

# My NOAA-19 Photo Album

Ed Murashie

What a vacation I had last February!

The excitement had begun in December 2008 when I searched the Internet for information on the upcoming *NOAA N Prime* weather satellite. I noticed that NOAA was soliciting bids for an Educator's Conference in conjunction with the launch and that a company named *Space Information Labs* (SIL) was likely to win.

I contacted SIL and a name from my past wrote me back, Edmund Burke, President and CEO. Back in 1998, I had met Edmund when I attended the very first NOAA Educator's Conference. Edmund was, and still is, affiliated with the *Endeavor Center Organization*, an outreach group whose goal is to inspire students with space science, especially through their teachers. I had thought the government had stopped sponsoring these events because of budget cuts but, in fact, had sponsored one for *NOAA N-Prime*. Edmund not only invited me to attend, but also asked if I would be a presenter; before he could change his mind, I agreed. I must say that putting together one of these conferences, lining up the funding, sponsors, conference center and working with NASA, NOAA and the Air Force for base clearances must be a lot of work, but no one could do a finer job than Edmund. He is one passionate man and a real inspiration for the teachers.

My first thought was to have a workshop on setting up an APT station—like a teacher might do in class. After talking to several people, including some in the business, their advice was to give a retrospect talk on the satellites. So I prepared a presentation with 90+ *Power Point* slides for a 75 minute talk that covered the history, types of weather satellites, how to set up an APT station, where to get the data on the Internet and what to do with the data once you have it all.

The conference was held at *Allan Hancock College* in Lompoc Valley Center near Vandenberg AFB, California and started for most at 9 am on February 3 then went on until 3 am on February 4. For the presenters, it began around 8 am, when we had to set up the classroom and figure out the elaborate audio visual system. Edmund welcomed the group of about 30 teachers, fewer than in the past due to education budget cuts, and introduced the speakers who gave 30 second synopses of their workshops. There were six workshops including *What's Up with Gravity*, *Mission to Planet Earth*, the Florida State University *Explores!* Program, *Using Satellites to Learn about Weather Around the World*, *How Satellites Measure the Atmosphere* and yours truly's *Weather Satellite Reception in the Classroom*.

There were three sessions, and each workshop was given twice. Shortly after Edmund's introduction, everyone was released to attend their first workshop. Now, even though I explained in my synopsis that the workshop expanded in scope to be *'Weather Satellites 101'*, to my worse nightmare, no one showed up! After ten minutes I wandered into Dr Paul Ruscher's *Explorers!* workshop; he glanced at me with a look to say: 'shouldn't you be in your own workshop?' Paul has been attending these conferences since the first one and has been one of the best promoters of weather satellite reception I know. I sat in for a while and then went back to my classroom to ponder whether or not *Weather Satellite Reception* is that boring as subject matter? Has teaching become so focused to allow only teaching the tests? Is this an American issue or one stretching across the world?

As I prepared for my next workshop, during the final session, I was relieved when one person and then another walked in and sat down. By the time I started my presentation, thirteen teachers

had showed up. I owe it to Paul and others who had championed my talk. The presentation went well with great questions during and after it, like: 'What do you mean by morning and afternoon satellites?' and political questions like 'Is the satellite data encrypted?' I represented GEO well by mentioning their publication, website, *YaHoo* email group and shop, and handing out PDF copies of back issues. I spoke highly of David Taylor's software and its many uses. I handed out CD copies of my presentation containing many images, Internet links and NASA and NOAA publications.

After the workshops, we took a bus to Vandenberg Air Force Base and had a tour of the *NASA Mission Control Data Center* from where the launch is controlled. Now this was impressive, because the teachers were able to sit in the directors' seats, with consoles displaying live data and the check list and headset sitting in front of them, five hours before the actual directors were to arrive and start the count down. And wouldn't you know it, the consoles are *Microsoft Windows* based. There is no more push of a button; it is a click of a mouse to launch a rocket. John Demko, NASA KSC Resident Office Manager at Vandenberg AFB, talked about the sequence of events, who sat at which consoles, and what his job was like. He spoke about his background as aerospace engineer and said his favourite activity is to give tours; his worst is managing budgets. Overall he loves his job and will probably retire doing it.

