felt she needed.”

For Marsha the highlights of the film are the in-cabin scenes. “To see the unmitigated joy on the faces of the crews made me long to be back in space,” she confesses. “I think this movie shares that joy with the audience in a way no other movie experience can.” But what about the sense of actually being in that privileged position looking back at the planet, a scene that has still only ever been seen first-hand by a handful of people? Does this IMAX movie successfully capture something of that?



**ABOVE TOP** The astronauts on the ISS were trained to use the digital Canon cameras to achieve the required shots.

**ABOVE BOTTOM** The use of digital cameras for the latest IMAX film enabled higher ISOs, making night shots possible.

“I don’t think it’s possible for any film to truly convey the feeling of what it’s like to see Earth from space,” says Marsha. “Imagery can’t give you that visceral, emotional ‘add’ of realising you are no longer on the planet. What the IMAX space films have done better than any other medium, however, is to convey a sense of what it’s truly like. Seeing the images of earth on the giant IMAX screen, with music and the eloquent voice-over of the crews, is about as close to the real experience as earthbound viewers are ever likely to get, and that’s an incredible achievement.” //

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