As if the Mission Center tour were not enough, Edmund lined up an even bigger attraction. He said we could either go back to the hotel to check in, or go out to the launch pad and watch them roll the tower back from 100-150 yards away! Was it any surprise the bus was full going to the pad? It was a perfect night, a beautiful sunset, a few scattered clouds, the slightest breeze—with the *Delta II* rocket and tower lit up by spotlights.

It took about five minutes to roll the tower back, by which time the sun had set, leaving the bright white payload fairing and slender green rocket against a black background with the temperatures dropping rapidly.

After checking into the hotel, we headed back to the *Pacific Coast Club* at Vandenberg AFB for a social hour followed by a buffet dinner. Let me tell you, the club really knows how to prepare an excellent buffet. The *Pacific Coast Club* was magnificent, with its collection of space photos, past officers' portraits and photos of President Kennedy touring the base. I questioned my luck early on when no one showed up at my first workshop but it turned around and did not stop with the Center and launch pad tour. In picking the best table to get photos for this article, I happened to pick the same table where the three NOAA dignitaries would sit. To my left was Tom Wrublewski, NOAA *N Prime* Satellite Acquisition Manager and a former teacher, Gary Davis, Director of the Office of Systems Development and Mike Mignogno, NOAA Polar Program Manager. We talked about the rich heritage of TIROS and the future and I gave them all a copy of my presentation.

Each man gave a brief talk about *NOAA N Prime*, its uses and the future of the polar program, including NPP and NPOESS. Tom's talk centred around a video that can be found on *YouTube* at

<http://www.youtube.com/watch?v=I5gD-YVpnzo>

One interesting part was President Kennedy's speech about going



The view at sunset, just hours before the initial launch attempt, as NOAA-Prime sits atop its Delta II launcher.



Ed standing 150 yards from the pad next to the 'No photo' sign



Ed presenting his workshop



Opening remarks by Edmund Burke



NOAA N-Prime Awaiting launch



The Delta II and tower



NASA Mission Data Center

to the moon, where he mentioned the TIROS satellite. The last speaker was Dean Davis, Senior Principal Scientist/Engineer for Boeing, who gave a great talk on the *Delta II* launch vehicle, which is celebrating its 20<sup>th</sup> anniversary.

After the speeches, it was just a matter of consuming enough caffeine to stay awake, board the bus and watch the rocket take off at 2:22:01 am. We rode out to the viewing site, took a few photos and then sadly climbed back on the bus when the launch was scrubbed. The problem was not the weather or the rocket; it was the launch pad and a faulty relay board that controlled the nitrogen pressurisation system. After a few hours of sleep and a filling breakfast it was time for a beautiful drive down the California coast. So if you ask yourself: 'Did Ed miss the launch?' Not really! I had seen two before but I had never *visited* the Mission Director Center and *seen* the rocket from 150 yards away! I highly recommend attending the next conference. I know I will.

My vacation was not over yet. I had pictures of the people responsible for the satellite and the satellite itself but I needed pictures from the satellite. After hearing first reports from Stefano Grassi and Douglas Deans, and seeing the great first images from Milan Konecny and Fred Piering, I decided it was my turn to see what NOAA-19's image quality looked like. Fred's first picture was so good that it can be found on the NASA and NOAA websites—certainly great press for us amateurs.

My first HRPT image was received at noon on Friday February 6, during orbit 5, but was noisy because I was not ready to operate on 1702.5 MHz with left hand circular polarisation. The following orbit at 1.39 pm still did not produce a noise-free image of the US West Coast because I had not figured out the correct polarisation. I spent Saturday at my ex-wife's house putting up the antenna I took to the conference, since I get better APT reception there than at my house because of power line noise. I received two good passes, from orbits 19 and 20, on 137.9125 MHz using a *Quorum Communications* quadrifilar antenna, a modified *Bearcat* scanner and the WXSAT APT decoder program. On the Sunday, I captured two noise free HRPT passes, orbits 33 and 34, now on 1698 MHz RHCP, with my homebrew equipment and two good APT passes. The HRPT images were processed using David Taylor's *HRPT Reader*. My final fun task was putting together this photo album.

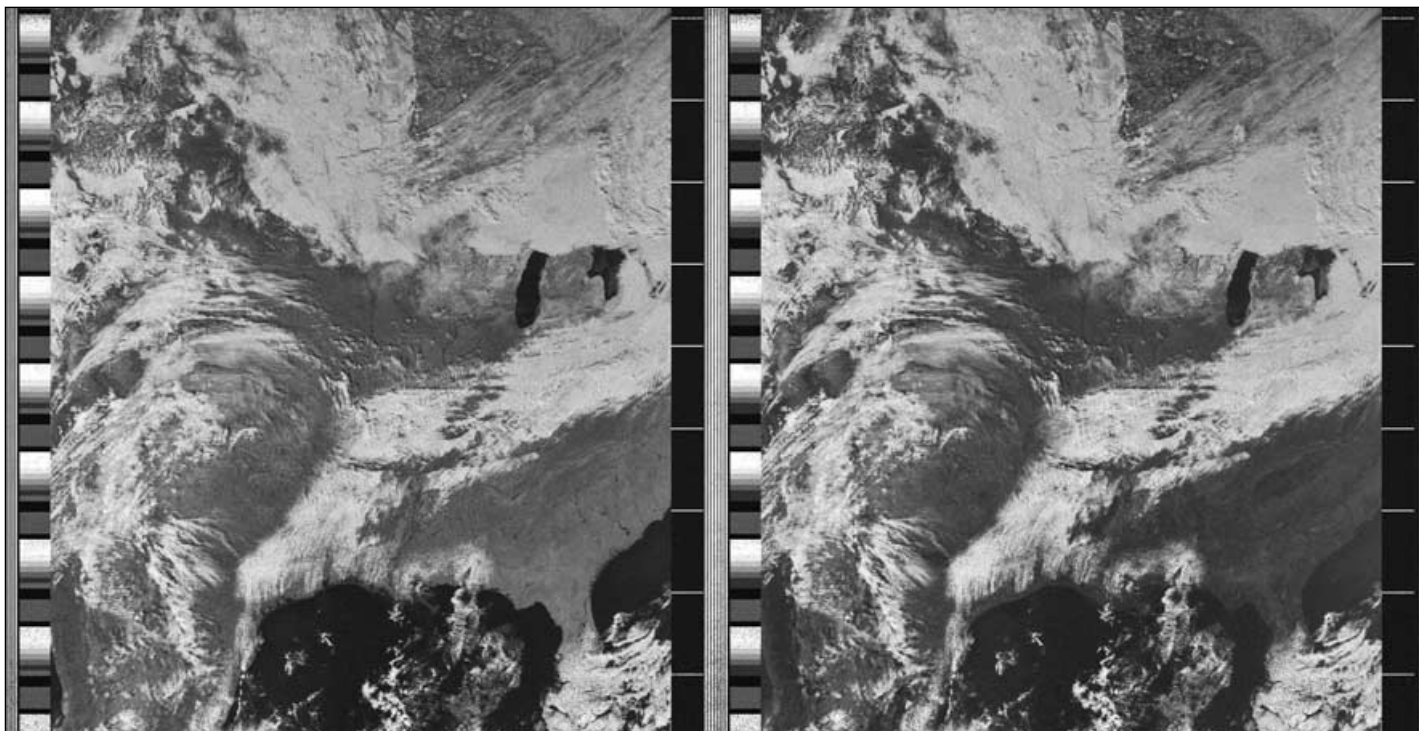
I learned many interesting facts about the satellite and rocket before, during and after the conference. First are the historical aspects of the launch. Next year will be the 50<sup>th</sup> anniversary of the launch of *TIROS I* on April 1, 1960. A team of volunteers are restoring the Fort Monmouth New Jersey *TIROS I* ground station and their work can be followed at

<http://www.infoage.org/>

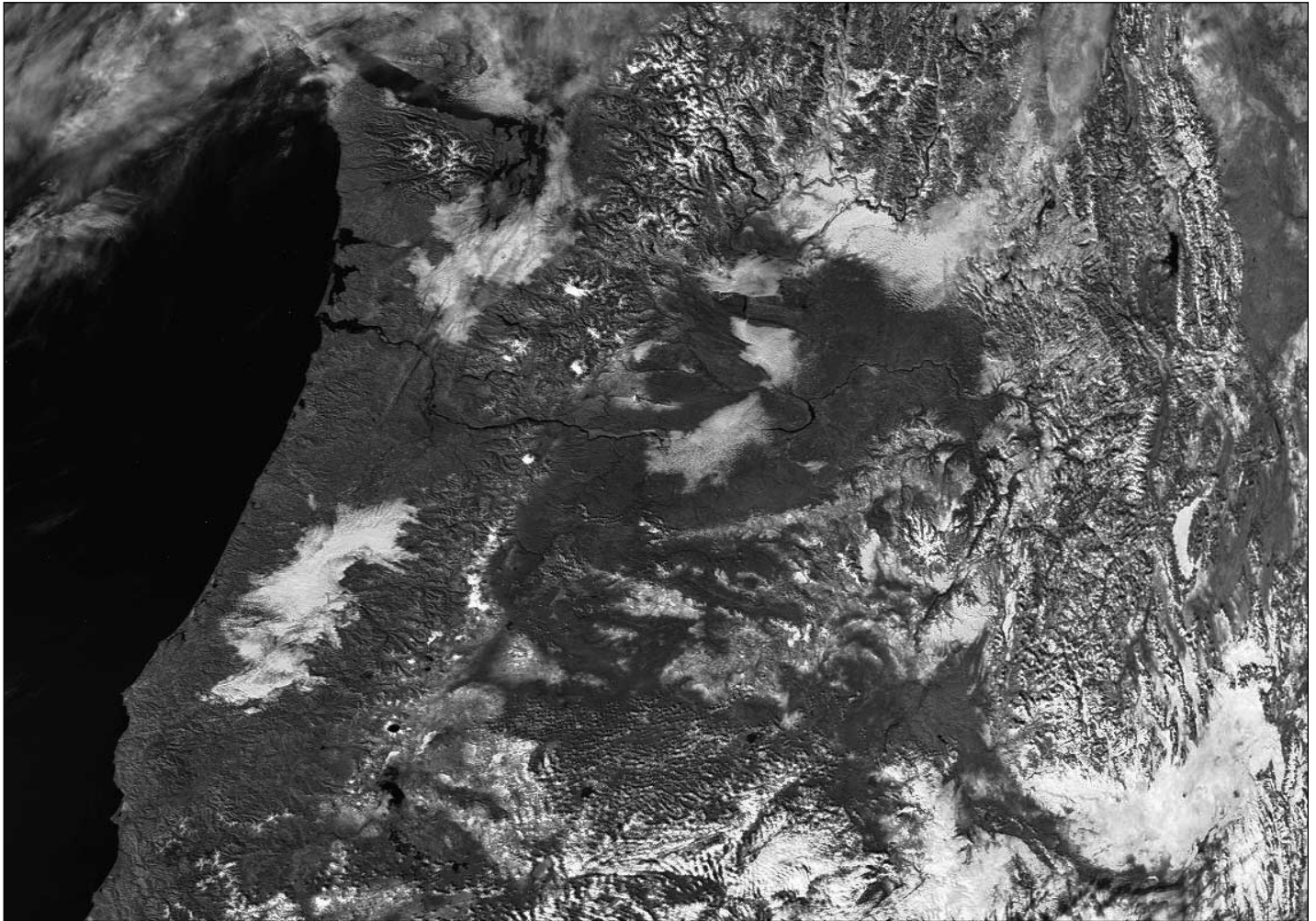
*ESSA 1*, the first operational TIROS satellite, was launched exactly 43 years prior to the day of this conference and the *Delta II* rocket used to launch *NOAA N Prime* celebrates its 20<sup>th</sup> anniversary during February. The saddest historical note is that this is the last ever TIROS satellite and marks the beginning of the end of APT and HRPT. This generation of TIROS has produced operational satellites lasting from two weeks to eleven years: an average lifetime of 3.75 years. Let's hope the latest will last the longest!

NOAA started the \$564 million TIROS project by defining the mission requirements and securing the funds. It then relied on NASA and the Department of Defense to supply the satellite, launch vehicle and launch support. NASA contracted with Lockheed Martin to build the spacecraft and ITT to build the six-channel AVHRR/3 instrument that supplies our images. During a routine operation on September 6, 2003, the *NOAA N Prime* satellite made news when it slipped off its turn-over-cart while being moved from a vertical to horizontal position. Twenty four bolts needed to secure the satellite to the cart had not been installed. Lockheed agreed to forgo their profits on the satellite to pay for the \$217 million dollar repairs. Seventy percent of the satellite was repaired or replaced. As a NOAA official put it, in many cases it was easier to replace the pieces than perform the analysis to see if the items were damaged. The repairs were made and the satellite was placed in storage on March 7, 2008.

On November 4, 2008, the satellite arrived at Vandenberg AFB from Lockheed Martin in Sunnyvale California and processing with final ground checks started. The assembly of the *United Launch Alliance Delta II 7320-10C* two-stage rocket, with three solid rocket motors, began in early December at Space Launch Complex-2, Vandenberg AFB. The rocket's 85.6-foot long 8-foot diameter first stage was powered by RP-1, highly refined kerosene, and liquid oxygen. The second stage, 19.6 feet long and 8 feet in diameter, was powered by hydrazine and nitrogen



My First NOAA-19 APT image, acquired during orbit No 19, at 19:52 UT on February 7, 2008



Detail of the States of Washington and Oregon - NOAA-19 channel 2 HRPT at 21:28 UT on February 7, 2008

tetroxide hypergolic fuels. Three solid GEM engines each 42.5 feet long and 3.3 feet in diameter were attached to the first stage. In January, NOAA N Prime was placed atop the Delta II second stage and the fairing attached.

The first launch attempt, during the Educator's Conference, was scrubbed at 1.52 am on February 4, just 30 minutes before launch. The reason was a fault in the relay board that controls the gaseous nitrogen purge system. Repairs were made and a second launch attempt made on February 5, despite approaching bad weather and a forecast for 60% weather violation at launch time. Again a scrub was called, five hours before launch, because of a fault in the air compressor that sends dry clean air into the fairing around the satellite to prevent hydrocarbon buildup.

The third attempt was on the morning of February 6 during the same 2.22 am launch window. Despite a 60% weather violation, the rocket was launched successfully, and within 15 seconds it disappeared into the low clouds. At 65 minutes 56 seconds after launch, NOAA N Prime separated from the Delta II second stage in a 470 nmi, 98.7° inclination orbit, trailing NOAA-18 by 37 minutes and leading by 5° west longitude. At 4.03 am the satellite was renamed NOAA-19 and Wayne McIntyre, NASA POES Project manager, declared the satellite 'in a nominal orbit and all spacecraft systems functioning properly'. NOAA-19 will go through a checkout phase and, once declared operational, will replace NOAA-18 as the primary afternoon satellite and work with Metop-A, the primary morning satellite, to monitor the Earth's environment. The launch timeline is nicely captured at

<http://spaceflightnow.com/delta/d338/status.html>

NOAA-19 carries an AVHRR/3 six-channel radiometer similar to the ones carried on NOAA-15 through NOAA-18. When first activated, the HRPT stream includes channels -1 through -3A.

Channels -3B, -4 and -5 are currently switched off until the unit has outgassed and the coolers turned on. APT shows channels-1 and -2 during this initial period but once fully operational, should display channels-2 and -4 during the day and channels -3B and -4 at night. Details about the AVHRR/3 characteristics and the spacecraft can be found in the NOAA N Prime booklet, which can be downloaded from

[http://www.nasa.gov/pdf/111742main\\_noaa\\_n\\_booklet.pdf](http://www.nasa.gov/pdf/111742main_noaa_n_booklet.pdf)

#### References

[http://www.nasa.gov/mission\\_pages/NOAA-N-Prime/main/index.html](http://www.nasa.gov/mission_pages/NOAA-N-Prime/main/index.html)  
<http://goespoes/gsfsc.nasa.gov/poes/index.html>  
<http://www.oso.noaa.gov/poes/index.htm>  
<http://www.osd.noaa.gov/POES/index.htm>

### **Second-Hand R2FX Sought**

We recently received an enquiry from Steve Craggs, who lives in Canada, asking if we could help him to obtain a second-hand R2FX APT receiver.

Steve wrote: 'I am looking for a used R2FX receiver. Perhaps some reader has an old one they used before buying the new R2ZX? It would cost me close to \$400 to buy a new receiver in Canada.'

Alternatively, I would be interested in plans to build a receiver, but the Internet does not seem to have any such plans. Please email me at [craggs@novachem.com](mailto:craggs@novachem.com)

Thanks.

Steve Craggs, Ontario, Canada.